HAWKEYE CONSULTING, INC.

Master Redevelopment Plan

Iowa City Municipal Airport

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IOWA INITIATIVE
FOR SUSTAINABLE COMMUNITIES

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1.0. Executive Summary

Hawkeye Consulting, Inc. is a civil engineering design firm headquartered in Iowa City, IA that employs experts in the fields of transportation, structural, hydrological, and environmental engineering. The firm won the initial bid to generate the new Master Redevelopment Plan for the Iowa City Municipal Airport. The project lasted from the notice of the RFP bid win on February 12th, 2015 until the presentation to the client on May 4th, 2015, a total of roughly 12 weeks.

The overarching objective of the Master Redevelopment Plan was to evaluate the current facilities and to make recommendations on how to most efficiently develop the farmland around the decommissioned southern Runway 18-36 to increase the Airport's future revenue generation capacity. This task involved both civil engineering and urban planning tasks. This plan was developed with a long term mindset and will serve as an expansion plan for the Airport for the next 30 years.

One of the major considerations of this project was Willow Creek, which runs through the Airport property on the southwestern side and is often a flooding concern. Nearly all airport buildings and facilities lie within Willow Creek's 100-year floodplain, as initially determined by FEMA, later confirmed through internal analysis. Implementing flood mitigation strategies for Willow Creek to remove the Airport from this floodplain is essential to the success of this project. Designing a Redevelopment Plan to attract new commercial and industrial entities would be useless if all of these new developments still lay within the 100-year floodplain. Through water resources engineering tasks, it was found that the most effective way to control this flooding would be to install a levee system on both sides of Willow Creek from where it crosses underneath Runway 7-25 to Mormon Trek Boulevard.

Through the design process, it was determined that the most effective solution would be for the airport to increase its revenue generation capacity by dividing the southern quadrant of farmland surrounding the old Runway 18-36 into two distinct development areas. The northern half of this area would focus on aviation related expansions, such as hangars and a maintenance facility, and the southern half would focus on non-aviation related expansions, such as commercial and industrial buildings. When the Redevelopment Plan is fully implemented, the northern development area will consist of five 10-unit T hangars, five 80'x80' bulk hangars, a 100'x100' maintenance facility, and a 24'x43' office building with attached bathroom. The total southern development area contains just over 27 acres, but this area was subdivided into plots with internal roadways and parking lots to make the land less intimidating for real estate developers. This area consists of 10 plots ranging in size from 0.92 acres to 4.24 areas, with a total plotted area of 17.82 acres.

To make the implementation of this plan financially reasonable for the Airport, the plan was divided into three expansion phases. The 1st Phase, to be implemented in 2015, involves adding the levee system, one T-hangar unit, two bulk hangars, the office building, and developing four of the plots at a total cost of $5.07 Million. The 2nd Phase, in year 2030, will add two T hangars, one bulk hangar, and two development plots onto Phase 1 at a 2015 cost of $2.21 Million. The third and final phase, in year 2045, will add the final two T hangars, the final two bulk hangars, and the final four development plots, at a 2015 cost of $3.59 Million. The total cost of this redevelopment plan, in 2015 dollars, is $10.89 Million.

2.0. Introduction

2.1. Iowa Initiative for Sustainable Communities

The Iowa City Municipal Airport Master Redevelopment Plan project was organized through the Iowa Initiative for Sustainable Communities (IISC) within the University of Iowa. The goal of this campus-wide effort is to enhance the State's overall sustainability through partnerships between local communities and the university. This program takes a holistic approach when working with communities, incorporating multiple disciplines (whenever appropriate) including, but not limited to, urban and regional planning, public health, engineering, business, geoscience, art and art history, journalism and mass communication, and education. This specific project was born from a partnership between the City of Iowa City and the College of Engineering. Throughout the project, the IISC served as a liaison between the project team and client, while also providing administrative and public relations support.

2.2. Airport Background

The Iowa City Municipal Airport (IOW), located on the south side of Iowa City, is contained by South Riverside Drive, Highway 1, and Mormon Trek Boulevard and services business and recreational aviation travelers in the Eastern Iowa area. The service area for the Airport is contained within a roughly 30 minute driving radius. The outer border of this service area is roughly contained by the following communities: Riverside on the southern border, West Liberty on the eastern border, Solon on the northern border, and Williamsburg on the western border.

The current Airport facilities consists of Runway 7-25, Runway 12-30, a terminal building, a maintenance facility, T and bulk hangars, and a fueling facility. Runway 7-25, oriented SW-NE, is 5,004 feet long and 100 feet wide. Runway 12-30, oriented NW-SE, is 3,900 feet long and 75 feet wide. On the Airport property, there still exists pavement from the decommissioned north-south Runway 18-36, but it is no longer used for takeoffs and landings. Rather, it is used for aircraft parking during Iowa Hawkeye football games and other "fly in" events. The Airport has six T-hangar buildings and four bulk and corporate hangars. These facilities are currently over capacity, with 83 aircraft based on the property and 79 designated storage spaces.

One of the most unique and challenging geographic aspects of the Airport property is Willow Creek, which acts as the southwestern border of the land. The waterway has two sharp bends along its path, which often leads to flash flooding from water spilling over the riverbanks onto the runways. Due to the flat topography of the land, water has the ability to reach the Airport buildings with relative ease. Nearly all of the airport's property lies within FEMA's 100 year floodplain. Any redevelopment plan will involve incorporating flood mitigation strategies at Willow Creek.

The Iowa City Municipal Airport is looking to increase its revenue generation capacity through development of the land surrounding the decommissioned Runway 18-36 to exercise greater levels of financial sustainability. Presently, the Airport leases this land out for farming purposes, which generates roughly $36,000 each year. The goal of this master redevelopment plan is to introduce potential design alternatives to upgrade Airport facilities to better serve customers and develop the farmland to attract professional entities.

2.3. Projected Future Airport Activity

One of the major tasks of this redevelopment plan was to evaluate the current Airport facilities and make recommendations as to how aircraft storage facility upgrades could be incorporated into the overall redevelopment of the area. To accomplish this task, a forecasting study was needed to estimate based aircraft requirements in the short term (the next 5 years) versus the long term (the next 30 years). A study of this sort analyzes and models local and national aviation trends in an attempt to make educated estimates about what the general aviation industry will look like at some point in the future. It is important to keep in mind that these forecasts are only estimates, and unforeseen future economic or regulatory changes could someday render the data archaic. However, this uncertainty is a factor that must be accepted and managed, as it is a necessary evil of the forecasting process.

Due to the time constraints required of this project, it was determined early on that an in-house forecasting study would not be feasible in time to meet the final project deadline. However, our firm was able to collaborate with aviation consulting firm Bolton and Menk, Inc., who recently performed a forecasting study for the Airport. Their based aircraft forecasts were used in conjunction with Hawkeye Consulting's previous evaluation of current Airport storage facilities to determine future based aircraft storage needs. This breakdown is shown below, in Tables 2.3.1 and 2.3.2.

Table 2.3.1: Future Based Aircraft Forecast

Year	Single Piston	Multi Piston	Turboprop	Turbojet	Helicopter	Ultralight / Experimental	Total
2015	65	6	2	7	1	2	83
2020	74	7	2	8	1	2	94
2025	77	8	4	13	1	3	105
2030	78	9	4	15	2	3	110
2035	82	10	5	18	2	4	121
2040	88	11	6	21	3	4	133
2045	94	12	7	25	3	5	146

Table 2.3.2: Airport Storage Requirement Upgrades

Year	Based Aircraft Requirements	Existing Hangar Spots (Bulk and T)	Additional Total Hangar Requirements
2015	83	79	4
2020	94	79	15
2025	105	79	26
2030	110	79	31
2035	121	79	42
2040	133	79	54
2045	146	79	67

Based on this forecasting study and the firm's analysis of the current Airport facilities, it was determined that an additional 15 hangar spaces will be required in the short term (over the next 5 years), and that figure will grow to a total of 67 hangar spaces in the long term (over the next 30 years). To meet this future demands, the firm recommends constructing five additional 10-unit T-hangars and five additional 80' x 80' box hangars. Under the assumption that each box hangar can provide storage for four aircraft, this upgrade will provide an additional 70 storage spots that the Airport can lease out to aircraft owners or corporate entities. These aircraft storage facility upgrades were incorporated into the overall redevelopment plan for the southern plot of the Airport property.

