`

YEAGER AIRPORT

Advanced Planning

Technical Report

Draft – May 2020

PREPARED FOR

The Central West Virginia
Regional Airport Authority

PREPARED BY
Landrum & Brown, Incorporated

Contents

Page

List of Tables

List of Exhibits Page

1 Introduction

In 2015, a slope failure destroyed the Yeager Airport (CRW) Engineered Materials Arresting System (EMAS), resulting in a decrease in Runway Safety Area (RSA) length, reductions in the declared distances for the runway, and the loss of vertical guidance. Operations at the Airport declined, some flights had to take weight penalties on certain destinations, and some airlines refused to initiate service at CRW due to the limited runway length available. In response, the Central West Virginia Regional Airport Authority (CWVRAA) conducted the 2017 Interim Runway Safety Area Study (2017 RSA Study) with the goal of identifying an interim solution to quickly improve safety and restore some of the lost operational capabilities. The improvements recommended in this report, including a new EMAS and a retaining wall were constructed in 2019.

While the 2019 RSA project improved the RSA and operational capability of the runway, additional upgrades are still needed in order to fully meet Federal Aviation Administration (FAA) safety standards and provide the runway length the airlines need. CWVRAA embarked on an Airfield Master Plan with two primary goals: (1) provide an RSA that fully complies with FAA requirements and (2) meet the short- and long-term runway length needs of the users of the Airport. The Master Plan recommended that Runway 05-23 be extended to 8,000 feet, Taxiway A be relocated to provide standard separation to Runway 05-23, and a standard RSA be provided.

While the Master Plan was underway, the FAA notified the Airport that the runway project needed to be completed in two phases. The first phase would focus on providing a standard RSA and meeting existing runway length needs, while the second phase would focus on meeting long-term needs. This resulted in the development of a second RSA Study that identified the most appropriate way to meet the short-term needs. The preferred alternative from the August 2019 RSA Study is shown on **Exhibit 1, *Phase 1 RSA Project***. This Phase 1 project shifts Runway 05-23 to the east by 1,125 feet, extends Runway 05-23 to the east by 1,300 feet, and provides a full-dimension RSA on both runway ends.

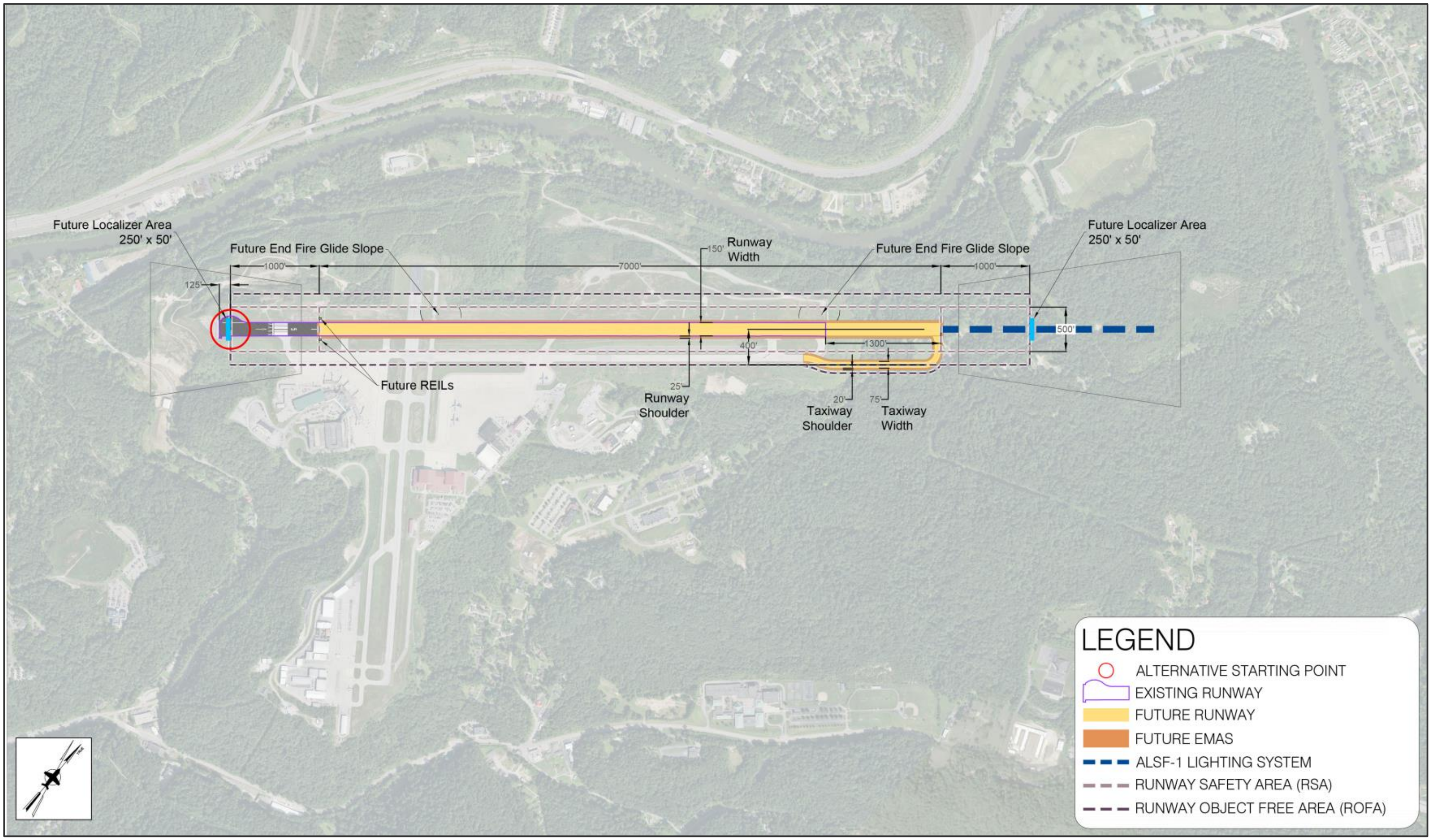
An environmental overview was completed as part of the September 2019 RSA Study. This overview found that the following National Environmental Policy Act (NEPA) categories may require additional investigation as a result of the Phase 1 RSA project:

- Air quality
- Biological resources
- Climate
- Department of Transportation (DOT) Act Section 4(f) resources
- Hazardous materials, pollution prevention, and solid waste
- Land use
- Noise and noise-compatible land use
- Visual effects
- Surface waters

The 8,000-foot long runway, NAVAID improvements, and the relocation of Taxiway A to meet runway-to-taxiway separation standards would be completed when required and when funds are available. These projects are shown on **Exhibit 2, *Ultimate Runway Extension and Taxiway A Relocation***. The long-term project is expected to be initiated post 2030.

