



COLONEL JAMES JABARA AIRPORT

Commercial Site Development Study



**COMMERCIAL SITE
DEVELOPMENT STUDY**

For

**COLONEL JAMES JABARA AIRPORT (AAO)
Wichita, Kansas**

Prepared for

The Wichita Airport Authority

By



In association with



DECEMBER 2022

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INTRODUCTION

This study has been undertaken to examine three undeveloped parcel Areas at the Colonel James Jabara Airport (AAO) in anticipation of marketing these parcels for aeronautical and/or non-aeronautical development. The generalized parcel Areas are identified in **Figure 1** and will be refined based on the future development plans for the airport. The analysis undertaken in this study is meant as a deep dive that is not normally done in a more traditional airport planning study such as the recently completed Airport Layout Plan (ALP) update & narrative report or a master plan. The information collected for each parcel is intended to aid potential developers and airport administration in understanding factors that may be considered when assessing potential development of the parcels. This is a planning and informational document, and nothing contained herein should be used for design purposes.

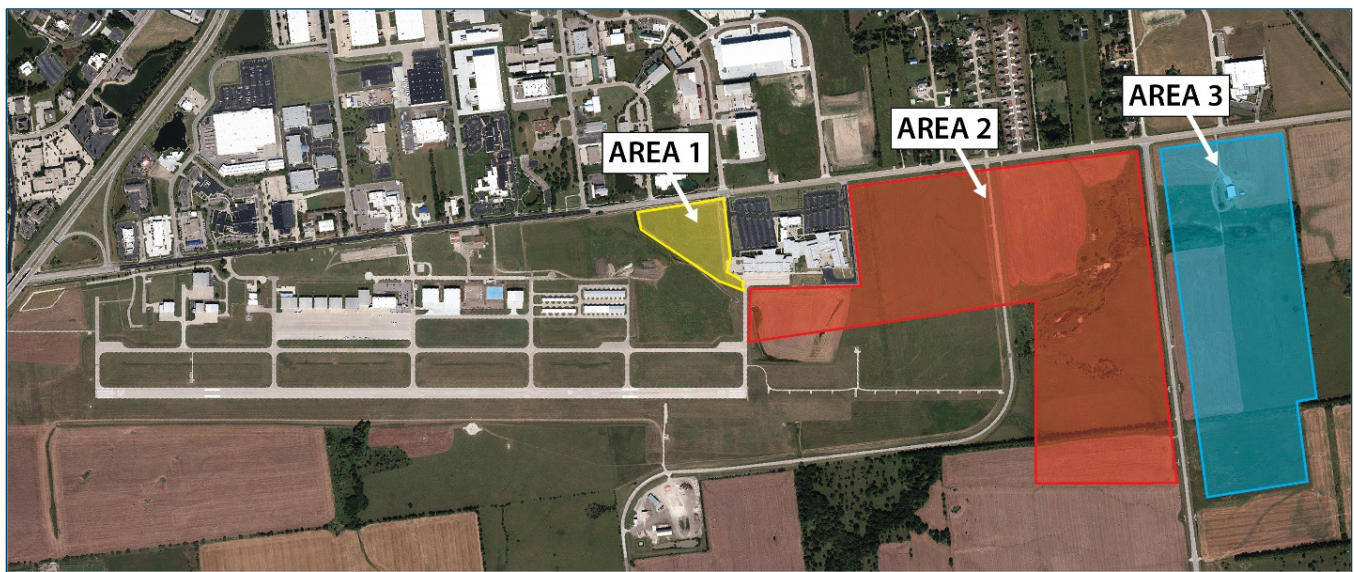


Figure 1 – Study Area Parcels (Generalized)

REFINED STUDY AREAS

Exhibit 1 – Airport Environs identifies the three parcel Areas under consideration which are labeled as Study Area 1, Study Area 2, and Study Area 3 and are described below:

Study Area 1 – South of WSU Tech: Study Area 1 is located along Webb Road on the west side of the airport immediately south of the Wichita State University Technology Campus of Applied Sciences and Technology – National Center of Aviation Training (WSU Tech). The south side of this parcel is defined by a drainage channel, a portion of which is a paved concrete stormwater conveyance channel. This Study Area is approximately seven acres.

Study Area 2 – North and East of WSU Tech: Study Area 2 is located to the immediate north and east of WSU Tech. It is bounded on the west by Webb Road, on the north by 45th Street North, on the east by the Runway 18 runway protection zone (RPZ), and on the south by Taxilane A1. This Study Area is

approximately 97 acres. This area includes a portion of the 43rd Street North right-of-way, a road that was closed in the summer of 2022 to bring the Runway 18 RPZ into full land use compatibility compliance. Future development of Study Area 2 may be considered with or without the roadway segment to provide access to navigational aids and emergency access. A potential future 1,000' runway extension to the north is also shown. This extension and its impact to the developable land available is discussed at length below.

In addition, a segment of Study Area 2 between WSU Tech and the 43rd Street N. alignment and adjacent to Webb Road is platted as open space. The original intent was to provide a buffer between airport activities and the residences on the west side of Webb Road.

Study Area 3 – North of 45th Street: Study Area 3 is physically separated from the primary airport property by 45th Street North. It is bounded to the west by Webb Road and to the north and east by private agricultural property. Study Area 3 is approximately 95 acres.

Currently none of the three Study Area parcels that are the subject of this study are served by a taxilane providing access to the runway system. The currently approved ALP includes two future taxilanes, one to serve Study Area 1 and one to serve Study Area 2. Study Area 3 is not planned to be served by a taxilane.

Exhibit 1 – Airport Environs shows the three Study Areas under consideration within a broad view of the overall airport environment. All three Study Areas are on airport owned land. The entirety of Study Areas 1 and 2 are in the City of Wichita. Approximately 75 acres of Study Area 3 are within the City of Wichita and the remaining 20 acres are in the City of Bel Aire. The parcel immediately north of Study Area 3 was annexed from Sedgwick County by the City of Bel Aire in 2022.

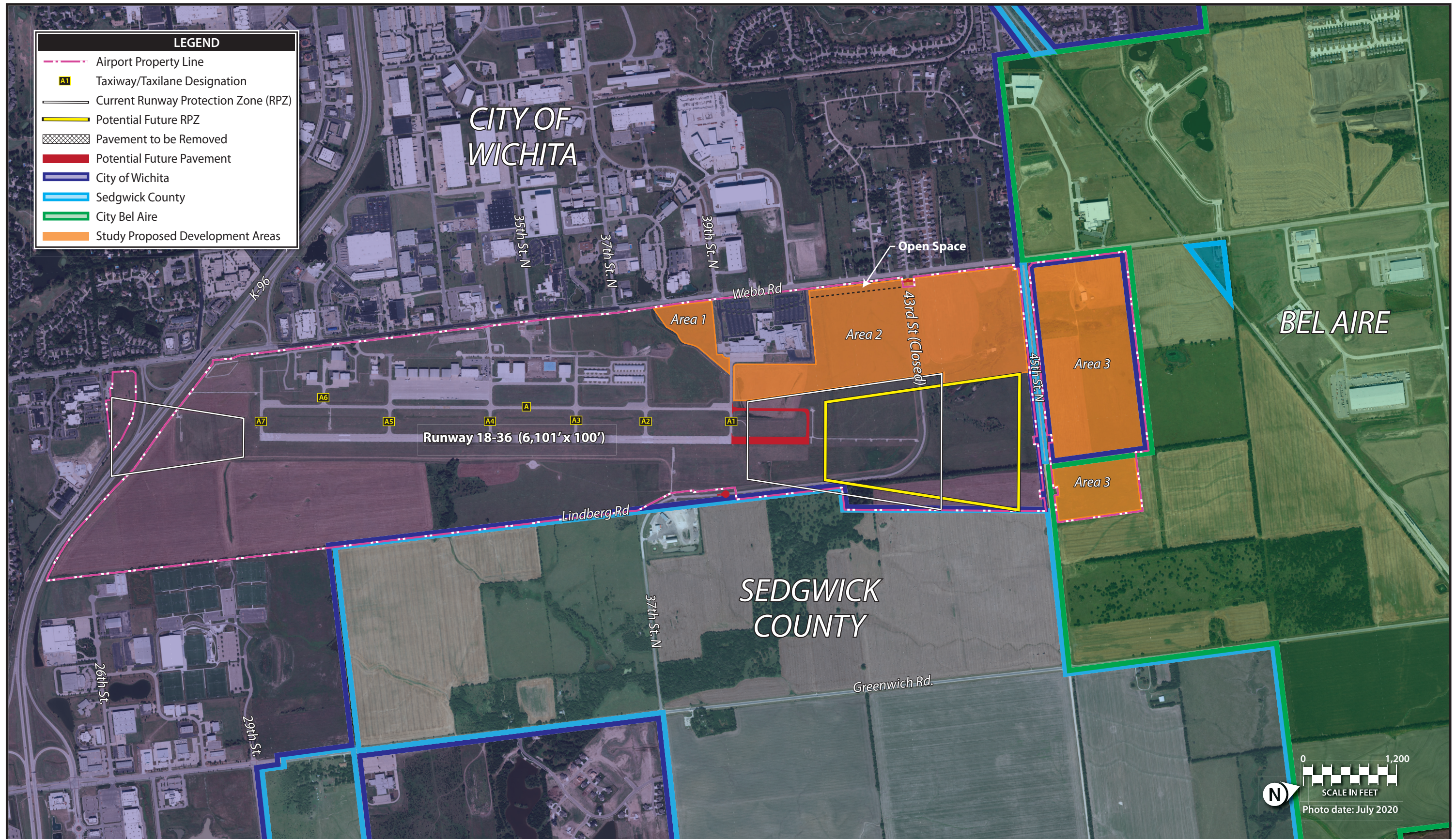
AIRPORT AMENITIES

While this study focuses on three specific parcel Study Areas, it is important to consider the capabilities of the airport. Colonel James Jabara Airport (AAO) is an FAA designated general aviation reliever airport. Reliever airports are planned to accommodate general aviation activity, including business jets, that might otherwise utilize nearby commercial service airports.

AAO offers a 6,101-foot-long concrete runway that is strength rated at 62,000 pounds for dual wheel landing gear which can accommodate repeated operations by nearly all general aviation aircraft including large business jets. There are multiple instrument approach systems. This includes an instrument landing system (ILS) approach to Runway 18 that provides visibility minimums of ½-mile and cloud ceiling minimums of 200 feet. This is the most sophisticated instrument approach available to general aviation airports. The airport is further supported by multiple RNAV (GPS) instrument approaches with weather minimums ranging from ½-mile visibility and 300-foot cloud ceilings (Runway 18) to 1-mile visibility and 400-foot cloud ceilings (Runway 36). This means the airport can remain open even in very poor meteorological conditions.

The airport has a full service fixed-base-operator that provides all typical FBO services. Numerous aeronautical businesses are based at the airport. There are 127 aircraft based at the airport including 35 business jets and 10 turboprops.

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CLIMATE CONDITIONS

Wichita, Kansas gets approximately 34 inches of rain per year. The U.S. average is 38 inches of rain per year. Wichita gets 13 inches of snow per year, and the U.S. average is 38 inches per year. On average there are 221 sunny days per year. The U.S. average is 205 sunny days per year. Wichita gets some kind of precipitation 79 days per year. The monthly mean maximum temperature is 93°F, which occurs in July. The monthly mean low temperature is 25°, which occurs in January.

Wind Analysis

The prevailing winds in Wichita are from the south for nine months of the year and from the north during the months of February, March, and April. Wind speeds average approximately 10 knots annually. During the daytime hours (7:00 a.m. – 8:00 p.m.), wind speeds average less than 15 knots for 12.22 hours of the 14 hours during the daytime. Visibility is generally very good in Wichita. On average there are 24.6 days per year when visibility is less than five miles for more than five daytime hours. **Table 1** summarizes this wind analysis.

Table 1 | Airport Wind Analysis

Year	Average Daytime ¹ Hours with Wind Speed <15 Kts	Days Per Year with Visibility Less Than 5 Miles for More than 5 Hours
2017	11.9	16
2018	12.19	18
2019	12.24	39
2020	12.36	29
2021	12.42	21
Average	12.22	24.6
¹ 7:00am - 8:00pm		

Source: Data is surface hourly global from NOAA for ASOS at AAO.

AERONAUTICAL v. NONAERONAUTICAL DETERMINATION

According to federal regulations, all airport property must be reserved for aeronautical purposes, first and foremost. If a federally obligated airport, such as AAO, has land that cannot or will not support an aeronautical purpose, then that land may be used for a non-aeronautical revenue producing purpose with FAA approval. Any revenue generated from airport land must be reserved for airport operation and capital improvement expenses. **Exhibit 2 – Study Area Land Use Classification** shows the recommended aeronautical and non-aeronautical classification for Study Areas 1, 2, and 3. For those areas identified for non-aeronautical purposes, the WAA will have to make a specific request to the FAA to remove that land from airport obligation; however, it will remain airport land that must comply with all other federal obligations because it was purchased with federal funds.

At its most basic level, there are three potential land use classifications for airport property:

- Airfield Operations
- Aeronautical Development
- Non-Aeronautical Revenue Support

Airfield Operations: This area includes the runway and taxiway system and the runway protection zones. The airfield operations area is intended for the safe and efficient movement of aircraft to and from the airfield. This land use designation includes the various object clearing areas, and only elements necessary for navigation can be located here.

When considering a possible north extension of the runway, the associated RPZ will extend into Study Area 2. Therefore, this portion of Study Area 2 is not considered for development purposes (consistent with RPZ design standards). There is a portion of Study Area 2 that is between the future RPZ and 45th Street North that encompasses approximately 9.4 acres. This area is included in the Airfield Operations area for the purpose of further protecting approach and departures to and from Runway 18. Technically, this 9.4 acres of land can be considered for compatible development that meets height restriction requirements; however, that is not currently considered in this study.

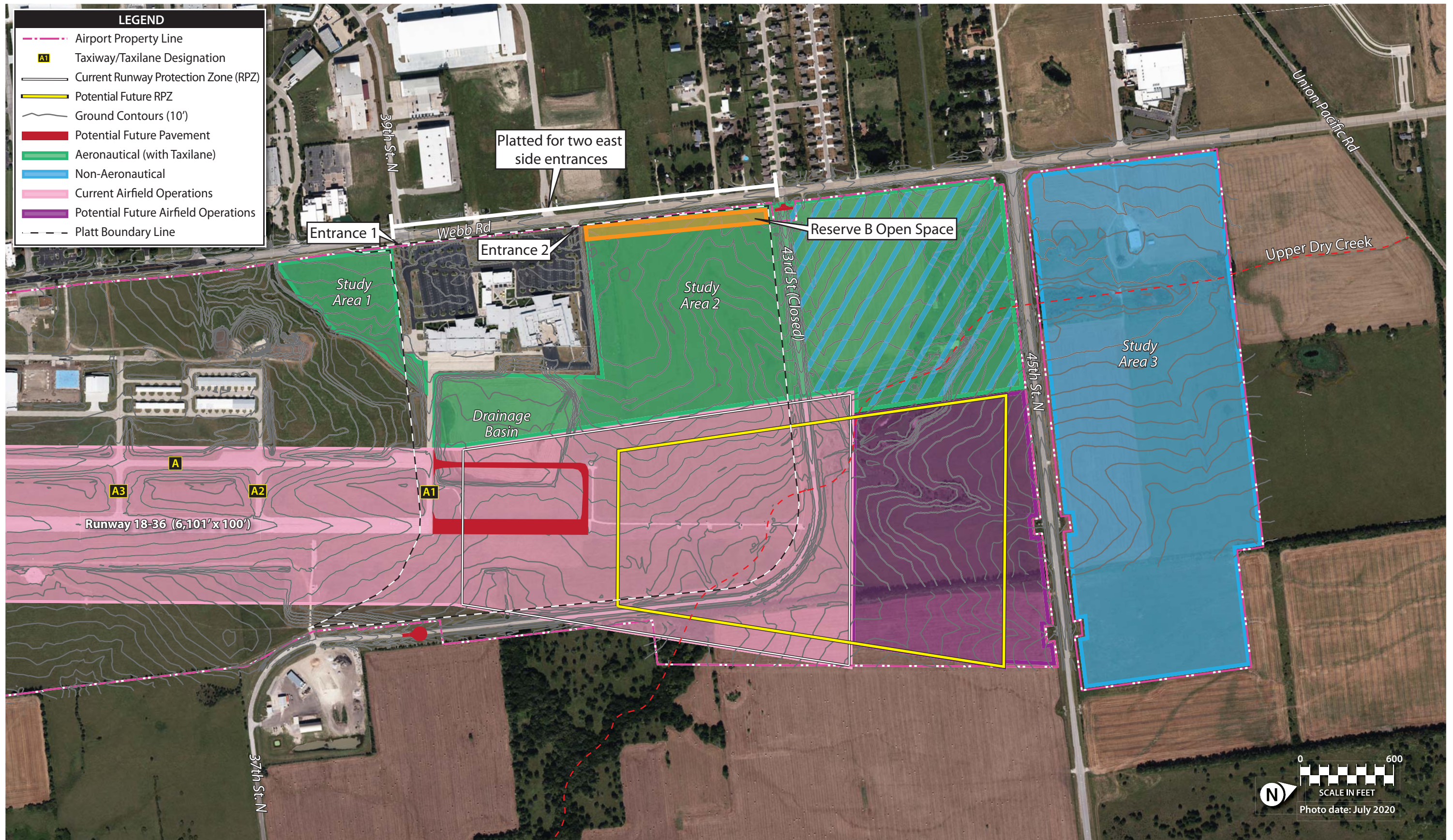
Aeronautical Development: The aeronautical development land use category includes those areas that are reserved for development that requires access to the airfield operations area, such as taxilanes, aircraft hangars, and aeronautical businesses. Generally, lands adjacent to the runway should be reserved for future aeronautical development to such a depth that it allows for future taxiways, taxilanes, aprons, hangars, and access roads. This land use category will also include airport support elements that may not require taxiway access, such as drainage infrastructure. Both Study Areas 1 and 2 are planned to have a taxilane extended from Taxilane A1; thus, both are designated for future aeronautical development.

Non-Aeronautical Revenue Support: Any non-aeronautical development must also be compatible with airport operations but does not have to be aeronautical in nature. Compatible land uses might include warehousing, laboratories, manufacturing, certain educational facilities (i.e., aeronautical higher education), or office buildings. Land uses that are incompatible with airports include homes, churches, and medical facilities. Study Area 3 is bounded on the south side by 45th Street North; therefore, it will never be able to connect to the runway system via a taxilane. As a result, Study Area 3 is available to serve in a non-aeronautical revenue generating capacity. The portion of Area 2 north of the 43rd Street alignment is distant from the runway/taxiway system and extension of a taxilane this far north may be cost prohibitive. As a result, Area 2 is shown on Exhibit 2 as available for either aeronautical or non-aeronautical uses.

TERRAIN CONDITION

Exhibit 2 – Study Area Land Use Classification also provides the ground contours for the airport including the three Study Areas. In relation to the runway system each of the Study Area parcels is relatively flat except for drainage channels. The south portion of Study Area 2 has a large drainage basin. The Upper Dry Creek bed passes through the north portion of Study Area 2. Extending a taxilane into Area 2 will require passage through the drainage basin, and a significant amount of fill will be needed. The Upper Dry Creek bed is planned to be avoided by the taxilane extension. Study Area 3 is also bisected by the Upper Dry Creek bed.

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PROXIMITY TO OTHER TRANSPORTATION INFRASTRUCTURE

Often an important factor for commercial developers is the proximity of the site to other modes of transportation. Obviously, all three parcels are part of the Colonel James Jabara Airport so the proximity to general aviation is immediate. In fact, with AAO having a 6,101-foot-long runway, most general aviation aircraft, including the largest business jets, can and do operate at the airport. AAO has a significant level of services available including a full service FBO and ample aircraft ramp space for transient and local parking.

Surface Roads/Interstate Highways

The main access road to the airport is from Webb Road on the west side. Webb Road is an arterial road. On the immediate south side of the airport is State Highway K-96. Via K-96, it is four miles to the south to Interstate 35 and five miles to the west to Interstate 135. Webb Road can also be taken north approximately two miles to the intersection with highway K-254.

Surface Road Access to Study Area 2

Standard City of Wichita street entrance guidance indicates that entrances should be at least 400 feet apart. The platted portion of Study Area 2, which includes the WSU Tech campus and extends north to the 43rd Street intersection, restricts the number of entrances to Webb Road to two over a length of 2,720 feet. Currently, there are two entrances from Webb Road from this platted area, both of which serve the WSU Tech campus.

Certain administrative actions can be taken to permit additional entrances to Webb Road to serve Study Area 2. The area could be re-platted with the restriction removed or the Access Control portion of the current platting could be vacated. If the Access Control portion is vacated, then two entrances could be considered to Study Area 2 north of the WSU Tech campus.

Railroads

A Union Pacific freight railroad mainline crosses Webb Road approximately 800 feet north of the northwest corner of Study Area 3. There is not currently a spur leading into airport property.

Commercial Service Airport

The Wichita Dwight D. Eisenhower National Airport (ICT) serves the greater Wichita and Sedgwick County area. It is located on the west side of downtown Wichita and is a 20-minute drive time from AAO. The airport is served by six airlines: Alaska, Allegiant, American, Delta, Southwest, and United. There are 14 non-stop destinations. The airport recently had more than 850,000 passenger enplanements.

RUNWAY EXTENSION/SHIFT CONSIDERATION

Colonel James Jabara Airport is a National General Aviation Reliever airport as classified by the FAA. This is the highest classification for a general aviation (GA) airport. There are only 92 National GA airports among 2,908 general aviation airports in the country that are included in the FAA's National Plan of Integrated Airport Systems (NPIAS). National GA Reliever airports are to be developed to be able to accommodate all general aviation aircraft including the largest business jets.

The current runway length can accommodate the largest business jets to some degree, however under certain conditions, such as very hot days and under heavy loading conditions, additional runway length could be needed. As a result, this study will consider the future possibility of extending the runway by 1,000 feet to the north for a total length of 7,100 feet. This is an important consideration because the extension and the various safety surfaces surrounding the extended runway will impact the three Study Areas under consideration. It would be extremely shortsighted to permit development that would eliminate the possibility of extending the runway in the future. For this study, the development capability of all three Study Areas will consider reserving the land necessary to accommodate the future runway extension. NOTE: The extension considered in this study could include shifting the runway to the north.

To preserve the feasibility of a future 1,000-foot runway extension or shift, the Airport Layout Plan (ALP) will need to be updated to reflect the extension. The revised ALP will then need an airspace review by FAA. While the airport can protect airport land based on consideration for a future extension, FAA protection surfaces do not officially apply until the ALP is updated.

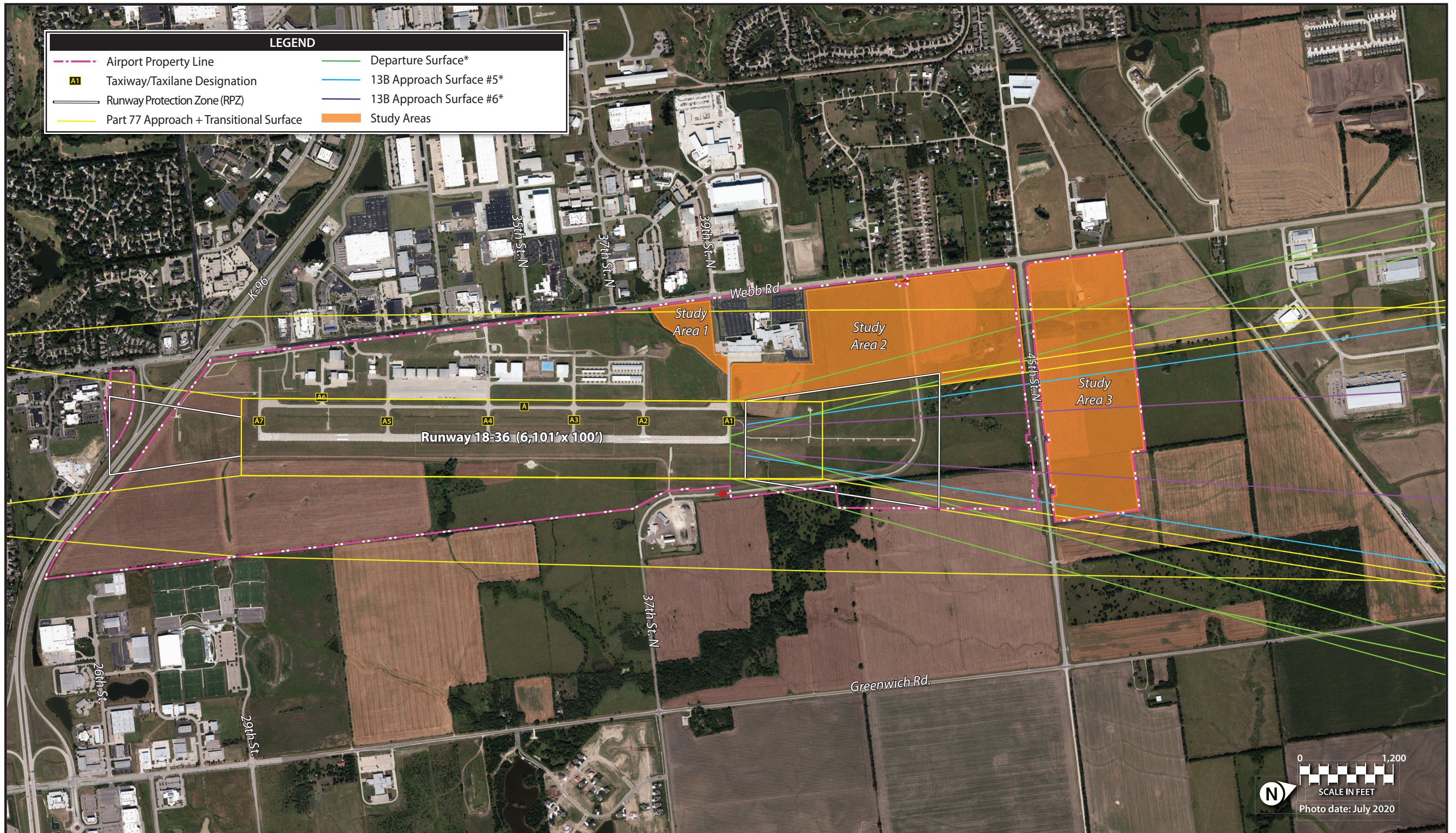
FAA RUNWAY SURFACES

There are numerous imaginary surfaces surrounding runways and on the approach to runway ends that must be clear of obstructions to optimize the capability of the runway. The applicable surfaces that may impact the study parcels are described in detail in FAA AC 150/5300-13B, *Airport Design*, and in Federal Regulations Title 14 Part 77, *Objects Affecting Navigable Airspace*. **Exhibit 3 – FAA Surfaces (Current)** shows the two-dimensional extent of these surfaces with the current runway environment. **Exhibit 4 – FAA Surfaces with Runway Extension** shows these surfaces when applied to a runway environment that includes a 1,000-foot extension. These surfaces are described in more detail below including the height limitations, where applicable.

Runway Protection Zone (RPZ): The RPZ is a trapezoidal shaped protection zone that extends from the end of the runways. Its purpose is to enhance the protection of people and property on the ground. The RPZ only covers the ground and does not have a height component. The primary goal for RPZ land is for it to be clear of incompatible objects and activities. The ideal method for the RPZ to meet the standards is for the airport to own RPZ land and to maintain it clear of any development. Therefore, the RPZ serving Runway 18 (both current and future) is considered to be undevelopable.

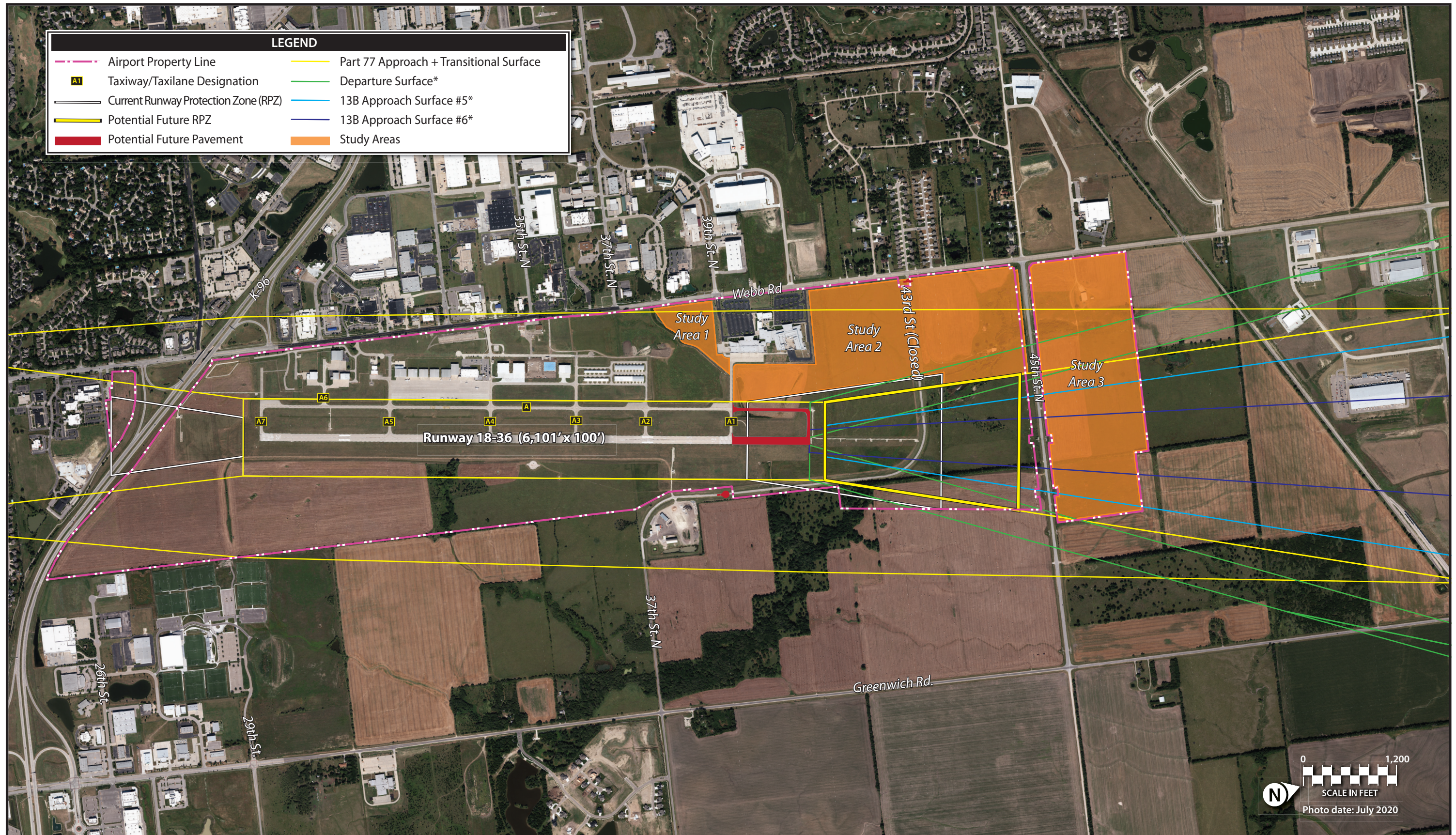
13B Approach Surface #5: FAA AC 150/5300-13B, *Airport Design*, describes two Approach Surfaces that apply to runway ends that support a precision approach, such as Runway 18. Approach Surface #5 begins 200 feet from the runway end with an inner width of 400 feet as centered on the extended runway centerline. It extends outward and upward to a length of 10,000 feet, an outer width of 3,400 feet, with

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* FAA AC 150/5300 - 13B, Airport Design

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* FAA AC 150/5300 - 13B, Airport Design

a slope of 34:1. **Exhibit 5 – 13B Approach Surface 5** shows this surface in isolation and the height limitations of this surface in relation to the Study Area parcels. Surface 5 extends over a portion of Study Area 3. On the south side of the impacted area, the height limitation is approximately 70 feet. On the north side the height limitation is approximately 100 feet.

This exhibit assumes the presence of a 1,000-foot runway extension. An exhibit showing the current condition is not provided because development within the 13B Approach Surface fan should remain below the future height restrictions so that development constructed before the future height limitations apply do not preclude extension of the runway.

13B Approach Surface #6: Approach Surface #6 begins at the runway end and has an inner width of 300 feet. It extends outward and upward to a length of 10,200 feet, an outer width of 1,520 feet, with a slope of 30:1. **Exhibit 6 – 13B Approach Surface 6**, is slightly narrower than Surface 5 and has a less restrictive height limitation. On the south end of Study Area 3 the height limitation is approximately 90 feet, and it is approximately 120 feet on the north end. This exhibit also considers the presence of a future runway extension.

Departure Surface: Clear departure surfaces allow pilots to follow standard instrument departure procedures, which assist pilots in avoiding obstacles during the initial climb after takeoff. As applied to the Runway 18 end, the departure surface consists of two parts: Section 1 and Section 2. Section 1 begins at the end of the runway and is the width of the runway. It extends upward and outward at a 40:1 slope to a length of 12,152 feet and an outer width of 7,512 feet. Section 2 of the Departure Surface are “wings” on the outer edges of Surface 1 that rise at a slope of 3:1 to a length of 450 feet. **Exhibit 7 – Departure Surface (Current)** shows in detail, the height limitations of this surface in areas where it extends over parts of Study Area 2 and Study Area 3 under current conditions. **Exhibit 8 – Departure Surface with Runway Extension** shows the height limitations with a runway extension.

Part 77 Approach and Transitional Surfaces: The Part 77 surfaces consist of the Primary, Horizontal, Conical, Transitional, and Approach Surfaces. It is the Approach and Transitional surfaces that will impact Study Areas 1, 2, and 3 with height restrictions. The Part 77 Approach Surface begins 200 feet from the runway end where it is 1,000 feet wide. It extends upward and outward at a 50:1 slope for the first 10,000 feet then at 40:1 for an additional 40,000 feet. The outer width is 16,000 feet. The Part 77 Approach Surface is the most restrictive surface on the extended runway centerline. The Transitional Surface extends from the sides of the runway Primary Surface (500 feet from centerline) and the Part 77 Approach Surface. The Transitional Surface rises at a 7:1 slope. **Exhibit 9 – Part 77 Approach & Transitional Surfaces (Current)**, shows the height limitation that these surfaces present over all three parcel areas in the current condition. **Exhibit 10 – Part 77 Approach & Transitional Surfaces with Runway Extension** shows the future condition.

ENVIRONMENTAL SENSITIVITIES

An additional consideration is the potential environmental sensitivities that will need to be considered by any development project. Construction on airport property will require compliance with the *National Environmental Policy Act (NEPA) of 1969*, as amended. This includes privately funded projects and those

projects receiving federal funding. For projects not categorically excluded under FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, compliance with NEPA is generally satisfied through the preparation of an environmental assessment (EA). In instances where significant environmental impacts are expected, as determined by the FAA, an environmental impact statement (EIS) may be required.

This Environmental Sensitivities section is focused on potential environmental impacts to the three Study Area parcels; however, a much more detailed analysis is available in the 2022 Airport Layout Plan & Narrative Report. There are 14 NEPA categories to be considered which are discussed briefly in relation to each Study Area. **Exhibit 11 – Environmental Sensitivities** shows a graphic representation of the environmental sensitivities in direct relation to Study Areas 1, 2, and 3. Once a development project is defined, then would be the time to complete any of the recommended studies and analysis.

Air Quality: Construction projects likely result in additional emissions; however, Sedgwick County currently meets federal requirements under the *Clean Air Act*. For construction emissions, a qualitative or quantitative emissions inventory under NEPA may be required, depending on the type of environmental review needed for new development adjacent to Webb Road.

Biological Resources: The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) report identified three threatened or endangered species: Northern long-eared bat (threatened mammal), the least tern (endangered bird), and the whooping crane (endangered bird) that should be considered when evaluating development in the area. The presence of trees on the three parcel areas could be a habitat for the northern long-eared bat. The presence of both the least tern and whooping crane is unlikely because both species prefer creek and river habitat for nesting activities.