3.0. Problem Statement

3.1. Design Objective

The overarching objective of the Master Redevelopment Plan for the Iowa City Municipal Airport project was to evaluate current Airport facilities and grounds and to make recommendations on how to most effectively develop the farmland around the decommissioned southern runway. The goal of this development plan is to provide a future revenue stream for the Airport that is higher than the current revenue coming from the leased farmland. This objective involved a combination of civil engineering and urban planning tasks.

3.2. Methodology

This redevelopment task first consisted of evaluating Willow Creek, a main focal point of the project. Addressing the existing flooding problems was of utmost importance in the beginning stages of the design process, as all subsequent development plans would have been rendered useless if the Airport land continued to be in the floodplain. The flow in the creek needed to be estimated, flood elevations and their return periods needed to be determined, and flood mitigation strategies needed to be researched and designed before the project could progress. These water resource engineering tasks were accomplished using ArcGIS and HEC-RAS.

Once the flooding challenges were identified, the next major undertaking was to develop potential layout designs, which included spec-built structures, internal and external roads, and utility tie-ins. The alternative solutions, as further detailed in Section 5.0, were developed and refined through regular meetings with the Airport Manager. With these layouts, the design of the building to spec was accomplished using AutoCAD 2D, AutoCAD Civil 3D, and Revit. The internal and external roads were designed to Iowa DOT specifications and standards. In the evaluation of the farmland to be developed upon, the existing utility layout was mapped using plan sets from the Iowa City Engineer and MidAmerican Energy, and improvements and extensions were designed to accommodate the new developments. Finally, materials needed for the construction were quantified, a cost estimate was determined, and a general construction phasing plan was set.

3.3. Constraints

There were several constraints that needed to be considered in the design process for the new developments at the Iowa City Municipal Airport. One of these key constraints was the overall construction cost of the project. Early in the process, the Airport Commission indicated their current plans of maintaining ownership of the proposed development land area and leasing the new developments to other entities rather than sell the land directly to entities. However, as was also made clear by the Client, the Airport has spent the last decade climbing out of debt, and is in no hurry to incur more debt anytime soon. Keeping this in mind, the overall scope and cost of the new developments needed to be realistic enough that the airport could afford to implement the plan, which would most likely be in conjunction with FAA funding. Another constraint faced by the design team concerned the layout of the land which the Airport permitted to be developed. Borders of the available land were set as: Willow Creek, Runway 7/25, Runway 12/30, Mormon Trek Rd, and Oak Crest Hill SE. The presence of the runways (with their accompanying FAA regulations) and Willow Creek limited the location and size of any new developments.

An additional constraint this project faced was the limited time available between the submittal of the RFP response and the final deadline. This project and the accompanying designs needed to be completed by the first week of May, leaving roughly 12 weeks to work through the design process from start to finish. Another major project constraint to address in the process was abiding by U.S. Army Corps of Engineers (USACE) restraints when designing improvements for Willow Creek, a major focal point of the project. The area in consideration for new development lay completely within the 100-year floodplain, as initially given by FEMA but later confirmed through floodplain analysis. In order to ensure the safety of Airport users, employees, facilities, and future developments, alterations need to be made to Willow Creek in accordance with USACE regulations. These suggested alterations are further detailed in Section 4.0 of this report. In addition to these requirements, FAA and Iowa DOT regulations and design standards need to be upheld in the development of new structures and roadways. The aesthetics of any new buildings also need to be considered. The additions have to be appealing to community members and the surrounding businesses, parties that would ultimately have to live with the changes.

3.4. Challenges

There were many different challenges that the design team faced throughout this project. Perhaps the most fundamental was the fact that the Airport did not plan to sell the land off to developers, but rather use their own capital to finance any upgrades or redevelopments and lease the new facilities out. Taking this approach, the Airport and the City of Iowa City would be taking the majority of the risk in this development. The design team had to keep this in mind during the design process and had to develop alternatives that would be financially reasonable for the Airport to pursue. Looking into past Airport expansions, financial aid was made available from the FAA on upgrades that were used solely for aviation purposes, such as constructing additional hangars. For these types of projects, the Airport received 90% of their funding from the FAA and the remaining 10% came from local government. A similar funding split was assumed for the current round of upgrades. The old adage that “you have to spend money to make money” seemed applicable with this project, and the design team treated this redevelopment plan as a long-term investment, rather than a short-term one.

The second largest challenge that this project faced was how to deal with the high flood-risk stemming from Willow Creek. The topography of the Airport property is quite flat and can be subject to flash floods with little or no warning. Willow Creek has two main bends on the Airport property, which are relatively sharp, leading to water spilling over the banks with ease during events of heavy rainfall. This problem required the design team to develop creative solutions during the design process, further outlined in the Section 4.0 of this report. An additional underlying challenge of this project came from the fact that many residents have no reason to visit the Airport if they are not travelling. As mentioned in the Strategic Plan (FY 2011- 2015), there is a need of better promotion of the Airport. It is possible to drive right past the Airport entrance and not realize an attraction was passed. During the redevelopment process, this fact was kept in mind so that whatever does eventually get developed near the southern runway would attract the right kind of entities and provide an increased revenue stream for the Airport.

3.5. Societal Impacts

With the current Airport layout, nearly all of the buildings, hangars, runways, and surrounding farmland lie within the 100-year floodplain for Willow Creek. The firm has developed flood mitigation strategies and improvement suggestions to ensure that this is not the case in the future, so that the new development area is not at a high risk of flooding. As part of the new development plan, the firm recommends increasing the amount of available hangar space at the Airport to allow for greater numbers of plane owners to house their aircrafts on-site while also attracting additional travelers and flight enthusiasts who were not previously considering using the Iowa City Municipal Airport. Providing increased storage space will only increase customer satisfaction with Airport facilities and alleviate any existing storage issues.

Developing the southern area of the Airport lot for an increased revenue stream with some combination of office, retail, or other attractions will provide the community with additional employment opportunities. Commercial offices could be leased to growing companies looking for increased office space. The addition of retail stores or restaurants would also provide employment opportunities. Unique attractions, such as an aviation museum, could add jobs while boosting morale within the community and improve the attitude towards the airport from the general public. Residents from Iowa City and beyond would be able to visit and see what unique assets the airport has to provide. With increased activity in that area of the community, surrounding businesses could experience a new wave of customers and consumers.

The firm’s redevelopment plan does not delve into what sort of buildings or businesses could be constructed in the southern plots of the Airport property. Rather, it specifies a plan to implement the necessary infrastructure to support buildings or other developments in the future, including utilities and flood mitigation strategies. Once these essential tasks are completed, the land will act as a blank canvas of plots from which entities can build upon to suit their needs. This implementation strategy also gives the Airport time to improve upon their cash reserves to lower the amount of debt they would acquire when they do develop the new plots of land.

The actual implementation and construction of this redevelopment plan will be performed by a general contractor and will likely include subcontractors. The intention is to work with the general contractor to ensure that local companies are used in this process wherever possible. This would provide more work and job stability within the Eastern Iowa construction industry, stimulating the local and regional economies.