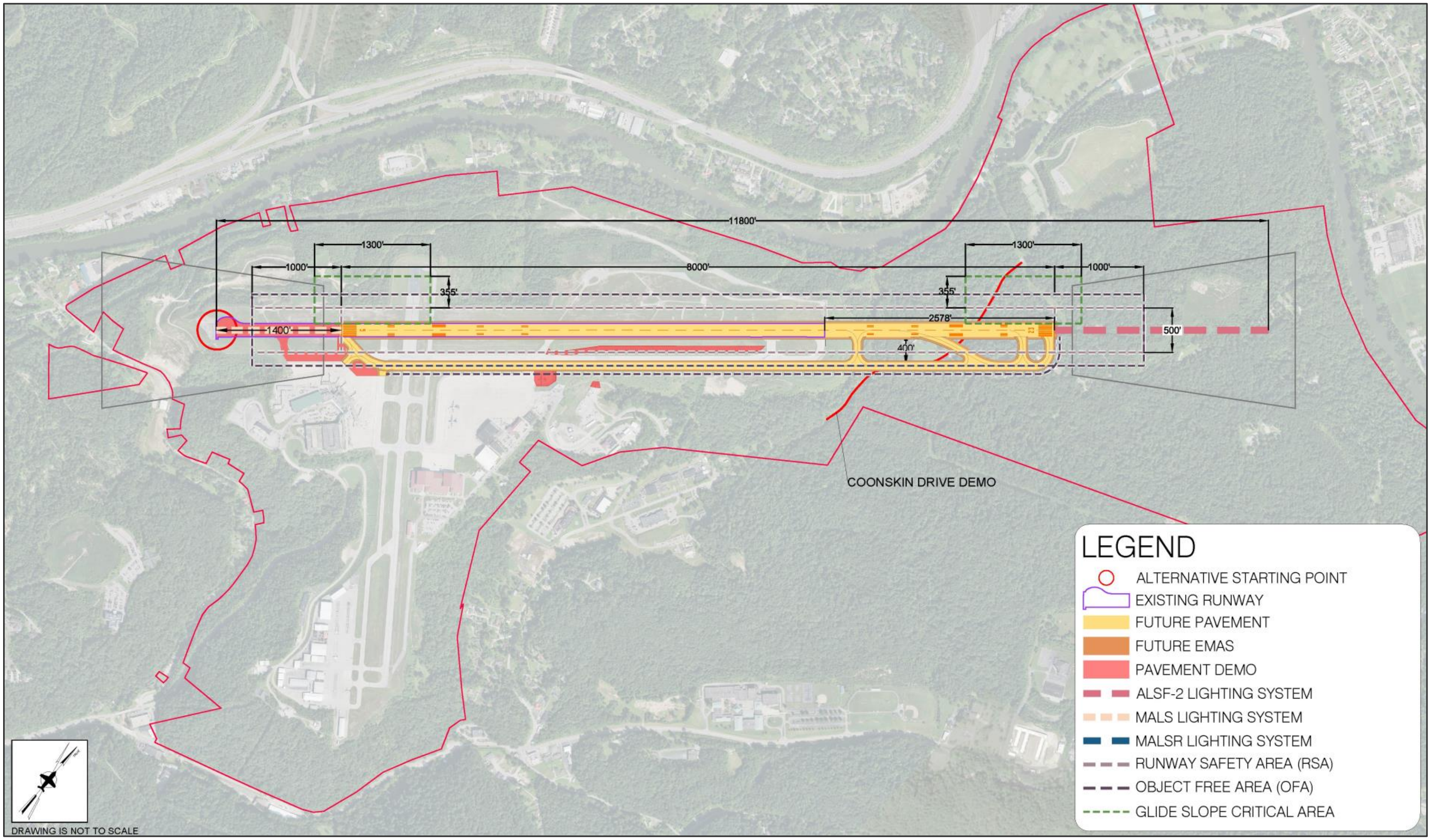
With the Master Plan complete and under review by the FAA, CRW is undertaking the next step in the development of the Phase 1 RSA Project by developing a runway justification presentation package, identifying water resource design philosophies and strategies to avoid adverse impacts to aquatic habitats and species, refining the grading plan developed in the Master Plan, refining the cost estimate based on updated grading, discussing environmental mitigation strategies, and laying out the next steps. This technical write-up provides the groundwork for the Phase 1 RSA Project's environmental process.

EXHIBIT 1 PHASE 1 – RSA PROJECT



Sources: Aerial photography by Quantum Spatial, 2017; Landrum & Brown analysis.

EXHIBIT 2 ULTIMATE RUNWAY EXTENSION AND TAXIWAY A RELOCATION



Sources: Aerial photography by Quantum Spatial, 2017; Landrum & Brown and ADCI analysis.

2 Purpose and Need

2.1 Runway Length

The existing runway length analysis used in the CRW Master Plan Update originated from the 2018 Interim RSA Study. That runway length analysis used a 2017 existing fleet to determine the critical aircraft for runway length at the time. Since 2017, CRW has experienced some changes in fleet mix such as aircraft type, number of operations, and destination pairs. These changes encouraged the Airport to conduct an updated existing runway length analysis using a 2020 fleet.

2.1.1 Methodology

In order to update the runway length analysis that was used in the Master Plan Update, an updated fleet was acquired from Diio Mi[1] for September of 2019 through August of 2020. This updated fleet was compared to the 2017 fleet used in the 2018 Interim RSA Study to determine similarities and differences. Both are shown in **Table 1, *Fleet Mix Updates and Comparison***. Aircraft found in both the 2017 and 2020 fleets are identified in purple text, and aircraft that meet 500 operations annually were also bolded (purple and bolded). The five bolded purple aircraft all have the potential to drive runway length at CRW based on their impact to the annual operations count. These five aircraft were carried forward in the runway length analysis and further analyzed using their furthest destination from CRW.

Two of the five aircraft analyzed had a change in furthest destination from 2017 to 2020. In 2017 the CRJ 200's furthest destination pairing from CRW was ATL; however, in 2020 the CRJ 200 is serving ORD, which is slightly further. In both years, the CRJ 200 was operating at over 5,000 operations annually from CRW regardless of destination. Additionally, the CRJ-700 only had two operations to ORD in 2017, however, by 2020, the CRJ-700 is operating over 500 operations with the furthest destination being PHL. This is a slightly closer destination to CRW, however. The remaining three aircraft, B717, B737-700, and CRJ 900, are all continuing to fly to ATL, however, their annual operations increased substantially.

These five aircraft were analyzed using their 2020 furthest destination pairing and the Aircraft Manufacturer's Airport Planning Manuals to determine the necessary takeoff length for Runway 05-23. The takeoff length requirements were analyzed using the hot day takeoff length charts at maximum payload and adjusted for the runway gradient on Runway 05-23. Runway 23 taekoff length requirements are 520 feet greater than those required for a runway with no slope. Therefore, this calculation was added into the takeoff length requirements (additional 520 feet added to the takeoff length).[2]

---

[1] Diio Mi by Cirium delivers market intelligence for the aviation industry and provides flights schedules from airline schedulers by airport.

[2] A 520-foot gradient adjustment was added to the takeoff length requirements per Section 509 from Advisory Circular 150-5325-4B, *Runway Length Requirements*. This section states that the takeoff length requirement must be increased by 10 feet per foot of difference in centerline elevations between the high and low points of the runway centerline elevations.

TABLE 1 FLEET MIX UPDATES AND COMPARISON

2017 Fleet Information (2018 Interim RSA Study)			2020 Fleet Information (2020 Analysis)	
Aircraft	***Furthest Destination***	***Ops***	***Furthest Destination***	***Ops***
A319	ATL	288	MCO	248
B717	**ATL**	**306**	**ATL**	**562**
B727	YIP	141		
B737-700	**ATL**	**168**	**ATL**	**562**
B757	MEM	61		
CRJ-200	**ATL**	**5,424**	**ORD**	**6,376**
CRJ-700	**ORD**	**2**	**PHL**	**508**
CRJ-900	**ATL**	**42**	**ATL**	**834**
DASH 8	PHL	4,068		
DC-9	MCI	641		
EMB 145	IAH	1,792	ORD	214
	Total Operations	12,174	Total Operations	9,304

Notes: Purple = aircraft found in both fleets, **Bold purple** = enough aircraft in 2020 fleet to be considered as a critical aircraft (over 500 annual operations in 2020)

Sources: Diio Mi by Cirium, data accessed March 3, 2020 for travel year ending August 2020; Landrum & Brown analysis.

2.1.2 Results

The 2018 Interim RSA Study identified the EMB145 as the critical aircraft for runway length with a required takeoff length of 6,820 feet off of Runway 23. This aircraft is currently being phased out of the fleet and now operates 214 operations at CRW annually, which is not sufficient to meet the critical aircraft threshold for runway length requirements. This aircraft was not analyzed in the updated 2020 analysis.

The updated 2020 runway length analysis identified the B717 as the critical aircraft for runway length at CRW. The B717 was analyzed in the 2018 Interim RSA Study, however, it did not meet the critical aircraft threshold for runway length, with roughly 300 operations in 2017. In 2020, the B717 is scheduled to fly over 500 operations annually out of CRW and would require 6,820 feet of runway for takeoffs at maximum payload. This aircraft, along with the four other aircraft analyzed are depicted in **Table 2, *2020 Runway Length Analysis Results***.

The B717 was the only aircraft with over 500 annual operations that could not take off fully loaded on Runway 05-23. The B717 would need to sacrifice payload on hot days. This payload sacrifice would be approximately 1,500 pounds, which is equivalent to roughly six passengers (assuming 250 pounds per passenger). The remaining four aircraft analyzed are capable of reaching their furthest identified destination on the existing runway length at CRW. Those four aircraft require takeoff lengths between 5,220 and 6,120 feet carrying maximum payload to their designated destinations.

TABLE 2 2020 RUNWAY LENGTH ANALYSIS RESULTS

Aircraft	Furthest Destination	Annual Ops.	Runway Length Needed (ft) [2]	Payload Hit (Existing Runway)
B717[1]	ATL	562	**6,820**	1,500 lbs. or 6 passengers
B737-700	ATL	562	**5,220**	N/A
CRJ 200	ORD	6,376	**6,120**	N/A
CRJ 700	PHL	508	**5,320**	N/A
CRJ 900[1]	ATL	834	**6,120**	N/A

[1] The B717 takeoff length differs from that in the 2018 Interim RSA Study runway length analysis due to the version used in that analysis. The high gross weighted version of the B717 was used in the 2018 Interim RSA Study, whereas the basic weighted version was used for this analysis.

[2] A 520-foot gradient adjustment was added to the takeoff length requirements per Section 509 from Advisory Circular 150-5325-4B, Runway Length Requirements. This section states that the takeoff length requirement must be increased by 10 feet per foot of difference in centerline elevations between the high and low points of the runway centerline elevations.