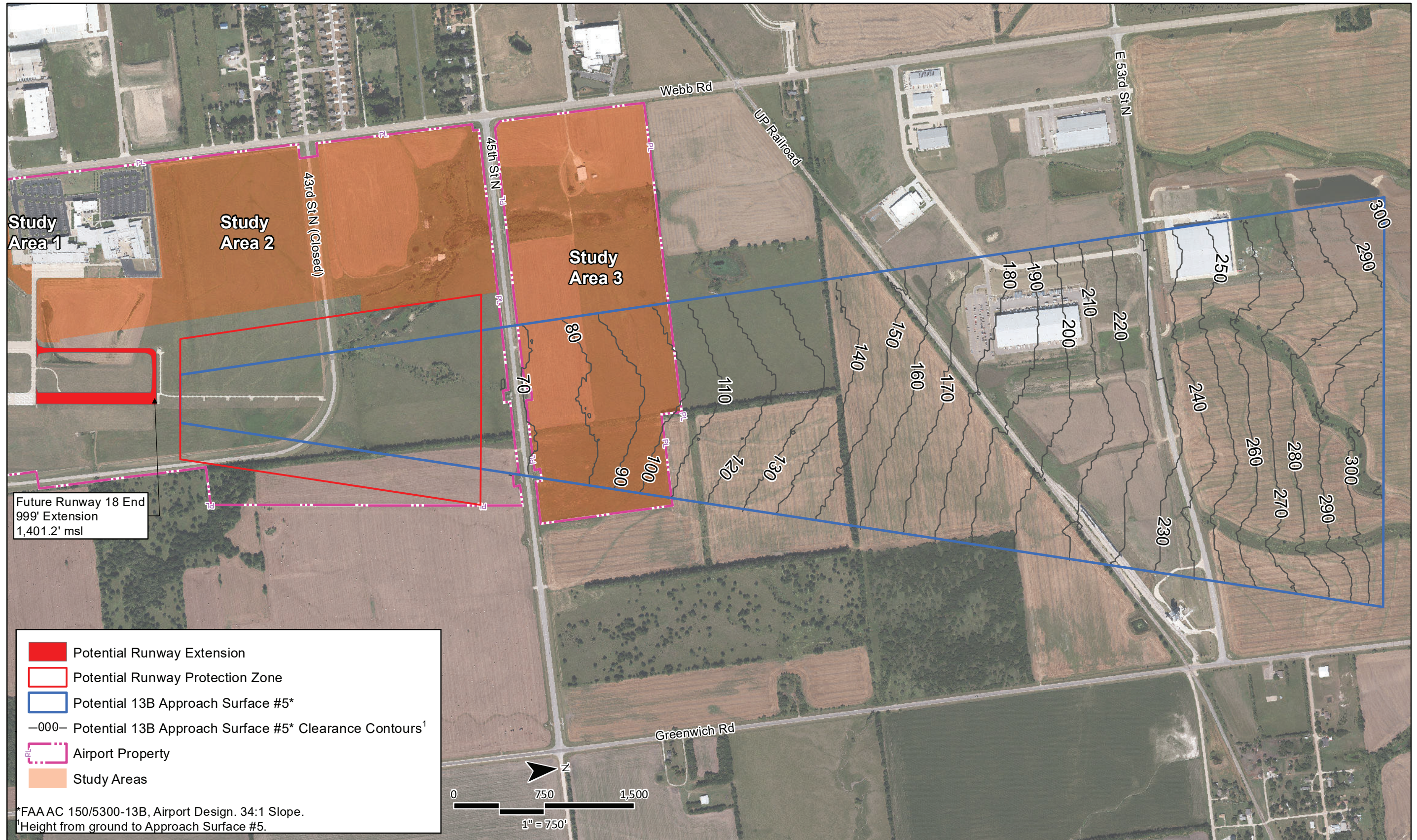
Climate: An increase in greenhouse gas (GHG) emissions could occur due to a specific development project. A project-specific analysis may be required per the FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, based on the parameters of the individual projects.

Coastal Resources: The airport is not located within a coastal resource zone.

Department of Transportation Act, Section 4(f): Resources that are protected by Section 4(f) are publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance; and publicly or privately owned land from an historic site of national, state, or local significance. Substantial impairment occurs when the activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished. There are no Section 4(f) land uses on any of the three parcels.

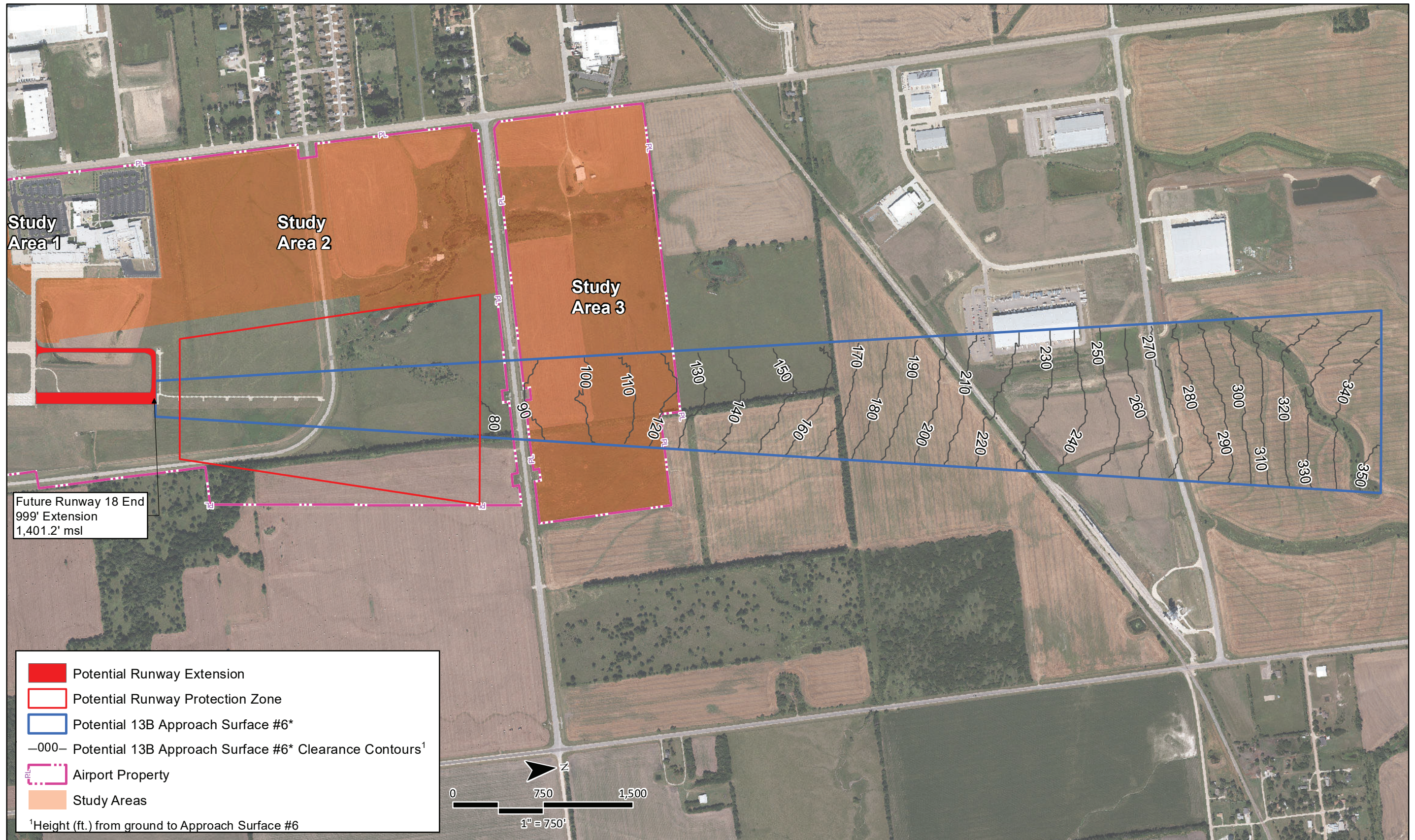
Farmlands: According to the Natural Resources Conservation Service (NRCS) Web Soil Survey, over 99 percent of the airport is either “Prime Farmland” or “Farmland of Statewide Importance. Important farmlands include pastureland, cropland, and forest considered to be prime, unique, or statewide or locally important land. Form AD-1006 is used by the NRCS to assess impacts under the *Farmland Protection Policy Act* (FPPA) and will need to be completed prior to development of any of the three parcels.

Hazardous Materials, Solid Waste, and Pollution Prevention: Fueling, aircraft maintenance, and other airport activities could involve fossil fuels or other types of hazardous materials. These operations are regulated and monitored by the appropriate regulatory agencies, such as the U.S. EPA and the Kansas



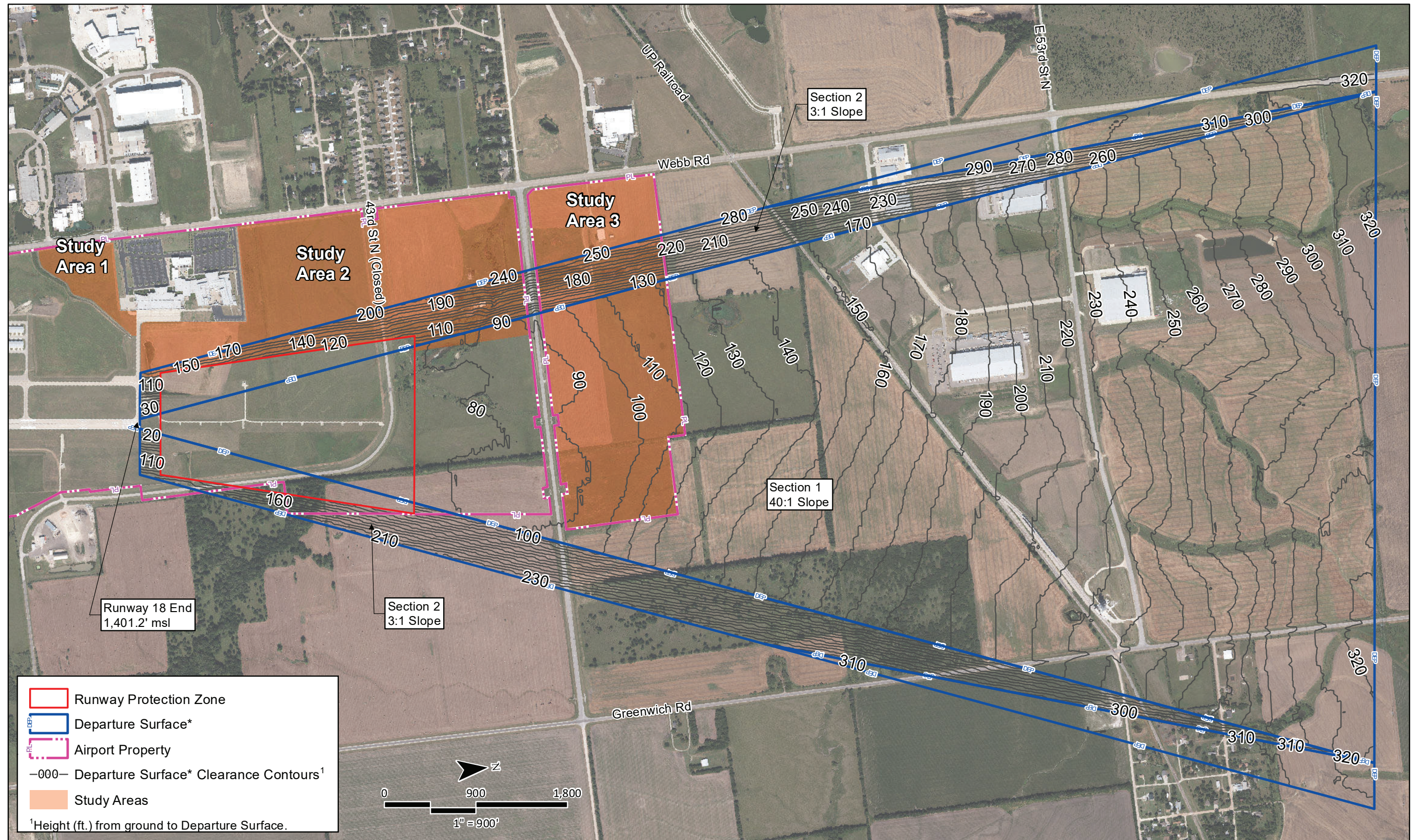
Source: Imagery - Martinez Geospatial (2020)

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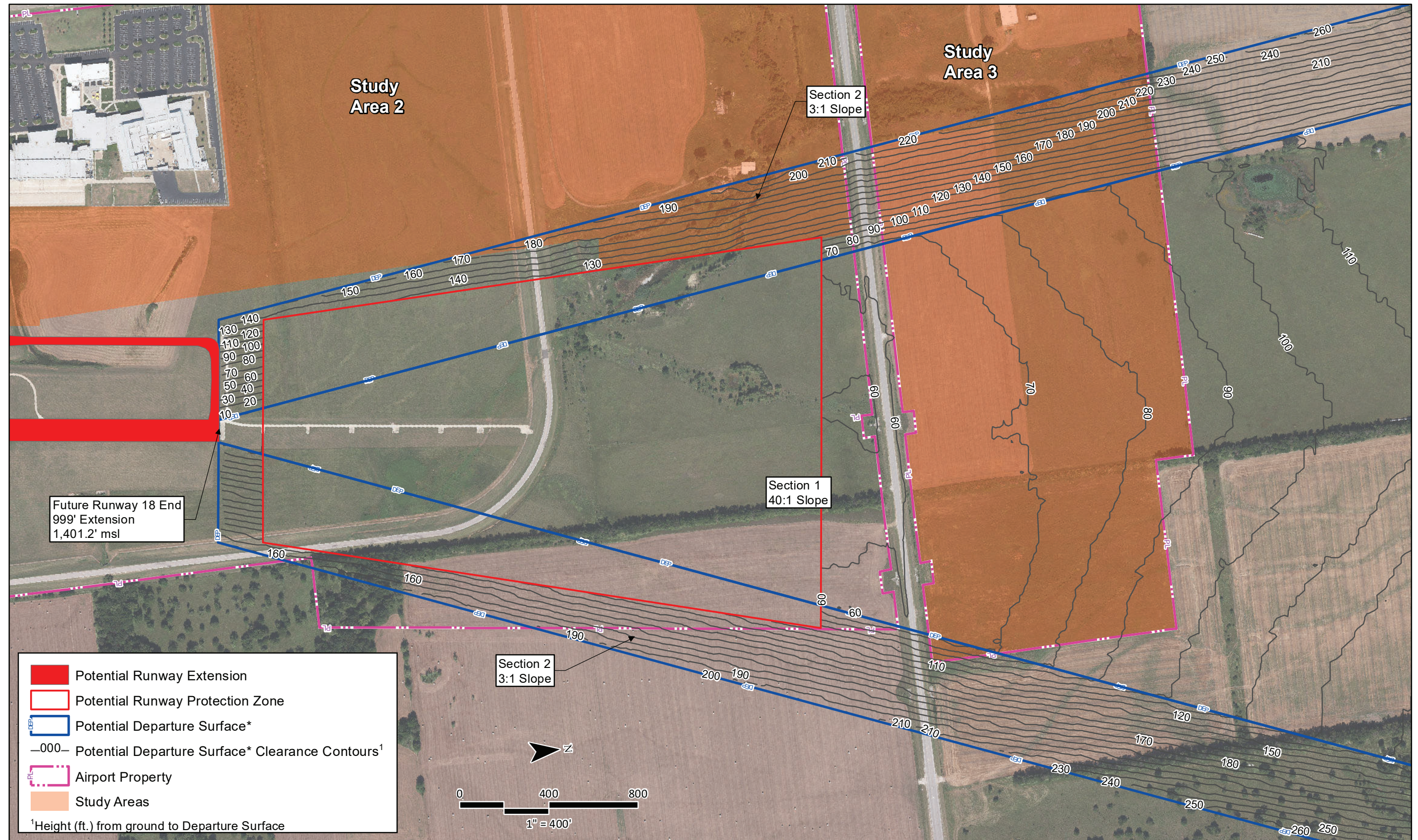
Source: Imagery - Martinez Geospatial (2020),
*FAAAC150-5300-13B, Airport Design, Table 3-4, Surface #6, 30:1 Slope

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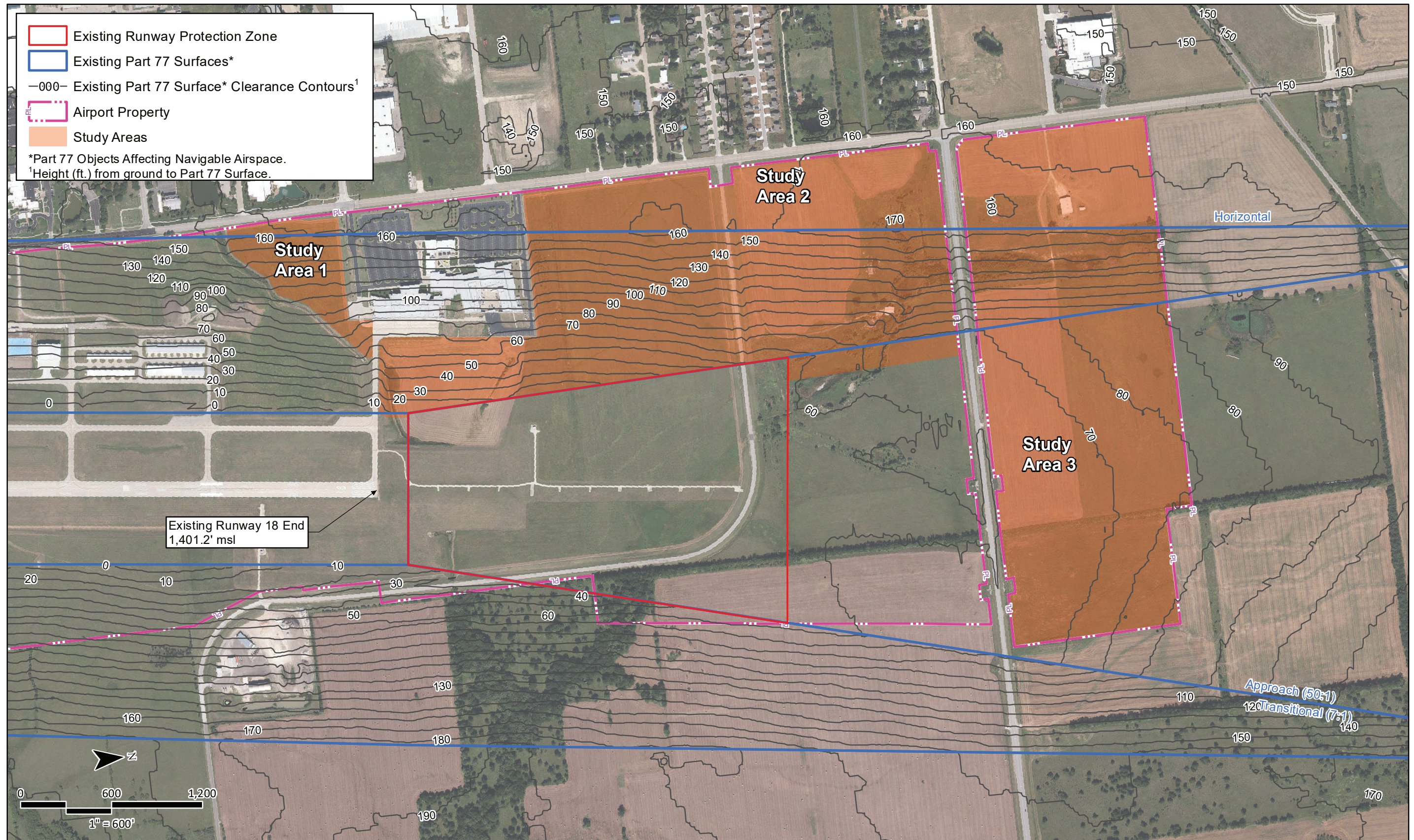
Source: Imagery - Martinez Geospatial (2020),
*Departure Surface - FAA AC 150-5300-13B, Airport Design, Surface #7

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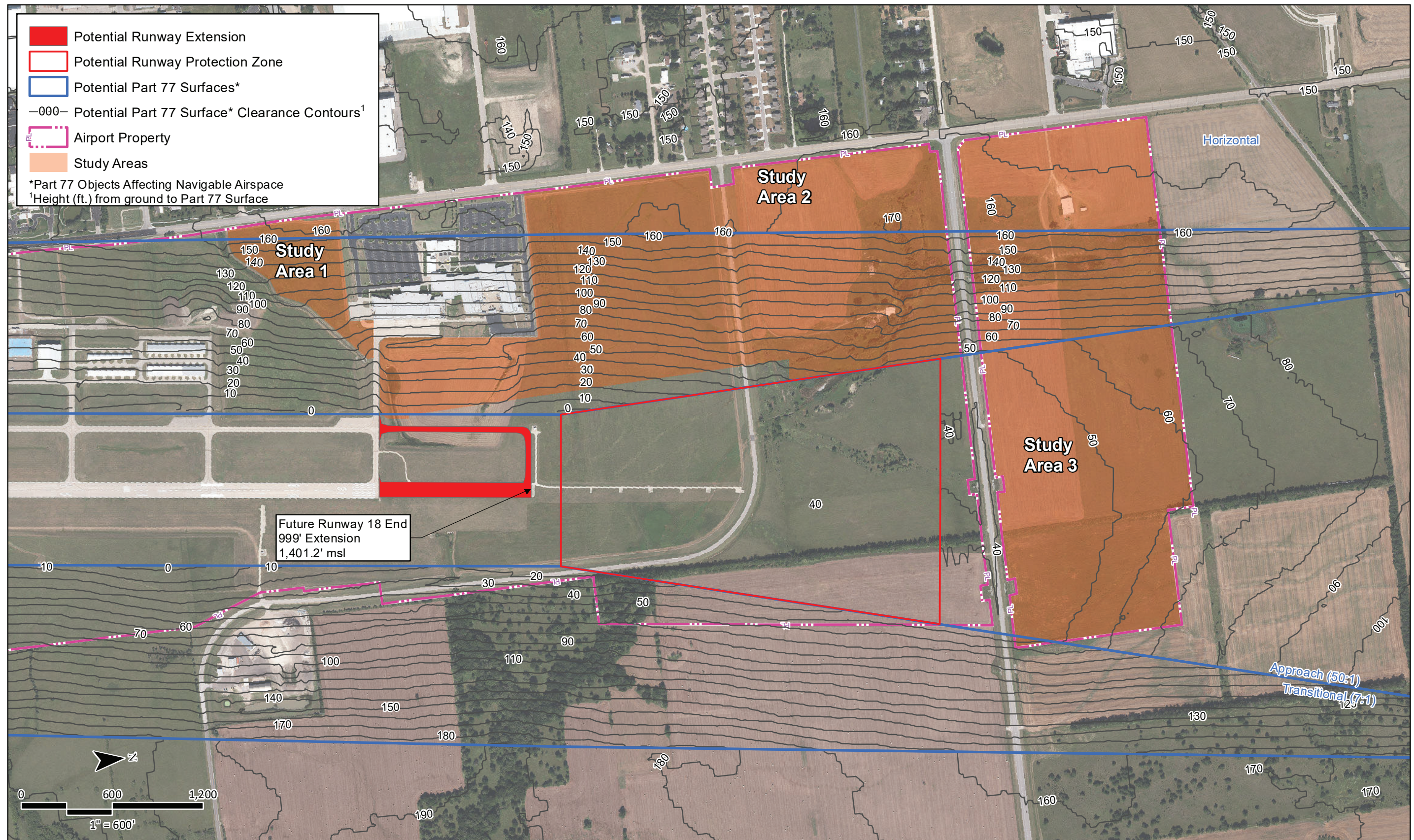
Source: Imagery - Martinez Geospatial (2020),
 *Departure Surface - FAA AC 150-5300-13B, Airport Design, Surface #7

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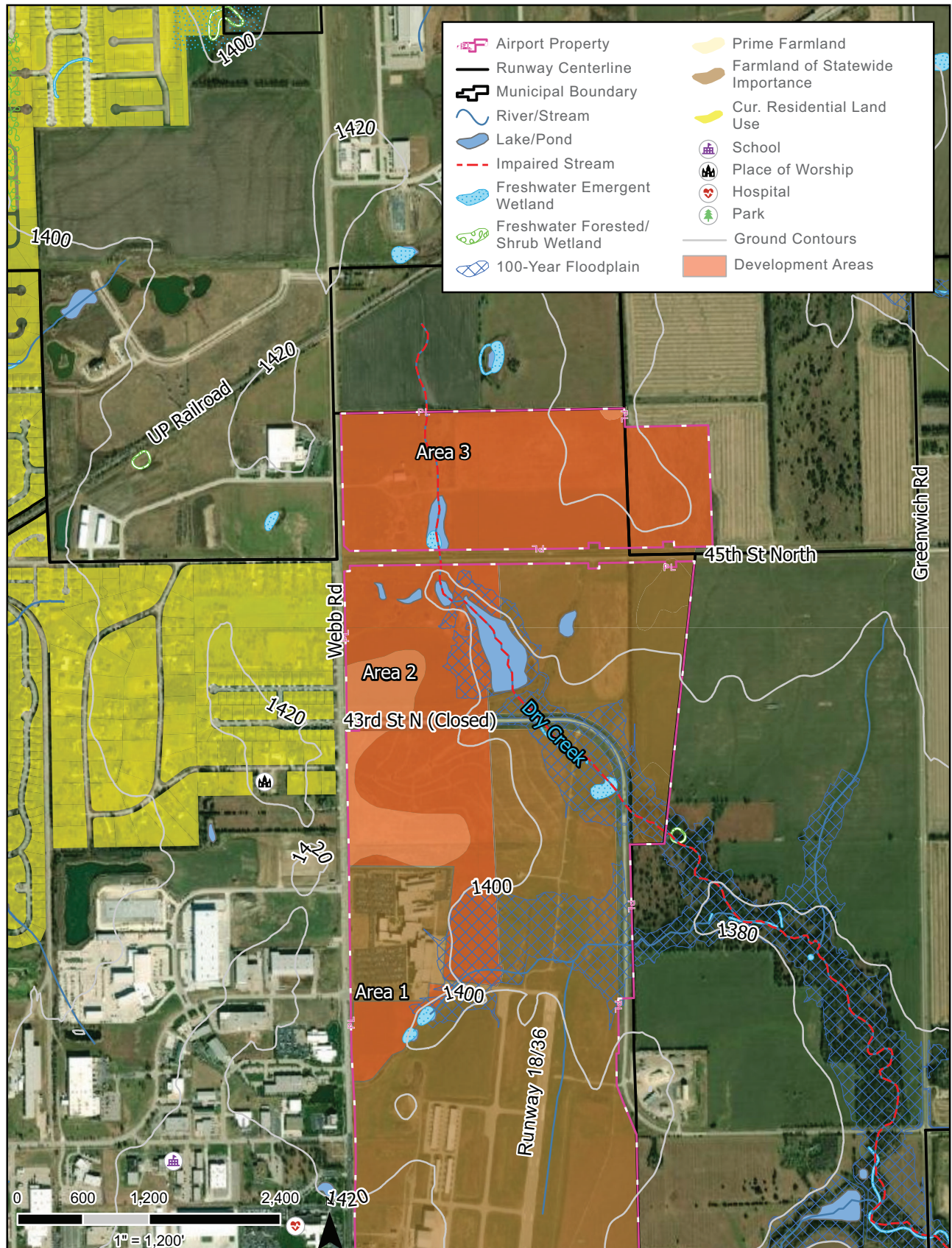
Source: Imagery - Martinez Geospatial (2020),
 Existing Part 77 Approach/Transitional/Horizontal Surfaces

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Source: Imagery - Martinez Geospatial (2020),
 Part 77 Approach/Transitional/Horizontal Surfaces,

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Department of Health and Environment (KDHE). The types of land uses envisioned for the three Study Areas do not include land uses that would produce an appreciably different quantity or type of hazardous waste. However, should this type of land use be proposed, further NEPA review and/or permitting may be required. There are no known hazardous materials or waste contamination sites currently on airport property.

Historic, Architectural, Archaeological, and Cultural Resources: There are no historical, architectural, archaeological, or cultural resources located on any of the three Study Areas.

Land Use: FAA has not established a significance threshold for Land Use. There are also no specific independent factors to consider. The determination that significant impacts exist is normally dependent on the significance of other impacts.

Natural Resources and Energy Supply: FAA has not established a significance threshold for this NEPA category. However, if a project were to cause demand to exceed available or future supplies of these resources, then additional environmental analysis may be needed.

Noise and Noise-Sensitive Land Use: The FAA noise threshold is if an action would increase noise by Day-Night Average Sound Level (DNL) 1.5 decibels (dB) or more. It is not anticipated that normal growth of the airport, including development of the three Study Areas would exceed this threshold. The most recent noise contours for the airport were generated for the 2005 Master Plan. The 2005 DNL 65 dB contour remains on airport property and will not affect properties beyond the airport boundary. **Exhibit 12 – Noise Contours** shows the noise contours in relation to the Study Areas. The noise contours do not impact any of the three Study Areas.

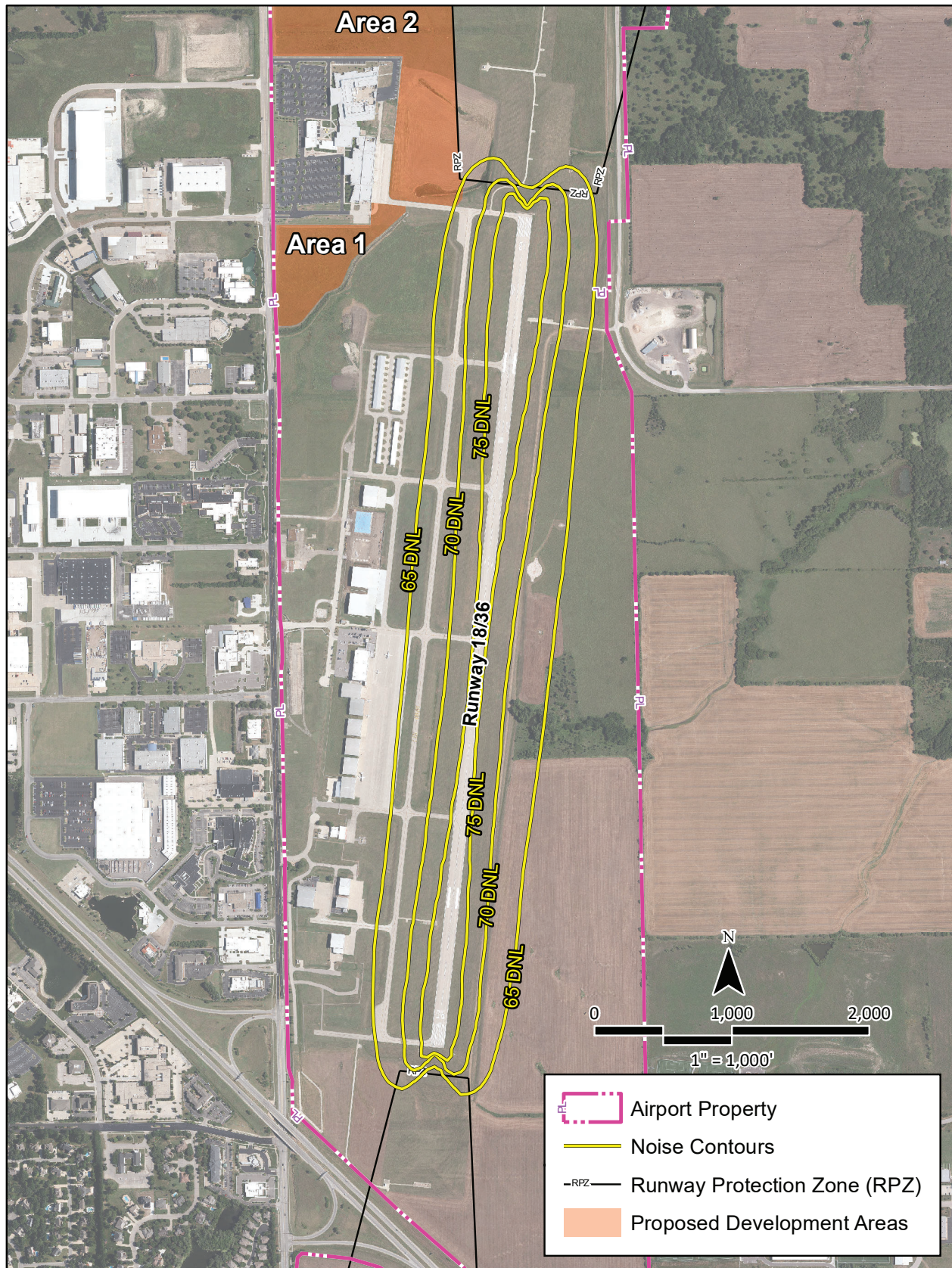
Socioeconomic, Environmental Justice, and Children’s Health and Safety Risks: Development of the three Study Areas could potentially encourage economic growth for the City of Wichita, the City of Bel Aire, and Sedgwick County. Results may include new construction jobs, new jobs at the airport and other non-aeronautical uses, new housing, and increase the local tax base. Development of the three Study Areas does not require acquisition of any property or relocation of any businesses.

Visual Effects: New lighting emissions would result from any new development on the airport. While there is not an FAA threshold of significance for light emissions, the developers and airport should consider the degree to which the project may create annoyance or interfere with normal activities or affect the character of the area.

Water Resources: Wetlands, floodplains, surface waters, ground water, and wild and scenic rivers are all considered under this NEPA category.

- **Wetlands:** According to the National Wetland Inventory, freshwater emergent wetlands, ponds, and streams were identified as wetlands at the airport. In 2005, a Preliminary Jurisdictional Determination (PJD) was performed on the northern 212 acres of the airport for the 2005 Airport Master Plan.¹ The PJD identified ephemeral stream channels exhibiting ordinary high-water

¹ Geotechnical Services, Inc. *Preliminary Jurisdictional Wetland Identification and Delineation for Colonel James Jabara Airport, Sedgwick County, Kansas* (July 2004)



Source: Noise contours shown are from the previous ALP Set dated October 2004. DNL: Day-Night Average Sound Level. Imagery from Martinez Geospatial.

marks which identify waterways as the potential jurisdiction of the U.S. Army Corps of Engineers (USACE). These channels are located north of Runway 18-36 and could potentially be affected by proposed aeronautical/non-aeronautical development outlined on the preferred concept plan. If projects outlined on the preferred concept plan involve the relocation or removal of wetlands, consultation with the USACE may be required to determine if a Section 404 permit under the *Clean Water Act* is warranted. A Section 404 permit regulates the discharge of dredged or fill material into jurisdictional waters and wetlands.

- *Floodplains:* The FEMA 100-year floodplain is located on portions of Study Areas 1 and 2. A Floodplain Development Permit may be required from the Wichita/Sedgwick County Metropolitan Area Building and Construction Department for any development or site improvements in a floodplain identified on the Official Floodplain Map. The Floodplain Manager shall review and approve this permit if development complies with the regulations.
- *Surface Waters:* The airport manages airport stormwater discharges with a National Pollutant Discharge Elimination System (NPDES) issued and regulated by the Kansas Department of Health and Environment (see Appendix A). Improvements to the airport will require a revised permit to be issued addressing operational and structural source controls, treatment of best management practices (BMPs), and sediment and erosion control.
- *Wild and Scenic Rivers:* Development of Study Areas 1, 2, and 3 will have no adverse effects on a designated wild or scenic river, the closest of which is 36 miles from the airport.