4.0. Willow Creek Flood Study

4.1. Background

Willow Creek runs through the Airport property on the southwestern quadrant, and a portion of it acts as the property border between Airport premises and the neighboring farmland. The creek flows northwest to southeast, originating from a retention pond located near the intersection of Benton Street and Mormon Trek Boulevard and terminating at a pond in Mesquakie Park, near the intersection of South Riverside Drive and McCollister Boulevard.

Willow Creek exists within a unique set of geographic features that gives concern to surrounding residents and businesses. Along the path of the creek there exist two relatively sharp bends that have trouble restraining large flows, which leads to water often spilling over the creek banks. This is combined with the fact that the Airport topography is quite flat, so as to accommodate the runways. Thus, whenever this overflow occurs, the water has the ability to travel with little topographic restraint, increasing the reach and damage of the flood. Nearly all of the Airport property lies within the 100-year FEMA floodplain, a fact that was confirmed through an internal floodplain analysis performed by the firm using water resources engineering software HEC-RAS and ArcGIS. The 100-year floodplain map that was generated from this internal study is shown in Figure 4.1.1. Interestingly enough, the Airport facilities do not lay within the floodplain of the Iowa River, even though the River is geographically closer, has a much greater steady flow, and has a higher risk of flooding than Willow Creek. Due to these unique topographical aspects of the creek, the Airport property is at a relatively higher risk of flash flooding. The average flow within the Creek is 328 cfs, as determined from the USGS Iowa StreamStats Ungauged Site Report. Moreover, the 100-, 200-, and 500-year flood flows are 2600 cfs, 3400 cfs, and 3760 cfs, respectively.

In order to plan the redevelopment of the south quadrant of the Airport, the first step was to address the flood hazard that is Willow Creek. It would be foolish to develop this area without first addressing the flood risks, as any new development would not be attractive to real estate developers and investors. Two different flood mitigation strategies were considered: a floodwall and a levee system. These two alternatives are further detailed next.

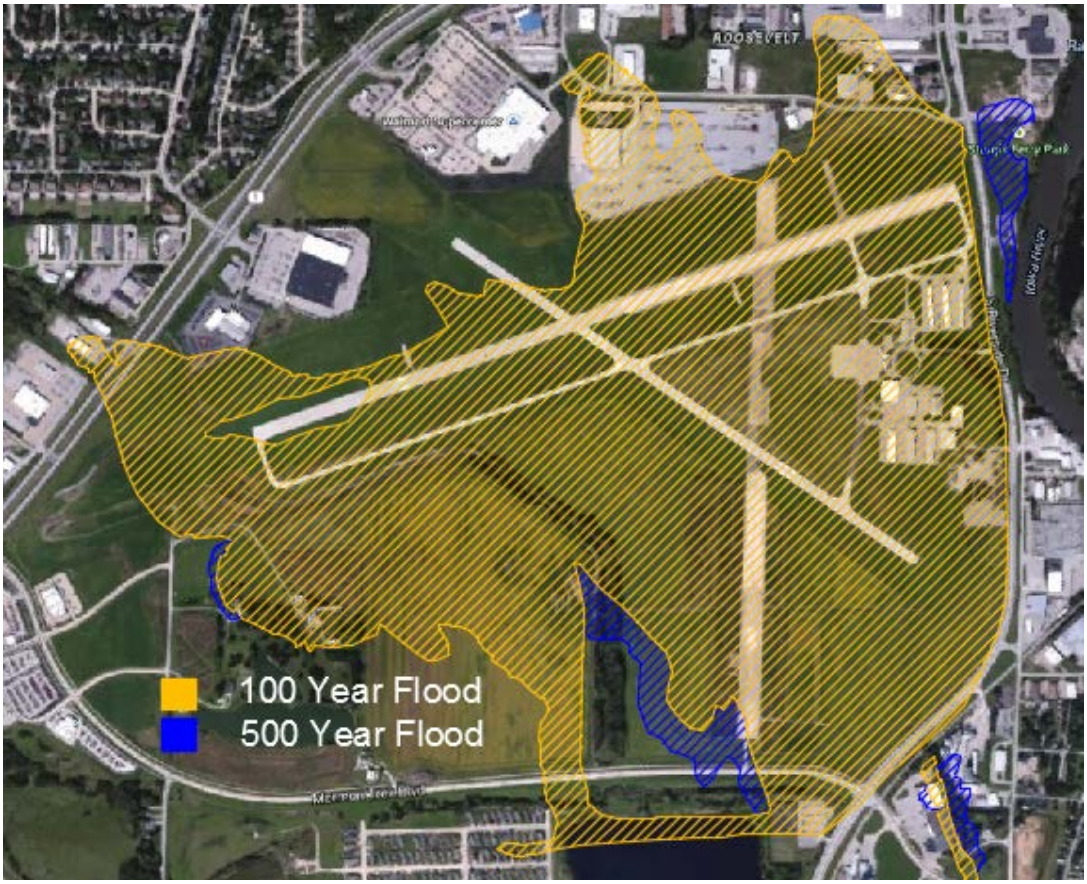

Figure 4.1.1: 100-year Willow Creek Floodplain Map

4.2. Flood Mitigation Strategy A: Floodwall

The first flood mitigation strategy considered was a floodwall running along both sides of Willow Creek from the culvert running underneath Runway 7-25 to Mormon Trek Boulevard, and from the culvert and Highway 1. A diagram of the potential floodwall location and cross section of the reconfigured Creek are shown in Figures 4.2.1 and 4.2.2, respectively. The cantilever floodwall will be constructed 5 feet away from the top of the banks. The floodwall will be constructed of concrete and will be designed with 3 feet of freeboard above the 100-year flood scenario. The floodwall was designed in accordance with FEMA and the U.S. Army Corps of Engineers design standards, with the heel of the wall 5 feet from the bank of the stream. The heel will extend 4.5 feet from the 1 foot thick cantilever and the toe will extend 1.5 feet from the cantilever. The footing of the floodwall will be 1 foot thick, and the wall will extend the required height above, and 4.5 feet below, the existing ground level. The height is determined by the flooding elevation and the 3 feet of freeboard required. In a general sense, the floodwall will have an elevation of 666 feet at the beginning of the floodwall near Runway 7-25 and a height of approximately 657 feet at the end near Mormon Trek Boulevard. The floodwall will be placed on both sides of Willow Creek, so as to not flood the neighboring farmland. It would do the public no good if the designated flood mitigation strategy protected the Airport property from flood damage, but only did so by forcing the water onto a

neighboring property. The Airport owns a small portion of property to the west of Willow Creek along the entirety of the banks, so no land acquisition will be involved with implementing this flood mitigation strategy. This design was developed internally using FEMA design standards. The cost of the floodwall has been determined to be roughly $1.95 Million.