Sources: Diio Mi by Cirium, data accessed March 3, 2020 for travel year ending August 2020. Landrum & Brown analysis.

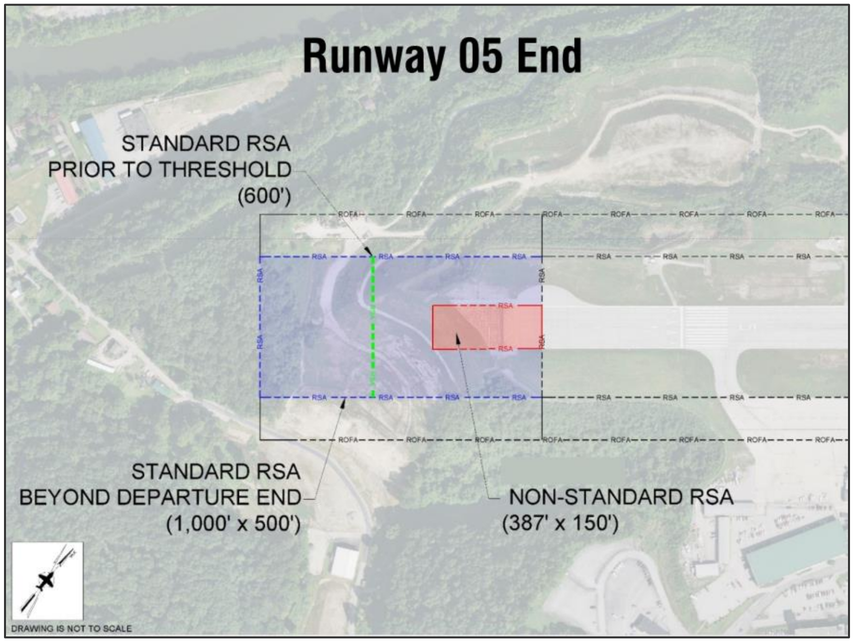
In summary, it is recommended that the B717 be used as the existing critical aircraft for runway length at CRW. The takeoff length requirement for the B717 is 6,820 feet based on the gradient adjustment of the existing runway location. When the runway is shifted based on the RSA Study preferred alternative, the runway length requirement will require an additional adjustment based on the new gradient. Continuation of the slope on the last quarter of the runway as required by FAA would result in the new Runway 23 end being an additional 10 feet lower, adding 100 feet to the takeoff runway length requirement. This results in a runway length requirement of 7,000 feet (6,920 feet rounded up to the nearest 100).

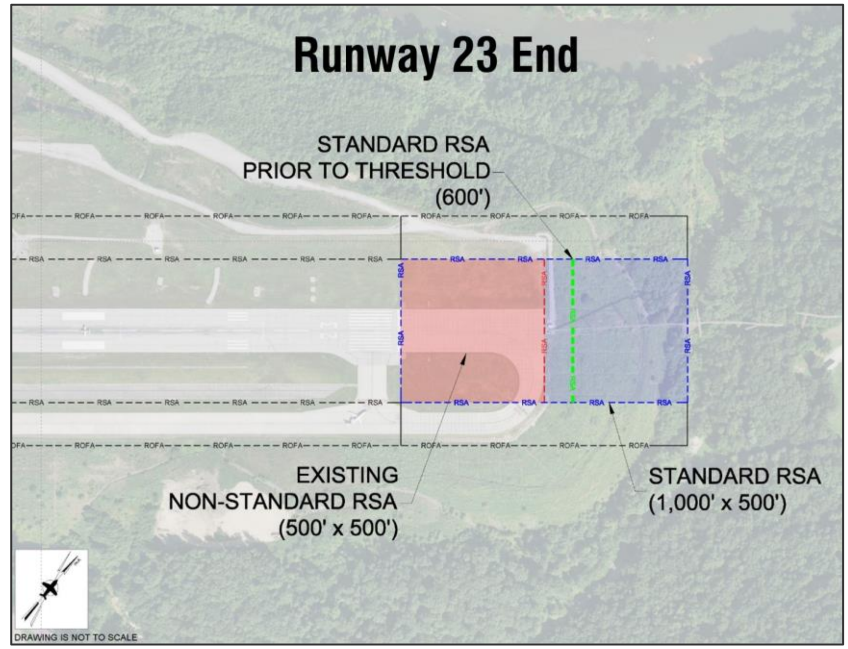
It is important to note that this analysis was completed prior to the downturn in air traffic due to the COVID-19 pandemic.

2.2 Runway Safety Area

According to FAA AC 150/5300-13A Change 1, Airport Design, the CRW Runway 05-23 RSA should be 500 feet wide, have a length that is 600 feet prior to the threshold and 1,000 feet beyond the end of the runway, and meet grading requirements. The EMAS on the Runway 05 end, recently constructed at CRW, increases safety but does not meet the RSA length requirement prior to the threshold or the width requirement. The Runway 23 RSA is also 500 feet long, so it does not meet the 600-foot or 1,000-foot RSA length requirement. Additionally, there are lighting and navigational aids in the RSA/ROFA at CRW. The existing RSA deficiencies for both runway ends are depicted in **Exhibit 3, *Existing Runway 05-23 RSAs***.

EXHIBIT 3 EXISTING RUNWAY 05-23 RSAS





Sources: Landrum & Brown analysis.

3 Water Resources Design Philosophy

This section advises the Airport on recommendations for erosion control and run-off, laying the groundwork for a more precise grading plan associated with the project. In approaching the design of a mass grading project of the scale of the proposed extension of Runway 23 at CRW, the design team will be vigilant in ensuring that the construction activities and the final conditions have minimal to no impact on the water resources in the project area. With the project's close proximity to the Elk River and associated tributaries, the potential exists for adverse effects to the water quality and the species that may inhabit the area.[3] In order to prevent any impacts during or following construction, emphasis will be placed on the application of suitable erosion and sediment control strategies (ESC) as well as application of best management practices for drainage and stormwater management (SWM).

3.1 Erosion and Sediment Control (ESC)

With the total anticipated limit of disturbance approaching 397.2 acres and a total earthwork volume of 25,642,000 cubic yards of earth, this project represents the largest earthwork moving project undertaken by the Airport since its original construction. However, it is critical to note that this massive project will actually consist of many phases and sub-phases strategically sequenced over several years to achieve the end product, so at any one time the total acreage will not be actively under construction. Careful layout of the disturbed areas and limitations on concurrent work will ensure that the overall runoff from the project is controlled and managed to minimize impacts on the surrounding environment. Measures to be employed include:

- Strategic phasing of clearing and grading
- Implementation of interception water features into grading
- Implementation of local controls
- Heightened inspection requirement

3.1.1 Strategic Phasing of Clearing and Grading

The proposed project will involve mass hauling of significant quantities of dirt. However, the project will not be phased as a single work area with the entirety of the project limits cleared simultaneously. In fact, the phasing plan will delineate borrow areas and corresponding fill areas for specific limits as building blocks of the overall project. Therefore, one of the most significant ESC measures to be undertaken will be to limit the size of the individual phases of work to minimize the amount of disturbed earth left exposed and susceptible to erosion at any one time. Additionally, the project site has approximately three drainage basins (not including sub basins). The grading plan will avoid simultaneous impacts to multiple basins and locate earthwork activities as far as possible from outfalls. Initial projects may focus on stream bypass structures, relocation of basin outfall points, and clear water diversions to segregate clean water flows from construction activities.

3.1.2 Implementation of Interception Water Features into Grading

A project of this magnitude allows for certain features to be built during construction to control sediment runoff and subsequently be converted into permanent stormwater management features. For larger drainage basins, one strategy to be employed is the use of sediment basins. The intent, where possible, would be to introduce depressions in the topography where runoff from the cleared areas will collect and pond prior to flowing to the

[3] There are 11 species of fish and clams that are found in Kanawha County; it is unknown if any of these species are in the impact area.

basin outfall. Sediment would be allowed to settle to the bottom of the pond with clear water exiting the pond over a weir or riser at a specified elevation to a controlled, non-erosive outfall. The ponds would be periodically cleared of silt to ensure the desired storage volume is maintained. As part of the final conditions, some of these features can be utilized as stormwater management facilities to provide water quality and quantity management. Similarly, any combination of drainage swales and conveyances can be used to provide clear water diversion to ensure segregation of flows during construction. Careful planning can make these conveyances potential final features of restored borrow areas. Any water collection facilities should be equipped with dewatering devices to draw down the basins over time and not create permanent standing water which could attract hazardous wildlife. Steep side walls and un-mowed banks can also help to deter wildlife from stormwater or drainage facilities.