TAXILANE EXTENSION AND GRADING ALTERNATIVES

A key to development of Study Areas 1 and 2 will be taxilane access to the runway system since both areas are designated for aeronautical development. Two taxilane alternatives for Study Area 1 are presented followed by three alternatives for taxilane access to Study Area 2. All the taxilane alternatives reflect a 35-foot-wide taxiway which is associated with Taxiway Design Group (TDG) 2 with a standard Taxilane Object Free Area (TLOFA) that is 110-feet wide that is associated with Airplane Design Group (ADG) II. The cost estimates for each of the taxilane alternatives are in **Appendix D**.

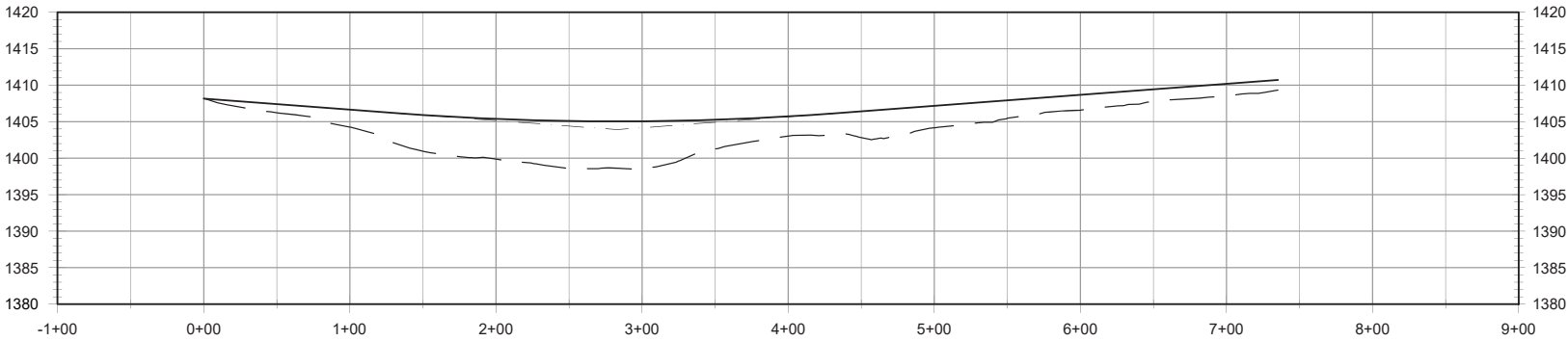
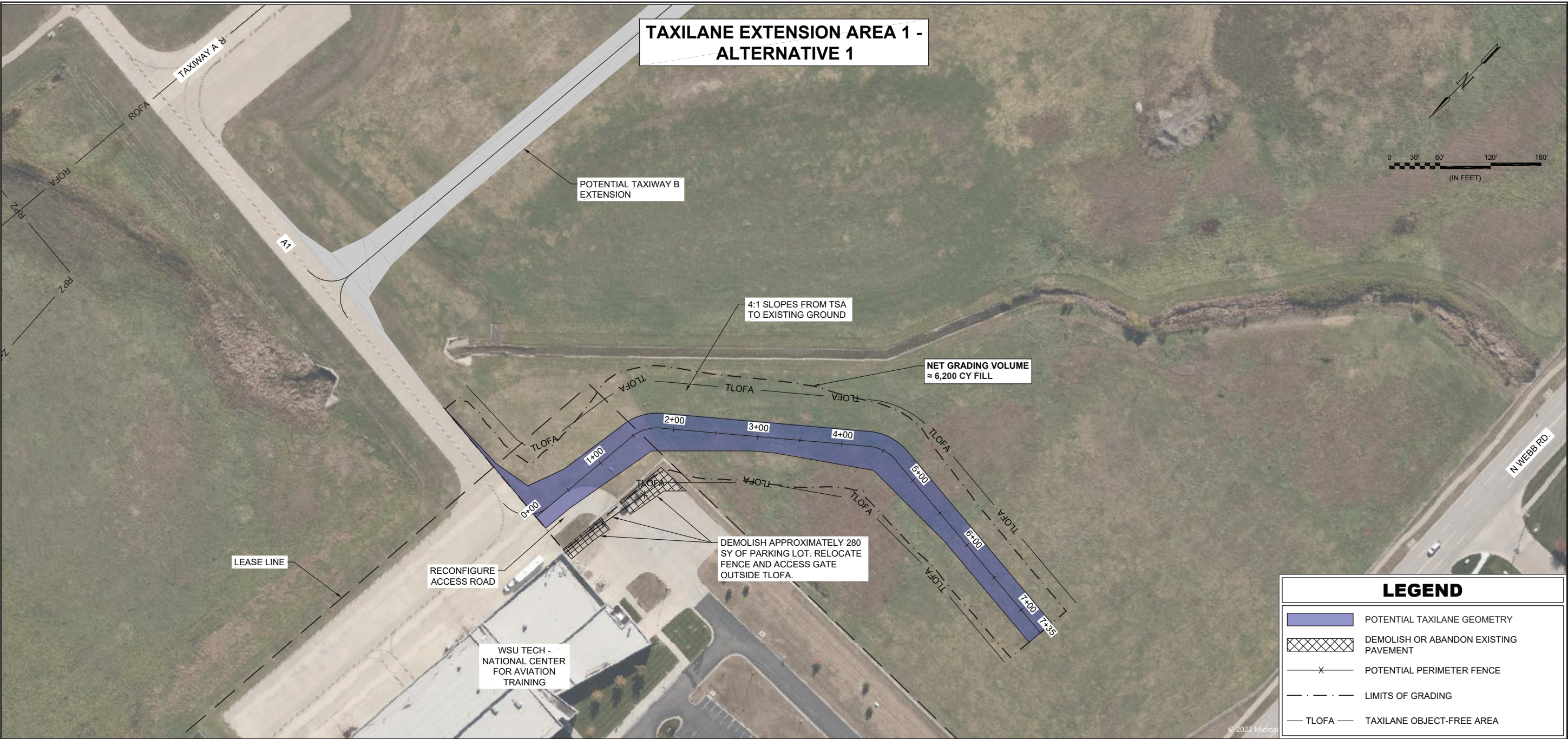
STUDY AREA 1 TAXILANE ALTERNATIVES

Study Area 1 is bounded by an existing drainage channel, the bottom of which is paved. The terrain slopes downward to the channel. The airport maintains a grade to the channel of not steeper than 4:1 so that maintenance equipment (i.e., mowers), can safely access the slope.

The taxilane alternatives to Study Area 1 consider extending from existing Taxilane A1. The first is depicted on **Exhibit 13 – Area 1 Taxilane Alternative 1**, and it is reflective of the geometry that is on the current ALP. Due to the requirement to maintain the TLOFA clear, a portion of the existing fence around WSU Tech is shown to be relocated about 10 feet. The taxilane would also cross over the existing leaseline for WSU Tech. This taxilane geometry is intended to allow hangar development on both sides

COLONEL JAMES JABARA AIRPORT

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of the taxilane. The location of this taxilane will allow for the slope to the drainage channel to remain less than 4:1 which is the maximum slope upon which mowers can still cut the hillside. The bottom of the exhibit shows a profile view of the taxilane. Construction of this taxilane will require approximately 6,200 square yards of net fill material.

Exhibit 14 – Area 1 Taxilane Alternative 2 shows a second alternative for extending a taxilane to serve Study Area 1. This taxilane has an angled intersection with Taxilane A1. The 4:1 slope to the drainage channel is maintained to continue to allow maintenance staff to cut the grass. A small corner of the fencing for WSU Tech would have to be relocated to accommodate the TLOFA. This taxilane will require approximately 2,400 square yards of net fill material to support the taxilane.

STUDY AREA 2 TAXILANE ALTERNATIVES

There is a large depression/drainage basin immediately east of the WSU Tech apron through which a taxilane would have to pass. **Exhibit 15 – Area 2 Taxilane Alternative 1** shows the first option. The potential taxilane will extend from an intersection with Taxilane A1. It would then extend northward along the edge of the RPZ. The TLOFA would not cross over the RPZ edge. At about the 43rd Street N. alignment, the taxilane angles slightly westward to take advantage of the level ground in this area. This option represents the eastern most location for a taxilane which will also provide the largest area to the west for development of Study Area 2. Construction of this taxilane will require approximately 28,600 cubic yards of net fill material.

The second taxilane alternative leading into Study Area 2 is presented on **Exhibit 16 – Area 2 Taxilane Alternative 2**. In this scenario, the planned taxilane is situated on the west side of the drainage basin, adjacent to WSU Tech. This alternative was considered to examine the amount of fill material that may be required in comparison to the first alternative. This alternative will require a net grading volume of approximately 34,600 cubic yards of fill material.

Because alternative 2 is positioned at its western most location, this alternative will provide for less developable space within Study Area 2 as compared to alternative 1.

A third alternative was considered and is depicted on **Exhibit 17 – Area 2 Taxilane Alternative 3**. The taxilane into Study Area 2 extends from Taxilane A1 at its mid-point. The ALP for the airport currently shows a future taxilane extending to the south (Taxilane B) from this same location, so a four-way intersection is planned. The taxilane into Study Area 2 extends parallel to the extended runway centerline until it reaches the RPZ where it extends further north at the edge of the RPZ. The net fill material required for this alternative is approximately 30,800 cubic yards.

PREFERRED TAXILANE ALTERNATIVES

Prior to considering facility layout options, it is necessary to select a preferred taxilane alternative for both Study Area 1 and 2. **Exhibit 14 – Area 1 Taxilane Alternative 2**, is the preferred alternative for access to Study Area 1. This alternative was selected because it closely aligns with FAA taxilane design criteria in that it is straight and does not have unnecessary turns. This alternative is also less expensive to construct than Alternative 1.

Exhibit 15 – Area 2 Taxilane Alternative 1 is the preferred alternative for extending a taxilane to Study Area 2. The primary purpose for selecting this alternative is that it provides the maximum developable area to the west of the taxilane. More developable area means the potential for greater revenue generation. This alternative does require the most fill material and replacement dry detention area as compared to the other two alternatives. However, the fill material would come from the excavation for the dry detention replacement so importing additional fill material would not be required which keeps construction costs down.

DEVELOPABLE LAND

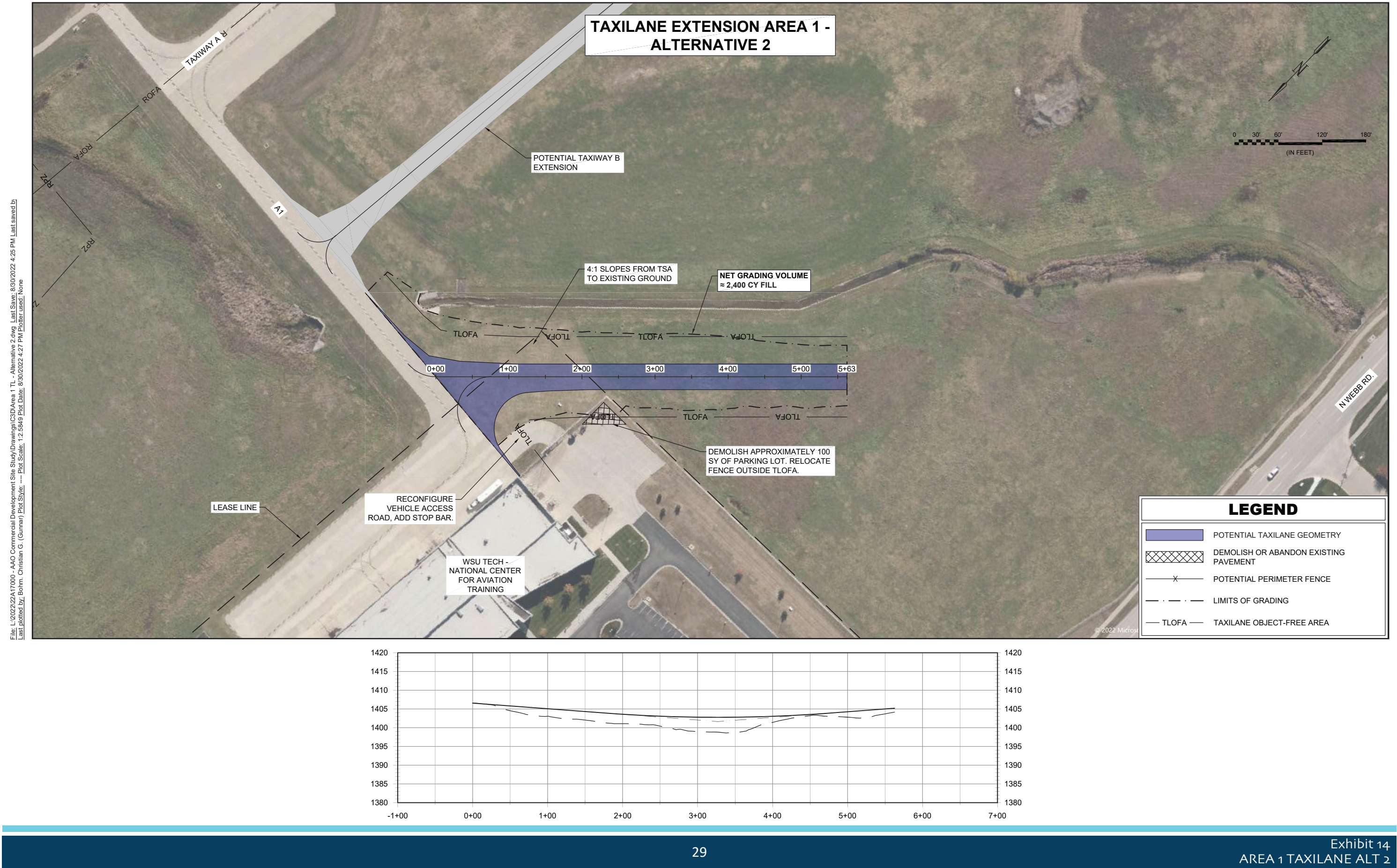
Each of the three Study Area parcels is available for development; however, not all the land can reasonably be developed. **Exhibit 18 – Developable Land** shows the area in acres that is potentially available for development outside of the planned taxilanes. Study Areas 2 and 3 are impacted by the 100-year floodplain and wetlands. If wetlands are planned to be disturbed, then a USACE wetland delineation study will be needed. If development is to occur in a floodplain, then a Floodplain Fill permit from the Kansas Department of Agriculture (KDA) will be required. The floodplain area will also need to be modeled in the developed condition to determine impacts to the floodplain encroachment area. Development in and around floodplains will need to be constructed to be one foot above the base flood elevation.

Study Area 1 has approximately 6.3 acres available for development when accounting for the preferred taxilane alternative. The TLOFA surrounding the taxilane is excluded as is a buffer around the drainage channel. This parcel slopes gently from west to east ranging in elevation from 1,410 feet above mean sea level (MSL) adjacent to Webb Road to 1,402 feet MSL.

There are two wetlands in Study Area 1 that were identified by USFWS in the 1980's. These wetlands appear to no longer be there because of a drainage improvement project completed in 2011. A USACE wetland delineation study may be needed to confirm that the wetlands have been removed. The FEMA floodplain map shows that a portion of Study Area 1 also falls within the 100-year floodplain; however, this may no longer be the case based on the 2011 drainage improvements. If the floodplain exists, then a Floodplain Fill permit will be required.

Study Area 2 has approximately 80 acres available for development. The existing drainage basin immediately north of Taxilane A1 has been excluded from the areas of potential development. The Upper Dry Creek passes through Study Area 2, and it is included as developable land which assumes drainage issues can be resolved. Both the wetland delineation and Floodplain Fill permitting processes will need to be followed.

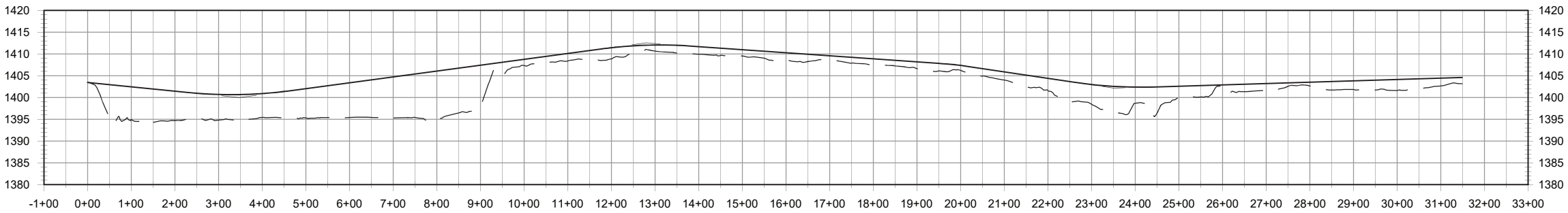
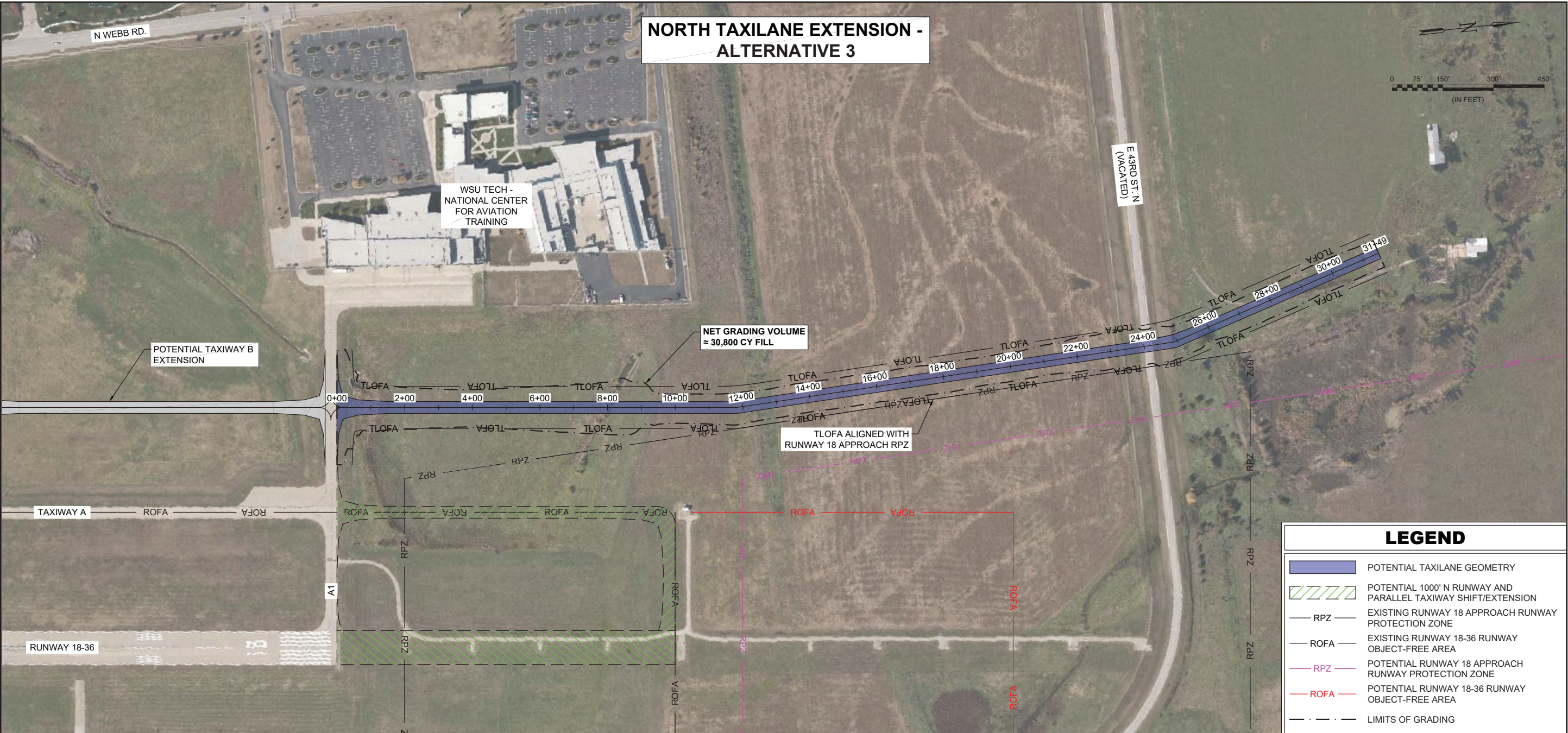
Study Area 3 is approximately 95 acres, and all is considered available for development. There is a small portion of the Upper Dry Creek bed and a small wetland in Study Area 3 which would trigger the permitting process.



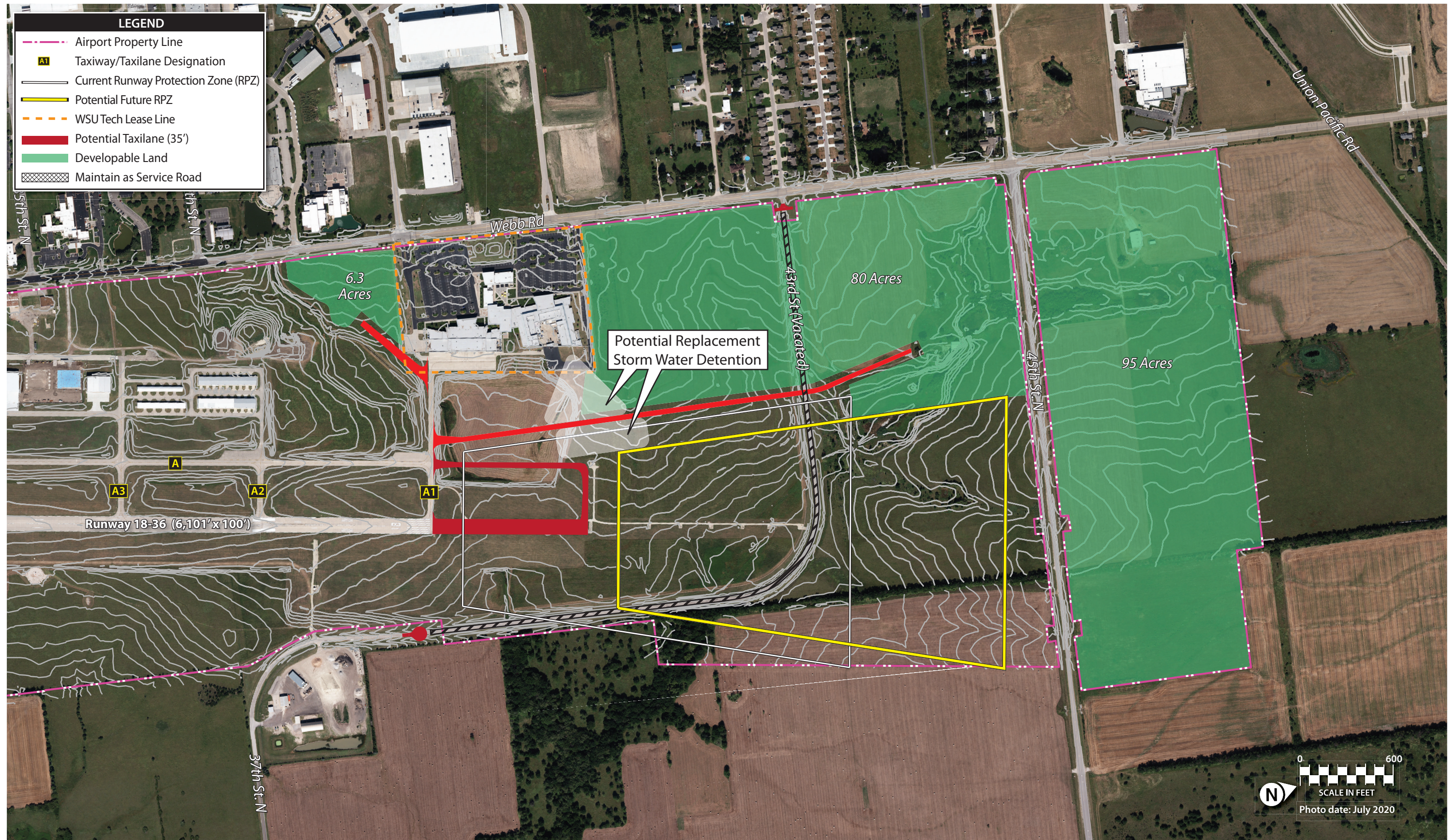




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COLONEL JAMES JABARA AIRPORT



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According to the Drainage Study included in Appendix E, construction of a taxilane through Study Area 2 will require additional stormwater detention to replace the fill needed to construct the taxilane. The Drainage Study indicates that the fill material needed for the taxilane construction can be excavated from areas to the east and west of the taxilane location (at the north end of the existing detention basin), which will result in more detention basin being created that connects to the current basin. Additional study will be required to further define the size/depth of the replace detention area. Exhibit 18 shows the maximum possible additional area that may be needed for replacement detention area. This includes approximately 1.0 acres of land identified as developable.

FACILITY CONCEPTS

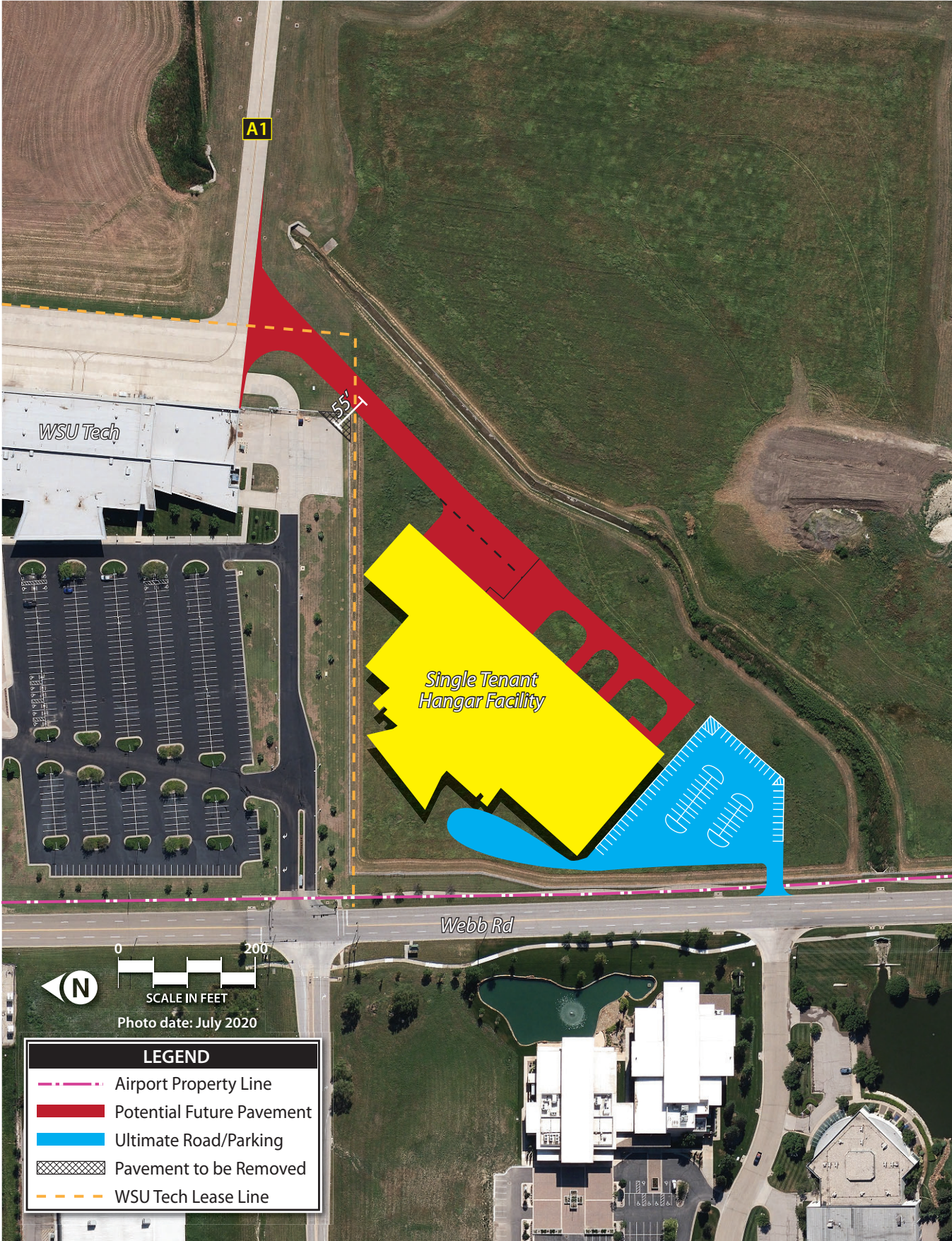
As noted previously, facility development in any of the three Study Areas must be compatible with airport operations. Development within Study Areas 1 and 2 is planned to be aeronautical in nature, meaning those facilities will house aircraft that need access to the runway system. Development in Study Area 3 is considered for non-aeronautical uses. All facility development is to be undertaken by the private sector under a land lease arrangement with the Wichita Airport Authority.

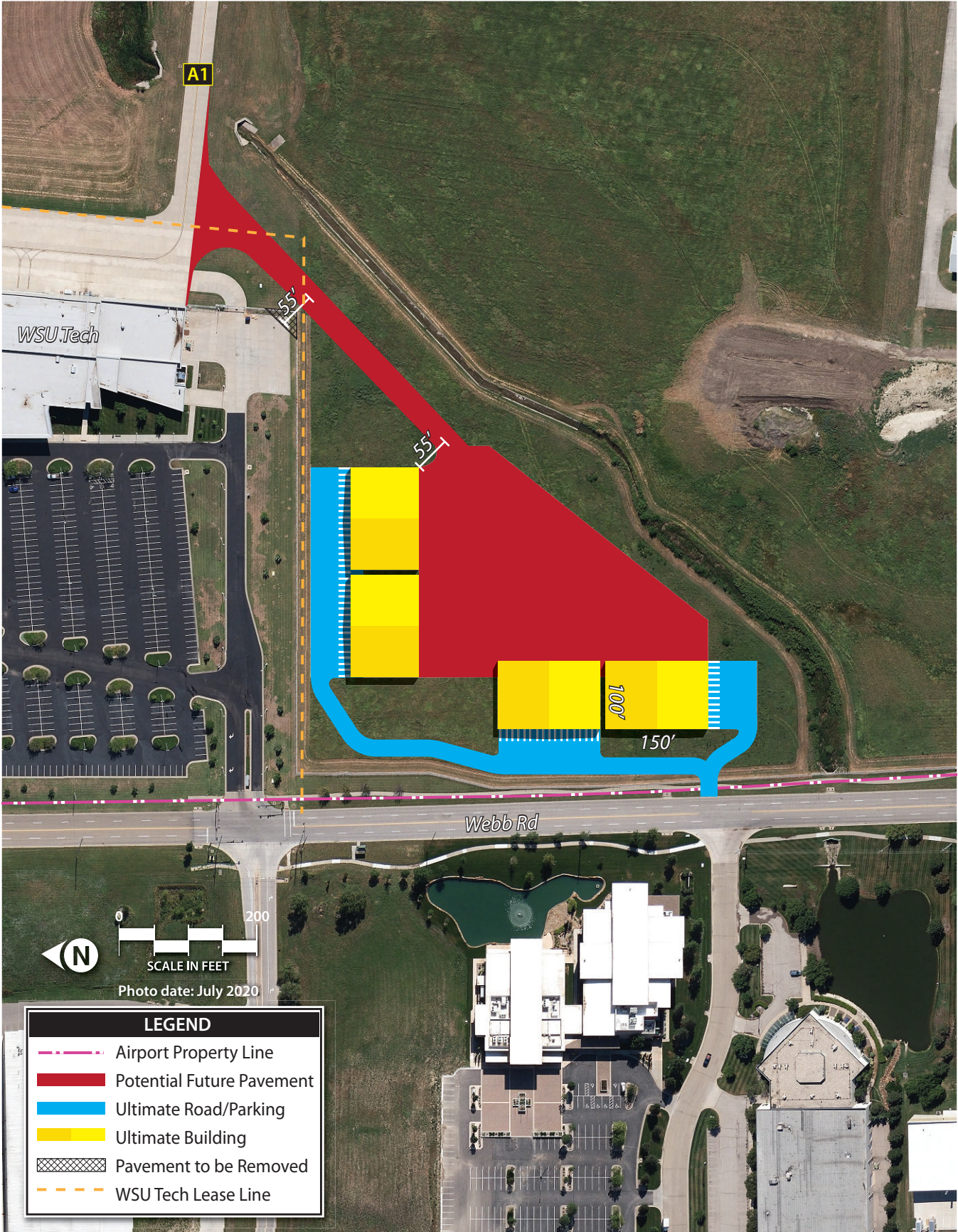
Several development concepts are presented below for each of the three Study Areas. These are only conceptual in nature and neither the airport nor a potential developer is obligated to build to the exact layout presented. Rather, the airport and/or developer should follow the facility layout concept to maximize the space available. Larger conventional hangars should be grouped together to best accommodate high activity uses. Smaller connected box hangars and T-hangars should be located further from the central conventional hangar complex. Apron space should be planned in the areas closest to the taxilane as these areas can accommodate parked aircraft but not buildings and hangars due to the restrictions of the imaginary surfaces surrounding the runway. Hangar aprons shall generally be no smaller than 1.5 times the square footage of the hangar bay according to the WAA Minimum Standards.

STUDY AREA 1 FACILITY CONCEPTS

Exhibit 19 – Area 1 Facility Layout Alternative 1 presents a concept for development by a single tenant in Study Area 1. If the development is a single tenant, then the construction of the taxilane would not be eligible for FAA funding as exclusive use taxilanes are not eligible for federal funding.

Exhibit 20 – Area 1 Facility Layout Alternative 2 presents a concept for development that would potentially serve multiple tenants. Under this scenario, the taxilane extension from Taxilane A1 would be eligible for federal funding because it would be a public taxilane. While there could be many potential hangar layouts, what is shown is a complex of four large conventional hangars. This has been a popular hangar type at Jabara, and each one could house, for example, an aeronautical business, a corporate flight department, bulk aircraft storage, or a single tenant.





STUDY AREA 2 FACILITY CONCEPTS

Study Area 2 presents an extremely rare opportunity for airport development. Study Area 2 is approximately 80 acres of developable aeronautical land. It is very rare that an airport with the capability of a 6,100-foot-long runway has an undeveloped parcel of this size. The availability of a parcel this size presents a unique opportunity for numerous aeronautical businesses such as aircraft manufacturers or maintenance, repair, overhaul (MRO). Both of these types of aeronautical businesses have large physical footprints. With Wichita being known as the Air Capital of the World due to the numerous aircraft manufacturers in the region, Jabara is well positioned to accommodate growth in this industry.

Exhibit 21 – Area 2 Facility Layout Alternative 1 considers a potential facility layout intended for a single tenant. It includes a large manufacturing building, several ancillary hangar buildings, and a large aircraft parking apron. The taxilane to Study Area 2 would be to a single user; therefore, it is not eligible for FAA funding.

Exhibit 22 – Area 2 Facility Layout Alternative 2 shows a potential hangar layout intended to serve multiple tenants. The layout includes a mix of conventional, box, and T-hangars. A large central apron area is bounded by several conventional hangars. This layout would be ideal for expanded or additional FBO services as well as other types of aeronautical businesses.