Figure 4.2.1: Location of Floodwall along Willow Creek

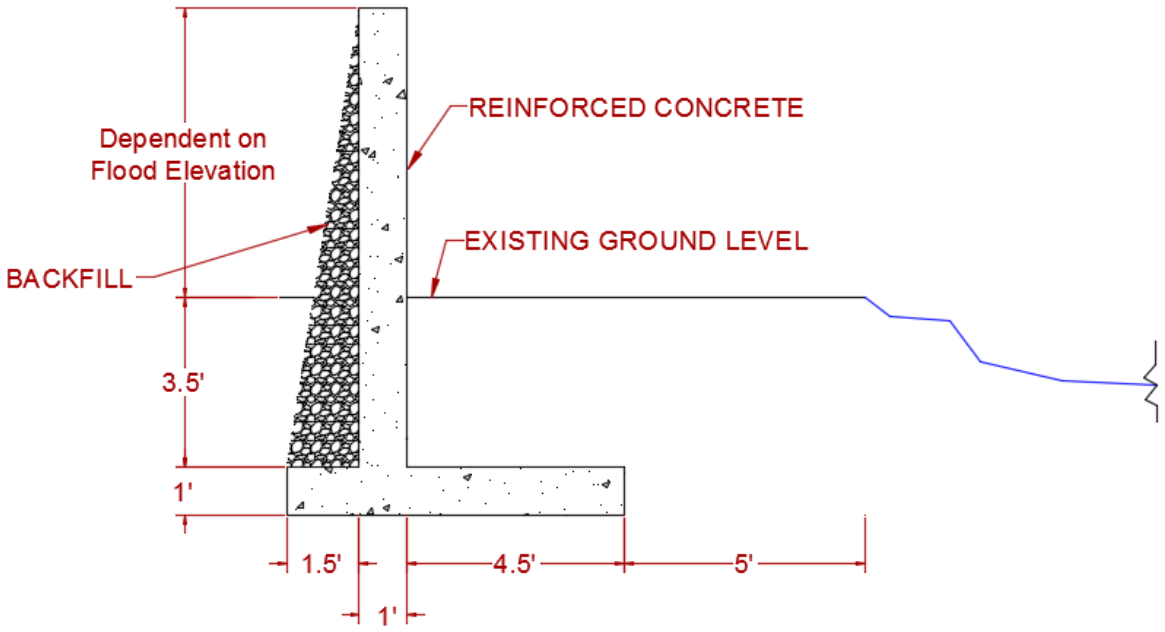

Figure 4.2.2: Typical Floodwall Cross Section

4.3. Flood Mitigation Strategy B: Levee System

The second flood mitigation strategy analyzed was a levee system running along both sides of Willow Creek from the culvert running underneath Runway 7-25 to Mormon Trek Boulevard and from the culvert to Highway 1. A diagram of the levee location and a typical cross section of the Creek with the levee are shown in Figures 4.3.1 and 4.3.2, respectively. This design was referenced from the Willow Creek Flood Study[5], prepared for a past Airport project by firm EarthTech Inc., and was modified to better conform to this Redevelopment Plan. The walls of the levee are designed with the standards set by USACE. The creek side and land side of the levee with have a slope of 3H: 1V. The elevation of the levee will be 3 feet of freeboard above the 100-year flood profile, as determined by water resource engineering software HEC-RAS. To give a general sense of this height differential, the elevation of the levee will be roughly 666 feet at the end where the levee meets the culvert running underneath Runway 7-25 and 657 feet on the Mormon Trek Boulevard end.

Unlike the design in the Willow Creek Flood Study, channel reconstruction will not be necessary to accommodate the levee. The 100-year flood velocity was determined to be 3.37 ft/s, which is within the acceptable range of not being so fast to erode the banks of the channel but not slow enough that sediment will settle onto the bottom of the channel and significantly affect its properties. The levee will be constructed using earthly materials to reduce the velocity of the creek and allow for a larger quantity of water to be reabsorbed into the ground, rather than be funneled to drainage systems. The cost of the levee system has been determined to be roughly $1.7 Million.

Figure 4.3.1: Location of Levee System along Willow Creek

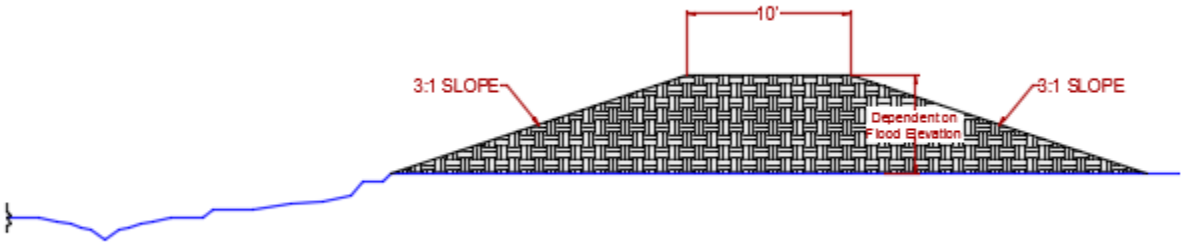

Figure 4.3.2: Typical Cross Section of Levee

5.0. Alternative Design Analysis

This section details, in brief, the different potential solutions that were developed for the Airport Master Redevelopment Plan. Three potential solutions were drawn from the combination of two different land use layouts and two different flood mitigation strategies. These three potential solutions are: Layout A with Flood Mitigation Strategy A (Floodwall), Layout B with Flood Mitigation Strategy A (Floodwall), and Layout A with Flood Mitigation Strategy B (Levee System). These alternatives are expanded upon below. It is important to keep in mind that these layouts and potential solutions were developed with a long-term mindset for the southern quadrant of the Airport, and the full layouts will be built in multiple stages as funding is secured and demand is realized. The ease of staging will be factored into the decision matrix process, as that is a unique aspect of the project.

Various permits will need to be obtained from the City of Iowa City at the start of the implementation process. The Airport land is mostly classified as a P1 Zone (Neighborhood Public) with a small portion at the southeastern corner classified as an I1 Zone (General Industrial). The portions to be developed will need to be rezoned into either a CI1 Zone (Intensive Commercial) or a CC2 Zone (Community Commercial). The exact amount of land needing to be rezoned and its new zone classification will be design specific. The retail and commercial development to the north of the Airport is classified as both CI1 and CC2 zones, which is generally consistent with the way these alternatives would need to be rezoned. Also, there will be a permitting process to work through with the FAA to release the land for commercial development, depending on what sort of entity decides to develop the commercially designated area of the south Airport quadrant. If the entity is aviation related, such as a one that manufactures radio equipment, the permitting process will be relatively straightforward. However, if the entity is not aviation related, this process will take longer and require the Airport to show that the land being leased to the non-aviation related business is not essential to Airport operations. This process will have to be kept in mind when evaluating potential developers.

5.1. Alternative 1: Layout A with Floodwall

This potential alternative solution consists of Redevelopment Layout A combined with Flood Mitigation Strategy A, the floodwall. This layout is shown in Figure 5.1.1 below. This layout consists of two main zones, the northern of which is designated for Airport use and the southern of which is designated for commercial and/or industrial use. As shown in the figure, the land designated for Airport use consists of five ten-unit T-hangars, five 80'x80' box hangars, a 100'x100' maintenance box hangar, a 24'x43' office area. Access to the hangars is provided at two locations, along the decommissioned Runway 18-36 (from which a 35 foot wide taxiway will be rehabilitated) and at the SE end of Runway 12-30. An internal roadway connects the current Airport buildings with a new parking lot area to service the new hangars. The Airport zone will be separated from the development zone with a 10' high chain link fence with a security gate. Access to the new hangar area will be provided via a roadway that will run through the development zone along the old Runway 18-36 and tie into Mormon Trek Boulevard. In this layout, there exists unused land to the northwest of the T-hangars, which could be further developed for aviation purposes in the future, if demand requires it.

Also shown in Figure 5.1.1 is a potential layout of what the commercial and industrial area could develop into. This layout is only a preliminary one, and helps break up the land into more manageable plots. Plots, parking areas, and roadways could be combined or modified in the event that a large manufacturer, or similar business type, requires more land than the plan currently allows for. Based on the current land breakdown, there exist 10 plots with areas ranging from 0.92 acres to 4.24 acres. The median plot size is 1.78 acres, and the total plotted development area is 17.82 acres. The total development area, including roadways and parking lots, is 27.25 acres.

Figure 5.1.1: Alternative Solution 1

5.2. Alternative 2: Layout A with Levee System

In this potential alternative solution, Redevelopment Layout A is combined with Flood Mitigation Strategy B, the levee system. This layout is shown in Figure 5.2.1 below. All layout specific information presented in Alternative 1 is directly relatable for this alternative solution. Highlights of this alternative for the aviation related developments include five ten-unit T-hangars, five 80'x80' bulk hangars, and an internal roadway connecting the current Airport hub area to the new hangar area with an attached parking lot. The land that will be developed for businesses and other entities was split into 10 plots with a total plotted development area of 17.82 acres, and the total development area, including roadways and parking lots, is 27.25 acres. The defining characteristic of this layout is that the aviation related developments, the new hangars and Airport facilities, are situated so that there is room to expand north and west in the future if demand calls for it without infringing on the commercial and/or industrial developments to the south.