3.1.3 Implementation of Local Controls

As with any project involving earth disturbance, the balance of effective ESC involves the use of effective local controls. Controls can be used to provide various functions to protect receiving waterways from sediment-laden water that runs off the construction site. Diversion controls, such as berms and dikes, bypass clean flows around disturbed areas. Filtering controls, such as silt fence and filter socks, filter sediment-laden runoff as it leaves the construction area. Energy dissipating controls, such as check dams and gabion baskets, slow runoff to reduce its velocity and erosive potential. Inlet protection devices can be used to protect existing drainage structures from conveying sediment-laden runoff in closed drainage systems. The runway extension project will be a new development project, and therefore the presence of existing closed drainage systems is expected to be minimal. Stabilization of disturbed areas is also critical to preventing excess sediment from leaving the construction site. Upon completion of each phase and sub-phase, disturbed areas will be seeded and/or covered with erosion control matting to minimize erosion until the final conditions are achieved.

For this project a typical sequence of local controls would include:

- Creation of bypass swales and conveyances for clear water diversion
- Creation of stabilized construction entrance(s)
- Identification and protection of any existing inlet structures
- Installation of perimeter filtering controls such as silt fence and filter sock.
- Installation of perimeter conveyance systems with check dams
- Construction of sediment basins with regular inspection and maintenance
- Installation of internal berms and dikes to control internal flows
- Construction/maintenance of suitable haul routes
- Temporary seeding and/or installation of erosion control matting in critical areas to provide stabilization following each phase and sub-phase
- Final clean out of sediment basins and conversion to stormwater management facilities
- Immediate establishment of cover vegetation post-construction
- Removal of all devices upon establishment of vegetation

Most of the grading areas on the project have significant land areas between the anticipated limits of disturbance and outfalls to receiving waterways. However, one constricted area adjacent to the Elk River will require special attention. The construction of the proposed culvert for fill over Coonskin Branch, as well as the required retaining wall, will occur adjacent to the Elk River. It should be noted that only approximately 13.2 acres drain to this area directly and that the amount of runoff anticipated is manageable. The 2019 Runway 05 RSA retaining wall and EMAS bed installation, which is located in proximity to Elk Two Mile Creek, provides an accurate analogy to this condition and demonstrates that construction can proceed adjacent to waterways with little impact.

3.1.4 Heightened Inspection Requirements

As part of the construction documents, specific inspection requirements would be added to increase the amount of scrutiny placed on the function of ESC elements. Requirements could include full-time inspection staff assigned by the contractor and construction management firm, stocking of specified materials and equipment for emergency repairs, a 24/7/365 response team for repairs and storm response, and similar measures. Requirements can also include daily inspection of open grading areas to ensure adherence to all requirements, testing and monitoring of adjacent waters and drainage conveyance for adverse effects, as well as monetary penalties for permit violations or silt releases.

3.2 Drainage and Stormwater Management (SWM)

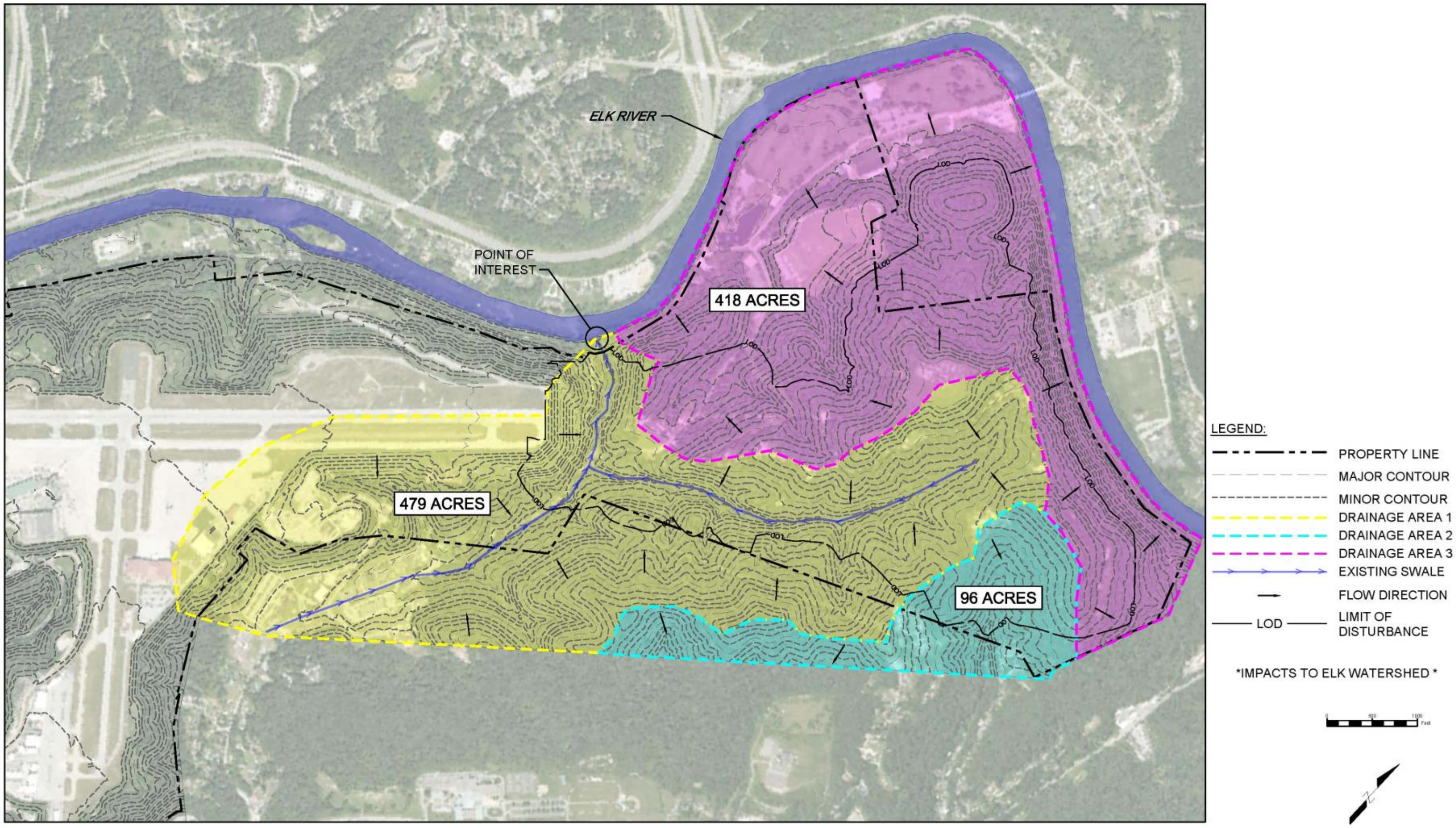
As with any development, the single greatest criteria for effective SWM is to ensure that post-development conditions do not degrade water quality or increase peak flows. The existing conditions within the project area are uniformly composed of rolling woodland terrain and virtually no impervious surfaces. Existing drainage areas related to the project area are presented in **Exhibit 4, *Existing Drainage Areas***. Post-construction, the area will be marked by significantly less vertical relief and more gradual side slopes. This change in topography will reduce the concentration and speed of runoff, resulting in less erosion and risk of slope failures. The proposed drainage areas are depicted in **Exhibit 5, *Proposed Drainage Areas***. Currently, the Airport endures periodic erosion and failure of steep slopes from the airfield down to the surrounding valley. Numerous stabilization projects have been recently constructed to minimize future slope failures. The reduction in overall vertical relief following the Phase 1 Runway 05-23 RSA project should mitigate some of these issues and reduce Airport-related sediment from being transported to the Elk River. Additionally, the amount of increase of impervious, less than 1.2% of the drainage areas within the project limits, is minute compared to the overall size of the project area and existing drainage basins. The additional pavement areas are limited mostly to additional runway and taxiway pavement.

FAA design standards require both runway and taxiway safety areas to have gentle side slopes and shoulders for prescribed distances. These vegetated areas act inherently as a form of drainage disconnect from pavement areas to discharge points allowing for infiltration of runoff. The FAA grading requirements will mean that structural water quality and quantity treatment devices must be located outside of safety areas. For fill areas, infiltration trenches and similar devices are discouraged. However, in areas of existing ground the use of such devices can recharge groundwater and provide water quality treatment opportunities. Given the minor increase in impervious area, water quantity treatment is not anticipated to be a major difficulty. However, if required, dry ponds and other similar best management practices (BMPs) can be incorporated.

One challenge of the proposed project is that the prescribed geometry of the airfield elements as well as extent of the borrow areas will span several drainage basins. Special attention will be applied to the grading design to avoid post-construction diversion of runoff between basins. Where possible, grading will be configured to match pre-development runoff patterns.