STUDY AREA 3 FACILITY CONCEPTS

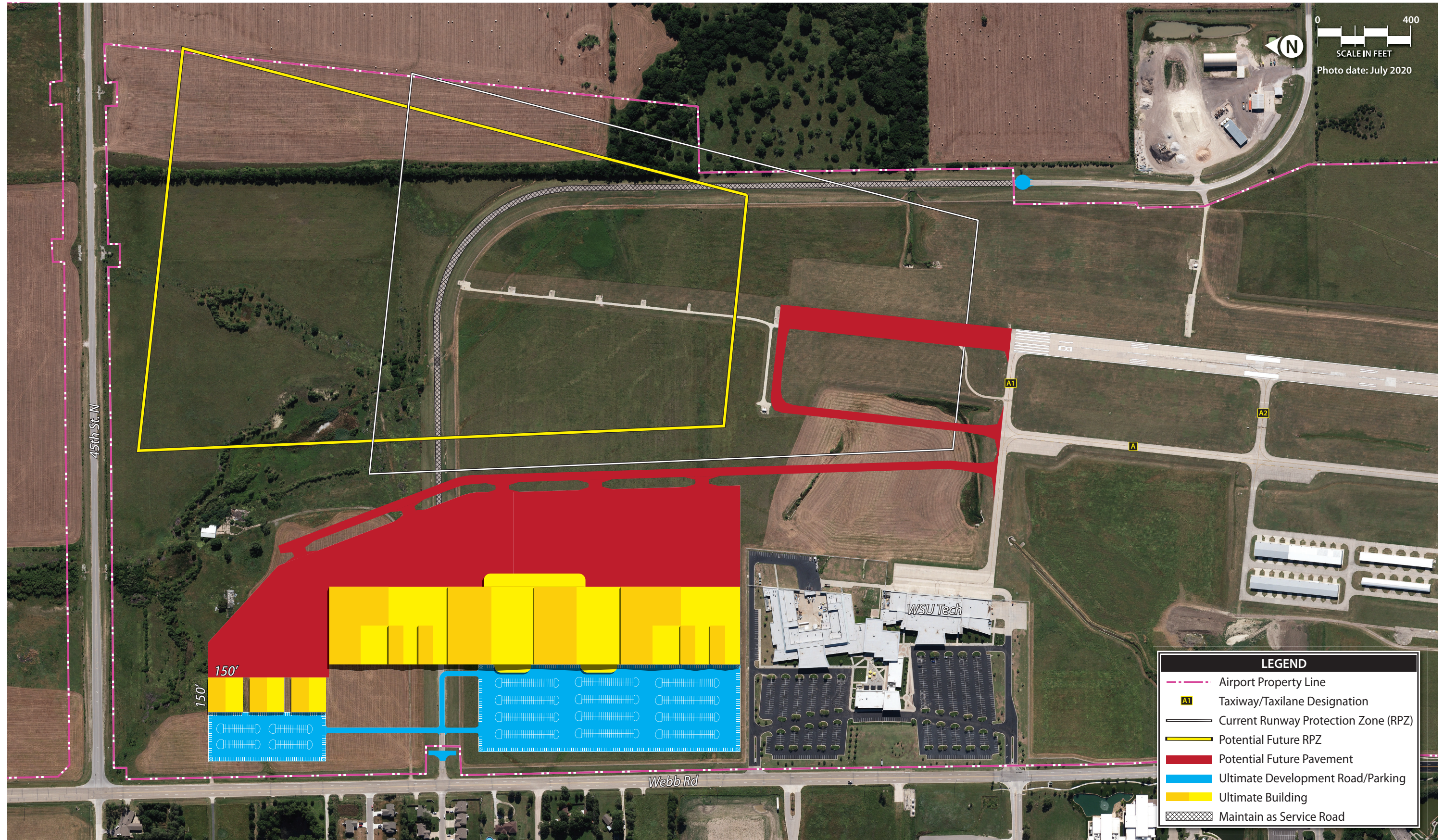
Study Area 3 is physically disconnected from the runway system by 45th Street North. Therefore, this land can be utilized by the airport for compatible nonaeronautical development. The airport will have to work with the FAA to obtain a formal release from obligation which will allow for non-aeronautical uses of the land. The land will remain in airport ownership, and any revenue generated through land leases will be reserved for use by the airport exclusively.

Exhibit 23 – Area 3 Facility Layout Alternative 1 considers a mix of commercial uses and light industrial uses, both of which are compatible with airport operations. The corner of 45th Street North and Webb Road is considered for the commercial parcel. The remaining land is considered for light industrial uses. Access to the light industrial parcel is from 45th Street North and via an internal roadway system.

Exhibit 24 – Area 3 Facility Layout Alternative 2 considers all the frontage on Webb Road for commercial uses. A slightly different roadway system is shown as well.

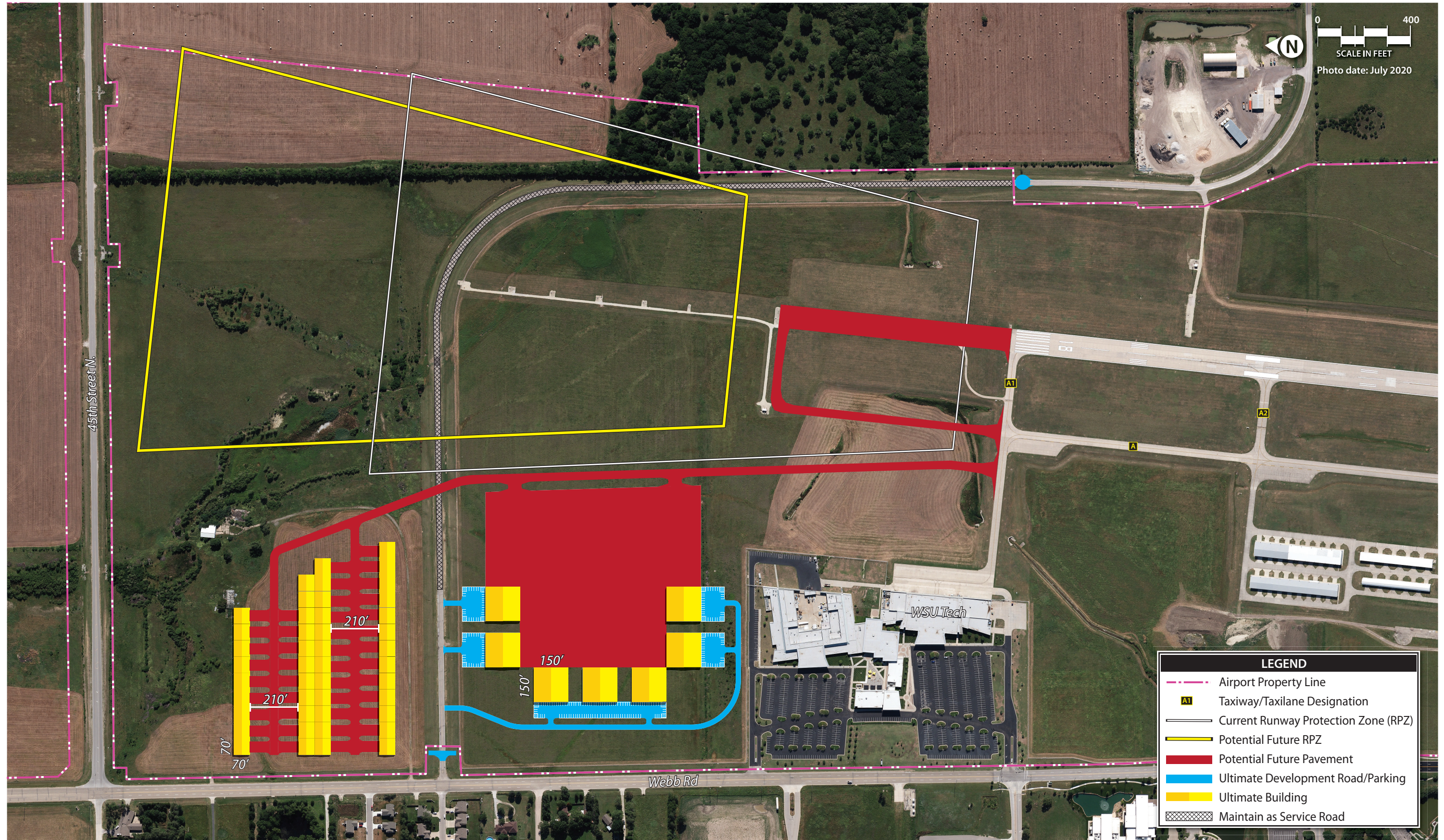
Area 3 is the closest to the Union Pacific Railroad line. It may be feasible to extend a railroad spur to Study Area 3 should a developer desire that access, however, it would have to cross private property.

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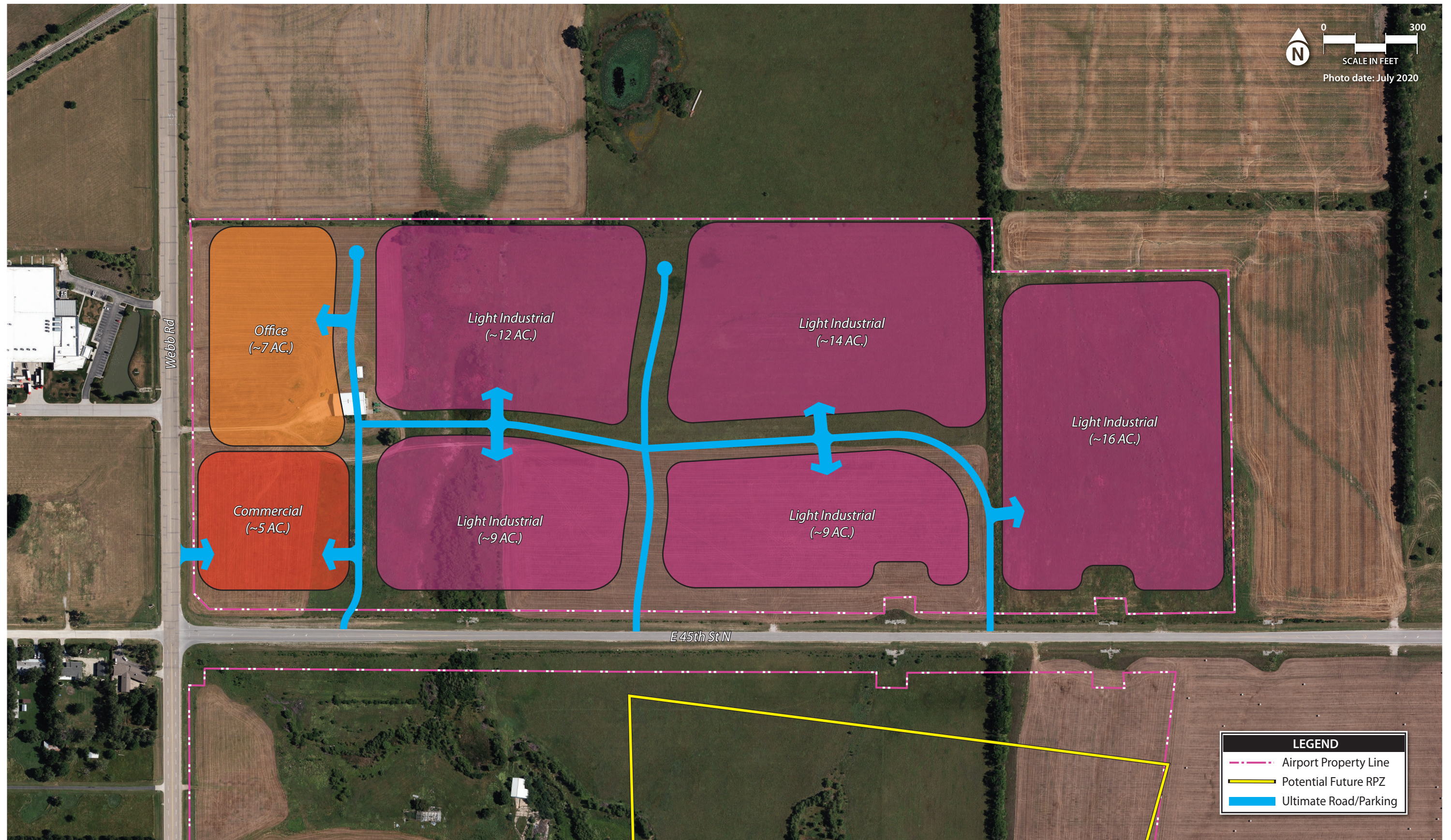


LEGEND	
---	Airport Property Line
A1	Taxiway/Taxilane Designation
	Current Runway Protection Zone (RPZ)
	Potential Future RPZ
	Potential Future Pavement
	Ultimate Development Road/Parking
	Ultimate Building
	Maintain as Service Road

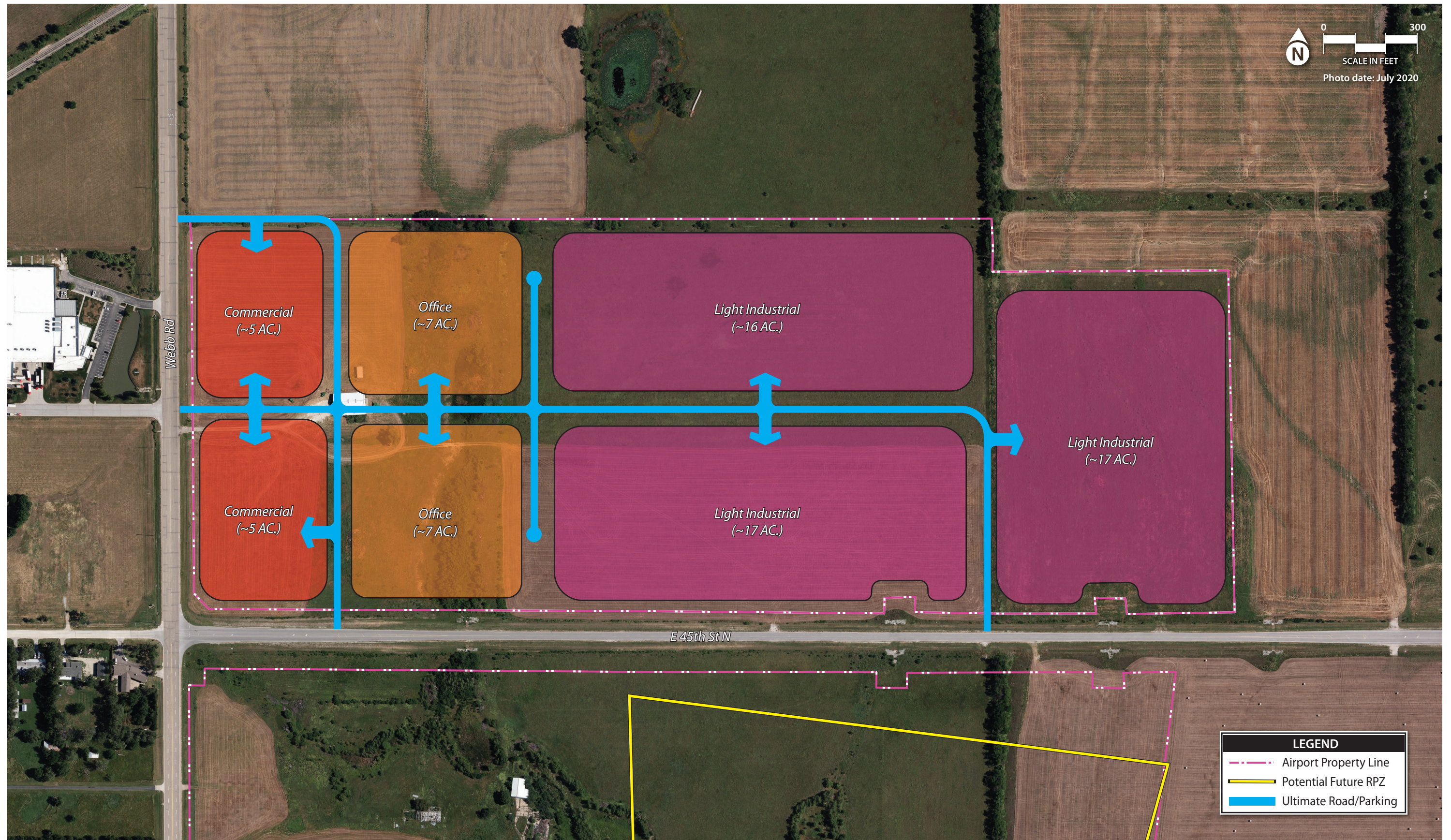
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ZONING AND BUILDING CODE EVALUATION

An important factor when considering land development is the current municipal zoning that applies to the land. Zoning is an indication of how the local municipality desires land to be developed in the future. However, there are limitations to the applicability of municipal zoning of a federally obligated airport, like Jabara. When any federally obligated airport accepts federal capital improvement grants, they agree, by contract, to maintain the airport free of incompatible land uses and to use the land for the preservation and improvement of the airport. Therefore, regardless of the municipal zoning of airport property, the airport must only support development that is compatible with the airport or risk not only future federal development grants but also the possibility of refunding past federal grants.

If a municipality has zoned airport land, it is most common to zone it as industrial, which is typically compatible with airport operations. Often, the zoning code includes an airport zone, which specifically describes allowable land uses, which are industrial in nature. Study Area 1 is zoned industrial. Study Area 2 south of the 43rd Street North alignment is also zoned industrial. Study Area 2 north of the 43rd Street North Alignment is zoned as low-density residential. That portion of Study Area 3 that is in the City of Wichita is zoned low-density residential, and the remaining portion in the City of Bel Aire is zoned agricultural. The airport staff is currently working to have the low-density residential and agricultural zoning designations changed to industrial. Nonetheless, the airport would not allow residential development on airport property because of the risk of violating the federal Grant Assurances to which they have agreed. **Exhibit 25 – Area Zoning** is a map showing the current zoning status of the airport environment.

Appendix B includes additional zoning information and the building code evaluation that was done as part of this study. It includes information related to the design and construction ordinances for both the City of Wichita and the City of Bel Aire. The current plat maps covering Study Areas 1 and 2 are included for reference. A portion of Study Area 2 has been platted, and Study Area 3 has not been platted.

UTILITY REPORT

Appendix C presents an analysis of the utility availability that would serve Study Areas 1, 2, and 3. This includes discussion of electricity, natural gas, communications lines, water distribution, and sanitary sewer.

TAXILANE EXTENSION COST ESTIMATES

Appendix D presents the cost estimates for the five taxilane extension alternatives. Table 2 summarizes the taxilane extension cost estimates.

COLONEL JAMES JABARA AIRPORT

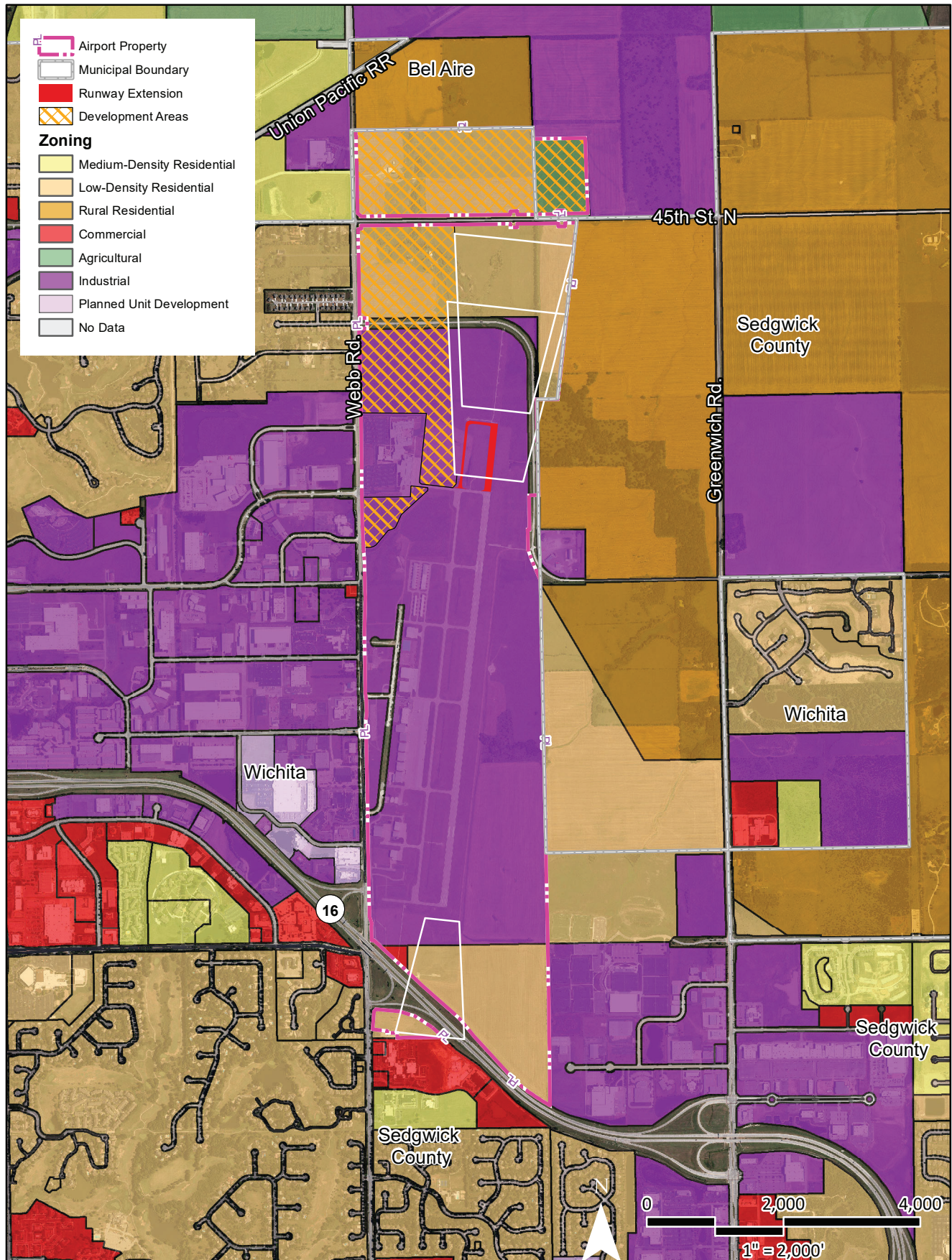


TABLE 2 | Taxilane Cost Estimates

Study Area	Alternative	Pavement Area (s.y.)	Net Fill Material (c.y.)	Cost Estimate
1	1	3,100	6,200	\$1,180,000
1	2	2,750	2,400	\$870,000
2	1	12,500	28,600	\$4,370,000
2	2	12,500	34,600	\$4,340,000
2	3	12,500	30,800	\$4,590,000

Source: Garver

DRAINAGE ANALYSIS

Appendix E presents analysis of the drainage patterns and infrastructure impacting Study Areas 1, 2, and 3. Outlined are the stormwater and drainage improvement standards for the Cities of Wichita and Bel Aire. An analysis of the current FEMA floodplain is also presented. The drainage appendix indicates that the extension of a taxilane into Study Areas 1 and 2 would require expansion or construction of additional dry detention facilities to maintain peak discharges and to handle the additional total runoff volume in the developed condition.

The analysis indicates that development of that portion of Study Area 3 which discharges to the south (that area within the City of Wichita), will result in a decrease in peak discharges for all but the two-year return period, indicating that no major detention facilities would be required to meet the water quantity standard. Therefore, no additional dry detention would be required for development of that portion of Study Area 3 located within the City of Wichita. That portion of Study Area 3 that is in the City of Bel Aire discharges to the northeast. It would require additional detention to be developed due to the upstream location of the area within the catchment.

In addition, preservation of water quality will need to be addressed by any potential developer.

CONCLUSION

This study has been undertaken to examine three undeveloped parcel areas at the Colonel James Jabara Airport (AAO) in anticipation of marketing these parcels for aviation related, aeronautical and/or non-aeronautical development. The information collected for each Study Area parcel is intended to aid potential developers and airport administration, in understanding factors that may be considered when assessing potential development of the parcels.

Study Areas 1 and 2 are currently reserved for future aeronautical uses, and to that end, a taxilane is planned to be extended to each Area. Study Area 3 is physically separated from the airport by a public roadway; therefore, non-aeronautical land uses are considered. The study includes depictions of the planned taxilanes and volume calculations of fill material that would be required to support the taxilane. Several facility layout concepts are presented in this study which are indented to provide the airport and developers with a general idea of the type of desired development for each of the three areas.

Several appendices are included in this report which cover zoning, building codes, utilities, taxilane construction cost estimates, and drainage analysis.

COLONEL JAMES JABARA AIRPORT

Commercial Site
Development Study



Appendix A

Airport Stormwater Discharge Permit



Division of Environment
Curtis State Office Building
1000 SW Jackson St., Suite 400
Topeka, KS 66612-1367



Phone: 785-296-1535
Fax: 785-559-4264
www.kdheks.gov

Janet Stanek, Acting Secretary

Laura Kelly, Governor

December 6, 2021

Rick Stone
Wichita Airport Authority
2173 Air Cargo Rd.
Wichita, KS 67209

**Industrial Stormwater Permit Holders Invoice for Annual Permit Fee
January 2022 through January 2023**

Dear Permittee: An Industrial Stormwater Permit is due **Immediately upon receipt.**

Facility Name: Colonel James Jabara Airport
Permit No. G-AR94-0018
Facility Location: Wichita
Please make check payable to: **KDHE**
Permit Fee: **\$60.00**

Please return this form with payment to:
KDHE Stormwater Coordinator
Kansas Department of Health & Environment
1000 SW Jackson Street– Suite 420
Topeka, KS 66612-1367

TO BE COMPLETED BY PERMITTEE:

- Has the annual comprehensive site evaluation (Permit Section 2.4.4) been completed? (Y/N) Y
- Has the SWP2 Plan been updated and certified (Permit Section 2.4.6)? (Y/N) Y

If you answered no to either of the above questions you are required to complete the annual evaluation and/or update/modify the SWP2 Plan within 90 days of this certification date.

Signature [Signature]

Date 12/13/2021

**TO ENSURE PERMIT COMPLIANCE, ALL QUESTIONS MUST BE ANSWERED, AND FORM
SIGNED AND SUBMITTED WITH PAYMENT.**

Contact the KDHE – Stormwater Coordinator at 785.296.5517 or Chris.Seeds@ks.gov with any questions

For official use only.	Check No.	Date Received:

COLONEL JAMES JABARA AIRPORT

Commercial Site
Development Study



Appendix B

Zoning and Building Code Evaluation



AAO Site Development Study

Code Evaluation

Prepared for: Coffman Associates

Colonel James Jabara Airport, Wichita, KS

Prepared by:



**1995 Midfield Road
Wichita, KS 67209**

December 2022

Garver Project No.: 2A17000

Colonel James Jabara Airport, Wichita, Kansas

1.0 Property Location

The property is located in Payne Township, Sedgwick County, Kansas and is owned by the Wichita Airport Authority. Areas 1 and 2 are in Wichita city limits, while Area 3 is partially divided between the City of Wichita and the City of Bel Aire. Adjacent to the site, Areas 1 and 2 generally abut the City of Wichita on all sides, with small portions of the Area 2 perimeter abutting Bel Aire or Sedgwick County. Area 3 abuts the City of Bel Aire on the north, east and west sides. Study area locations and city boundaries are shown in Figure 1.

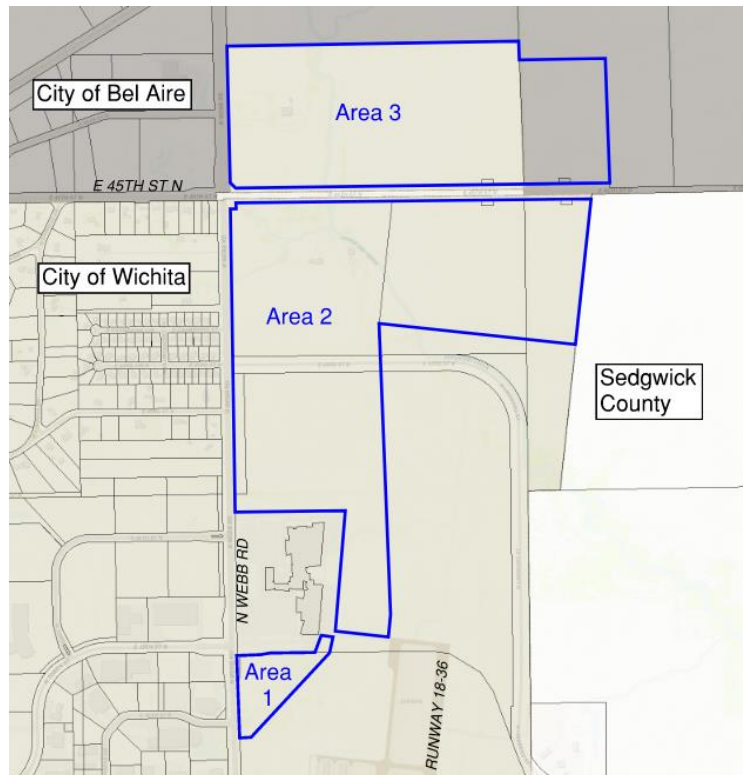


Figure 1: Study Areas

2.0 Platting

2.1 City of Wichita-Sedgwick County

Area 1 sits in the northwest corner of a parcel which was platted as Lot 1, Block A of the Colonel James Jabara Airport Addition. The portion of Area 2 that is south of vacated 43rd / Lindberg Street is located within a parcel which was platted as Lot 1, Block 1 of Colonel James Jabara Airport 2nd Addition. Plat maps for both additions are included on Page B-8. Area 2 south of vacated 43rd / Lindberg Street consists of two unplatted parcels, one east and one west, which are of approximately equal size. Area 3 is also an unplatted parcel.

The current plat for Lot 1, Block 1 of Colonel James Jabara Airport 2nd Addition contains elements which may be restrictive to a proposed development on the south half of Area 2 in terms of access and usable

Colonel James Jabara Airport, Wichita, Kansas

area. Access control from Webb Road between 39th Street and vacated 43rd / Lindberg Street is limited to two openings, both of which are currently utilized as the entrance drives for the WSU Tech Campus. Additionally, there is a 100-ft. wide reserve at the northwest corner of the Lot, which extends 1,067 ft. south along Webb Road, that is platted for open space purposes. A plat amendment or re-plat would be necessary to establish additional access openings from Webb Road and to vacate Reserve B.

Any potential new platting, re-platting, or plat amending on the site would require approval from the Wichita-Sedgwick County Metropolitan Area Planning Commission (MAPC).

2.2 City of Bel Aire

The east portion of Area 3, located in Bel Aire, is an unplatted parcel of land.

Any potential new platting of the parcel would require approval from the Bel Aire Planning and Development Department.

3.0 Zoning Ordinances

3.1 State of Kansas

Kansas Statute 3-116 requires any lease of municipal airport property to be for aviation-related purposes. This land use condition must be met in addition to the municipal zoning regulations listed below.

3.2 City of Wichita-Sedgwick County

Zoning for the City of Wichita is regulated by the Wichita-Sedgwick County MAPC. The Wichita-Sedgwick County Unified Zoning Code contains the articles for zoning district standards; regulations are also provided in Title 28 of the City of Wichita Code of Ordinances. A zoning map is included on Page B-11.

The development areas located in Wichita are currently classified as the following districts:

- Area 1 – LI (Limited Industrial)
- Area 2 – LI (Limited Industrial) south of 43rd Street and SF-5 (Single-Family Residential) north of 43rd Street
- Area 3 – SF-5 (Single-Family Residential)

The SF-5 portion of Areas 2 & 3 is expected to be re-zoned as LI by 2023.

3.2.1 LI – Limited Industrial

LI districts are the preferred zoning for development at Jabara, and are described as moderate intensity manufacturing, industrial, and commercial uses. Lot, setback, and building height restrictions for LI districts are listed in Table 1.

Colonel James Jabara Airport, Wichita, Kansas

Table 1: Limited Industrial Site Requirements and Restrictions

LI – Limited Industrial	
Minimum Lot Size	None
Minimum Lot Width	None
Minimum Front Setback	20 ft.
Minimum Rear Setback	None
Minimum Interior-Side Setback	0/5 ft.
Minimum Street-Side Setback	None
Maximum Height	80 ft. + 2 ft. increase/1 ft. add. setback

Article III of the Unified Zoning Code lists uses permitted by-right in LI Districts. Commercial uses include office, vehicle and equipment sales, vehicle repair, and warehouse. Industrial uses include freight terminal, gas and fuel storage and sales, manufacturing, research services, storage, vehicle storage yard, warehousing, and welding or machine shop. Conditional commercial uses include airport or airstrip and heliport. The code narrative as well as a full list of permitted uses for LI districts is included on Page B-13.

3.2.2 SF-5 – Single-Family Residential District

SF-5 districts are described as low to moderate density single-family and complimentary uses in areas with full public services.

All areas currently zoned as SF-5 (portions of Areas 2 & 3) are expected to be re-zoned as LI by 2023.

3.2.3 Airport Hazard Zoning

In addition to the development restrictions identified for the zoning districts, the Wichita-Sedgwick County Airport Hazard Zoning Map also identifies maximum allowable structure height, without the need for a permit, for areas based on proximity to airports. Based on this map, structures in Areas 1 and 2 exceeding 25' and structures in Area 3 exceeding 75' in height would require a permit. The Airport Hazard Zones Map is included on Page B-20.

3.3 City of Bel Aire

Zoning for the City of Bel Aire is regulated by the Bel Aire Planning and Development Department. Zoning maps are available on the City website; a zoning map has been included on Page B-21. City zoning regulations are in Chapter 18a of the Bel Aire City Code.

The development study Area 3 is located in Bel Aire and is currently classified as AG Agricultural. To meet the requirement for aviation-related development, this area is expected to be re-zoned as M1 – Planned Unit Development (PUD) – Industrial District.

3.3.1 M-1 – Planned Unit Development (PUD) – Industrial District

“M-1” PUD- Industrial Districts are intended to encourage innovation in commercial and industrial development through designs allowing for a more efficient use of land, incorporation of new technologies in urban land development, and incorporation of a greater variety and flexibility in type, design, and layout of structures.

Colonel James Jabara Airport, Wichita, Kansas

Article 7 of the Bel Aire Zoning Regulations lists permitted uses in M-1 districts. Permitted uses include commercial office and retail uses pursuant to a PUD, and manufacturing and industrial uses pursuant to a PUD. Conditional uses include intensive commercial, manufacturing, or industrial development typically not located near residential areas. A complete list of permitted uses for M-1 districts is included on Page B-23.

Regulations for height, area, setbacks, streets, parking, signage, and landscaping are pursuant to an approved plat and may differ from development to development within the PUD district.

4.0 Subdivision Regulations

4.1 City of Wichita-Sedgwick County

The City of Wichita-Sedgwick County Unified Subdivision Regulations provides rules and procedures for the improvement of property to ensure proper subdivision planning. These regulations provide for the proper location of streets, reservation or dedication of land, necessary on-site and off-site improvements, flood prevention and stormwater pollution control, designation of building lines, design compatibility, environmental protection, coordination of public and private resources for development, and the establishment of standards for the design and construction of improvements. Development on the proposed parcels within City of Wichita and Sedgwick County limits shall follow these regulations. The Subdivision Regulations are available on the Wichita-Sedgwick County Planning website.

<https://www.wichita.gov/Planning/Pages/SubdivisionRegulations.aspx>

4.2 City of Bel Aire

City of Bel Aire Subdivision Regulations are contained in Chapter 18b of the Bel Aire City Code. These regulations are designed and intended to provide efficient and orderly location of streets, storm water drainage, protection from periodic flooding conditions, adequate water supply, adequate sewage disposal, various utility services, adequate access for firefighting equipment and police protection, proper coordination with governmental agencies, and to establish administrative procedures for community development. The Subdivision Regulations are available on the City of Bel Aire Planning & Community Development Website. <https://belaireks.gov/180/Planning-Community-Development>

5.0 Design and Construction Ordinances

5.1 Federal Aviation Administration (FAA)

As a member of the National Plan of Integrated Airport Systems (NPIAS) and recipient of federal funding through the Airport Improvement Program (AIP), all development at AAO must adhere to FAA grant assurances as well as design and construction standards established through FAA Advisory Circulars (ACs). These include but are not limited to:

- AC 150/5200-33 Hazardous Wildlife Attractants on or Near Airports
- AC 150/5320-5 Surface Drainage Design
- AC 150/5320-6 Airport Pavement Design and Evaluation
- AC 150/5370-10 Standard Specifications for Construction of Airports

Colonel James Jabara Airport, Wichita, Kansas

5.2 Wichita Airport Authority (WAA)

The WAA has established standards and procedures which are applicable to design and construction projects on airport property. Adherence to these standards will be required as directed by the WAA for approval of the development project.

5.3 City of Wichita

Article 8 of the City of Wichita-Sedgwick County Subdivision Regulations indicates that the City of Wichita is the appropriate engineering jurisdiction based on the site location. This means that City of Wichita standards and specifications would be utilized for the applicable landside improvements. Additionally, any coordination relating to approval of engineering drawings, inspections, acceptance, petitions, and surety would be done through the City Engineer. Information on improvement standards and procedures can be found in the City of Wichita Code of Ordinances, as well as on the Public Works and Utilities website. The following items from the code are especially relevant.