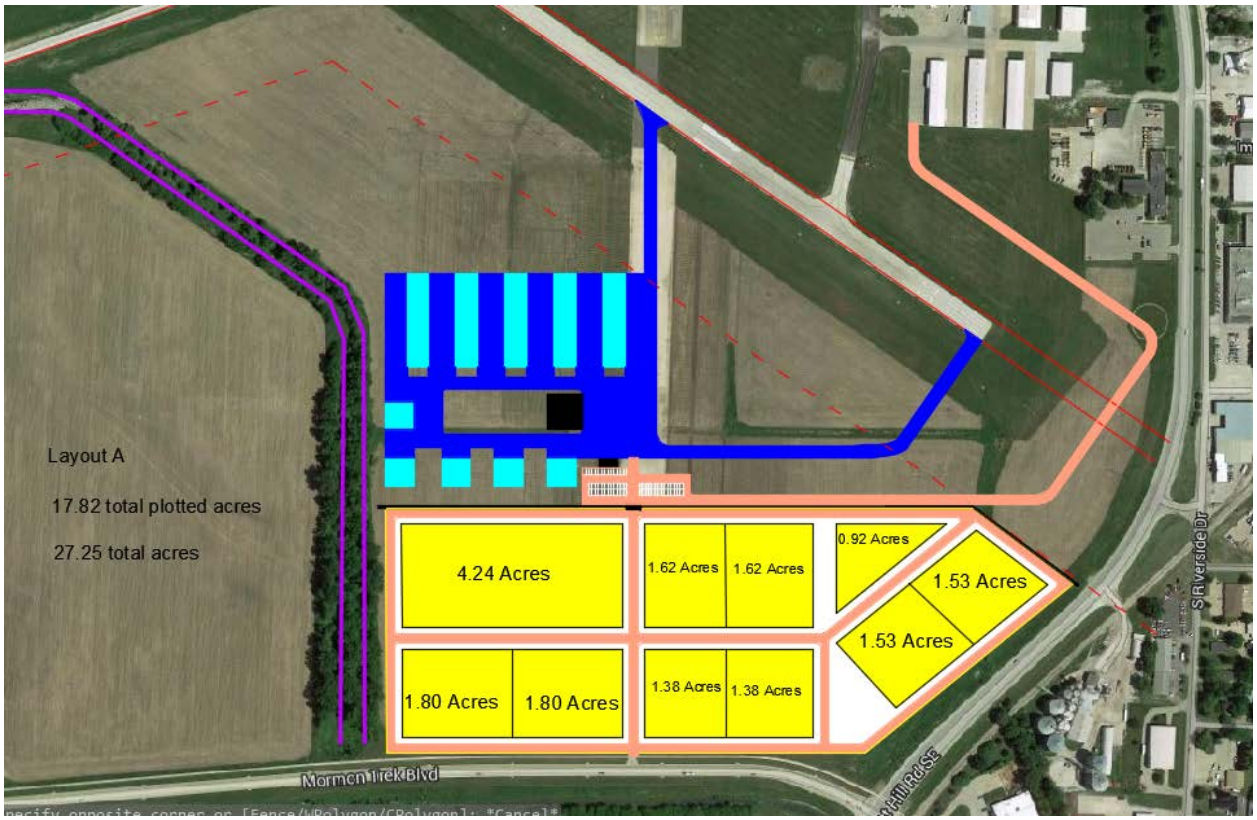

Figure 5.2.1: Alternative Solution 2

5.3. Alternative 3: Layout B with Levee System

This potential alternative solution consists of Redevelopment Layout B combined with Flood Mitigation Strategy B, the levee. This layout is shown in Figure 5.3.1 below. Just as with Layout A, this redevelopment layout contains five ten-unit T-hangars, five 80'x80' box hangars, a 100'x100' maintenance box hangar, a 24'x43' office area, although they are oriented in a different fashion. Like the previous layout, there are two aircraft access points to

the new hangars, at a point in the middle of Runway 12-30 along the old Runway 18-36 and at the northwest end of Runway 12-30. There also exists an internal roadway connecting the new hangar area to the current hub of the Airport along with a parking lot for those who rent space in the hangars.

One major difference between Layout A and Layout B is the orientation of the hangars. With this layout, the new developments for use solely by the Airport are situated as far north and west as restrictions allow. While this does allow for more land being dedicated to revenue generation from outside entities, it eliminates the possibility of expanding beyond this redevelopment plan on the southern Airport quadrant, assuming the same geographic restrictions. As was the case with the first two Alternatives, this potential alternative solution split up the southern portion of the redevelopment area into a preliminary plot system to reduce challenges with attracting business developments. Based on the current land breakdown, there exist 8 plots, with areas ranging from 2.30 acres to 5.89 acres. The median plot size is 3.17 acres, and the total plotted development area is 25.35 acres. The entire development area, including roadways and parking, is 35.9 acres. As was the case with the previous Alternative, this layout is only preliminary and can help give a sense of what size plots could be created, but this is open to change based on demand from businesses and real estate developers.

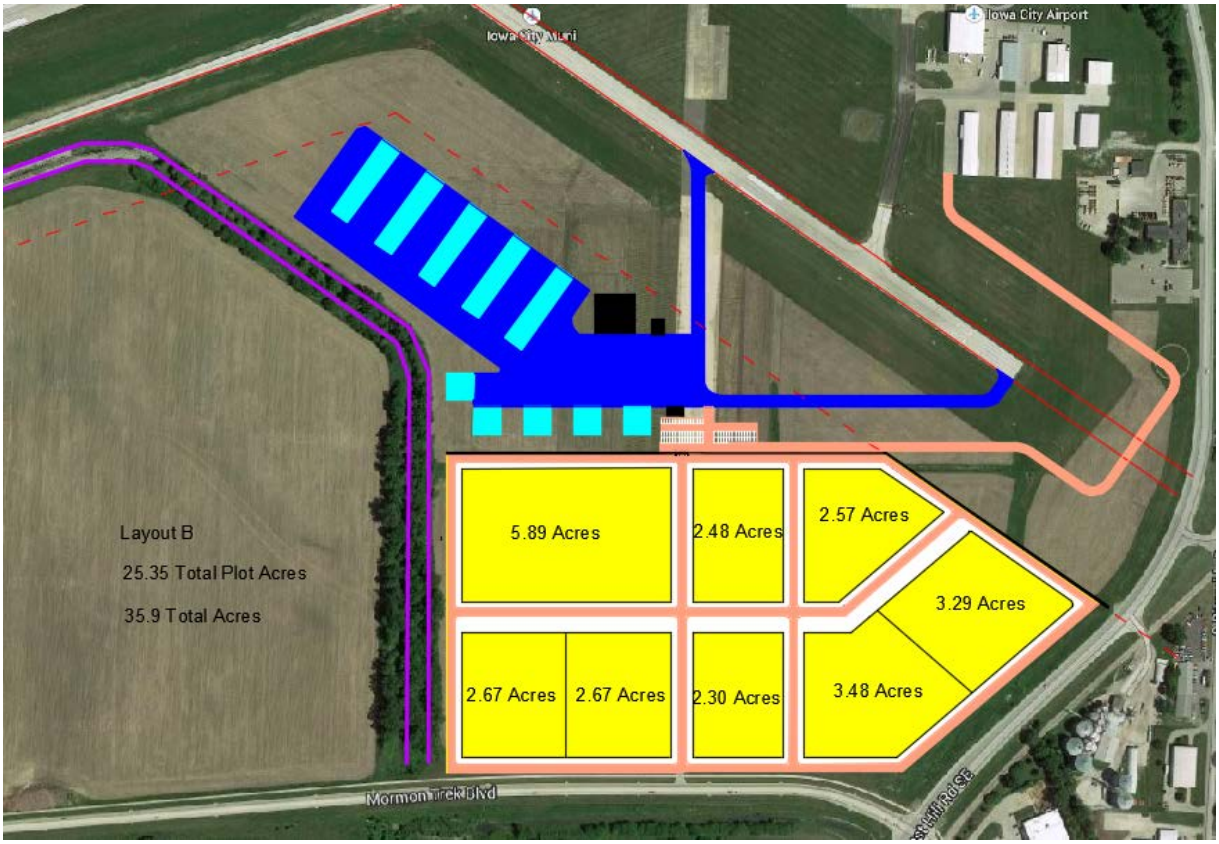

Figure 5.3.1: Alternative Solution 3

5.4. Design Criteria

Each of the criteria considered for the design matrix are briefly discussed below. These criteria were used on a point-by-point basis to determine how each potential solution compared to one another.