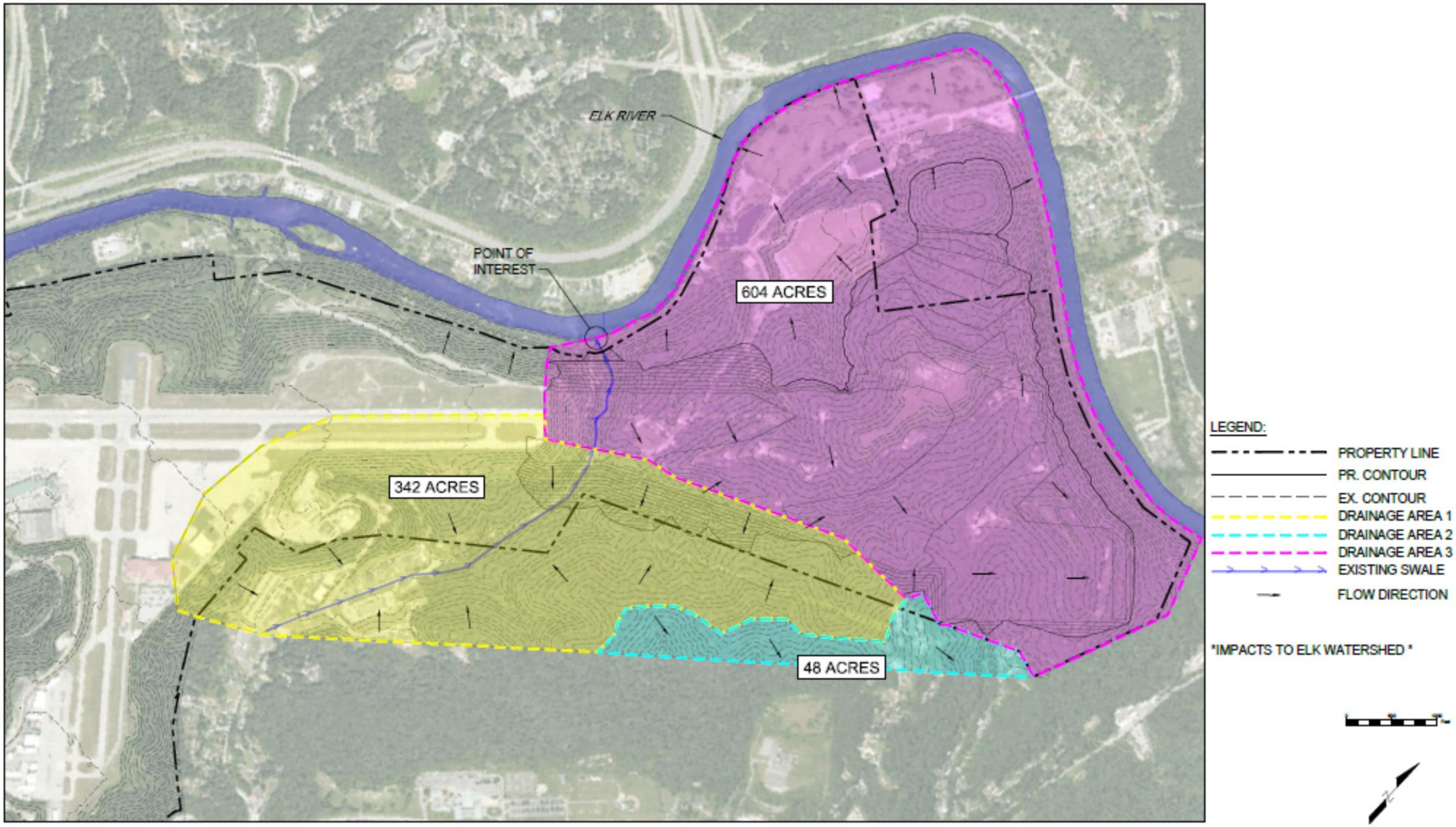
Construction of the culvert for Coonskin Branch under the proposed fill will be a major element of the design effort. It is anticipated that a temporary stream diversion will be required in phases along the proposed 1,500-foot length in order to complete the construction. Once constructed, the culvert can be utilized as a conveyance for additional flows where they are collected into adjacent drainage systems. It is anticipated that the remainder of the drainage collection system will be comprised of open drainage ditches, minor culverts under roadways, yard inlets, and short pipe runs with stable outfalls. The nature of the proposed construction as well as the overall topography in the area, will serve to minimize the need for closed drainage systems and allow natural drainage patterns to remain.

EXHIBIT 4 EXISTING DRAINAGE AREAS



Source: ADCI analysis, March 2020.

EXHIBIT 5 PROPOSED DRAINAGE AREAS



Source: ADCI analysis, March 2020.

4 Refined Grading Plan

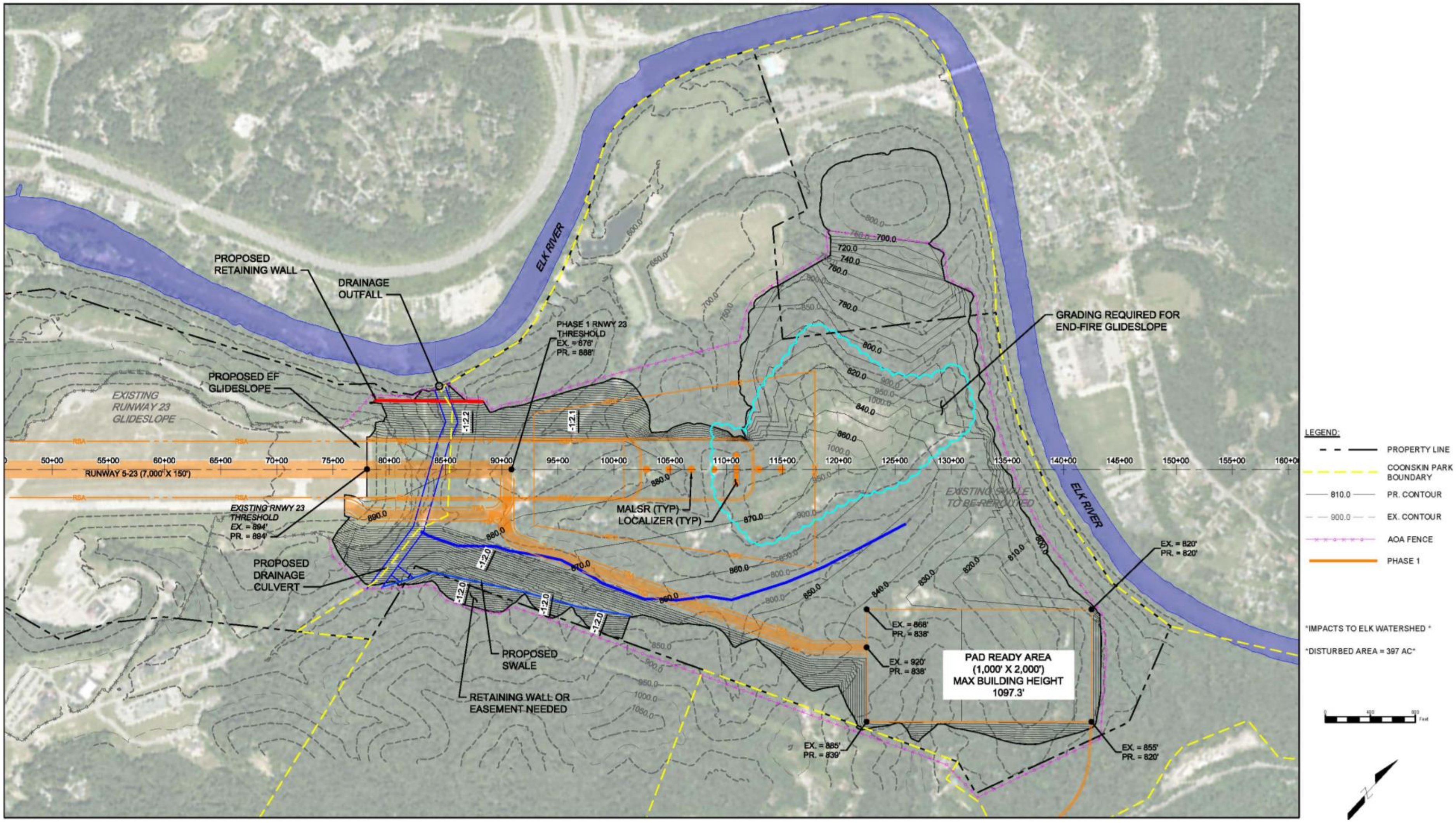
The extension of Runway 05-23 to 7,000 feet, as shown in **Exhibit 6, *Overall Grading Plan***, will require a significant grading and excavation operation. The runway is located atop three flattened mountains forming a plateau, and an extension of the Runway 23 end will necessitate filling in the adjacent valley floor, affecting adjacent on-Airport properties including the park area. Proposed cut and fill areas related to the project are depicted in **Exhibit 7, *Proposed Cut and Fill Areas,*** and ***Exhibit 8, Section view of Runway 23 Cut and Fill***. As a practical matter and, in order to keep the cost and phasing challenges to a minimum, all fill materials will be taken from adjacent borrow areas. This will help to reduce distance required to transport materials, impacts to the environment/local watershed, and overall time of construction.