5.3.1 Ordinances

- Title 10 – Public Streets and Sidewalks
- Title 15 – Fire Protection
- Title 16 – Sewers, Sewage Disposals, and Drains
- Title 17 – Water
- Title 18 – Building Code
- Title 19 – Electricity
- Title 21 – Plumbing and Gas Fitting Code
- Title 22 – Air Conditioning, Refrigeration, and Warm Air Heating Code
- Title 27 – Flood Damage Prevention

Titles 10, 15, 16, and 17 are applicable to those respective public or private site improvements to serve new development. Titles 19, 21, and 22 generally refer to Title 18, which contains the Wichita/Sedgwick Unified Building and Trade Code. Title 18, Flood Damage Prevention requirements and applicability to the site is discussed further in the drainage report. Also discussed in the drainage report are the City Stormwater Manual and requirements for water quality treatment and water quantity management.

5.3.2 City of Wichita Private Projects

City of Wichita Private Project procedures are applicable to projects involving the construction of public infrastructure improvements by private contract. These improvements include water, sanitary sewer, drainage, and paving. Procedures involve the submittal of engineering plans and required documentation to the City, review and approval of plans by the City Engineer and appropriate departments, coordination of construction and inspection as well as surety with the contractor, and the submittal of as-built drawings for City records. Detailed guidelines are provided on the Public Works and Utilities website. Table 4 lists the improvement thresholds for when Private Projects become applicable.

Colonel James Jabara Airport, Wichita, Kansas

Table 2 – Private Projects

Item	Requirements
Private Project Water (PPW)	Any line publicly maintained, any domestic service line over 2", and any fire protection line from the tap to the building and/or furthest hydrant.
Private Project Sewer (PPS)	Any publicly maintained line, and any private sewer line 8" or larger.
Private Project Drainage (PPD)	Developments that require stormwater management facilities, detention ponds, downstream channel protection, water quality treatment, and/or storm sewers.
Private Project Paving (PPD)	Required for any public or private street or for any changes being made in City of Wichita Right of Way that cannot be issued under a pavement cut permit.

5.4 City of Bel Aire

Bel Aire standards and specifications would be utilized for applicable landside development within the City. Additionally, any coordination relating to approval of engineering drawings, inspections, acceptance, petitions, and surety would be done through the City Engineer. Information on improvement standards and procedures can be found in the Bel Aire City Code, as well as on the City Public Works page. The following items from the code are especially relevant.

- Chapter 11 – Streets and Sidewalks
- Chapter 13 – Fire Protection
- Chapter 14 – Sanitary Sewers and Stormwater
- Chapter 16 – Municipal Water Service
- Chapter 17 – Building Codes


Colonel James Jabara Airport, Wichita, Kansas


Plat Maps

PC42-10



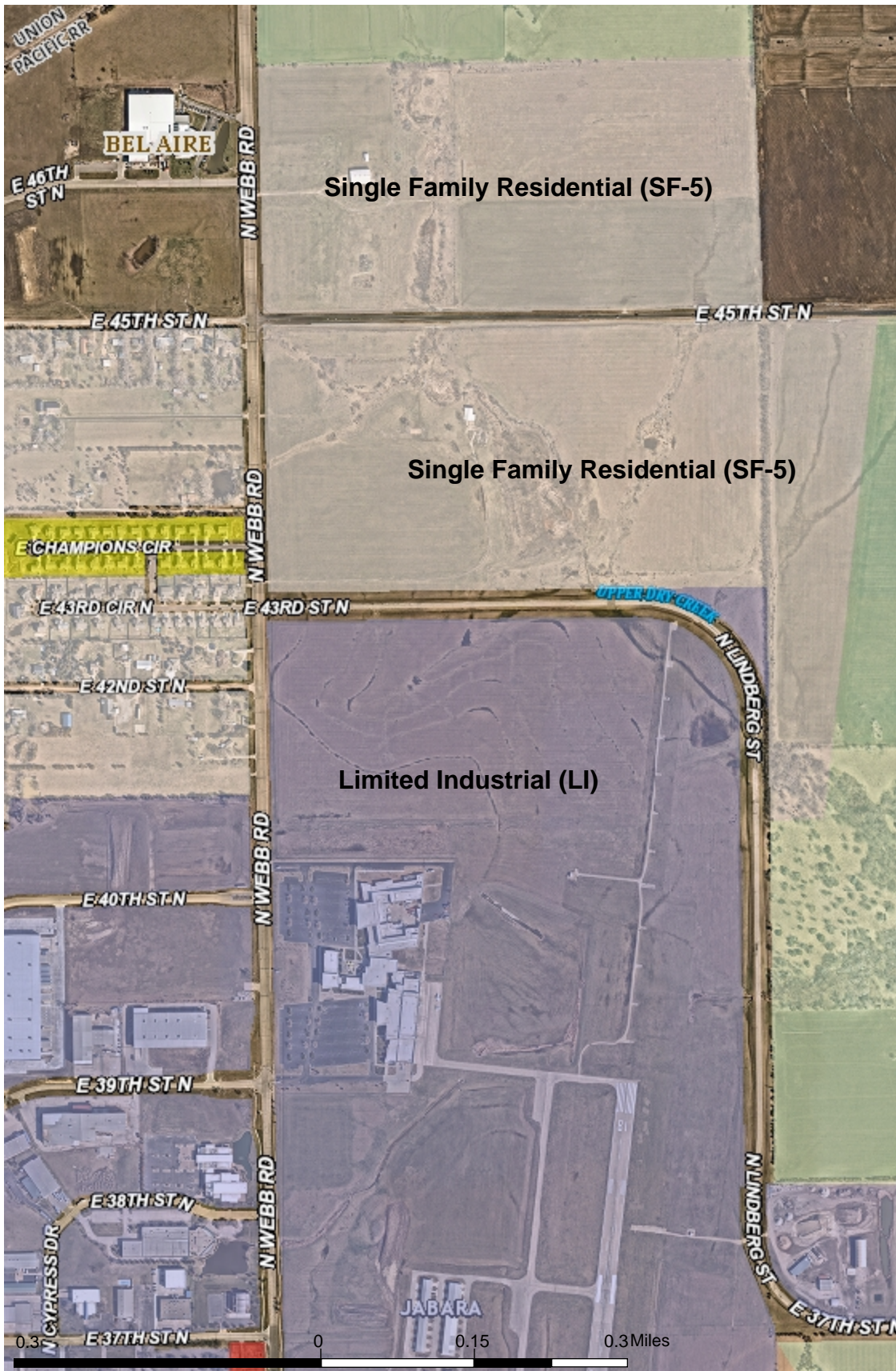
This digital plat record accurately reproduces in all details the original plat filed with the Sedgewick County Register of Deeds. Digitized under the supervision of Register of Deeds Bill Neak by Sedgewick County Geographic Information Systems.


Bill Neak, Register of Deeds
For the Sedgewick County Register of Deeds

 SEDGWICK COUNTY, KANSAS

Colonel James Jabara Airport, Wichita, Kansas

Zoning Attachments



Legend

Zoning

- RR
- SF-20
- SF-10
- SF-5
- TF-3
- MF-18
- MF-29
- B
- MH
- NO
- GO
- NR
- LC
- GC
- CBD
- OW
- IP
- LI
- IP-A
- GI
- AFB
- U
- PUD
- AIRPORT
- OLD TOWN

Cityof_Wichita_KS_section3.si

- Red: Band_1
- Green: Band_2
- Blue: Band_3

CityofWichita_KS_section1.sid

- Red: Band_1
- Green: Band_2
- Blue: Band_3

CityofWichita_KS_section2.sid

- Red: Band_1
- Green: Band_2
- Blue: Band_3

1: 9,600



This information is not an official record, and cannot be used as such. The user should rely only upon official records available from the custodian of records in the appropriate City and/or County department. Some data provided here and used for the preparation of these maps has been obtained from public records not created or maintained by the City of Wichita.

Map Created On: 6/21/22 3:56 PM



Wichita-Sedgwick County Unified Zoning Code - Article III Zoning District Standards

20. - LI Limited Industrial District ("LI")

- a. **Purpose.** The purpose of the LI Limited Industrial District is to accommodate moderate intensity manufacturing, industrial, commercial and complementary land uses. The LI District

is generally compatible with the "Employment/Industry Center" designation of the *Wichita-Sedgwick County Comprehensive Plan*. It is intended for application primarily within the City of Wichita, although it may be appropriate for application in areas of unincorporated Sedgwick County that have been designated as "Wichita 2030 Urban Growth Area."

b. **Permitted Uses.** The following uses shall be permitted by-right in the LI District.

(1) **Residential Uses**

None allowed by-right

(2) **Public and Civic Uses**

**This list only identifies the land uses based on zoning. Not all uses allowed by LI District are necessarily allowed for on-airport development.*

Auditorium or Stadium

Cemetery

Church or Place of Worship

Community Assembly

Correctional Facility, subject to Sec. III-D.6.h

Correctional Placement Residence, Limited and General, subject to Sec. III-D.6.h

Day Care, Limited and General, subject to Sec. III-D.6.i

Golf Course

Government Service

Hospital

Library

Nursing Facility

Parks and Recreation

Recycling Collection Station, Private, subject to Sec. III-D.6.q

Recycling Collection Station, Public, subject to Sec. III-D.6.r

Recycling Processing Center, subject to Sec. III-D.6.s

Reverse Vending Machine, subject to Sec. III-D.6.u

Safety Service

University or College Utility, Minor

(3) Commercial Uses

Animal Care, Limited or General

Automated Teller Machine

Bank or Financial Institution

Broadcast/Recording Studio

Car Wash, subject to Sec. III-D.6.f

Construction Sales and Service

Convenience Store

Entertainment Establishment in the City, subject to Sec. III-D.6.w

Event Center in the City, subject to Sec. III-D.6.w

Event Center in the County

Farmer's Market in the City, subject to Sec. III-D.6.jj

Farmer's Market in the County

Funeral Home

Hotel or Motel

Kennel, Boarding/Breeding/Training, subject to Sec. III-D.6.k

Marine Facility, Recreational

Medical Service

Microbrewery

Mobile Food Unit in the City, subject to Sec. III-D.6.oo

Monument Sales

Nightclub in the City, subject to Sec. III-D.6.w

Nightclub in the County, subject to Sec. III-D.6.ff

Nursery and Garden Center

Office, General

Parking Area, Commercial

Pawnshop

Personal Care Service

Personal Improvement Service

Post Office Substation

Printing and Copying, Limited

Printing and Publishing, General

Recreation and Entertainment, Indoor and Outdoor

Restaurant

Retail, General

Rodeo in the City, subject to Sec. III-D.6.kk

Riding Academy or Stable

Secondhand Store

Service Station

Sexually Oriented Business, subject to Sec. III-D.6.ff

Tattooing and Body Piercing Facility, subject to Sec. III-D.6.ee

Tavern or Drinking Establishment, subject to Sec. III-D.6.w

Teen Club in the City, subject to Sec. III-D.6.w

Vehicle and Equipment Sales

Vehicle Repair, Limited and General

Vocational School

Warehouse, Self-Service Storage

Wireless Communication Facility, subject to Sec. III-D.6.g

(4) Industrial, Manufacturing and Extractive Uses

Asphalt or Concrete Plant, Limited, subject to Sec. III-D.6.d

Freight Terminal

Gas and Fuel Storage and Sales

Manufacturing, Limited and General

Research Services

Storage, Outdoor, subject to Sec. III-D.6.dd

Vehicle Storage Yard

Warehousing

Welding or Machine Shop

Wholesale or Business Services

(5) Agricultural Uses

Agriculture

Agricultural Processing

Agricultural Research

Agricultural Sales and Service

Grain Storage

- c. **Conditional Uses.** The following Uses shall be permitted in the LI District if reviewed and approved by the Planning Commission in accordance with the procedures and standards of Sec. V-D.

(1) Residential Uses

None allowed by Conditional Use

(2) Public and Civic Uses

Day Reporting Centers, subject to Sec. III-D.6.ii

School, Elementary, Middle and High

Utility, Major

(3) Commercial Uses

Airport or Airstrip

Heliport

(4) Industrial, Manufacturing and Extractive Uses

Asphalt or Concrete Plant, General

Landfill

Mining or Quarrying

Oil and Gas Drilling

Rock Crushing

Solid Waste Incinerator, subject to Sec. III-D.6.v

Transfer Station

Wrecking/Salvage Yard, subject to Sec. III-D.6.e

(5) Agricultural Uses

None allowed by Conditional Use

- d. **Property development standards.** Each site in the LI District shall be subject to the following minimum property development standards. Setbacks and heights are for Principal Structures. See Sec. III-D.7.e for Setbacks and heights for Accessory Structures. See also Secs. III-E.2.e(2) and III-E.2.e(3) for Front Setbacks on unplatted tracts or major roadways. Compatibility standards in Secs. IV-C.4 and IV-C.5 may take precedence.

(1) **Minimum Lot Area:** No minimum

(2) **Minimum Lot Width:** No minimum

(3) **Minimum Front Setback:** 20 feet, provided that the minimum required Front Setback may be reduced pursuant to Sec. III-E.1.e(5)

(4) **Minimum Rear Setback:** No minimum

(5) **Minimum Interior Side Setback:** zero feet, but if an Interior Side Setback is provided it shall be at least five feet in width.

(6) **Minimum Street Side Setback:** No minimum

(7) **Maximum Height:** 80 feet, plus two feet of additional height for each foot of Setback beyond the minimum required Setbacks.

e. **Special LI District regulations**

- (1) **Environmental performance standards.** Uses and activities that are in violation of the Sedgwick County Code or the Code of the City of Wichita or that are out of character with ordinary and customary standards and practices for a Permitted Use to such an extent

that the Use or activity is obnoxious, offensive or a nuisance due to odor, dust, smoke, noise, vibration or other similar causes, are prohibited in the LI District.

Wichita-Sedgwick County Airport Hazard Zoning Map

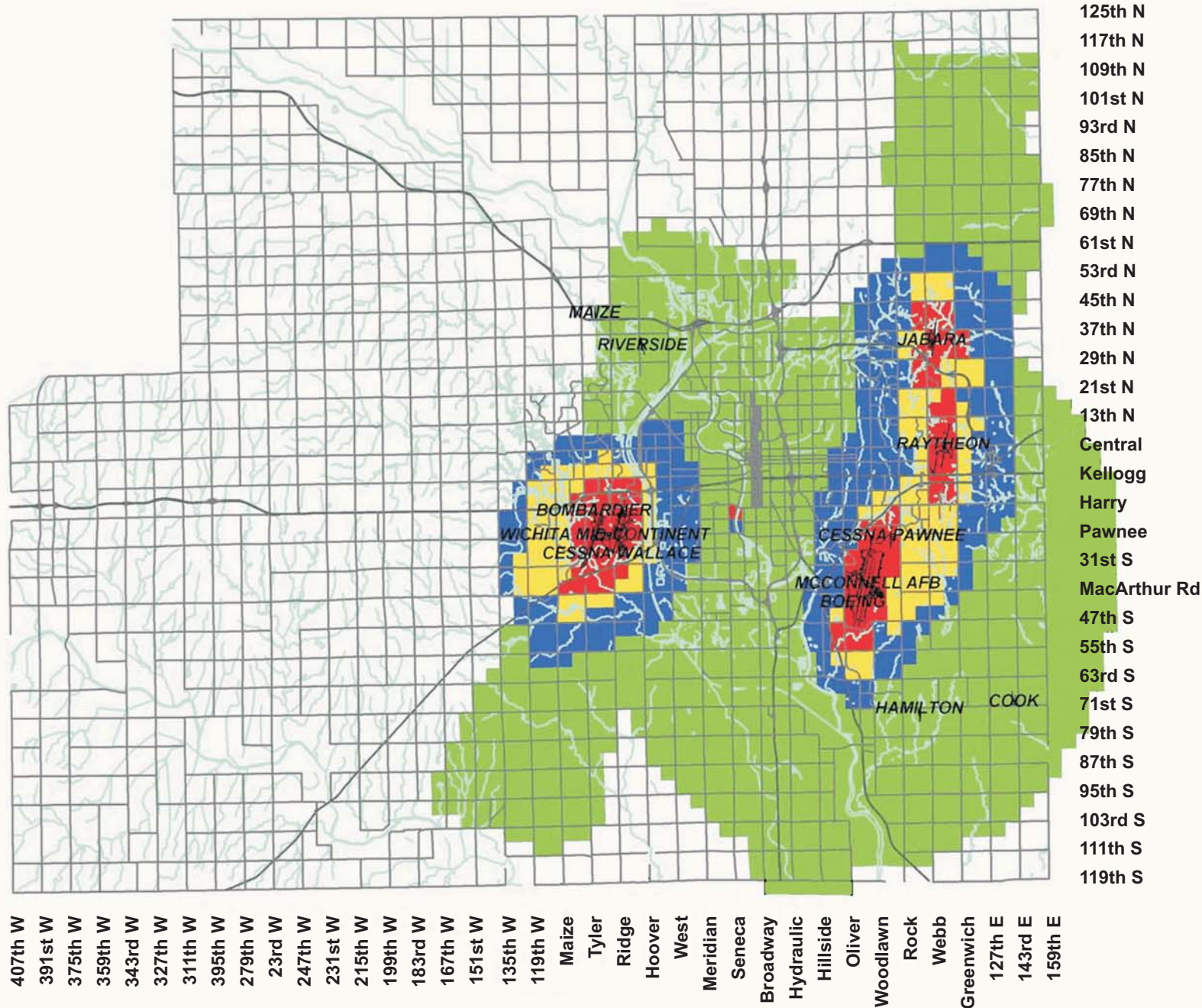
Airport Hazard Zones

No Permit Required If:

- Area A 25 ft. or less
- Area B 75 ft. or less
- Area C 150 ft. or less
- Area D 300 ft. or less

Areas Outside of Airport Hazard Zones

No Permit Required



Software: ARC/INFO 3.2 (METSINKS)
ArcView GIS Ver. 3.2
Hardware: DEC ALPHA 2100A
Raster: 1/4" D5000
Map Data Source:
Road Centerlines
provided by
City of Wichita GIS and
Sedgwick County GIS
City Limit boundaries



It is understood that while the City of Wichita, Kansas, Center
Department of Information Systems Department has no obligation
and warrant to holders that there are no representation or information
contained in the above map, the City Center 2000 year

Zoning Districts

Bel Aire, Kansas



Map Legend

- Government Properties
- Parks
- Property Boundaries
- Bel Aire City Limits

Zoning Types

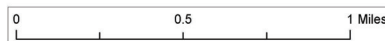
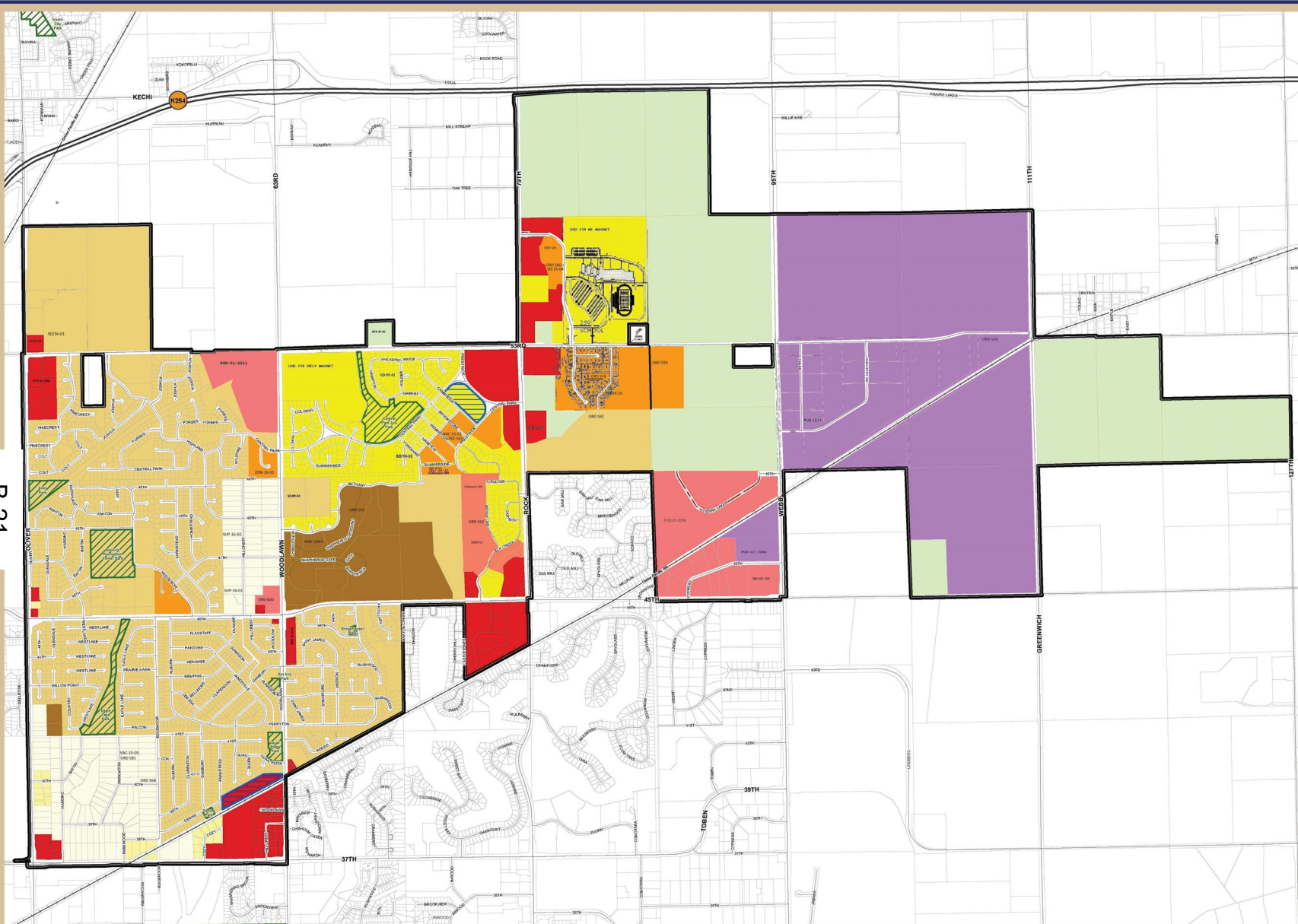
- Rural Residential
- AG Agricultural
- R-1 Residential 1
- R-2 Residential 2
- R-3 Residential 3
- R-4 Residential 4
- R-5 Residential 5
- R-5b Residential 5b
- R-6 Residential 6
- C-1 Commercial 1
- C-2 Commercial 2
- M-1 Manufacturing
- MPH Manufactured Home Park



DATE: 9/15/16

It is understood that the Sedgwick County GIS, Division of Information and Operations, has no indication or reason to believe that there are inaccuracies in information incorporated in the base map.

The GIS personnel make no warranty or representation, either expressed or implied, with respect to the information or the data displayed.



City of Bel Aire Zoning Code - Article 7 Zoning Districts

7.13 PLANNED UNIT DEVELOPMENT - INDUSTRIAL DISTRICT (M-1)

The “M-1” Planned Unit Development - Industrial District is intended to encourage innovation in commercial and industrial development, through designs allowing for a more efficient use of land, incorporation of new technologies in urban land development, and incorporation of a greater variety and flexibility in type, design, and layout of structures.

A. **Use Regulations.** No building, structure, land or premises shall be used, and no building or structure shall hereafter be erected, constructed, reconstructed, moved or altered except in conformance with those uses provided for below.

1. Permitted uses: The following uses shall be permitted by right in the “M-1” Planned Unit Development - Industrial, subject to all applicable development and performance standards:
 - a. Commercial office and retail uses pursuant to a Planned Unit Development.
 - b. Manufacturing and industrial uses pursuant to a Planned Unit Development.
2. Conditional uses: The following uses shall be permitted in the “M-1” District if reviewed and approved by the Planning Commission in accordance with the procedures and standards of Article 5.03.
 - a. All conditional uses listed in all other more intensive zoning districts.
 - b. All uses generally considered intensive commercial, or manufacturing or industrial, and typically not located near residential areas, as such products are not typically purchased by consumers for their day-to-day use, and are more likely to produce odor, noise, vibration, intensive lighting, heavy traffic, or other offensive effects

B. **Accessory Uses.** Accessory uses and structures in the Industrial District shall be permitted pursuant to the specific terms of a Planned Unit Development, or as conditional uses pursuant to the procedures set forth within Article 5.03. The following are accessory uses and structures:

1. Automotive repair and maintenance shops, maximum of two (2) bays in conjunction with gasoline service stations.
2. Car washes (single-bay, automatic) in conjunction with gasoline service stations.
3. Dwelling units for security, management or maintenance personnel.
4. Fences or walls.
5. Flag poles, under sixty (60) feet in height.
6. Food service and vending machines for tenants.

7. Gate houses.
8. Parking and loading areas.
9. Private parking garages.
10. Recreational areas and facilities.
11. Satellite dish antennas.
12. Signs.
13. Solar collectors.
14. Storage lots for vehicles awaiting repair, with screening requirements.

COLONEL JAMES JABARA AIRPORT

Commercial Site
Development Study



Appendix C **Utility Study**



AAO Site Development Study

Utility Study

Prepared for: Coffman Associates

Colonel James Jabara Airport, Wichita, KS

Prepared by:



**1995 Midfield Road
Wichita, KS 67209**

December 2022

Garver Project No.: 2A17000

Colonel James Jabara Airport, Wichita, Kansas

1.0 Public Utilities

1.1 Water Distribution

The City of Wichita and City of Bel Aire have existing distribution facilities adjacent to the study areas.

Generally, normal pressures of 60-75 psi are sufficient to provide sprinkler service to a building under 4 stories. To ensure that residual pressure of 20 psi is maintained during fire flows, utilization of an 8-in. diameter main will likely be required.

1.1.1 Area 1

- 20-in. main in the west Webb Road right-of-way (City of Wichita)
- 8-in. main north of the southern entrance drive for WSU Tech – NCAT (City of Wichita)



City of Wichita GIS Map – Area 1 Water

Colonel James Jabara Airport, Wichita, Kansas

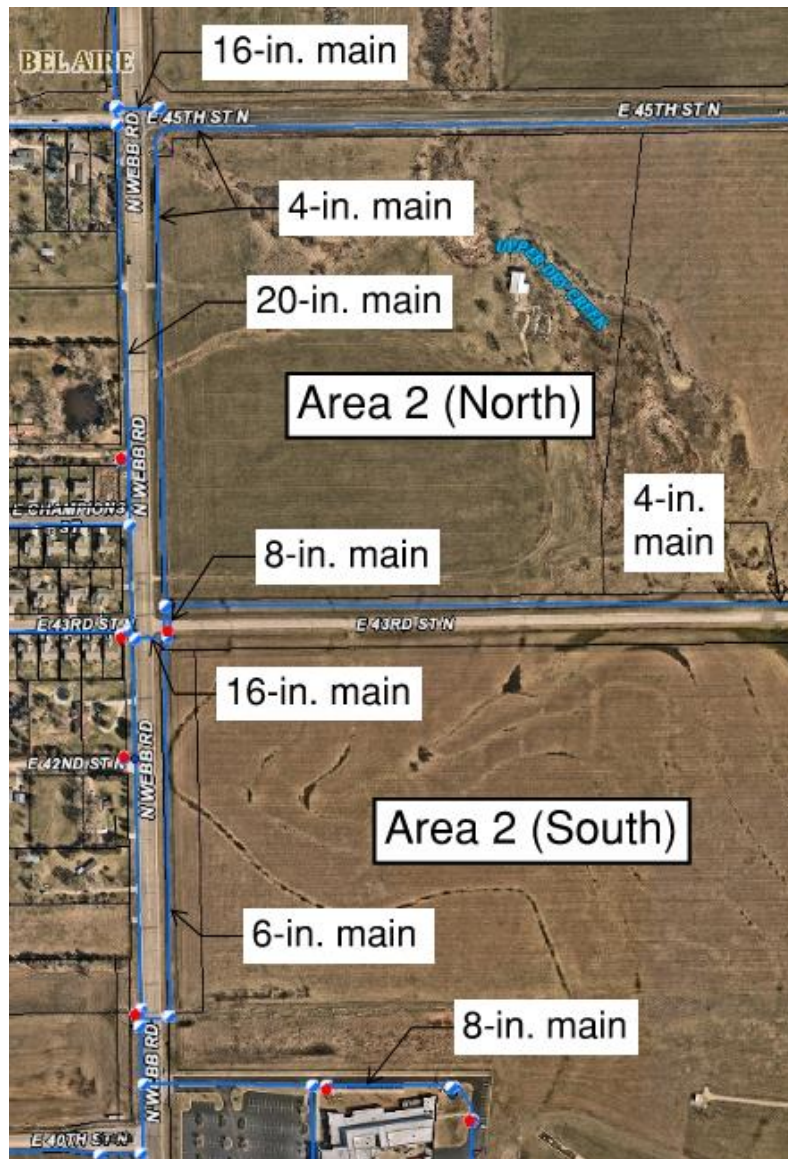
It is anticipated that any water demands of a proposed FBO, MRO, or other commercial / industrial development could be met by the water mains which exist adjacent to the site. A new 8-in. main could likely be extended south from the existing 8-in. main to serve a department service connection and meter for domestic service, and to support fire service and hydrant connections within the site. Based on design flows, size, and layout of the premises, it may be necessary to loop the new main by connecting it to the existing 20-in. main on the west side of Webb Road. Looping the new line would help maintain higher static pressure.

Based on information from the Wichita Fire Department, the site has an IOS rating of 1 (Rating for the entire City of Wichita). The site is approximately 1.5 miles north of WFD Firehouse 18, which is located at the southeast corner of the K-96 interchange on Webb Road.

1.1.2 Area 2

- 8-in. main along the north entrance drive for WSU Tech – NCAT (City of Wichita)
- 20-in. main in the west Webb Road right-of-way (City of Wichita)
- 6-in. main in the east Webb Road right-of-way between the south Area 2 boundary and the north side of vacated 43rd / Lindberg Street (City of Wichita)
- 16-in. main which terminates on the southeast corner of the intersection of vacated 43rd / Lindberg Street and Webb Road (City of Wichita)
- 8-in. main which extends north from the end of the 16-in main at the southeast corner of the intersection of vacated 43rd / Lindberg Street and terminates on the northeast corner of the intersection (City of Wichita)
- 4-in. main in the north right-of-way of vacated 43rd / Lindberg Street (City of Wichita)
- 4-in. main in the east Webb Road right-of-way between the north side of vacated 43rd / Lindberg Street and the north Area 2 boundary (City of Wichita)
- 4-in. main in the south 45th Street right-of-way (City of Wichita)
- 16-in. main which terminates northeast of the intersection of 45th Street and Webb Road (City of Wichita)

Colonel James Jabara Airport, Wichita, Kansas



City of Wichita GIS Map – Area 2 Water

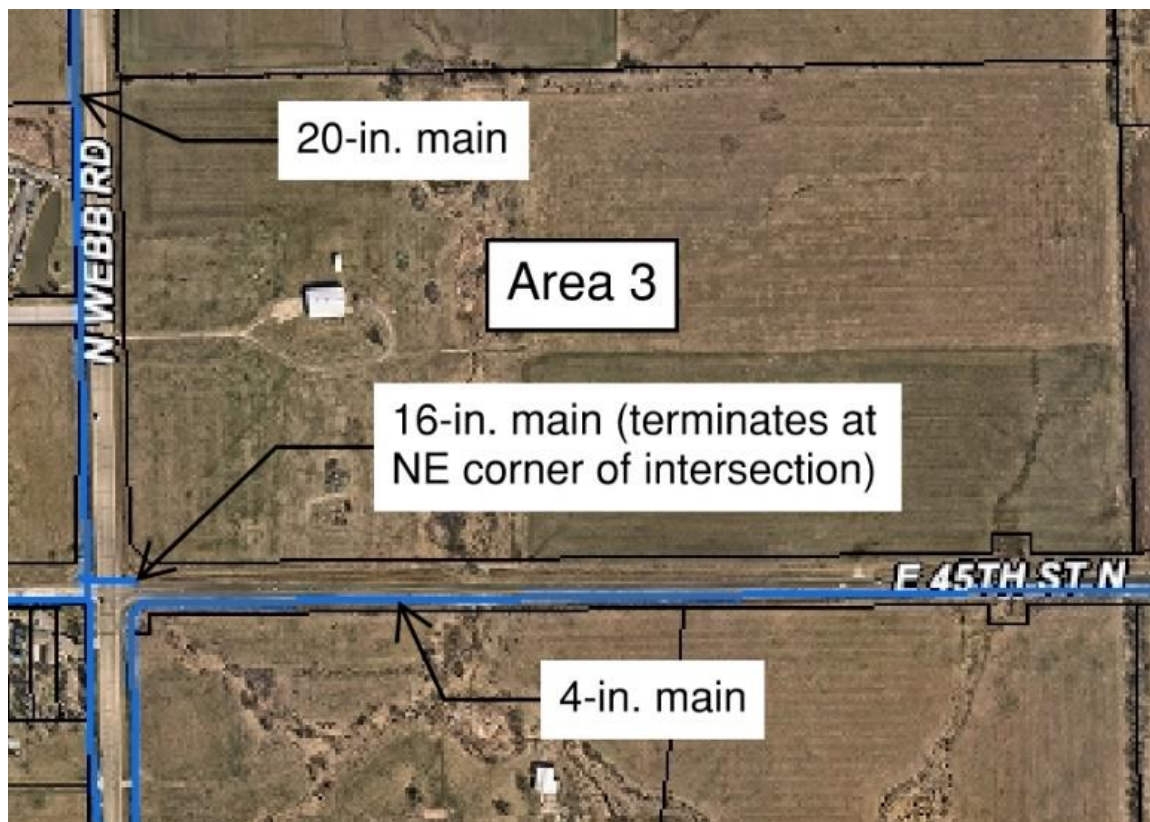
It is anticipated that any water demands of a proposed FBO, MRO, or other commercial / industrial development could be met by the water mains which exist adjacent to the site. A new 8-in. main could likely be installed, from either the existing 8-in. main to the south or extended from the termination points of the existing 16- or 8-in. mains in the east Webb Road right-of-way, to serve department service connections and meters for domestic service, and to support fire service and hydrant connections within the site. Based on design flows, size, and layout of the premises, it may be necessary to loop the new main by connecting between the existing 8-in. main and/or termination points of the 16- or 8-in mains. A connection could also be made to the larger 20-in. main on the west side of Webb Road. Looping the new lines would help maintain higher static pressures. The smaller 4- to 6-in. mains could potentially be utilized for domestic service but would likely be insufficient to meet fire flow demands without construction of onsite fire protection supply storage tanks.

Colonel James Jabara Airport, Wichita, Kansas

Based on information from the Wichita Fire Department, the site has an IOS rating of 1 (Rating for the entire City of Wichita). The site is approximately miles north of WFD Firehouse 18, which is located at the southeast corner of the K-96 interchange on Webb Road.