A. Redevelopment Cost

The overall upgrade cost is perhaps the most important factor in the overall Master Redevelopment Plan. This factor will have the largest bearing on what upgrades the Airport can make, and when they can make them. As was previously mentioned, the FAA is being counted on to cover 90% of aviation related upgrade costs and the remaining 10% will be provided by the City of Iowa City, as has been the case for past projects. For this specific project, the 90/10 split will only apply to the upgrades that are directly related to aviation uses, such as with the addition of hangars. It is unknown what sort of federal funding may be available for the upgrades to the commercial development area. Likewise, only roughly 50% the cost of the Willow Creek upgrades will be federally funded, as that is the percentage of the overall south quadrant redevelopment that is aviation related. This category received a weighting factor of "x 3" in the design matrix.

B. Amount of Revenue Generation Area

One of the overarching goals of the Master Redevelopment Plan was to increase the revenue generating capacity of the Airport to provide a greater level of financial stability in the future. The amount of land from the southern quadrant of the Airport property that is dedicated to commercial and/or industrial redevelopment is directly related to this goal. The more land that is dedicated for development, the greater this revenue should be, in theory. This factor was the second most important factor considered, and also received a weighting multiplier of "x 3" in the design matrix.

C. Expansion Ability

This Master Redevelopment Plan was developed with a design life of 30 years in mind, but the planning for the future of the Iowa City Municipal Airport should not stop with that. Almost certainly, this will not be the last Airport upgrade, so the planning of future aviation related improvements needed to be kept in mind during this design process. The upgrades that are to be implemented over the next 30 years should not compromise the ability of the Airport to expand the aviation facilities beyond that point. This factor received a weighting of "x 2" in the design matrix.

D. Ease of Staging

Due to financial restrictions and a lack of user demand, the entire improvement plan will not be implemented all at once. The two Redevelopment Layouts were developed based on future projections of based aircraft requirements at the Airport. These projections were quantified every 5 years for the 30 year design life so as to give a sense of what the based aircraft needs are in the short-term (the next 5 years) versus the long-term (the next 30 years). With these projections and the final design, a staging plan can be developed to phase in the upgrades over the 30 year design life. If the Airport were to

implement all hangar additions in the present, they would have a great deal of debt and mostly empty hangars that were only partially filled. The ease of phasing the hangar additions in over the short-, mid-, and long-term will be important in overall Airport operations in the interim while the entire plan is implemented. This factor received a weighting of "x 2" in the design matrix.

E. Aesthetics of Flood Mitigation Strategy

In an ideal setting, the flood mitigation strategy that is ultimately incorporated into Willow Creek will be unassuming and blend into the Airport premises with ease. Those who regularly use the Airport and the business that ultimately develop the plots of land will be the ones who have to live with the strategy used to control the flooding. A basic strategy may be just as effective at flood mitigation as a design that is more natural to the terrain, but at a significantly lower aesthetical value. This factor is marginally important, and it received a weighting multiplier of "x 2" in the matrix.

F. Layout Familiarity to Pilots

From an operational standpoint, increasing the based aircraft storage capacity of the Airport isn't an effective use of resources unless pilots and maintenance vehicles can safely and easily navigate the Airport premises and access their aircraft. Many of the pilots who store their aircraft in the hangars are not full-time pilots, and may not have a wealth of experience at different airports and with a variety of different airport layouts. Thus, it is important to ensure that the new aircraft storage facilities are arranged in a way that will be familiar and intuitive for pilots. This factor received a weighting of "x 1" in the design matrix, as it was something to consider in the design process but definitely worthy of a lesser impact on the final decision.

5.5. Design Matrix

To assist in the decision making process, and in an attempt to make the final decision as logical and unambiguous as possible, a design matrix was developed and evaluated. In this matrix, each potential solution was evaluated and ranked against the other solutions for a variety of criteria, which were briefly discussed in the above section. For a given criteria, the solution that was the most favorable got the highest ranking (1), while the solution that was least favorable got the lowest ranking (3). These scores were then multiplied by a weighting factor, which was based on that criteria's relative importance to the matrix. The criteria that were the most important received the highest weighting factor (x 3), while the criteria that were only marginally important received the lowest weighting factor (x 1). After all criterions were considered and all solutions ranked, the scores were summed. The potential alternative with the lowest overall score was the solution that was determined to be best suited for the Iowa City Municipal Airport and was developed further into a final design. A general cost breakdown for the three alternatives is located in Table 5.5.1 and the matrix is shown in Table 5.5.2 below.

A relative ranking system was used for this matrix because the three alternatives were so similar and any errors made in the calculations or evaluation would be systematic, and not affect the overall outcome of the matrix. If an absolute ranking system was used, such as one

that awarded scores from 1 to 5 with the possibility of the same score being awarded to multiple alternatives, error could be introduced with the judgement of the alternative. For example, it may have been difficult to determine why a solution deserved a score of 4 for a given criteria, rather than a 3. It was determined that a relative ranking system would be more accurate overall in the judging of the criteria.

Using a relative scoring system for the ranking of criteria created some minor issues for the matrix. For some of the criteria, two of the three solutions were identical due to the unavoidable fact of having two unique Redevelopment Layouts and three alternative designs. For example, in the "Amount of Revenue Generation Area" matrix criteria, Alternative One and Three had the same area, and needed to receive the same score. Alternative Two received the highest ranking of 1, so both Alternative One and Three received a score of 2.5, splitting the difference between the two remaining rankings, 2 and 3.

Table 5.5.1: General Cost Breakdown between Alternatives

	Alternative One	Alternative Two	Alternative Three
	Layout A + Floodwall	Layout A + Levee	Layout B + Levee
	27.25 Acres Total for Development	27.25 Acres Total for Development	35.9 Acres Total for Development
Line Item	17.82 Acres from Dev. Plots	17.82 Acres from Dev. Plots	25.35 Acres from Dev. Plots
Site Preparation, Grading, and Drainage	$ 1,856,037	$ 1,856,037	$ 2,078,456
Hangars/Structures	$ 2,440,800	$ 2,440,800	$ 2,440,800
Paving - Hangar Area	$ 2,560,817	$ 2,560,817	$ 3,160,233
Paving - Taxiways	$ 416,289	$ 416,289	$ 395,215
Paving - Access Roads and Parking Lot	$ 381,818	$ 381,818	$ 389,264
Gate and Fencing	$ 39,644	$ 39,644	$ 40,717
Flood Mitigation	$ 1,950,000	$ 1,700,000	$ 1,700,000
Utilities	$ 250,000	$ 250,000	$ 300,000
Total Cost	**$ 9,895,405**	**$ 9,645,405**	**$ 10,504,685**