The general design and phasing of the grading operation depend heavily on the neighboring topography within the Coonskin Park boundary. Excavated material from the mountains northeast of Runway 05-23 will be relocated to fill the valley floor. This will provide the necessary grade for the extension of Runway 23, at both the 7,000' and 8,000' lengths, along with installation of the Approach Lighting System (ALS), extension of Taxiway A, and a large expanse of land dedicated to future CRW development.

Several constraints and requirements were considered in the grading design of the Runway 05-23 extension. Per FAA airport design criteria, Aircraft Approach Category (AAC) C runway requirements, the maximum longitudinal slope is 0.8% in the first and last quarters of the runway and no vertical curves are permitted. Utilizing the maximum allowable slope for the runway and safety area would require less fill in the adjacent valley, and therefore fewer environmental impacts and associated construction costs. However, too steep of a runway and safety area slope would negatively impact the functionality of proposed NAVAID/VISAID systems (according to the existing Ohio University NAVAID siting study), create drainage and erosion issues, and increase the likelihood of off-Airport penetrations to the proposed Runway 23 approach surfaces. Considering these constraints, a longitudinal slope of 0.5% (which closely matches existing) was selected to allow for flexibility in design of the runway and safety area. This option maintains the approximate existing slope of the Runway 23 end and also allows for potential future development along the runway without another mass grading effort.

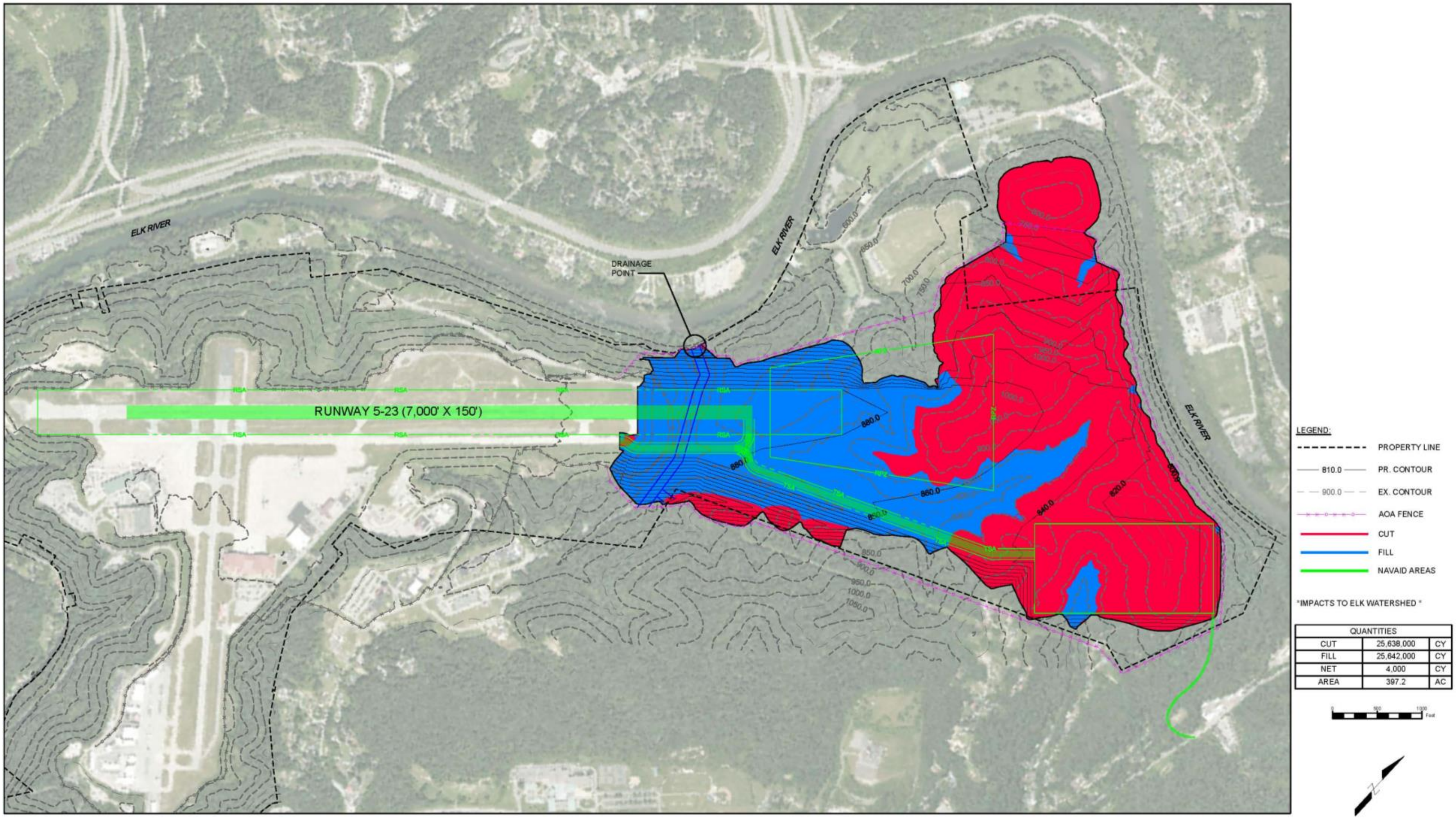
Secondly, for an AAC C runway the RSA longitudinal slope can range from 0% to 3.0%. A 2,400-foot Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) system would require this grading from the Runway 23 threshold to extend further into the nearby state park and into the river if it was a continuous fill. It was decided to grade the Runway 23 RSA, and extended fill, at a slope of approximately 2% "down" from the runway end. In order to ensure positive control of runoff and avoid potential for erosion of the resultant embankment, an interception slope is provided for at the edge of the resultant embankment to intercept runoff before it flows down to the river. This cut operation will provide necessary fill for the runway extension and will effectively direct drainage away from the runway and river.

EXHIBIT 6 OVERALL GRADING PLAN



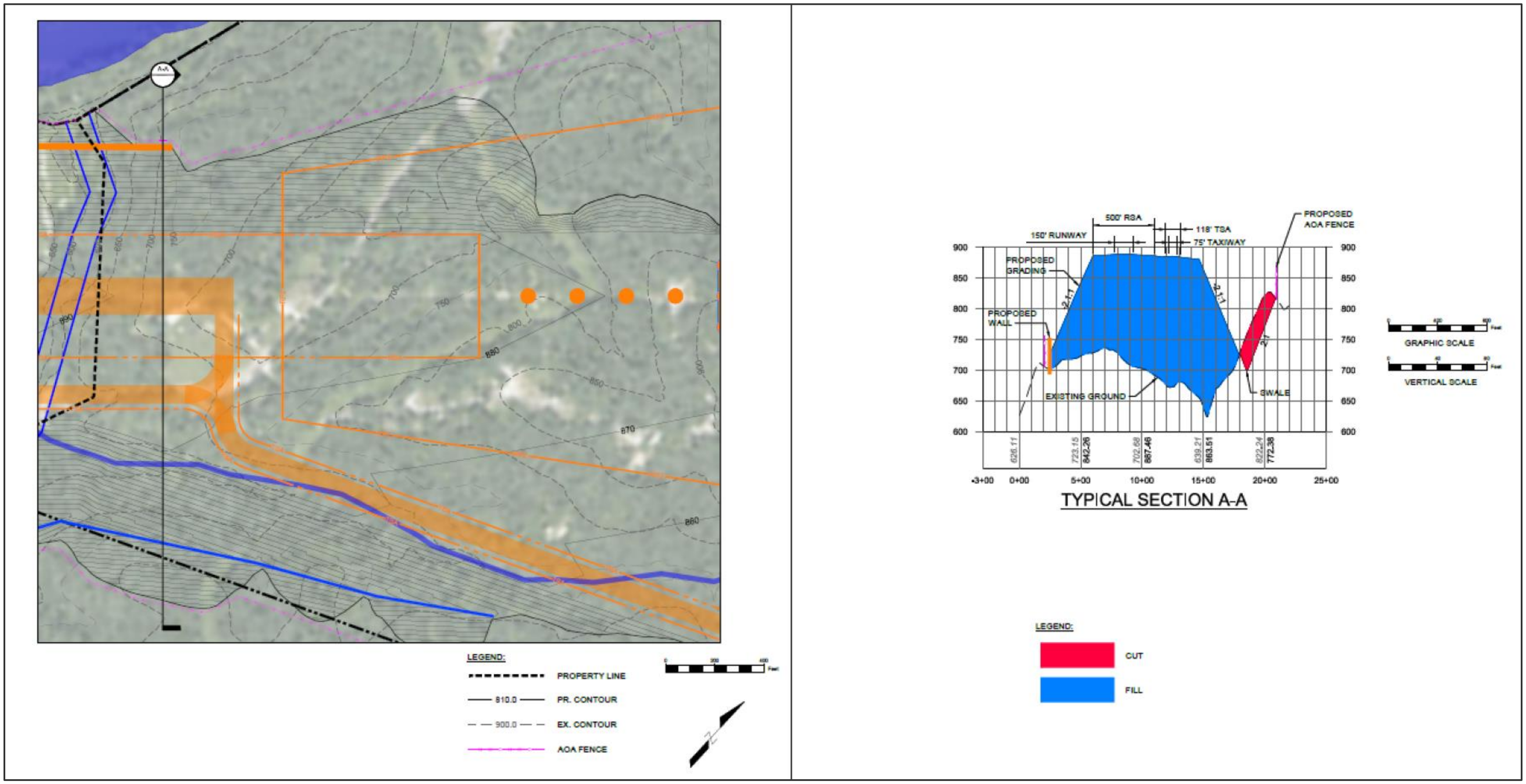
Source: ADCI analysis, March 2020.