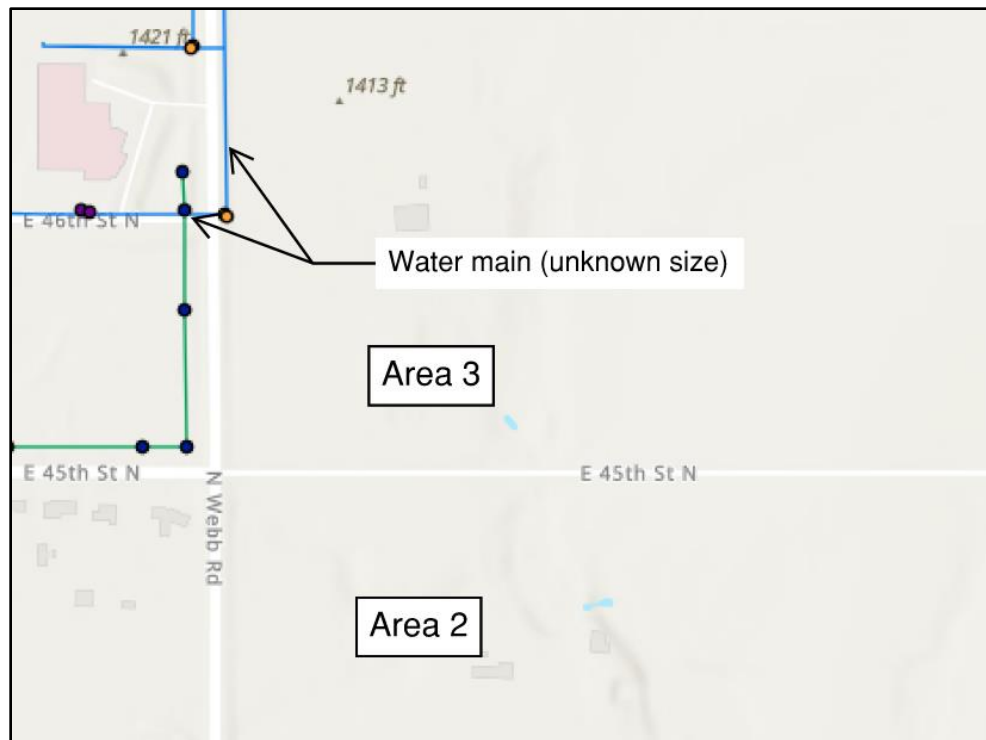
1.1.3 Area 3

- 16-in. main which terminates northeast of the 45th Street and Webb Road intersection (City of Wichita)
- 20-in. main in the west right-of-way for Webb Road (City of Wichita)
- 4-in. main in the south right-of-way for 45th Street (City of Wichita)
- Main north of 46th Street that extends to the east side of Webb Road and then runs north in the east Webb Road right-of-way (City of Bel Aire)



City of Wichita GIS Map – Area 3 Water

Colonel James Jabara Airport, Wichita, Kansas



City of Bel Aire Utility Map

It is anticipated that any water demands of a commercial or industrial development could be met by the water mains which exist adjacent to the site. A new 8-in. main could likely be extended from the existing 16-in. main in the southwest corner to serve department service connections and meters for domestic service, and to support fire service and hydrant connections within the site. The Bel Aire main would also likely have capacity to serve the site, assuming it is 8-in. diameter or larger. The smaller 4- to 6-in. mains could potentially be utilized for domestic service but would likely be insufficient to meet fire flow demands without construction of onsite fire protection supply storage tanks.

Because Area 3 is partially located in Wichita and Bel Aire, public utility installation would require an inter-local agreement or a release from one city to allow the other to provide the service from their facilities. This would allow the site to be served by a single provider, rather than having a supply from two separate sources within the same development. The City of Bel Aire has indicated that they would be open to discussion about allowing Wichita to serve the portion of Area 3 located in Bel Aire, and that they may also be able to provide service to the entire parcel.

Based on information from the Wichita Fire Department, the site has an IOS rating of 1 (Rating for the entire City of Wichita). The site is approximately 12,700 ft. north of WFD Firehouse 18, which is located at the southeast corner of the K-96 interchange on Webb Road. The City of Bel Aire utilizes the Sedgwick County Fire Department, which has a joint first response agreement with the City of Wichita. The Wichita and Sedgwick County Fire Departments could both respond to the east side of Area 3 located in Bel Aire.

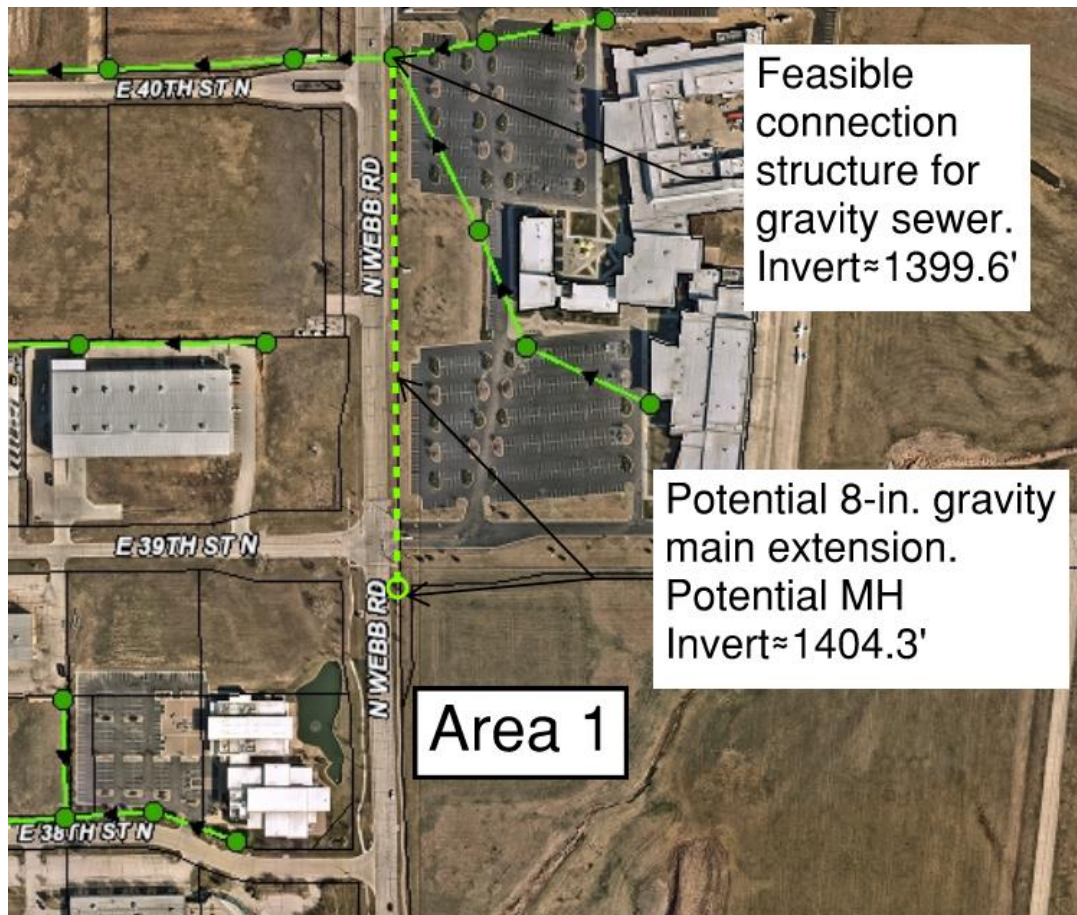
Colonel James Jabara Airport, Wichita, Kansas

1.2 Sanitary Sewer

The City of Wichita has existing sewer facilities in the vicinity of Areas 1 and 2, and the City of Bel Aire has existing sewer facilities in the vicinity of Area 3.

1.2.1 Area 1

Existing City of Wichita sewer mains and structures adjacent to Area 1 are shown on the following map.



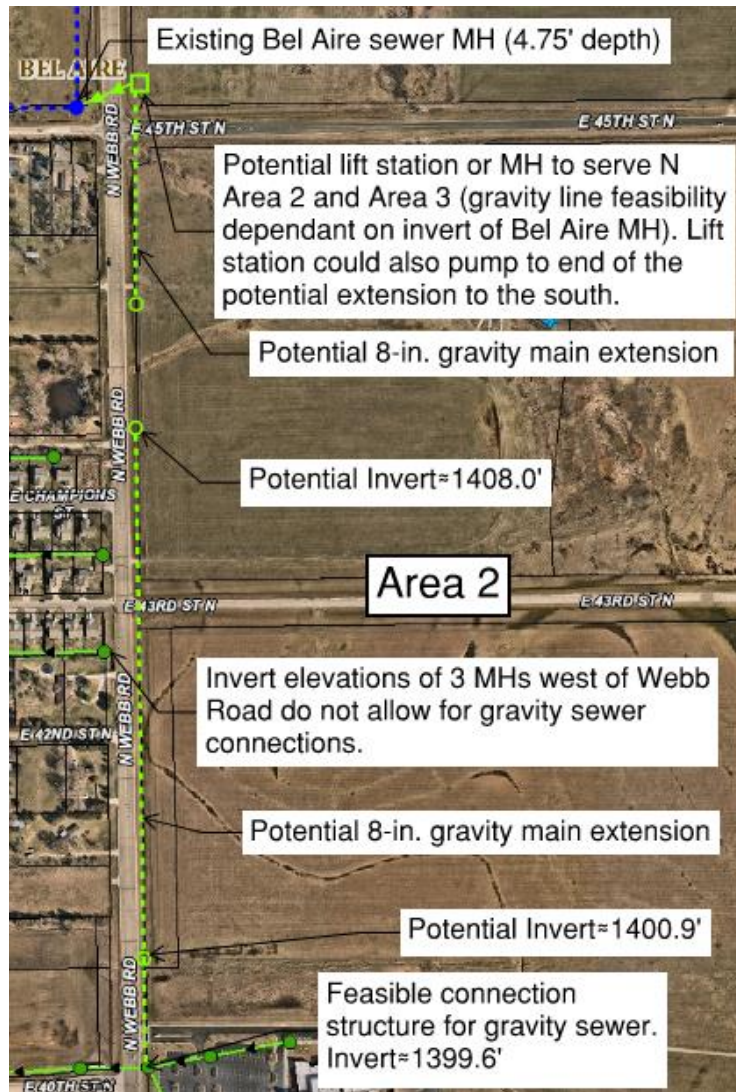
City of Wichita GIS Map – Area 1 Sanitary Sewer

Based on existing sewer invert elevations and lidar contours, the only feasible tie in location for a gravity system to serve Area 1 is the manhole located near the northern entrance drive for WSU Tech – NCAT. The existing 8-in. main is anticipated to meet the demands of a proposed development. Using the minimum design criteria for gravity sewer, a linear sanitary sewer extension from this structure to the northwest corner of Area 1 would allow for a minimum invert of approximately 1404.3-ft. (9.2' depth in right-of-way) on the site. This would provide sufficient cover at the structure and could reasonably provide service for on-grade development within Area 1 without requiring significant site grading to raise the finished floor elevation. Gravity sewer for basements could not be provided; however, duplex pumps could be utilized to pump to the manhole structure if a basement was desired.

Colonel James Jabara Airport, Wichita, Kansas

1.2.2 Area 2

Existing City of Wichita and City of Bel Aire sewer mains and structures adjacent to Area 2 are shown on the following map.



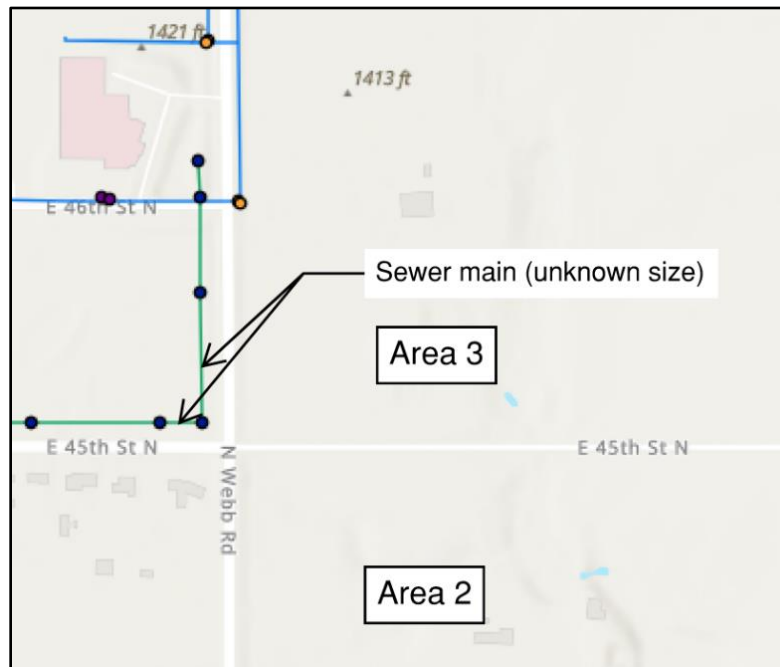
City of Wichita GIS Map – Area 2 Sanitary Sewer

Based on existing sewer invert elevations and lidar contours, the only feasible location to connect a gravity line to the Wichita sewer system is the manhole located near the northern entrance drive for WSU Tech. The existing 8-in. main is expected to meet the demands of a proposed development. Using minimum design criteria for gravity sewer, a linear main could be extended approximately 2,000-ft. north of the existing structure before cover would become too shallow due to falling elevations of the existing ground to the north and northeast in Area 2. Along this potential extension, a structure at the southwest corner of Area 2 could have an approximate invert elevation of 1400.9 ft. (16.2' depth in right-of-way), and a structure at the far north end could have an approximate invert of 1408.0 ft. (4.0' depth in right-of-way).

Colonel James Jabara Airport, Wichita, Kansas

Service for the north and northeast portions of Area 2 would require pumping with duplex pumps or a lift station, or substantial fill to raise the finished grade.

Existing City of Bel Aire sewer mains and structures adjacent to Area 2 are shown on the following map.



City of Bel Aire Utility Map – Area 2 & 3

An existing Bel Aire sewer manhole is located northwest of 45th Street and Webb Road, but is only 4.75' in depth, and could only be accessed through a force main. A connection to the Bel Aire sewer manhole would require approval from the City and likely an inter-local agreement. The City of Bel Aire has indicated that they would be open to a discussion about providing public utility service to portions of the site located in Wichita.

1.2.3 Area 3

No existing City of Wichita sewer mains are located on or adjacent to Area 3. The nearest sewer structure from which gravity service could be provided is a manhole and 18-in. sewer main in the west Rock Road right-of-way at the intersection of 45th Street and Rock Road, one mile west of the site. The 18-in. main is deep enough that minimum allowable pipe slopes could be maintained from the site to the connection point in Area 3.

Otherwise, development on Area 3 would require pumping with duplex pumps or a lift station to the manholes identified in Area 2.

Because Area 3 is partially located in Wichita and Bel Aire, public utility installation would require an inter-local agreement or a release from one city to allow the other to provide the service from their facilities. This would allow the site to be served by a single provider, rather than having a supply from two separate

Colonel James Jabara Airport, Wichita, Kansas

sources within the same development. The City of Bel Aire has indicated that they would be open to discussion about allowing Wichita to serve the portion of Area 3 located in Bel Aire, and that they may also be able to provide service to the entire parcel.

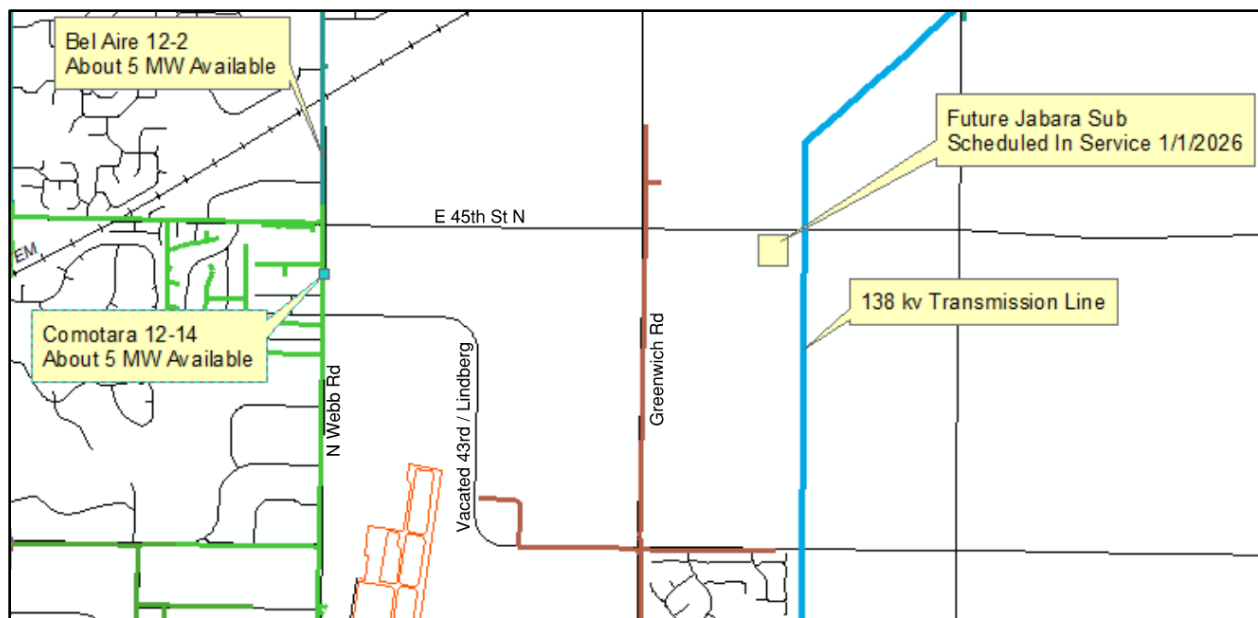
2.0 Private Utilities

A summary of existing private utilities near the site, including electric, natural gas, and communications, is provided in the following sections. Any potential private utility extensions on the airport must be installed underground. The One-Call private utility list indicated that Southern Star Central Gas and CenturyLink communications facilities may exist near the study Areas. Information was requested from these companies, but not received.

2.1 Electric

2.1.1 Evergy

Existing Evergy facilities are adjacent to the site and a facilities map is included below. Electrical lines are located in the Webb Road right-of-way along Areas 1, 2, and 3. The capacity of the Webb Road electrical lines is approximately 5 MW. Evergy has indicated a future 138 kV transmission line and substation east of airport property is planned for 2026, which will increase the available power. The planned facilities are also identified in the map.



Evergy Facilities Map

Colonel James Jabara Airport, Wichita, Kansas

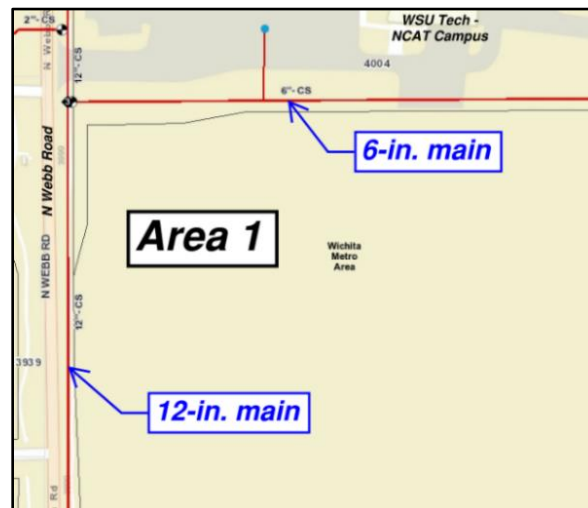
2.2 Natural Gas

2.2.1 Kansas Gas Service (KGS)

Existing KGS facilities are adjacent to the site. Gas mains with the potential to serve a commercial or industrial development within each area are summarized below. Maps received from the utility company are also provided.

2.2.1.1 Area 1

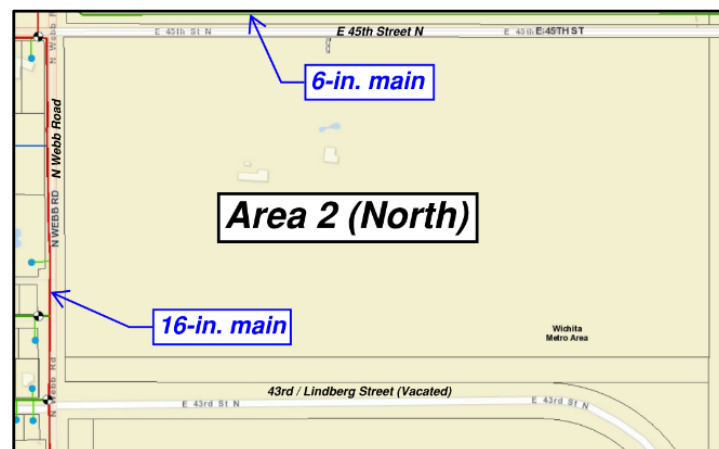
- 12-in. main in the east Webb Road right-of-way
- 6-in. main south of the WSU Tech - NCAT entrance drive



KGS Facilities Map – Area 1

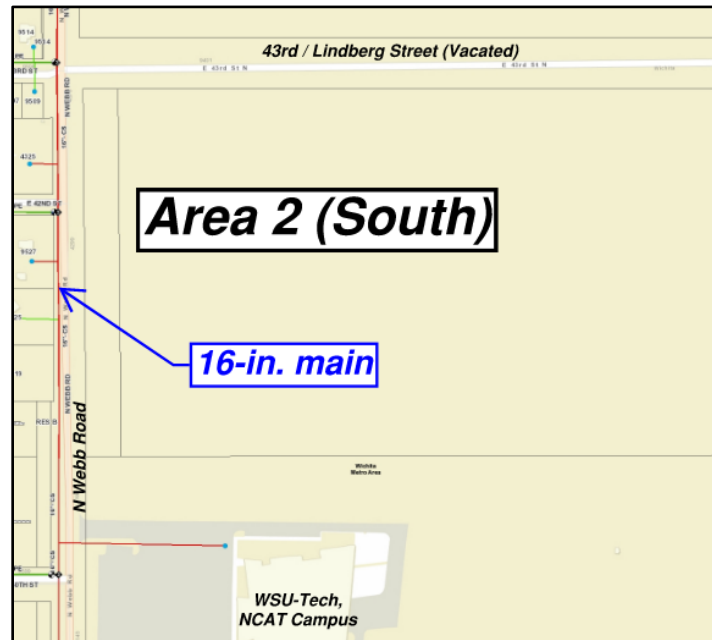
2.2.1.2 Area 2

- 16-in. main in the west Webb Road right-of-way
- 6-in. main in the north 45th Street right-of-way



KGS Facilities Map – Area 2 North

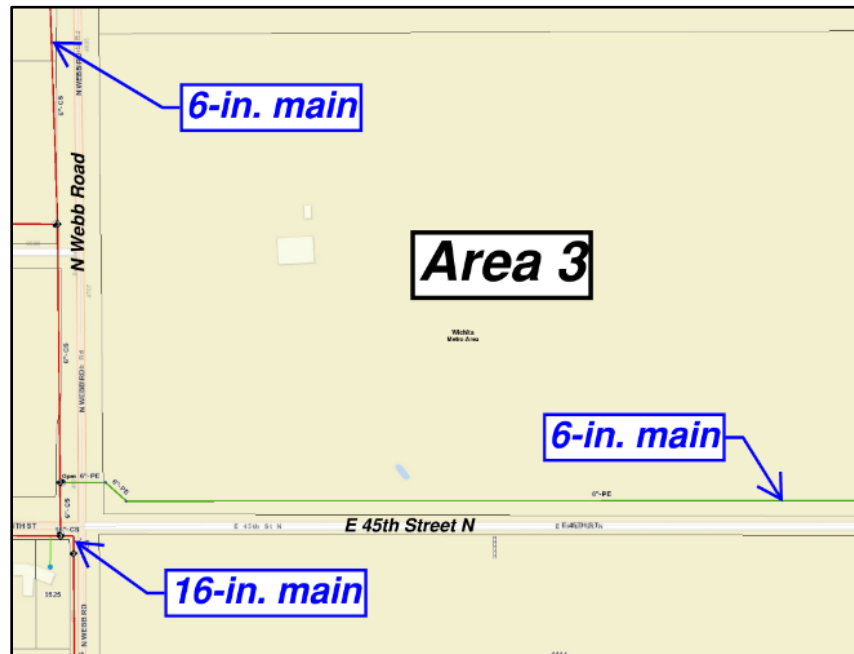
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KGS Facilities Map – Area 2 South

2.2.1.3 Area 3

- 6-in. main in the north 45th Street right-of-way
- 6-in. main in the west Webb Road right-of-way
- 16-in. main in the southwest corner of the intersection of 45th Street and Webb Road



KGS Facilities Map – Area 3

Colonel James Jabara Airport, Wichita, Kansas

Other than the construction of service lines, no significant linear main extensions would be required to serve the site. Boring east under Webb Road from the 16-in. main would likely be required to serve Area 2. Coordination with KGS would be necessary to establish any service agreements and to verify that existing facilities could meet proposed demands based on the ultimate development. Any potential developer-incurred costs for extension of service within the site would also be coordinated with KGS.

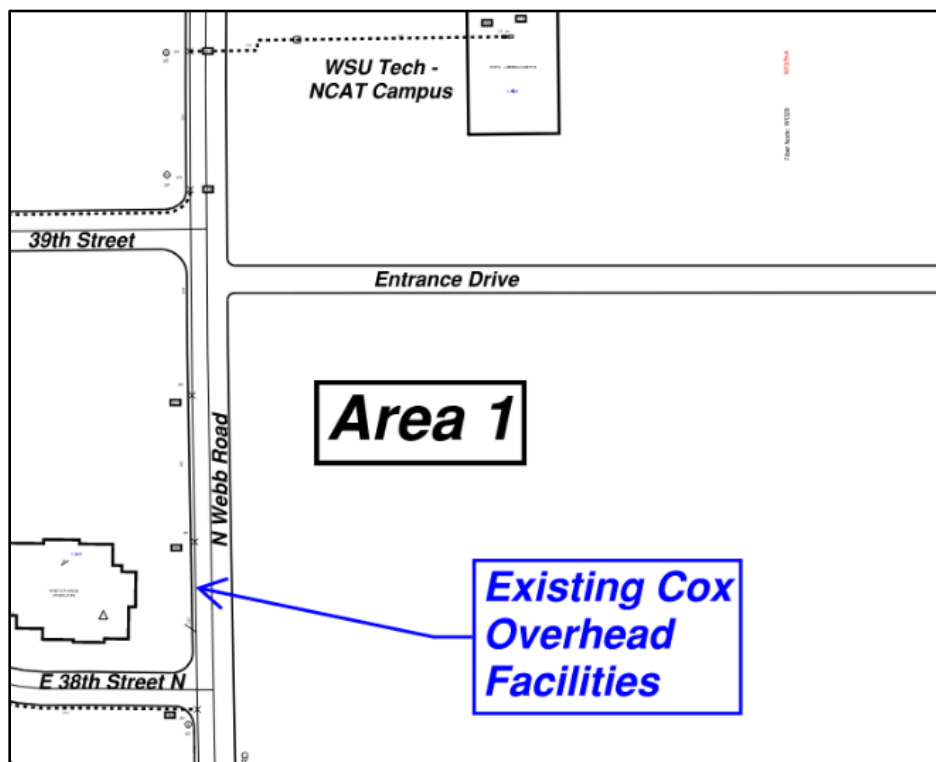
2.3 Communications

2.3.1 Cox Communications

Existing Cox facilities are adjacent to the site. Facilities with the potential to serve a commercial or industrial development within each area are summarized below. Maps received from the utility company are also provided.

2.3.1.1 Area 1

- Overhead communication lines in the west Webb Road right-of-way

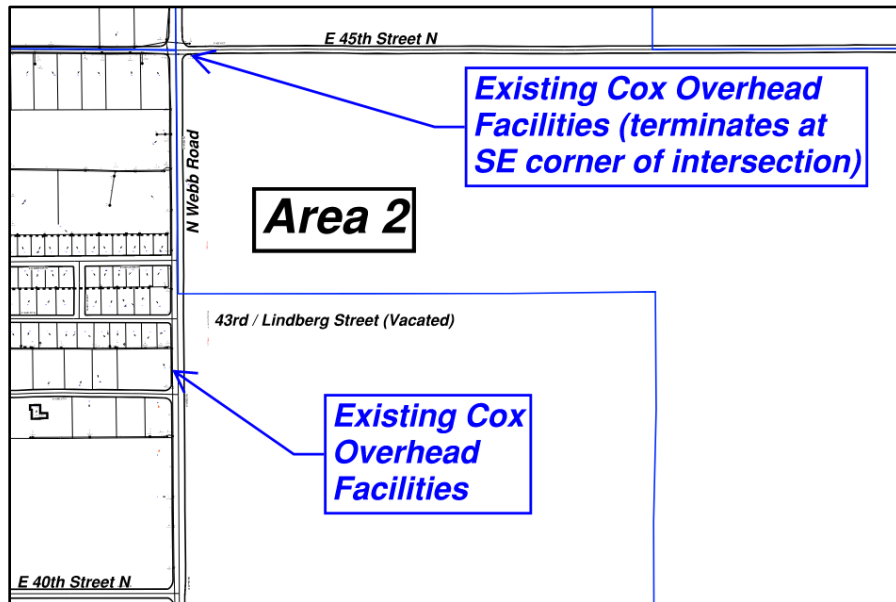


Cox Facilities Map – Area 1

Colonel James Jabara Airport, Wichita, Kansas

2.3.1.2 Area 2

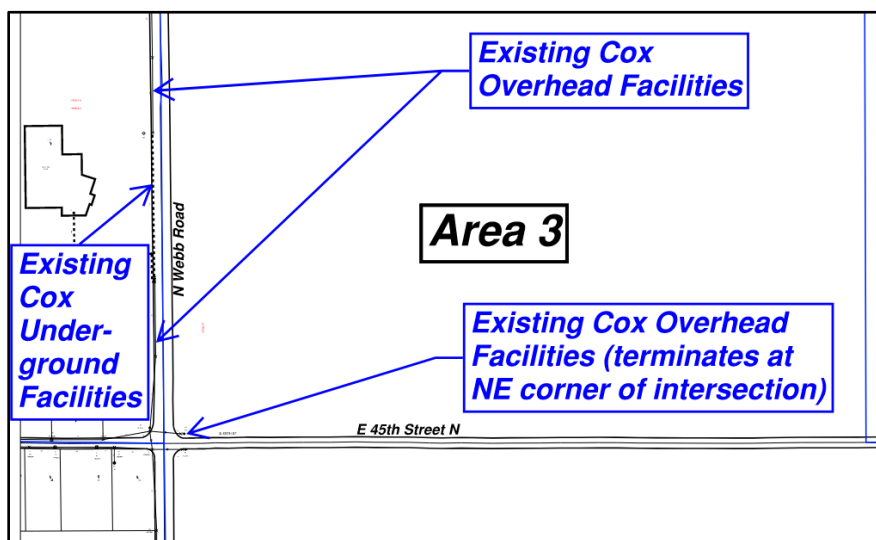
- Overhead communication lines in the west Webb Road right-of-way
- Overhead communication line which terminates at the southeast corner of the intersection of 45th Street and Webb Road



Cox Facilities Map – Area 2

2.3.1.3 Area 3

- Overhead and underground communication lines in the west Webb Road right-of-way
- Overhead communication line which terminates at the northeast corner of the intersection of 45th Street and Webb Road



Cox Facilities Map – Area 3

Colonel James Jabara Airport, Wichita, Kansas

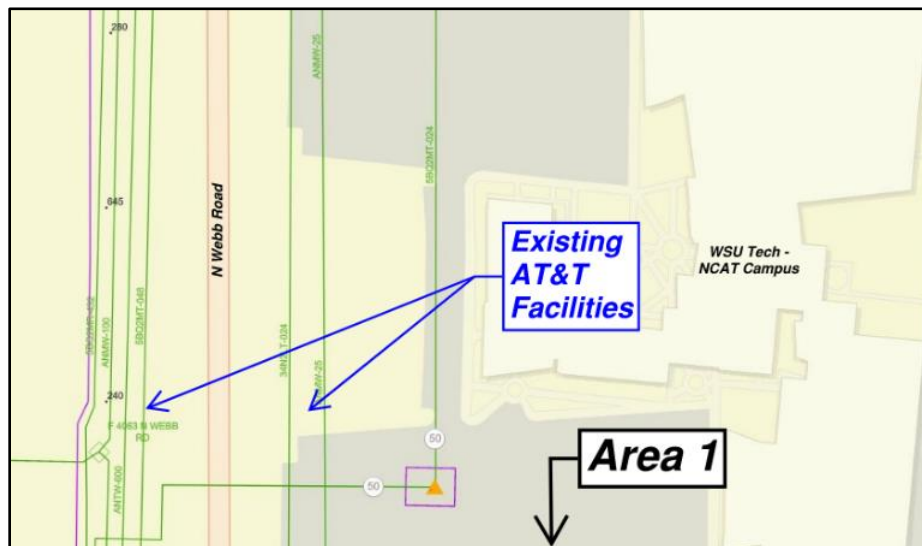
Other than the installation of service connections, no major linear overhead or buried communication line extensions would be required to bring service the site. Coordination with Cox Communications would be necessary to establish any service agreements and to determine any potential developer-incurred costs for extension of service within the site.

2.3.2 AT&T

Existing AT&T facilities are adjacent to the site. Facilities with the potential to serve a commercial or industrial development within each area are summarized below. Maps received from the utility company are also provided.

2.3.2.1 Area 1

- Communication lines in the east and west Webb Road right-of-way

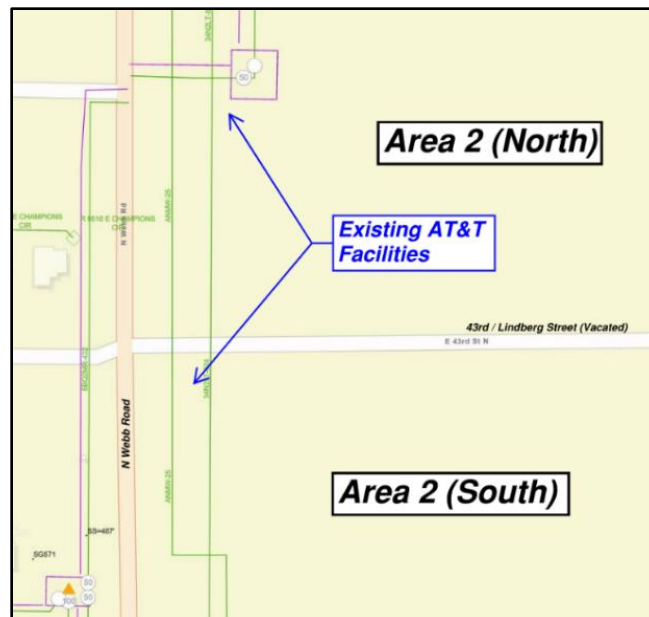


AT&T Facilities Map – Area 1

2.3.2.2 Area 2

- Communication lines in the east and west Webb Road right-of-way on the south side of Champions Circle.
- Communication lines in the east Webb Road right-of-way north of Champions Circle
- Communication lines in the south 45th Street right-of-way

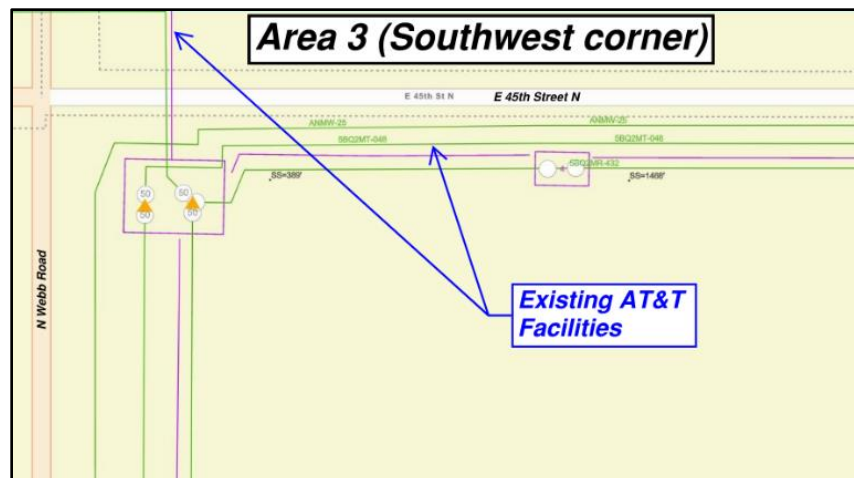
Colonel James Jabara Airport, Wichita, Kansas



AT&T Facilities Map – Area 2

2.3.2.3 Area 3

- Communication lines in the south 45th Street right-of-way
- Communication lines in the east Webb Road right-of-way



AT&T Facilities Map – Area 3

Other than the installation of service connections, no major linear overhead or buried communication line extensions would be required to bring service the site. Coordination with AT&T would be necessary to establish and service agreements and to determine any potential developer-incurred costs for extension of service within the site.