Table 5.5.2: Design Matrix

		Alternative One		Alternative Two		Alternative Three	
Criteria	**Weighting Factor**	**Ranking**	**Weighted Ranking**	**Ranking**	**Weighted Ranking**	**Ranking**	**Weighted Ranking**
Redevelopment Cost	3	2	6	1	3	3	9
Revenue Generation Area	3	2.5	7.5	2.5	7.5	1	3
Expansion Ability	2	1.5	3	1.5	3	3	6
Ease of Staging	2	1.5	3	1.5	3	3	6
Flood Mitigation Aesthetics	2	3	6	1.5	3	1.5	3
Layout Familiarity	1	1.5	1.5	1.5	1.5	3	3
Sum			27		21		30

5.6. Preferred Alternative

As can be seen in Table 5.5.2, the option that has been determined to be best suited for the Airport Redevelopment Plan is Alternative 2, which was comprised of Redevelopment Layout A combined with the Levee System. This option had the highest ranking, or at least a share of it, for five of the six categories, including the total redevelopment cost, the ability to expand, the ease of staging, flood mitigation aesthetics, and the layout familiarity for pilots. The only category where another alternative was more favorable was with the amount of

revenue generation area category. Layout A provides 25% less revenue generation area than Layout B does, but the overall development cost is lower, and there exists the ability to easily expand upon this design past the 30 year design life, so the design team is confident with this outcome. This alternative solution is further expanded upon in Section 6: Final Design Details.

6.0. Final Design Details

This section further details the final design for the Iowa City Municipal Airport Master Redevelopment Plan. The selected option was Alternative 2, which consisted of Redevelopment Layout A combined with Flood Mitigation Strategy B, the levee. This layout was determined from the design matrix, and its most attractive feature is that it provides a large development area for revenue generation while still providing the option to expand hangar developments beyond current forecasts.

6.1. Flood Mitigation Details

As previously mentioned, the chosen alternative's strategy to control flooding on the Airport property was the levee system. Implementing this system will first involve the removal of trees along Willow Creek for construction purposes. The levee will have side slopes of 3:1 on the internal and external walls, as shown on a typical cross section in Figure 6.1.1. The levee will be constructed with 3 feet of freeboard above the 100 year flooding elevations, which range from an elevation of 657 feet to an elevation of 666 feet. The levee will have an average height of around 6 feet, which comes from 3 feet of flooding and 3 feet of freeboard at most locations. Channel reconstruction will not be necessary to accommodate the levee. The 100-year flood velocity was determined to be 3.37 ft/s, which is within the acceptable range of not being rapid enough to erode the banks of the channel but also not slow enough that sediment will settle out to the bottom of the channel and significantly affect its properties. The top portion of the levee will be constructed using earthen materials to reduce the velocity of the creek and allow for a larger quantity of water to be reabsorbed into the ground, rather than be funneled to drainage systems.

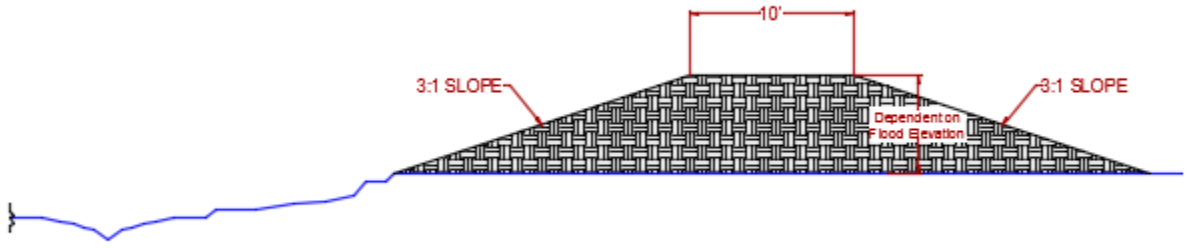

Figure 6.1.1: Typical Cross Section for Chosen Flood Mitigation Strategy

The floodplain for Willow Creek with the new levee system was modeled using the same water resources engineering software, HEC-RAS, to ensure that the Airport property was no longer in the 100-year floodplain. A sample output cross section containing the new levee and the 100-, 200-, and 500-year flood event elevations are shown in Figure 6.1.2. As can be seen

from the figure, the levee adequately contains these three extreme flooding events, protecting the Airport facilities and any future business developments in the south quadrant. The new 100-year floodplain map is shown in Figure 6.1.3.

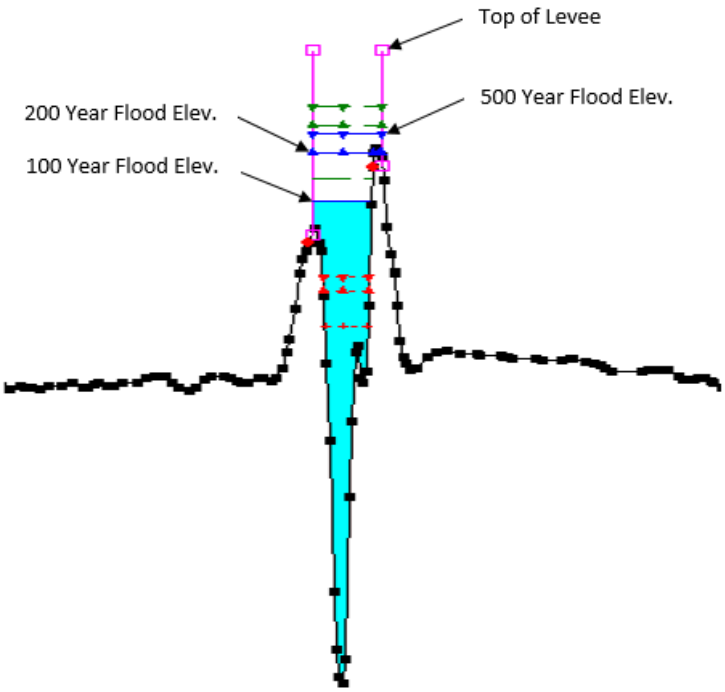

Figure 6.1.2: 100-, 200-, and 500-Year Flood Elevations

Figure 6.1.3: 100-Year Floodplain with Levee surrounding Willow Creek

6.2. Development Area Details

The final design of the development area is broken down into two components, the aviation related segment and the non-aviation related segment. The aviation related development area is located on the north half of the area surrounding the old Runway 18-36 and consists of the five 10 unit T-hangars, five 80'x80' box hangars, a 100'x100' maintenance box hangar, and a 24'x43' Airport office building with public restroom. These developments will be connected to the current infrastructure via two access points, one at the southeast end of Runway 12-30 and one at the midpoint of that same runway. A separate internal roadway will connect the current Airport hub with this new development area, and an additional parking lot will be constructed for use by aviation travelers who lease space in the hangars. The developments will lie outside of all FAA restrictions on building heights, to help streamline the permitting process when the implementation plan begins. This regulation restricts the height to 35' for buildings that are not more than 400' from the edge of a runway, or 300' from the edge of a taxiway.

The pavement that will connect the aviation development area and the foundation that the hangars will be constructed on were designed to handle the same loadings that Runway 7-25 and Runway 12-30 currently experience. Upholding these standards was essential to the design of the pavement, as the apron area will be experiencing similar loading events to the runways. As shown in Figure 6.2.1, this apron area and hangar slab will consist of 12 inches of 3000 psi reinforced concrete built on top of 12 inches of compacted stone. The specific stone used will likely be limestone, as it is prevalent in Iowa and would reduce transportation costs. The aircraft access point that connects to the middle of Runway 12-30 will be constructed on top of a portion of the old Runway 18-36. This access taxiway will be 35 feet wide, and the old concrete runway will be cracked and seated, which will involve forcibly breaking down the pavement into a pseudo rolled stone sub-base layer. Doing this will reduce the volume of stone needed to provide the appropriate level of support for the concrete slab.