EXHIBIT 7 PROPOSED CUT AND FILL AREAS



Source: ADCI analysis, March 2020.

EXHIBIT 8 SECTION VIEW OF RUNWAY 23 CUT AND FILL



Source: ADCI analysis, March 2020.

A 50:1 FAR Part 77 approach surface was analyzed to determine any airspace penetrations that must be mitigated for the runway extension to be possible, at both the 7,000-foot and 8,000-foot lengths (see **Exhibit 9, *Profile View of Runway 05/23***). The topography approximately 4,000 feet northeast of Runway 23 was found to penetrate the approach surface at its current elevation if left untouched. Additionally, a recent study conducted by the Avionics Engineering Center at Ohio University concluded the landscape within 1,800 feet of the Runway 23 threshold needs to be “removed or reduced” to allow a proposed end-fire glideslope system to operate effectively. Excavating these areas would provide some of the necessary fill for the runway extension while minimizing Part 77 penetrations and allowing for the functionality of the proposed glideslope system.

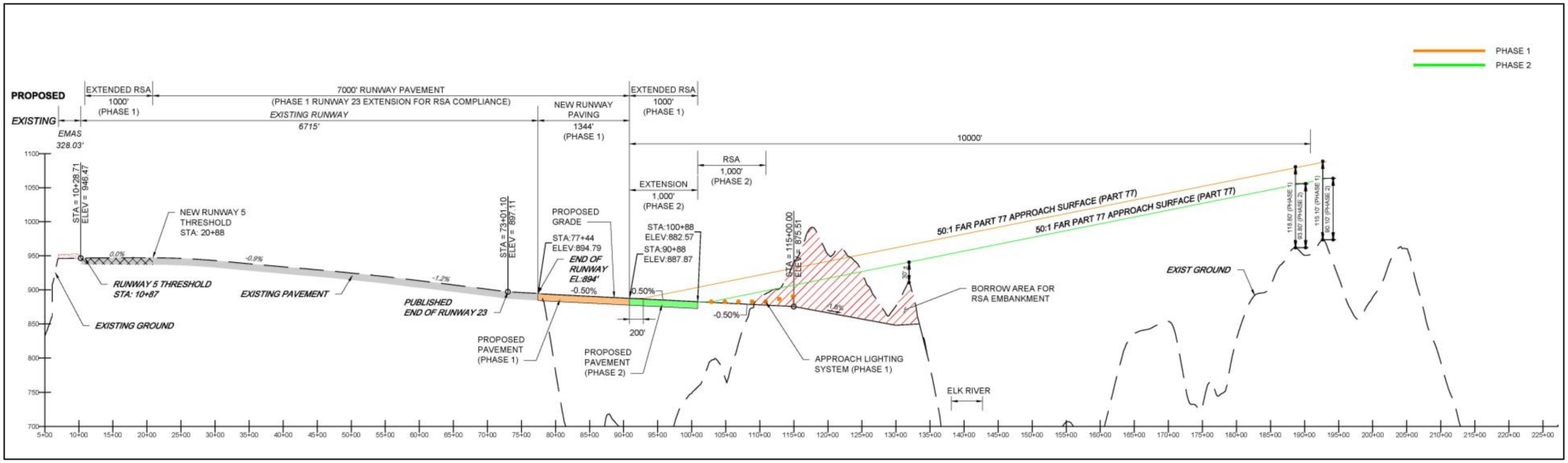
In addition to runway requirements, the long-term extension of parallel Taxiway A was strategically designed based on FAA criteria. The minimum separation distance required by the FAA is 400 feet from runway centerline to taxiway centerline. The existing Taxiway A centerline is approximately 325 feet from the runway centerline. Therefore, at least the extension of the taxiway must be provided for at a 400-foot offset to satisfy the FAA requirement. Grading modifications for the taxiway relocation and extension effort extend south to the limits of Airport property and would require additional fill, potentially some retaining walls and/or minor easement acquisition.

A 1,000-foot by 2,000-foot pad-ready area with an access road is provided for future expansion and would accommodate future airport development. This area is a result of the cut requirements of the earthwork operation but results in a developable site. The existing drainage swale at the northeastern edge of the site must be relocated to accommodate this grading and convey drainage to the Elk River in a non-erosive manner. The proposed swale, as shown in **Exhibit 10, *Swale Relocation***, will flow southward to an underground drainage culvert, which will carry drainage under the runway to a stable outfall into the Elk River.

A final design consideration when looking at the site holistically was to keep cut and fill quantities as balanced as possible. Any areas that require fill are designed to be obtained by areas of cut needed to make the runway operation feasible. A balanced site will minimize earthwork costs and improve the feasibility of the project.

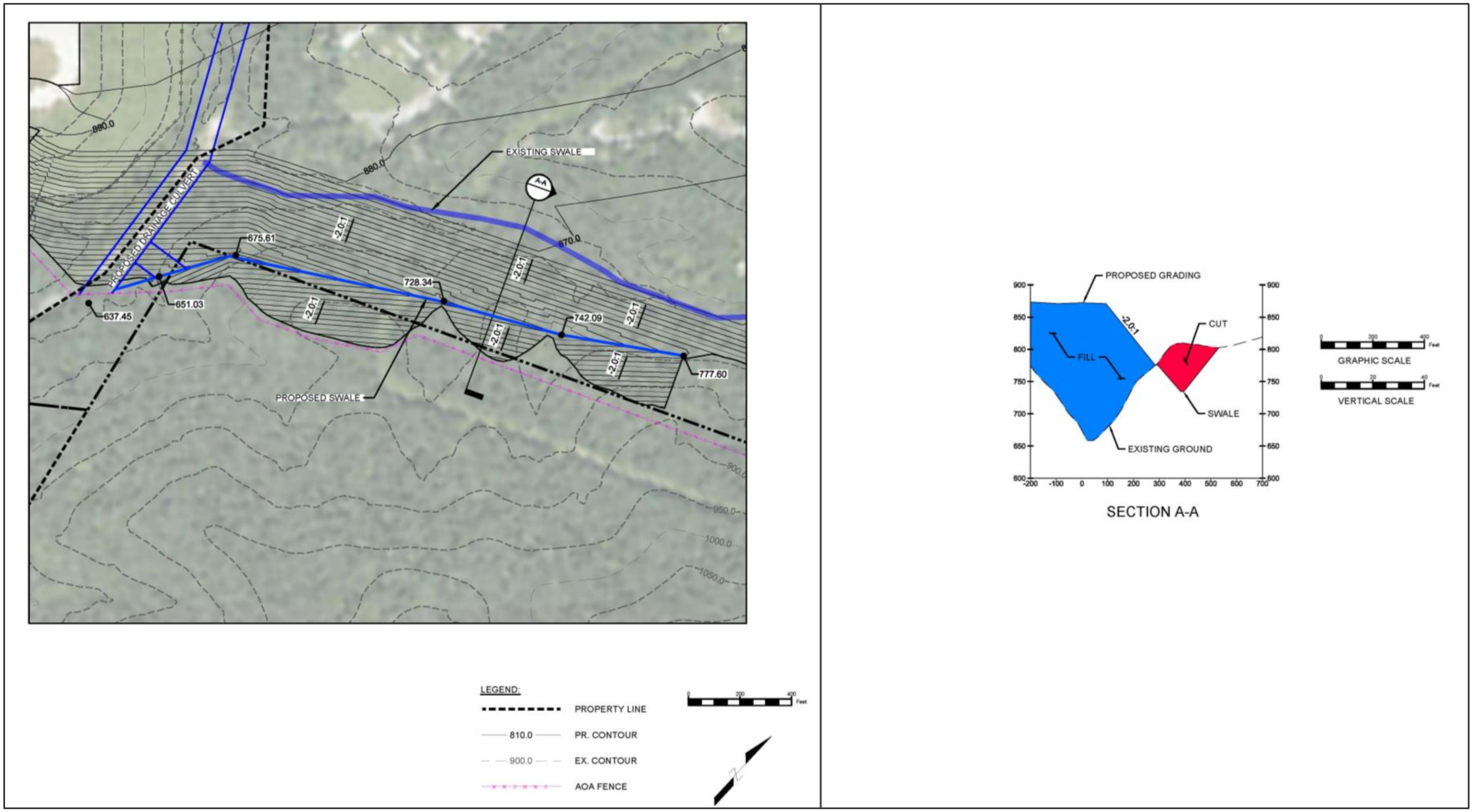
Numerous constraints were considered in the grading design of this complex program. The proposed grading of the runway extension, RSA, taxiway relocation/extension, future Airport development areas, and associated site modifications will provide a suitable site for the program construction while balancing earthwork, managing drainage and erosion, and ensuring all FAA standards are met.