COLONEL JAMES JABARA AIRPORT

Commercial Site
Development Study



Appendix D

Taxilane Cost Estimates



**WICHITA AIRPORT AUTHORITY
COLONEL JAMES JABARA AIRPORT (AAO) - COMMERCIAL DEVELOPMENT STUDY
ENGINEER'S ESTIMATE OF PROBABLE COST
Area 1 - Alternative 1**

			Engineer's Estimate of Probable Cost		
ITEM NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
GENERAL					
1	CONTRACTOR QC PROGRAM (2.0%)	LS	1	\$15,000.00	\$15,000.00
2	CONSTRUCTION SAFETY AND SECURITY	LS	1	\$50,000.00	\$50,000.00
3	TEMPORARY EROSION CONTROL	LS	1	\$25,000.00	\$25,000.00
4	CONSTRUCTION LAYOUT AND STAKING (1.5%)	LS	1	\$11,000.00	\$11,000.00
5	MOBILIZATION (10%)	LS	1	\$76,000.00	\$76,000.00
					\$177,000.00
CIVIL					
6	UNCLASSIFIED EXCAVATION	CY	6,200	\$15.00	\$93,000.00
7	UNSUITABLE EXCAVATION	CY	620	\$30.00	\$18,600.00
8	PAVEMENT REMOVAL AND RECONFIGURATION OF EXISTING ACCESS DRIVE	LS	1	\$10,000.00	\$10,000.00
9	P-155 LIME-TREATED SUBGRADE (12")	SY	3,793	\$13.00	\$49,309.00
10	STORMWATER AND DRAINAGE IMPROVEMENTS	LS	1	\$10,000.00	\$10,000.00
11	4 INCH PIPE UNDERDRAIN	LF	886	\$40.00	\$35,440.00
12	4 INCH NON-PERFORATED OUTLET PIPE	LF	60	\$35.00	\$2,100.00
13	UNDERDRAIN CLEANOUT RISER	EA	2	\$1,500.00	\$3,000.00
14	GEOTEXTILE FABRIC	SY	3,821	\$4.00	\$15,284.00
15	P-209 CRUSHED AGGREGATE BASE COURSE (6")	SY	3,793	\$15.00	\$56,895.00
16	P-203SP STABILIZED DRAINAGE LAYER (4")	SY	3,646	\$25.00	\$91,150.00
17	STEEL REINFORCEMENT (MESH)	SY	170	\$12.00	\$2,040.00
18	P-501 PCC PAVEMENT (8")	SY	3,322	\$70.00	\$232,540.00
19	PAVEMENT MARKINGS	SF	388	\$4.00	\$1,552.00
20	SEEDING (BUFFALO)	AC	3	\$5,000.00	\$15,000.00
21	SODDING (BUFFALO)	SY	1,030	\$17.00	\$17,510.00
					\$653,420.00
ELECTRICAL					
22	LOCKOUT/TAGOUT AND CCR CALIBRATION	LS	1	\$5,000.00	\$5,000.00
23	PERIMETER FENCE AND AUTOMATIC SLIDING ACCESS GATE, RELOCATED	LS	1	\$40,000.00	\$40,000.00
24	NON-ENCASED ELECTRICAL CONDUIT, 1-WAY 2"C	LF	1,620	\$8.00	\$12,960.00
25	ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 16" DIAMETER BY 24" DEPTH	EA	4	\$800.00	\$3,200.00
26	LED BASE MOUNTED TAXIWAY EDGE LIGHT	EA	23	\$1,300.00	\$29,900.00
27	NO. 8 AWG, 5kV, L-824 TYPE C CABLE	LF	1,780	\$2.00	\$3,560.00
28	NO. 6 AWG, SOLID, BARE COUNTERPOISE WIRE	LF	1,620	\$4.50	\$7,290.00
					\$101,910.00
Total Construction =					\$930,000.00
10% Contingency =					\$90,000.00
Total Estimated Construction Cost =					\$1,020,000.00
Estimated Soft Costs					
Engineering Design (8%)				\$	80,000.00
Construction Services (8%)				\$	80,000.00
Total Estimated Soft Costs =				\$	160,000.00
Total Estimated Project Cost (2022 Dollars) =					\$1,180,000.00

WICHITA AIRPORT AUTHORITY
COLONEL JAMES JABARA AIRPORT (AAO) - COMMERCIAL DEVELOPMENT STUDY
ENGINEER'S ESTIMATE OF PROBABLE COST
Area 1 - Alternative 2

				Engineer's Estimate of Probable Cost	
ITEM NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
GENERAL					
1	CONTRACTOR QC PROGRAM (2.0%)	LS	1	\$11,000.00	\$11,000.00
2	CONSTRUCTION SAFETY AND SECURITY	LS	1	\$50,000.00	\$50,000.00
3	TEMPORARY EROSION CONTROL	LS	1	\$25,000.00	\$25,000.00
4	CONSTRUCTION LAYOUT AND STAKING (1.5%)	LS	1	\$8,000.00	\$8,000.00
5	MOBILIZATION (10%)	LS	1	\$53,000.00	\$53,000.00
					\$147,000.00
CIVIL					
6	UNCLASSIFIED EXCAVATION	CY	2,400	\$15.00	\$36,000.00
7	UNSUITABLE EXCAVATION	CY	240	\$30.00	\$7,200.00
8	PAVEMENT REMOVAL AND RECONFIGURATION OF EXISTING ACCESS DRIVE	LS	1	\$5,000.00	\$5,000.00
9	P-155 LIME-TREATED SUBGRADE (12")	SY	3,072	\$13.00	\$39,936.00
10	STORMWATER AND DRAINAGE IMPROVEMENTS	LS	1	\$10,000.00	\$10,000.00
11	4 INCH PIPE UNDERDRAIN	LF	696	\$40.00	\$27,840.00
12	4 INCH NON-PERFORATED OUTLET PIPE	LF	40	\$35.00	\$1,400.00
13	UNDERDRAIN CLEANOUT RISER	EA	2	\$1,500.00	\$3,000.00
14	GEOTEXTILE FABRIC	SY	3,099	\$4.00	\$12,396.00
15	P-209 CRUSHED AGGREGATE BASE COURSE (6")	SY	3,072	\$15.00	\$46,080.00
16	P-203SP STABILIZED DRAINAGE LAYER (4")	SY	2,956	\$25.00	\$73,900.00
17	STEEL REINFORCEMENT (MESH)	SY	130	\$12.00	\$1,560.00
18	P-501 PCC PAVEMENT (8")	SY	2,697	\$70.00	\$188,790.00
19	PAVEMENT MARKINGS	SF	356	\$4.00	\$1,424.00
20	SEEDING (BUFFALO)	AC	3	\$5,000.00	\$15,000.00
21	SODDING (BUFFALO)	SY	810	\$17.00	\$13,770.00
					\$483,296.00
ELECTRICAL					
22	LOCKOUT/TAGOUT AND CCR CALIBRATION	LS	1	\$5,000.00	\$5,000.00
23	NON-ENCASED ELECTRICAL CONDUIT, 1-WAY 2"C	LF	1,240	\$8.00	\$9,920.00
24	ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 16" DIAMETER BY 24" DEPTH	EA	4	\$800.00	\$3,200.00
25	LED BASE MOUNTED TAXIWAY EDGE LIGHT	EA	16	\$1,300.00	\$20,800.00
26	NO. 8 AWG, 5kV, L-824 TYPE C CABLE	LF	1,360	\$2.00	\$2,720.00
27	NO. 6 AWG, SOLID, BARE COUNTERPOISE WIRE	LF	1,240	\$4.50	\$5,580.00
					\$47,220.00
Total Construction =					\$680,000.00
10% Contingency =					\$70,000.00
Total Estimated Construction Cost =					\$750,000.00
Estimated Soft Costs					
Engineering Design (8%)				\$	60,000.00
Construction Services (8%)				\$	60,000.00
Total Estimated Soft Costs =				\$	120,000.00
Total Estimated Project Cost (2022 Dollars) =					\$870,000.00

WICHITA AIRPORT AUTHORITY
COLONEL JAMES JABARA AIRPORT (AAO) - COMMERCIAL DEVELOPMENT STUDY
ENGINEER'S ESTIMATE OF PROBABLE COST
Area 2 - Alternative 1

**Engineer's Estimate of
Probable Cost**

ITEM NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
GENERAL					
1	CONTRACTOR QC PROGRAM (2.0%)	LS	1	\$56,000.00	\$56,000.00
2	CONSTRUCTION SAFETY AND SECURITY	LS	1	\$150,000.00	\$150,000.00
3	TEMPORARY EROSION CONTROL	LS	1	\$100,000.00	\$100,000.00
4	CONSTRUCTION LAYOUT AND STAKING (1.5%)	LS	1	\$42,000.00	\$42,000.00
5	MOBILIZATION (10%)	LS	1	\$280,000.00	\$280,000.00
					\$628,000.00

CIVIL					
6	UNCLASSIFIED EXCAVATION	CY	28,600	\$15.00	\$429,000.00
7	UNSUITABLE EXCAVATION	CY	2,860	\$30.00	\$85,800.00
8	P-155 LIME-TREATED SUBGRADE (12")	SY	14,542	\$13.00	\$189,046.00
9	STORMWATER AND DRAINAGE IMPROVEMENTS	LS	1	\$125,000.00	\$125,000.00
10	4 INCH PIPE UNDERDRAIN	LF	3,289	\$40.00	\$131,560.00
11	4 INCH NON-PERFORATED OUTLET PIPE	LF	200	\$35.00	\$7,000.00
12	UNDERDRAIN CLEANOUT RISER	EA	7	\$1,500.00	\$10,500.00
13	GEOTEXTILE FABRIC	SY	14,723	\$4.00	\$58,892.00
14	P-209 CRUSHED AGGREGATE BASE COURSE (6")	SY	14,542	\$15.00	\$218,130.00
15	P-203SP STABILIZED DRAINAGE LAYER (4")	SY	13,994	\$25.00	\$349,850.00
16	STEEL REINFORCEMENT (MESH)	SY	640	\$12.00	\$7,680.00
17	P-501 PCC PAVEMENT (8")	SY	12,716	\$70.00	\$890,120.00
18	PAVEMENT MARKINGS	SF	1,629	\$4.00	\$6,516.00
19	SEEDING (BUFFALO)	AC	10	\$5,000.00	\$50,000.00
20	SODDING (BUFFALO)	SY	3,840	\$17.00	\$65,280.00
					\$2,624,374.00

ELECTRICAL					
21	LOCKOUT/TAGOUT AND CCR CALIBRATION	LS	1	\$5,000.00	\$5,000.00
22	NON-ENCASED ELECTRICAL CONDUIT, 1-WAY 2"C	LF	6,950	\$8.00	\$55,600.00
23	ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 16" DIAMETER BY 24" DEPTH	EA	4	\$800.00	\$3,200.00
24	LED BASE MOUNTED TAXIWAY EDGE LIGHT	EA	49	\$1,300.00	\$63,700.00
25	NO. 8 AWG, 5kV, L-824 TYPE C CABLE	LF	7,650	\$2.00	\$15,300.00
26	NO. 6 AWG, SOLID, BARE COUNTERPOISE WIRE	LF	6,950	\$4.50	\$31,275.00
					\$174,075.00

Total Construction = \$3,430,000.00
10% Contingency = \$340,000.00
Total Estimated Construction Cost = \$3,770,000.00

Estimated Soft Costs
Engineering Design (8%) \$ 300,000.00
Construction Services (8%) \$ 300,000.00
Total Estimated Soft Costs = \$ 600,000.00

Total Estimated Project Cost (2022 Dollars) = \$4,370,000.00

WICHITA AIRPORT AUTHORITY
COLONEL JAMES JABARA AIRPORT (AAO) - COMMERCIAL DEVELOPMENT STUDY
ENGINEER'S ESTIMATE OF PROBABLE COST
Area 2 - Alternative 2

**Engineer's Estimate of
Probable Cost**

ITEM NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
GENERAL					
1	CONTRACTOR QC PROGRAM (2.0%)	LS	1	\$55,000.00	\$55,000.00
2	CONSTRUCTION SAFETY AND SECURITY	LS	1	\$150,000.00	\$150,000.00
3	TEMPORARY EROSION CONTROL	LS	1	\$100,000.00	\$100,000.00
4	CONSTRUCTION LAYOUT AND STAKING (1.5%)	LS	1	\$42,000.00	\$42,000.00
5	MOBILIZATION (10%)	LS	1	\$277,000.00	\$277,000.00
					\$624,000.00

CIVIL					
6	UNCLASSIFIED EXCAVATION	CY	34,600	\$15.00	\$519,000.00
7	UNSUITABLE EXCAVATION	CY	3,460	\$30.00	\$103,800.00
8	P-155 LIME-TREATED SUBGRADE (12")	SY	14,347	\$13.00	\$186,511.00
9	STORMWATER AND DRAINAGE IMPROVEMENTS	LS	1	\$25,000.00	\$25,000.00
10	4 INCH PIPE UNDERDRAIN	LF	3,258	\$40.00	\$130,320.00
11	4 INCH NON-PERFORATED OUTLET PIPE	LF	200	\$35.00	\$7,000.00
12	UNDERDRAIN CLEANOUT RISER	EA	7	\$1,500.00	\$10,500.00
13	GEOTEXTILE FABRIC	SY	14,513	\$4.00	\$58,052.00
14	P-209 CRUSHED AGGREGATE BASE COURSE (6")	SY	14,347	\$15.00	\$215,205.00
15	P-203SP STABILIZED DRAINAGE LAYER (4")	SY	13,804	\$25.00	\$345,100.00
16	STEEL REINFORCEMENT (MESH)	SY	630	\$12.00	\$7,560.00
17	P-501 PCC PAVEMENT (8")	SY	12,551	\$70.00	\$878,570.00
18	PAVEMENT MARKINGS	SF	1,613	\$4.00	\$6,452.00
19	SEEDING (BUFFALO)	AC	10	\$5,000.00	\$50,000.00
20	SODDING (BUFFALO)	SY	3,800	\$17.00	\$64,600.00
					\$2,607,670.00

ELECTRICAL					
21	LOCKOUT/TAGOUT AND CCR CALIBRATION	LS	1	\$5,000.00	\$5,000.00
22	NON-ENCASED ELECTRICAL CONDUIT, 1-WAY 2"C	LF	6,880	\$8.00	\$55,040.00
23	ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 16" DIAMETER BY 24" DEPTH	EA	4	\$800.00	\$3,200.00
24	LED BASE MOUNTED TAXIWAY EDGE LIGHT	EA	42	\$1,300.00	\$54,600.00
25	NO. 8 AWG, 5kV, L-824 TYPE C CABLE	LF	7,570	\$2.00	\$15,140.00
26	NO. 6 AWG, SOLID, BARE COUNTERPOISE WIRE	LF	6,880	\$4.50	\$30,960.00
					\$163,940.00

Total Construction = \$3,400,000.00
10% Contingency = \$340,000.00
Total Estimated Construction Cost = \$3,740,000.00

Estimated Soft Costs
Engineering Design (8%) \$ 300,000.00
Construction Services (8%) \$ 300,000.00
Total Estimated Soft Costs = \$ 600,000.00

Total Estimated Project Cost (2022 Dollars) = \$4,340,000.00

WICHITA AIRPORT AUTHORITY
COLONEL JAMES JABARA AIRPORT (AAO) - COMMERCIAL DEVELOPMENT STUDY
ENGINEER'S ESTIMATE OF PROBABLE COST
Area 2 - Alternative 3

				Engineer's Estimate of Probable Cost	
ITEM NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
GENERAL					
1	CONTRACTOR QC PROGRAM (2.0%)	LS	1	\$59,000.00	\$59,000.00
2	CONSTRUCTION SAFETY AND SECURITY	LS	1	\$150,000.00	\$150,000.00
3	TEMPORARY EROSION CONTROL	LS	1	\$100,000.00	\$100,000.00
4	CONSTRUCTION LAYOUT AND STAKING (1.5%)	LS	1	\$44,000.00	\$44,000.00
5	MOBILIZATION (10%)	LS	1	\$294,000.00	\$294,000.00
					\$647,000.00
CIVIL					
6	UNCLASSIFIED EXCAVATION	CY	30,800	\$15.00	\$462,000.00
7	UNSUITABLE EXCAVATION	CY	3,080	\$30.00	\$92,400.00
8	P-155 LIME-TREATED SUBGRADE (12")	SY	14,494	\$13.00	\$188,422.00
9	STORMWATER AND DRAINAGE IMPROVEMENTS	LS	1	\$240,000.00	\$240,000.00
10	4 INCH PIPE UNDERDRAIN	LF	3,278	\$40.00	\$131,120.00
11	4 INCH NON-PERFORATED OUTLET PIPE	LF	200	\$35.00	\$7,000.00
12	UNDERDRAIN CLEANOUT RISER	EA	7	\$1,500.00	\$10,500.00
13	GEOTEXTILE FABRIC	SY	14,674	\$4.00	\$58,696.00
14	P-209 CRUSHED AGGREGATE BASE COURSE (6")	SY	14,494	\$15.00	\$217,410.00
15	P-203SP STABILIZED DRAINAGE LAYER (4")	SY	13,948	\$25.00	\$348,700.00
16	STEEL REINFORCEMENT (MESH)	SY	630	\$12.00	\$7,560.00
17	P-501 PCC PAVEMENT (8")	SY	12,674	\$70.00	\$887,180.00
18	PAVEMENT MARKINGS	SF	1,623	\$4.00	\$6,492.00
19	SEEDING (BUFFALO)	AC	10	\$5,000.00	\$50,000.00
20	SODDING (BUFFALO)	SY	3,820	\$17.00	\$64,940.00
					\$2,772,420.00
ELECTRICAL					
21	LOCKOUT/TAGOUT AND CCR CALIBRATION	LS	1	\$5,000.00	\$5,000.00
22	NON-ENCASED ELECTRICAL CONDUIT, 1-WAY 2"C	LF	6,930	\$8.00	\$55,440.00
23	ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 16" DIAMETER BY 24" DEPTH	EA	4	\$800.00	\$3,200.00
24	LED BASE MOUNTED TAXIWAY EDGE LIGHT	EA	47	\$1,300.00	\$61,100.00
25	NO. 8 AWG, 5kV, L-824 TYPE C CABLE	LF	7,620	\$2.00	\$15,240.00
26	NO. 6 AWG, SOLID, BARE COUNTERPOISE WIRE	LF	6,930	\$4.50	\$31,185.00
					\$171,165.00
Total Construction =				\$3,590,000.00	
10% Contingency =				\$360,000.00	
Total Estimated Construction Cost =				\$3,950,000.00	
Estimated Soft Costs					
Engineering Design (8%)				\$	320,000.00
Construction Services (8%)				\$	320,000.00
Total Estimated Soft Costs =				\$	640,000.00
Total Estimated Project Cost (2022 Dollars) =					\$4,590,000.00

COLONEL JAMES JABARA AIRPORT

Commercial Site
Development Study



Appendix E **Drainage Study**



AAO Commercial Development Study

Drainage Study

Colonel James Jabara Airport, Wichita, KS



Prepared by:



**1995 Midfield Rd
Wichita, KS 67209**

December 2022

Garver Project No.: 22A17000

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Attachments

Attachment A HEC-HMS Simulation Results

Attachment B NRCS Soils Report

1.0 Introduction and Background

This drainage report has been prepared to analyze the hydrology and stormwater drainage of three undeveloped areas at Jabara Airport and to determine impacts of future development to the system; specifically with regard to water quality and quantity. Hydrological modeling was performed to identify site drainage improvements which would likely be required for site development based on City of Wichita stormwater requirements. Other applicable State and local regulations and procedures are also discussed.

2.0 Site Overview

2.1 Location

The site is on airport property at Colonel James Airport (AAO) which is located northeast of the intersection of K-96 and North Webb Road. Specifically, the study area includes three undeveloped parcels and airfield areas near the north end of the airport. Area 1 is to the southwest of the WSU Tech – NCAT campus, Area 2 is generally located north and east of the NCAT campus with 45th Street as the north boundary, and Area 3 is located northeast of the Webb Road and 45th Street intersection. A map of the study areas is shown in Figure 1.

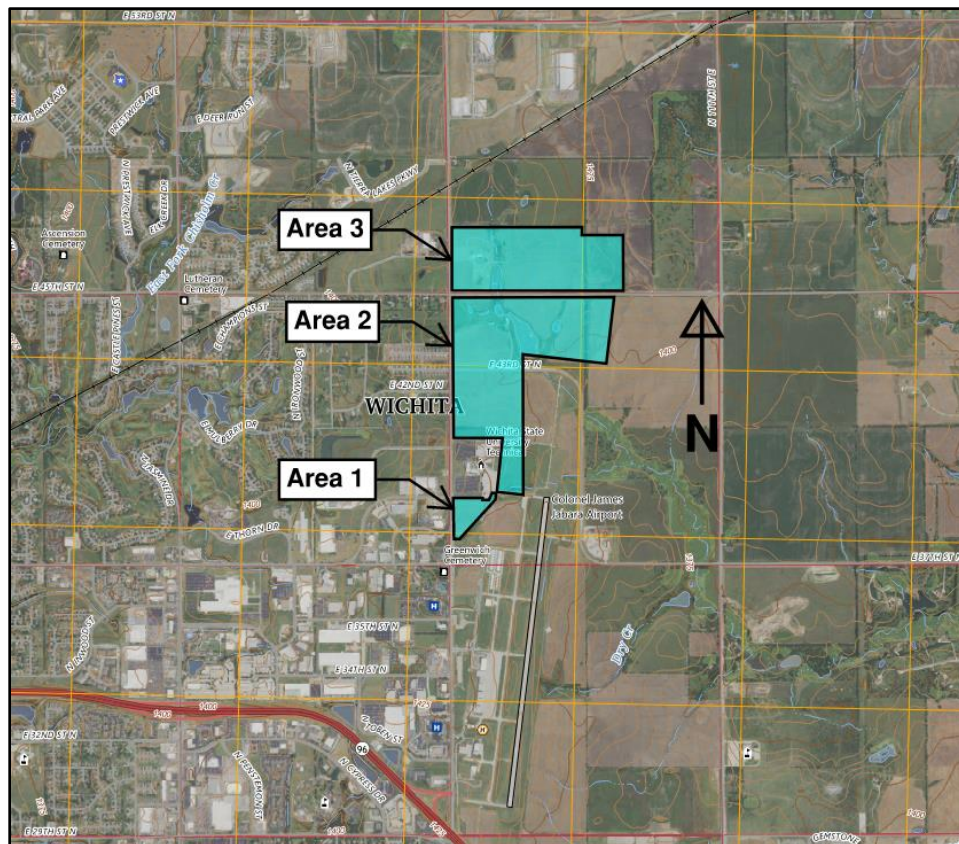


Figure 1: Study Areas

2.2 General Drainage Patterns

Overall, onsite runoff from these areas flows east into open channels, storm conduit, or tributaries and discharges into Upper Dry Creek, which flows southeast through the site. An area east of the WSU Tech campus currently provides some capacity as a dry detention pond; this area will be analyzed as part of this study. Offsite drainage from the west side of Webb Road and from north of Area 3 also contributes to the total discharge from the site. Figure 2 shows existing site contours and the general drainage patterns.

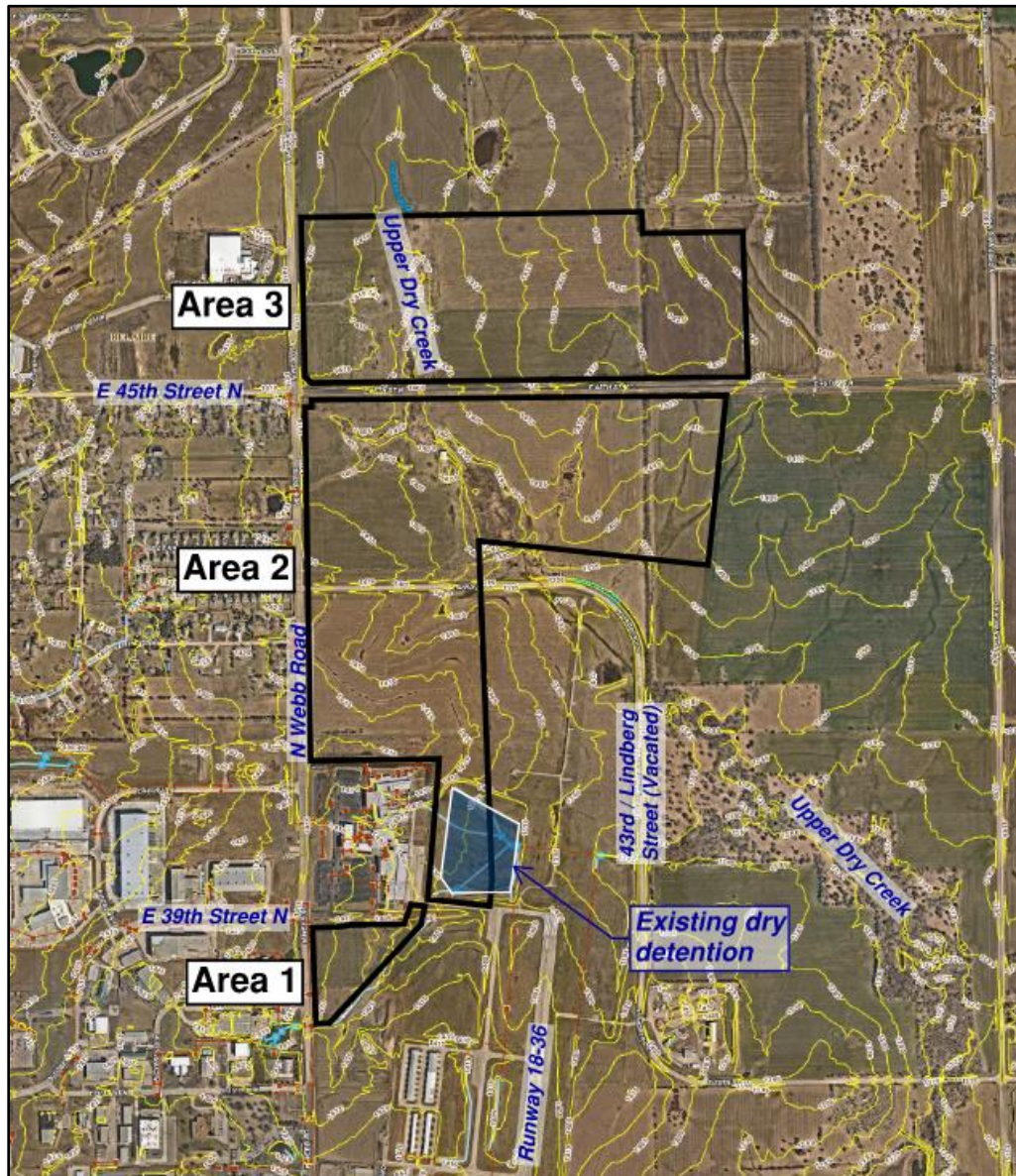


Figure 2: GIS Contours and Stormwater Sewer

3.0 Regulations

3.1 Federal Aviation Administration Standards

FAA standards for runoff quality and quantity are provided in *Advisory Circular 150/5320-5D Airport Drainage Design*.

3.1.1 Quality (Chapter 11)

The runoff volume to be treated with BMP's is the "first-flush volume" as this is known to carry the most significant non-point pollutant loads. Definitions of the first flush volume vary with the most common definitions being:

- The first 0.5 inch of runoff per acre of impervious area
- The first 0.5 inch of runoff per acre of catchment area
- The first 1.0 inch of runoff per acre of catchment area.

3.1.2 Quantity

For on-airport development, the following design storms shall be used for surface runoff calculations.

- Taxiways – 5-year design storm is recommended with no encroachment on taxiway pavement.
- Aprons – 5-year design storm is recommended such that ponding around apron inlets does not exceed 4 inches.
- Other Areas – 10-year design storm is recommended for other developed areas such as roadways, administrative areas, and industrial areas.
- Additional Considerations – In some designs, portions of the drainage system are based on as high as a 50-year design storms to reduce likelihood of flooding a facility essential to operations and to prevent loss of life.

3.1.3 On-Site Detention

FAA Advisory Circular 150-5200-33 Hazardous Wildlife Attractants on or near Airports provides recommended separation distances between Aircraft Operation Areas (AOA) and hazardous wildlife attractants.

- 10,000 feet is recommended from the hazardous wildlife attractant to the nearest AOA.
- 5-miles is recommended to protect approach, departure, and circling airspace.

On-site retention "wet ponds" will not be allowed due to the attraction of wildlife, especially waterfowl. Detention facilities shall be either underground storage or "dry ponds" capable of draining in 48 hours after a storm event.

In addition, where constant flow of water is anticipated through the basin, or where any portion of the basin bottom may remain wet, detention facilities should include a concrete or paved pad and/or ditch/swale in the bottom to prevent vegetation that may provide nesting habitat.

3.2 City of Wichita Standards

Stormwater and drainage improvements for any potential development projects on the site shall meet the City of Wichita Stormwater Manual requirements for water quality treatment, downstream stabilization, and water quantity management standards.

3.2.1 Quality

Water Quality Treatment Requirement for New Developments Stormwater state that “runoff must be treated for water quality prior in accordance with the standards and criteria presented in this section of the Stormwater Manual”.

To comply with the quality treatment standard, facilities shall be designed to remove 80% of the average annual total suspended solids load for typical urban runoff (post-development) from the stormwater quality treatment volume for the 85th percentile storm event for the Wichita area.

3.2.2 Downstream Stabilization

Downstream stabilization shall be provided for developments which create or add five acres or greater of impervious area. This standard can be met in one of the following ways.

- The runoff volume from the new development that results from the 1-year frequency, 24- hour storm event shall be detained for not less than 24 hours; or
- The volume difference between the pre-development and post-development runoff from the development that results from the 1-year frequency, 24-hour storm event must be infiltrated, reused or evaporated.

3.2.3 Quantity

The calculated peak discharge of stormwater runoff at each site stormwater outfall resulting from the 2-year, 5-year, 10-year, 25-year and 100-year return frequency, 24-hour duration storm events shall be no greater after development or redevelopment of the site than that which would result from the same 2-year, 5-year, 10-year, 25-year and 100-year return frequency, 24-hour duration storm events on the same site prior to development or redevelopment.

3.3 City of Bel Aire Standards

Chapter 14 of the Bel Aire City Code contains stormwater design and performance requirements for developments in the city.

3.3.1 Control of Downstream Flooding

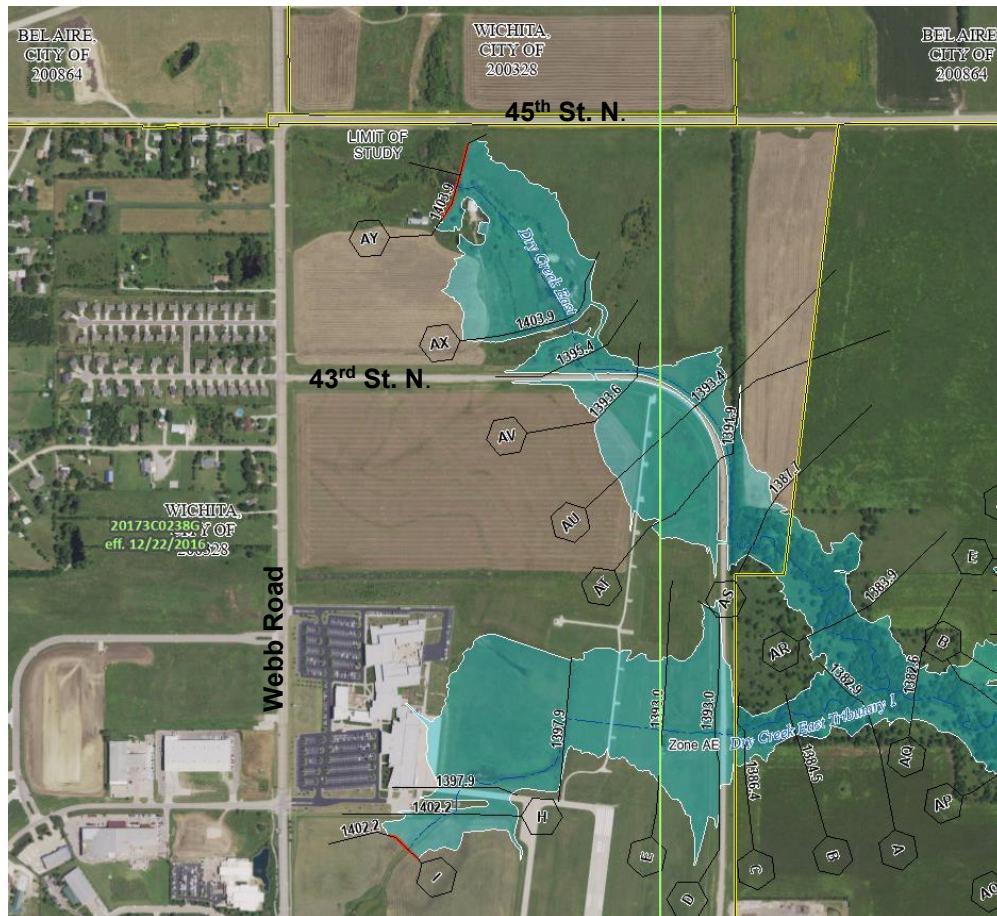
“The Director will determine whether the proposed plan will cause downstream local flooding conditions based on existing downstream development, downstream drainage system capabilities, and analysis of the system before and after the proposed development. If it is determined that the development will cause downstream flooding, provisions to minimize flooding conditions shall be included in the design of improvements.”

3.3.2 Quantity

Detention of stormwater runoff may be used in developments in order to minimize downstream flooding conditions. Generally, stormwater detention basins shall be designed and constructed for the attenuation of the peak rate of runoff to an amount not greater than that occurring prior to development

3.4 Floodplain

Portions of the site are classified as Special Flood Hazard Area AE on the FEMA FIRM map. This is floodplain area that is susceptible to being inundated from the base flood (100-yr event). The FEMA FIRM map is shown in Figure 3. Cross sections with 1% annual chance are also identified on the map. State and local requirements and procedures are applicable for development projects located in floodplain areas.



3.4.1 State of Kansas

For any development involving the placement of fill or other material within the floodplain area, a Floodplain Fill permit must be obtained from the Kansas Department of Agriculture (KDA). A permit from KDA would also be necessary for any modifications to Upper Dry Creek.

3.4.2 City of Wichita & Sedgwick County

Prior to any proposed development or improvements within the floodplain, a Floodplain Development permit must be obtained from the Wichita-Sedgwick County MAPC. Any development or improvement must meet the requirements of Section 3.7 of the City Stormwater Manual and Title 27 of the Wichita Code of Ordinances. A summary of development requirements is provided below.

- New construction or substantial improvements of any commercial, industrial, or other non-residential structures, including manufactured homes, shall have the lowest floor, including basement, elevated a minimum of two (2) feet above the base flood elevation or, together with attendant utility and sanitary facilities, be floodproofed so that below two (2) feet above the base flood elevation the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.
- Until a floodway is designated, no new construction, substantial improvement, or other development, including fill, shall be permitted within any unnumbered or numbered A zones, or AE zones on the FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one (1) foot at any point within the community.
- Provide compensatory storage when development or other encroachments occur in the floodplains of volume sensitive basins. Volume sensitive basins shall be defined by the local jurisdiction. Location and magnitude of compensatory excavations shall be incorporated in the construction plans and must be approved by the local jurisdiction.

3.5 U.S. Army Corps of Engineers

Wetlands and Waters of the United States are defined and regulated by the U.S. Army Corps of Engineers (USACE). Based on the U.S. Fish and Wildlife Service's National Wetlands Inventory map, wetland areas are located on or adjacent to the site. This map is shown in Figure 4 (wetland areas are shaded in bright green, freshwater ponds shaded in blue). Developments within defined wetland areas or with the potential to impact downstream wetland areas may require permitting under Section 404 of the Clean Water Act. Prior to any development on the site, coordination with the USACE should occur to see if a wetland delineation, Jurisdictional Determination, and any subsequent permitting is required. If wetlands / waters of the United States are present, wetland mitigation will need to be incorporated into the site design.

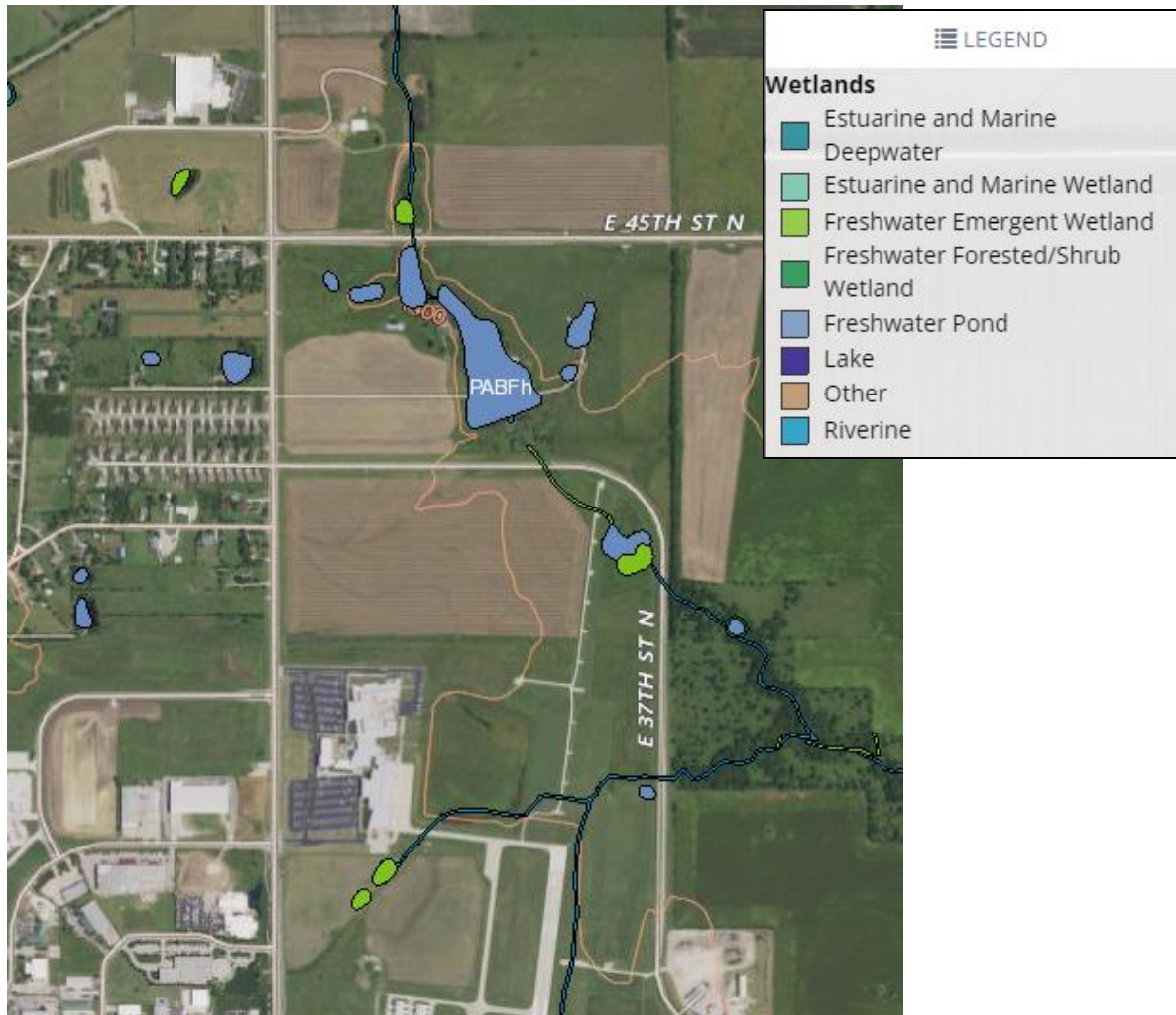


Figure 4: U.S. Fish and Wildlife Services Wetlands Map

4.0 Hydrologic Modeling

A conceptual hydrologic analysis was performed to evaluate impacts of development on water quantity and to indicate where new dry detention facilities might be required. Modeling was done using guidance from the City of Wichita Stormwater Manual. Hydrographs were developed for each condition using the NRCS Unit Hydrograph method, modeled in HEC-HMS software from the U.S. Army Corps of Engineers. The NRCS Curve Number method was used to account for rainfall losses. Hypothetical design storm events were modeled by applying local point rainfall depths for each return period to an NRCS 24-hour, Type 2 rainfall distribution.

4.1 Analysis Points

Four junction locations were analyzed. These points include culverts which could not practically be improved, inflow to the dry detention area, and the primary outlet to Upper Dry Creek which is not routed

through the dry detention area. Based on the City water quantity management requirements, it was assumed that the existing structures and conduits discharging into Upper Dry Creek on the east side of the site will remain constant.

Table 1: Analysis Points

Point	Description
Junction 1	5' x 10' RCB under TWY A1
Junction 2	Dry detention pond (total inflow)
Junction 3	Site outlet to Upper Dry Creek (SE Subbasin C)
Junction 4	Culvert under North 45 th Street

4.2 Drainage Subbasins

Five subbasins, containing onsite and offsite areas, were delineated using lidar contours and USGS data. The subbasins ultimately outlet into Upper Dry Creek directly east of the site.

- Subbasins A and B discharge into Dry Creek East Tributary 1, which passes through the dry detention area and outlets the site to the east through conduits.
- Runoff from Subbasins C, D, and E enters Upper Dry Creek onsite and is carried southeast through the open channel.
- The far northeast corner of Area 3 is in a separate catchment which falls to the northeast and carries runoff into a tributary approximately 1.6 miles east of the site.

Subbasins are shown in Figure 5 on the following page.

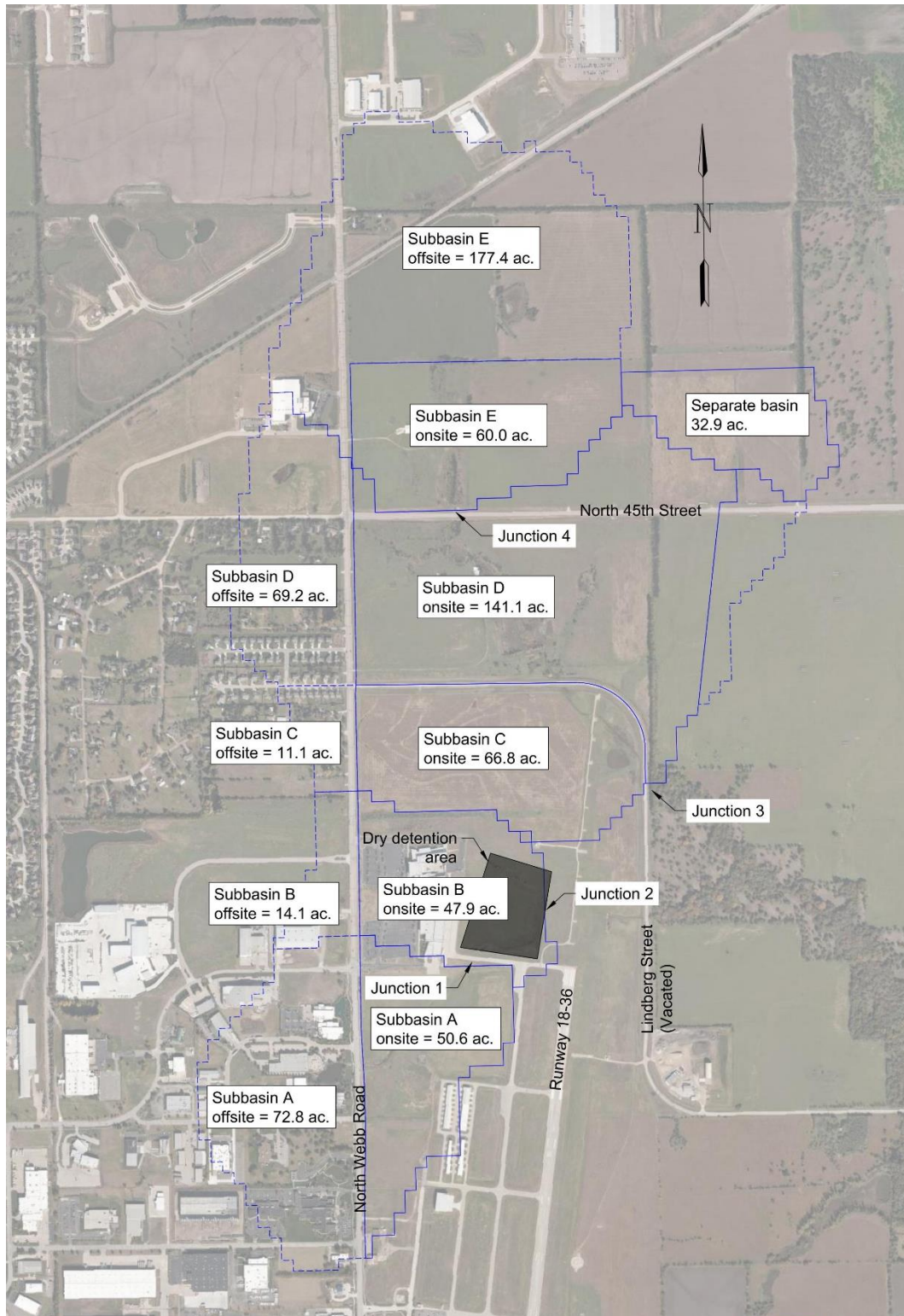


Figure 5: Subbasin Areas

4.3 Land Use and Engineering Properties

4.3.1 Soils and Current Land Use

A NRCS soils report was prepared for the project area. Soils onsite primarily consist of Rosehill silty clay, with some Farnum loam soils being present toward the west sides of Areas 2 and 3. Slopes are generally between 1 and 3 percent. Hydrologic soils groups are classified as group D for the Rosehill silty clay and B for the Farnum loam. Existing land use for the areas is undeveloped farmland / pasture.

4.3.2 Developed Land Use

For this study, the ultimate land use is assumed to be commercial and industrial developments, including airfield taxiway extensions and apron pavement to serve Areas 1 and 2. It is assumed that Area 3 will not have airfield access. The total area of developable land will be determined based on property lines, existing easements, local zoning setbacks, and FAA critical areas for the existing and proposed airfield infrastructure.

4.3.3 Impervious Areas and Curve Numbers

Curve numbers were developed using information from the City Stormwater Manual; composite values were calculated when required. Impervious areas were estimated using aerial imagery, Airport ALP drawings and average values from the Storm Manual. Offsite conditions were assumed constant pre- and post-development. Land use properties for the subbasins are provided in Table 2.

Table 2: Land Use Properties

	Subbasin A	Subbasin B	Subbasin C	Subbasin D	Subbasin E
Onsite area (acres)	50.6	47.9	66.8	141.1	60.0
Offsite area (acres)	72.8	14.1	11.2	69.2	177.4
Existing onsite impervious (%)	13.1	34.0	1.4	2.5	0.3
Developed onsite impervious (%)	57.9	36.3	25.8	24.6	56.7
Offsite impervious (%)	55.0	40.0	30.0	27.5	5
Impervious CN	98	98	98	98	98
Existing onsite pervious CN	84	88	84	84	84
Developed onsite pervious CN	88	88	88	88	88
Offsite pervious CN	88	84	88	84	84

4.3.4 Times of Concentration

Times of concentration were developed for each catchment area and for each design storm. Onsite, values were calculated for the existing and developed conditions. Calculations were performed using the NRCS method. Open channel travel time was calculated based on assumed velocities for curb, natural channel, and lined or conduit flows. A minimum value of 15 minutes was used in the models. Calculated times of concentration are provided in Table 3.

Table 3: Times of Concentration

min.	Subbasin A			Subbasin B			Subbasin C			Subbasin D			Subbasin E		
	Existing Onsite	Developed Onsite	Offsite	Existing Onsite	Developed Onsite	Offsite	Existing Onsite	Developed Onsite	Offsite	Existing Onsite	Developed Onsite	Offsite	Existing Onsite	Developed Onsite	Offsite
T _{C,2}	54.6	21.4	54.4	35.8	15.4	41.5	71.4	25.5	61.4	72.2	40.5	80.5	53.7	17.9	79.4
T _{C,5}	51.0	20.3	50.1	32.7	14.4	37.9	67.2	24.4	58.1	68.4	39.5	76.0	50.0	16.9	75.4
T _{C,10}	48.6	19.7	47.3	30.6	13.8	35.5	64.5	23.8	55.9	65.9	38.9	73.1	47.6	16.2	72.8
T _{C,25}	46.0	19.0	44.3	28.4	13.1	32.9	61.5	23.1	53.6	63.2	38.1	69.9	45.0	15.5	70.0
T _{C,50}	44.2	18.5	42.3	26.9	12.6	31.3	59.5	22.6	52.0	61.4	37.7	67.8	43.2	15.1	68.2
T _{C,100}	42.8	18.1	40.6	25.7	12.2	29.8	57.9	22.2	50.7	59.9	37.3	66.0	41.8	14.6	66.6

4.4 Results

Summary tables for each HEC-HMS simulation can be found on Page E-16. These show the peak discharge and total volumes at the junctions in the existing and developed conditions for each design storm event.

4.4.1 Detention

The results show that development in Areas 1 and 2 will require expansion or construction of additional dry detention facilities to maintain existing peak discharges and to handle the additional total runoff volume in the developed condition. For the portion of Area 3 which discharges to the south, results show a decrease in peak discharges for all but the 2-yr return period, indicating that no major detention facilities would be required to meet the water quantity standard. For the portion of Area 3 in Bel Aire, which discharges to the northeast, it is expected that detention will be required for development due to the upstream location of the area within the catchment.

Fill required for construction of a north taxilane through the existing dry detention basin would also impact the system due to reduction in storage volume. Because the base of the pond falls west to east, actual reduction in storage is dependent on the taxilane alignment.

- Taxilane Alternative 1 = 12,900 CY of storage volume loss
- Taxilane Alternative 2 = 2,400 CY of storage volume loss
- Taxilane Alternative 3 = 10,200 CY of storage volume loss

Since the basin currently overtops during at least the base flood event, a loss of storage would result in an increase of peak discharge. To offset this impact, compensatory storage could be provided when constructing the north taxilane by expanding the north side of the dry detention pond. This material could then be used as fill for the taxilane embankment. Taxiway alignment alternatives 2 & 3 would also dictate the potential need for equalizer structures to prevent an increase in base flood elevation west of the new taxilane.

4.4.2 Culverts

Because of uncertainty in the available data for the existing culverts, precise performance curves could not be developed.

The FEMA FIRM indicates that outlet flow from Area 1 currently overtops the Taxiway A1 RCB in at least the 100-yr rainfall event. Due to the increased peak discharge post-development, it can be expected that the overtopping would occur with a higher frequency. To determine any improvement that may be necessary, impacts to the overtopping flow condition and base flood elevations would need to be assessed based on the proposed site layout and topographical survey data.

The 45th Street culvert outlet for Area 3 is not identified on the FEMA FIRM, indicating that no overtopping occurs during the base flood event. Because peak discharges post-development are shown to decrease, no capacity issues with the existing culvert are anticipated.

HEC-HMS Simulation Results

Colonel James Jabara Airport, Wichita, KS

Project: AAO development study Simulation Run: Existing - 002				
Start of Run: 04Jul1776, 00:00		Basin Model: Existing - 002		
End of Run: 05Jul1776, 00:05		Meteorologic Model: 002-yr		
Compute Time: DATA CHANGED, RECOMPUTE		Control Specifications: Control 1		
Show Elements:	All Elements	Volume Units:	<input checked="" type="radio"/> IN <input type="radio"/> ACRE-FT	Sorting: <input type="text" value="Alphabetic"/>
Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-1, A1 RCB	0.19283	170.8	04Jul1776, 12:25	2.49
Junction-2, dry pond inflow	0.28977	270.5	04Jul1776, 12:20	2.51
Junction-3, E site outlet	0.82111	473.4	04Jul1776, 12:40	1.92
Junction-4, 45th St culvert	0.37083	208.6	04Jul1776, 12:35	1.87

Project: AAO development study Simulation Run: Existing - 005				
Start of Run: 04Jul1776, 00:00		Basin Model: Existing - 005		
End of Run: 05Jul1776, 00:05		Meteorologic Model: 005-yr		
Compute Time: DATA CHANGED, RECOMPUTE		Control Specifications: Control 1		
Show Elements:	All Elements	Volume Units:	<input checked="" type="radio"/> IN <input type="radio"/> ACRE-FT	Sorting: <input type="text" value="Alphabetic"/>
Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-1, A1 RCB	0.19283	236.2	04Jul1776, 12:20	3.28
Junction-2, dry pond inflow	0.28977	372.6	04Jul1776, 12:15	3.30
Junction-3, E site outlet	0.82111	681.7	04Jul1776, 12:35	2.66
Junction-4, 45th St culvert	0.37083	301.7	04Jul1776, 12:30	2.61

Project: AAO development study Simulation Run: Existing - 010				
Start of Run: 04Jul1776, 00:00		Basin Model: Existing - 010		
End of Run: 05Jul1776, 00:05		Meteorologic Model: 010-yr		
Compute Time: DATA CHANGED, RECOMPUTE		Control Specifications: Control 1		
Show Elements:	All Elements	Volume Units:	<input checked="" type="radio"/> IN <input type="radio"/> ACRE-FT	Sorting: <input type="text" value="Alphabetic"/>
Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-1, A1 RCB	0.19283	298.2	04Jul1776, 12:20	3.98
Junction-2, dry pond inflow	0.28977	470.7	04Jul1776, 12:15	4.00
Junction-3, E site outlet	0.82111	877.5	04Jul1776, 12:35	3.33
Junction-4, 45th St culvert	0.37083	389.3	04Jul1776, 12:30	3.28

Project: AAO development study Simulation Run: Existing - 025				
Start of Run: 04Jul1776, 00:00		Basin Model: Existing - 025		
End of Run: 05Jul1776, 00:05		Meteorologic Model: 025-yr		
Compute Time: DATA CHANGED, RECOMPUTE		Control Specifications: Control 1		
Show Elements:	All Elements	Volume Units:	<input checked="" type="radio"/> IN <input type="radio"/> ACRE-FT	Sorting: <input type="text" value="Alphabetic"/>
Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-1, A1 RCB	0.19283	386.3	04Jul1776, 12:20	4.99
Junction-2, dry pond inflow	0.28977	610.9	04Jul1776, 12:15	5.01
Junction-3, E site outlet	0.82111	1159.0	04Jul1776, 12:35	4.30
Junction-4, 45th St culvert	0.37083	515.2	04Jul1776, 12:30	4.25

Colonel James Jabara Airport, Wichita, KS

Project: AAO development study Simulation Run: Existing - 050

Start of Run: 04Jul1776, 00:00 Basin Model: Existing - 050
End of Run: 05Jul1776, 00:05 Meteorologic Model: 050-yr
Compute Time: DATA CHANGED, RECOMPUTE Control Specifications: Control 1

Show Elements: **All Elements** Volume Units: ☒ IN ☐ ACRE-FT Sorting: **Alphabetic**

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-1, A1 RCB	0.19283	461.0	04Jul1776, 12:15	5.84
Junction-2, dry pond inflow	0.28977	727.7	04Jul1776, 12:15	5.87
Junction-3, E site outlet	0.82111	1401.2	04Jul1776, 12:30	5.13
Junction-4, 45th St culvert	0.37083	623.0	04Jul1776, 12:25	5.07

Project: AAO development study Simulation Run: Existing - 100

Start of Run: 04Jul1776, 00:00 Basin Model: Existing - 100
End of Run: 05Jul1776, 00:05 Meteorologic Model: 100-yr
Compute Time: DATA CHANGED, RECOMPUTE Control Specifications: Control 1

Show Elements: **All Elements** Volume Units: ☒ IN ☐ ACRE-FT Sorting: **Alphabetic**

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-1, A1 RCB	0.19283	546.2	04Jul1776, 12:15	6.73
Junction-2, dry pond inflow	0.28977	854.0	04Jul1776, 12:10	6.76
Junction-3, E site outlet	0.82111	1665.1	04Jul1776, 12:30	6.00
Junction-4, 45th St culvert	0.37083	740.9	04Jul1776, 12:25	5.94

Project: AAO development study Simulation Run: Developed - 002

Start of Run: 04Jul1776, 00:00 Basin Model: Developed - 002
End of Run: 05Jul1776, 00:05 Meteorologic Model: 002-yr
Compute Time: DATA CHANGED, RECOMPUTE Control Specifications: Control 1

Show Elements: **All Elements** Volume Units: ☒ IN ☐ ACRE-FT Sorting: **Alphabetic**

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-1, A1 RCB	0.19283	202.8	04Jul1776, 12:10	2.84
Junction-2, dry pond inflow	0.28977	342.1	04Jul1776, 12:05	2.75
Junction-3, E site outlet	0.82111	621.3	04Jul1776, 12:15	2.28
Junction-4, 45th St culvert	0.37083	217.7	04Jul1776, 12:05	2.13

Project: AAO development study Simulation Run: Developed - 005

Start of Run: 04Jul1776, 00:00 Basin Model: Developed - 005
End of Run: 05Jul1776, 00:05 Meteorologic Model: 005-yr
Compute Time: DATA CHANGED, RECOMPUTE Control Specifications: Control 1

Show Elements: **All Elements** Volume Units: ☒ IN ☐ ACRE-FT Sorting: **Alphabetic**

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-1, A1 RCB	0.19283	274.2	04Jul1776, 12:10	3.66
Junction-2, dry pond inflow	0.28977	462.6	04Jul1776, 12:05	3.56
Junction-3, E site outlet	0.82111	842.2	04Jul1776, 12:15	3.06
Junction-4, 45th St culvert	0.37083	298.3	04Jul1776, 12:05	2.89

Colonel James Jabara Airport, Wichita, KS

Project: AAO development study Simulation Run: Developed - 010

Start of Run: 04Jul1776, 00:00 Basin Model: Developed - 010
End of Run: 05Jul1776, 00:05 Meteorologic Model: 010-yr
Compute Time: DATA CHANGED, RECOMPUTE Control Specifications: Control 1

Show Elements: Volume Units: ☒ IN ☐ ACRE-FT Sorting:

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-1, A1 RCB	0.19283	338.6	04Jul1776, 12:10	4.38
Junction-2, dry pond inflow	0.28977	571.4	04Jul1776, 12:05	4.28
Junction-3, E site outlet	0.82111	1039.4	04Jul1776, 12:15	3.75
Junction-4, 45th St culvert	0.37083	371.3	04Jul1776, 12:05	3.57

Project: AAO development study Simulation Run: Developed - 025

Start of Run: 04Jul1776, 00:00 Basin Model: Developed - 025
End of Run: 05Jul1776, 00:05 Meteorologic Model: 025-yr
Compute Time: DATA CHANGED, RECOMPUTE Control Specifications: Control 1

Show Elements: Volume Units: ☒ IN ☐ ACRE-FT Sorting:

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-1, A1 RCB	0.19283	436.2	04Jul1776, 12:05	5.40
Junction-2, dry pond inflow	0.28977	730.2	04Jul1776, 12:05	5.30
Junction-3, E site outlet	0.82111	1332.7	04Jul1776, 12:10	4.74
Junction-4, 45th St culvert	0.37083	478.3	04Jul1776, 12:05	4.56

Project: AAO development study Simulation Run: Developed - 050

Start of Run: 04Jul1776, 00:00 Basin Model: Developed - 050
End of Run: 05Jul1776, 00:05 Meteorologic Model: 050-yr
Compute Time: DATA CHANGED, RECOMPUTE Control Specifications: Control 1

Show Elements: Volume Units: ☒ IN ☐ ACRE-FT Sorting:

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-1, A1 RCB	0.19283	521.1	04Jul1776, 12:05	6.27
Junction-2, dry pond inflow	0.28977	866.1	04Jul1776, 12:05	6.16
Junction-3, E site outlet	0.82111	1584.0	04Jul1776, 12:10	5.59
Junction-4, 45th St culvert	0.37083	570.1	04Jul1776, 12:05	5.39

Colonel James Jabara Airport, Wichita, KS

Project: AAO development study Simulation Run: Developed - 100

Start of Run: 04Jul1776, 00:00 Basin Model: Developed - 100
 End of Run: 05Jul1776, 00:05 Meteorologic Model: 100-yr
 Compute Time: DATA CHANGED, RECOMPUTE Control Specifications: Control 1

Show Elements: Volume Units: ☒ IN ☐ ACRE-FT Sorting:

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Junction-1, A1 RCB	0.19283	611.7	04Jul1776, 12:05	7.18
Junction-2, dry pond inflow	0.28977	1010.4	04Jul1776, 12:05	7.07
Junction-3, E site outlet	0.82111	1847.0	04Jul1776, 12:10	6.47
Junction-4, 45th St culvert	0.37083	668.6	04Jul1776, 12:05	6.27

Summary Results for Junction "Junction-2, dry pond inflow" — ☐ X

Project: AAO development study Simulation Run: Existing - 100
 Junction: Junction-2, dry pond inflow

Start of Run: 04Jul1776, 00:00 Basin Model: Existing - 100
 End of Run: 05Jul1776, 00:05 Meteorologic Model: 100-yr
 Compute Time: DATA CHANGED, RECOMPUTE Control Specifications: Control 1

Volume Units: ☐ IN ☒ ACRE-FT

Computed Results

Peak Discharge: 854.0 (CFS)	Date/Time of Peak Discharge: 04Jul1776, 12:10
Volume: 104.5 (ACRE-FT)	

Summary Results for Junction "Junction-2, dry pond inflow" — ☐ X

Project: AAO development study Simulation Run: Developed - 100
 Junction: Junction-2, dry pond inflow

Start of Run: 04Jul1776, 00:00 Basin Model: Developed - 100
 End of Run: 05Jul1776, 00:05 Meteorologic Model: 100-yr
 Compute Time: DATA CHANGED, RECOMPUTE Control Specifications: Control 1

Volume Units: ☐ IN ☒ ACRE-FT

Computed Results

Peak Discharge: 1010.4 (CFS)	Date/Time of Peak Discharge: 04Jul1776, 12:05
Volume: 109.2 (ACRE-FT)	

NRCS Soils Report



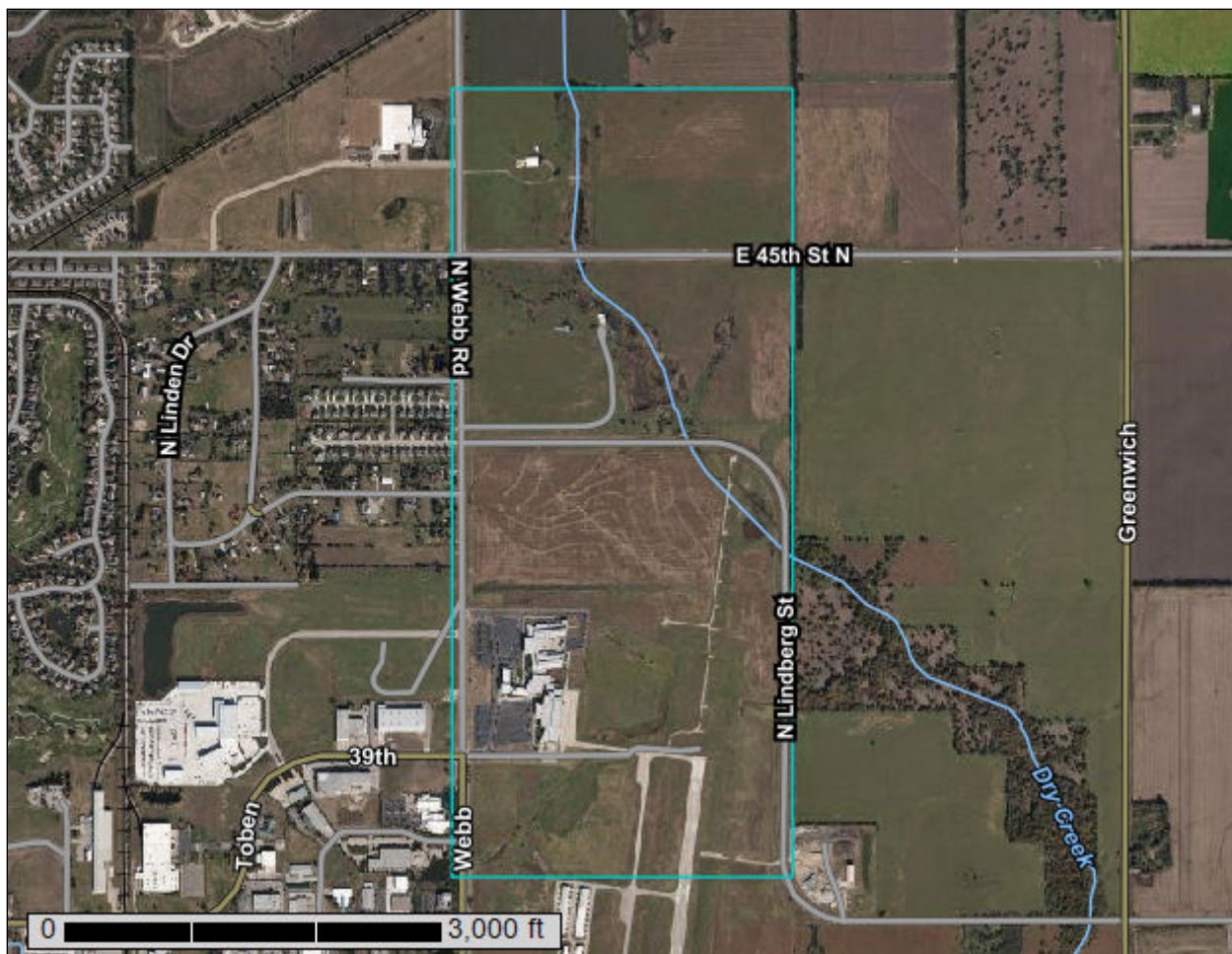
United States
Department of
Agriculture

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 **Sedgwick County, Kansas**



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 (<https://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.

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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

Custom Soil Resource Report

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 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:
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: Sedgwick County, Kansas
Survey Area Data: Version 18, Sep 13, 2022

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

Date(s) aerial images were photographed: Sep 23, 2018—Nov 29, 2018

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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
3858	Goessel silty clay, 1 to 3 percent slopes	0.3	0.1%
3911	Rosehill silty clay, 1 to 3 percent slopes	360.1	92.4%
4570	Clime silty clay, 3 to 7 percent slopes	0.2	0.1%
5893	Farnum loam, 1 to 3 percent slopes	29.1	7.5%
Totals for Area of Interest		389.8	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.

Sedgwick County, Kansas

3858—Goessel silty clay, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tpvy
Elevation: 1,310 to 1,640 feet
Mean annual precipitation: 27 to 34 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 165 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Goessel and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Goessel

Setting

Landform: Paleoterraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium over loamy alluvium

Typical profile

Ap - 0 to 6 inches: silty clay
A - 6 to 13 inches: silty clay
Bss - 13 to 31 inches: silty clay
BC - 31 to 51 inches: silty clay
2C - 51 to 79 inches: clay loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 3 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Ecological site: R076XY107KS - Clay Hills
Hydric soil rating: No

Minor Components

Ladysmith

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R076XY107KS - Clay Hills
Hydric soil rating: No

Irwin

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R076XY107KS - Clay Hills
Hydric soil rating: No

Rosehill

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R076XY107KS - Clay Hills
Hydric soil rating: No

Aquolls, occasionally ponded

Percent of map unit: 1 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R074XY132KS - Subirrigated
Hydric soil rating: Yes

3911—Rosehill silty clay, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tt6d
Elevation: 1,310 to 1,640 feet
Mean annual precipitation: 27 to 34 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 165 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Rosehill and similar soils: 90 percent

Minor components: 10 percent

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

Description of Rosehill

Setting

Landform: Hillslopes

Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Side slope

Down-slope shape: Convex

Across-slope shape: Linear

Parent material: Residuum weathered from clayey shale

Typical profile

Ap - 0 to 9 inches: silty clay

BA - 9 to 18 inches: silty clay

Bw - 18 to 29 inches: silty clay

C - 29 to 36 inches: silty clay

Cr - 36 to 79 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent

Depth to restrictive feature: 32 to 39 inches to paralithic bedrock

Drainage class: Well drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 10 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum: 2.0

Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: D

Ecological site: R076XY107KS - Clay Hills

Hydric soil rating: No

Minor Components

Goessel

Percent of map unit: 5 percent

Landform: Paleoterraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R076XY107KS - Clay Hills

Hydric soil rating: No

Irwin

Percent of map unit: 4 percent
Landform: Interfluves
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R076XY107KS - Clay Hills
Hydric soil rating: No

Aquolls, occasionally ponded

Percent of map unit: 1 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R074XY132KS - Subirrigated
Hydric soil rating: Yes

4570—Clime silty clay, 3 to 7 percent slopes

Map Unit Setting

National map unit symbol: 2tt6x
Elevation: 1,310 to 1,640 feet
Mean annual precipitation: 27 to 34 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 165 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Clime and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clime

Setting

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

Typical profile

A - 0 to 10 inches: silty clay
Bw - 10 to 19 inches: silty clay
C - 19 to 31 inches: silty clay
Cr - 31 to 41 inches: bedrock

Properties and qualities

Slope: 3 to 7 percent
Depth to restrictive feature: 20 to 39 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Ecological site: R076XY112KS - Limy Hills
Hydric soil rating: No

Minor Components

Rosehill

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R076XY107KS - Clay Hills
Hydric soil rating: No

Edalgo

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R074XY107KS - Clay Hills
Hydric soil rating: No

Irwin

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R076XY107KS - Clay Hills
Hydric soil rating: No

Longford

Percent of map unit: 3 percent
Landform: Interfluves

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Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R074XY115KS - Loamy Hills
Hydric soil rating: No

Lancaster

Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R074XY115KS - Loamy Hills
Hydric soil rating: No

Aquolls, occasionally ponded

Percent of map unit: 1 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R074XY132KS - Subirrigated
Hydric soil rating: Yes

5893—Farnum loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2ww17
Elevation: 1,660 to 2,610 feet
Mean annual precipitation: 25 to 33 inches
Mean annual air temperature: 55 to 57 degrees F
Frost-free period: 180 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Farnum and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Farnum

Setting

Landform: Paleoterraces
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Alluvium

Typical profile

Ap - 0 to 9 inches: loam
Bt1 - 9 to 25 inches: loam

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Bt2 - 25 to 48 inches: sandy clay loam

Bt3 - 48 to 73 inches: clay loam

Btk - 73 to 79 inches: loam

Properties and qualities

Slope: 1 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 1

Land capability classification (nonirrigated): 2c

Hydrologic Soil Group: B

Ecological site: R079XY115KS - Loamy Plains

Hydric soil rating: No

Minor Components

Penalosa

Percent of map unit: 8 percent

Landform: Paleoterraces

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R079XY107KS - Clayey Plains

Hydric soil rating: No

Nalim

Percent of map unit: 6 percent

Landform: Paleoterraces

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R079XY115KS - Loamy Plains

Hydric soil rating: No

Goessel

Percent of map unit: 5 percent

Landform: Paleoterraces

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R076XY107KS - Clay Hills

Hydric soil rating: No

Geary

Percent of map unit: 3 percent

Landform: Hillslopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

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Across-slope shape: Linear
Ecological site: R074XY115KS - Loamy Hills
Hydric soil rating: No

Naron

Percent of map unit: 2 percent
Landform: Dunes on paleoterraces
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: R079XY122KS - Sandy Loam
Hydric soil rating: No

Aquolls, occasionally ponded

Percent of map unit: 1 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R074XY132KS - Subirrigated
Hydric soil rating: Yes

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