EXHIBIT 9 PROFILE VIEW OF RUNWAY 05-23



Source: ADCI analysis, March 2020.

EXHIBIT 10 SWALE RELOCATION



Source: ADCI analysis, March 2020.

5 Refined Cost Estimates

The Airfield Master Plan estimated the cost of the Phase 1 project at $168 million in 2019 dollars. These estimated costs from the Airfield Master Plan were viewed as preliminary, reflecting a master plan level of detail, which was subject to refinement in subsequent implementation steps.

As the grading refinements presented in this report were made, the costs associated with the project were revised. The main difference in the construction cost estimate from the Airfield Master Plan relates to the volume of earthwork. A more detailed look at the required grading, including the runway and taxiway layout, future runway extension, NAVAIDs, ALS, and vehicle roadways in addition to the drainage requirements, it became apparent that the resultant embankments would create an undesirable condition in terms of future erosion potential. The volume of earthwork therefore was increased to allow for the embankment to continue to the adjacent hillside and provide a stable plateau and potential for future Airport related development. Therefore, while the initial cost increased, the iterative cost for a future runway extension was lowered to factor in the reduction in future earthwork required. The resulting total Phase 1 project is now estimated to cost $210 million in 2020 dollars.

Additionally, the cost to increase the runway from 7,000 to 8,000 in the long-term plan is estimated to cost about $49 million, which is lower than originally estimated in the Airfield Master Plan ($62 million). With the proposed grading changes, the long-term extension of Runway 05-23 cost goes down.

These costs will continue to be revised over time as more project refinements are made.

6 Potential Environmental Mitigation Strategies

The Airfield Master Plan update initially analyzed the environmental impacts associated with the airfield alternatives grading analysis.[4] As the grading for the preferred alternative from the Master Plan has evolved, so have the potential environmental impacts in the area. Thus, an environmental overview was completed as part of the September 2019 Runway Safety Area Study and evaluated the NEPA environmental impact categories identified in FAA Order 1050.1F. The following topics were evaluated and mitigation strategies for each is discussed.

- Air Quality: If air quality is a concern, CRW's voluntary low emissions program (VALE) credits can be applied to reduce emissions below threshold.
- Biological Resources:
  - Fifteen endangered or threatened species are found in Kanawha County; it is not known if these species are in the impact area so field surveys will be needed.
  - Eleven species of fish and clams could potentially be affected by the proposed project. However, construction process and runway development can be designed in such a way to avoid run off into the river and impacts to these species if they are present.
  - Four bat species could potentially be affected by the proposed project. Two species are cave dwelling and not likely to occur in the area. Two are tree dwelling and, if present, may require mitigation (planting new trees, contributing to bat conservation fund) or placing restrictions on removal of trees during critical time periods (June/July).
- Climate: There is no threshold of significance for greenhouse gas emissions per FAA guidance.
- Coastal Resources (Coastal Barriers and Coastal Zones): No impacts are anticipated.
- Department of Transportation Act Section 4(f) Resources:
  - No Land and Water Conservation Funds (LWCF) were used to acquire or develop the areas of the park that would be needed for the runway project.
  - Park losses would be mitigated:
  - Central West Virginia Regional Airport Authority (CWWRAA) owns the Skeen property to the north of Coonskin Park that can be converted to a park.
  - Flat land provided by cut and fill process will be used to provide soccer fields, baseball fields, picnic shelters, and/or an aquatic facility.
- Farmlands: No impacts are expected.
- Hazardous Materials, Solid Waste, and Pollution Prevention: Ensure that Freedom Industries Site has been fully remediated.
- Historical, Architectural, Archeological, and Cultural Resources: No impacts are anticipated.
- Land Use: Vast majority of project is on Airport property.
- Natural Resources and Energy Supply: Significant adverse impacts are unlikely.
- Noise and Noise-Compatible Land Use: Any noise impacts in areas that do not currently experience them could be mitigated.
- Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks:
  - No environmental justice, children's environmental health or safety risk concerns.
  - Development is likely to produce new jobs and increased tax revenues.
- Visual Effects: Any visual effects impacts could be mitigated.
- Water Resources:
  - Wetlands: Any wetland impacts could be mitigated.

[4] Section 4.5.8, Environmental and Local Impacts, Airfield Master Plan, November 2019.

- Floodplains: It is anticipated that the floodplain associated with the Elk River would be avoided.
- Surface Waters: Impacts could be mitigated.
- Groundwater: No impacts are expected.
- Wild and Scenic Rivers: No impacts are expected.

7 Environmental Process

The FAA requires that an environmental approval process be undertaken for the Phase 1 RSA Study project. That process can take the form of an Environmental Assessment (EA) or an Environmental Impact Statement (EIS). An EIS is needed for projects that are expected to have significant environmental impacts that cannot be mitigated. The purpose of an EA is to determine whether a proposed action has the potential for significant impacts that would require an EIS. The FAA can make a decision to prepare an EIS without first completing the EA. A comparison of an EA to an EIS is shown in **Table 3, *EA vs EIS***.

When there is doubt regarding the type of environmental process to pursue, there are three potential courses of action to consider:

- Prepare an EA with sponsor-selected consultant:
  - Typically the sponsor can select a consultant and get under contract within three months.
  - If at a later date it is determined an EIS is required, a new consultant selection process will be required with FAA managing the procurement process.
  - The EA would officially convert to the EIS process and timeframe.
- Prepare an EA with FAA-selected consultant:
  - Under this option, the sponsor would manage the EA process; however, the FAA would select the consultant.
  - Typical time to select a consultant is four to six months on average.
  - This option can save time if at a later date it is determined that an EIS is required as the same consultant can immediately begin preparing the EIS.
- The EA would officially convert to the EIS process and timeframe.
  - Prepare an EIS
  - Under this option, the FAA would select the consultant and manage the EIS process.
  - Typical time to select a consultant is four to six months on average.

TABLE 3 COMPARISON OF EA AND EIS PROCESS

	Environmental Assessment	Environmental Impact Statement
Purpose	To identify if significant impacts would occur as a result of the proposed action	To identify and disclose all impacts that would occur as a result of the proposed action
Duration	Typically takes 12 to 24 months to prepare and obtain FAA decision	Environmental Order (EO) 13807 recommends 2 year process to complete an EIS for major infrastructure projects which is typically measured from the release of the Notice of Intent (NOI) to the issuance of the Record of Decision (ROD). If additional planning or forecasting efforts are required, additional time would occur prior to the NOI to conduct the analysis. This can cause the timeframe to exceed two years.
Process Control	Airport Sponsor manages the project up until submittal of EA.	FAA manages the preparation of the EIS.
Agency Coordination	Requires coordination with other regulatory agencies. Scoping is not required but FAA can request.	Formal coordination with other regulatory agencies occurs throughout process. Scoping is required.
Level of Analysis	The EA must present a detailed analysis commensurate with the level of impact of the proposed action and alternatives, to determine whether any impacts will be significant.	Environmental impact categories must be discussed to the level of detail necessary to support the comparisons of impacts of each alternative retained for detailed analysis, including the no action alternative.
Public Consultation	The appropriate level of public involvement for an EA is determined on a case-by-case basis. A Public Hearing may be required.	A Public Hearing is required.
Comment Period	Circulation of a draft EA for public comment should be considered but is optional at the discretion of the responsible FAA official.	The required comment period for a draft EIS is a minimum of 45 days.
Federal Determination	Results in either issuance of a Finding of No Significant Impact (FONSI), or the decision to prepare an EIS.	The FAA must prepare a ROD to present the agency decision and identify any mitigation commitments.