The internal roadways and parking lots were designed using Iowa DOT standards for the case of a flexible pavement with a low volume traffic loading. A typical section for this portion of the roadway is shown in Figure 6.2.2. This portion of the design calls for 4 inches of HMA to be placed upon 6 inches of compacted aggregate. As with the concrete apron area, this aggregate will likely be limestone.

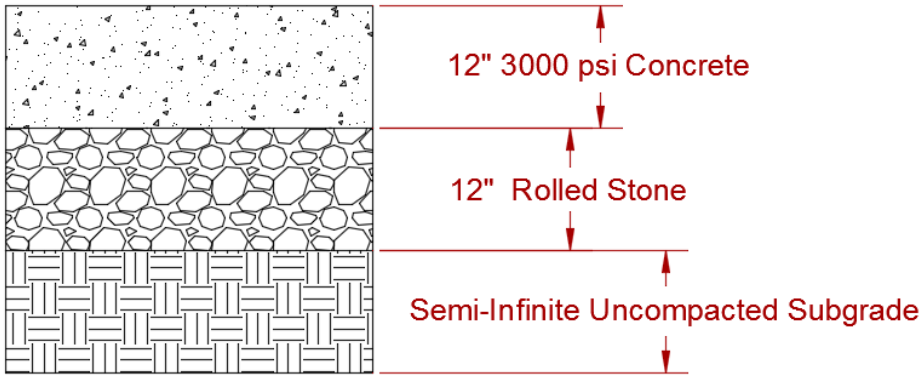

Figure 6.2.1: Concrete Apron Area Typical Cross Section

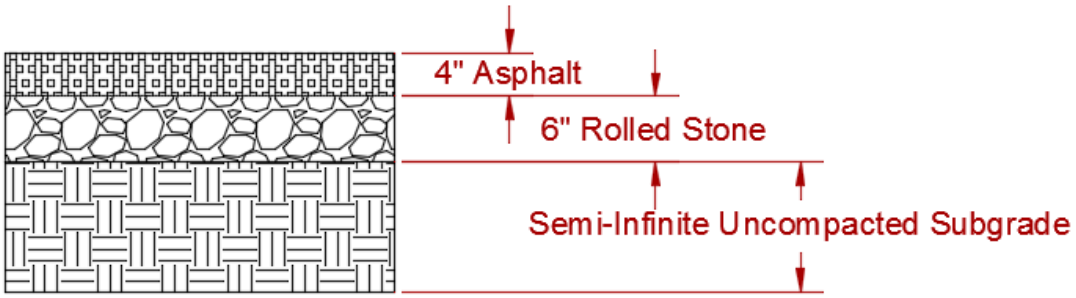

Figure 6.2.2: Internal Roadway Typical Cross Section

To determine the hangar sizing and spacing requirements, a design aircraft was specified, which was recommended by the Airport Manager. The design aircrafts were a Cessna 421 and Beechcraft King Air 300 for the T-hangars and box hangars, respectively. Pre-engineering hangar design firm Erect-A-Tube, operating from Harvard, Illinois, was consulted for this design. This firm has been used on past Airport expansions. Figures 6.2.3 and 6.2.4 show the hangar layout renderings of a 10 unit T-hangar, respectively. Figure 6.2.5 shows a rendering of an 80'x80' box hangar. To give a general sense of size, the 10-unit T-hangar will measure 60 feet wide and 264 feet long.

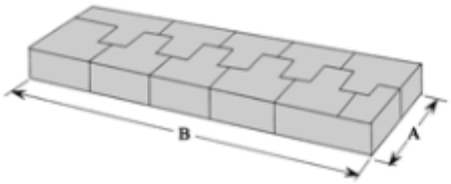

Figure 6.2.3: 10 Unit Nested T-Hangar Layout

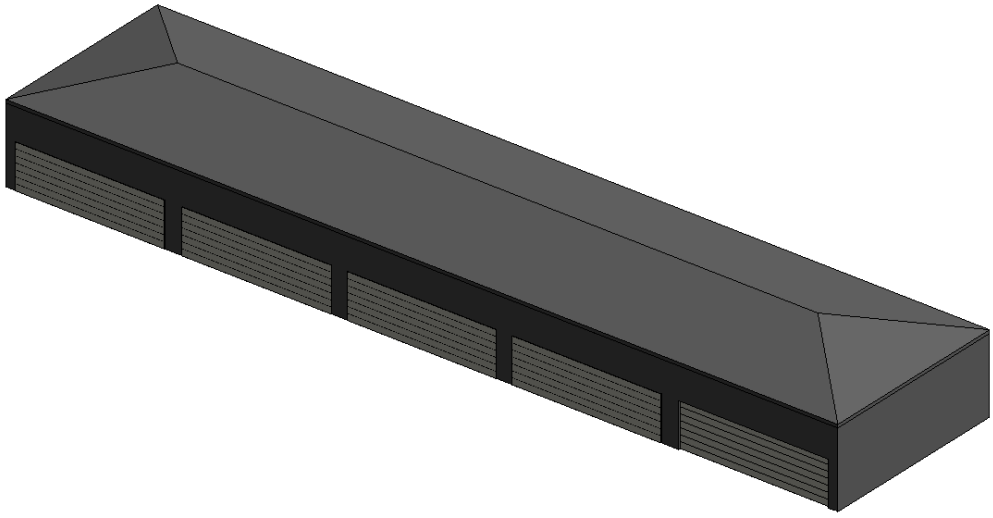

Figure 6.2.4: 10 Unit Nested T-Hangar Rendering

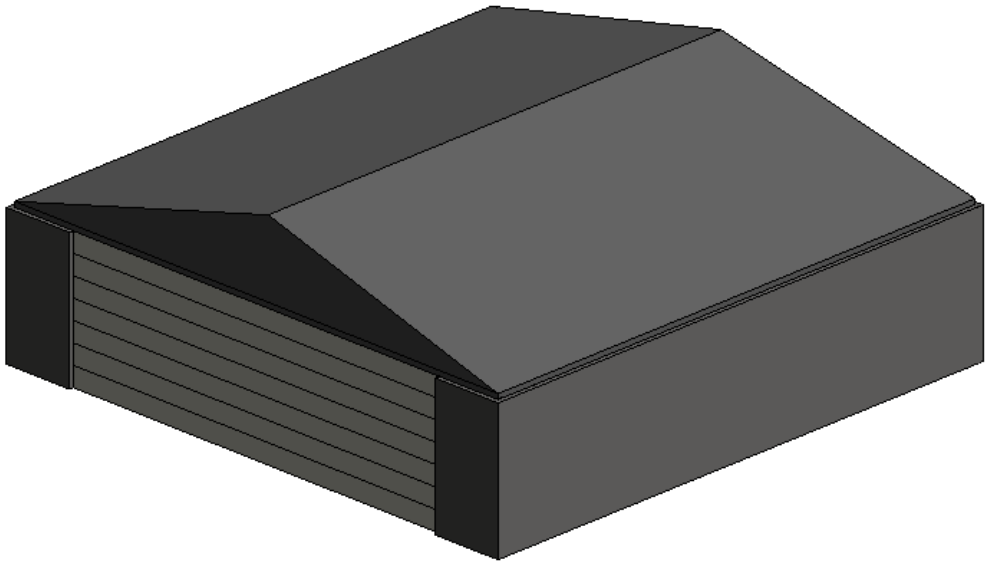

Figure 6.2.5: 80’x80’ Box Hangar

A 3-dimensional rending of the developed Airport layout and levee system was drafted using Revit and AutoCAD Civil 3D, and is shown from multiple angles in Figures 6.2.6 through 6.2.8. A diagram showing the layout of the hangar area with relevant dimensions is shown in Figure 6.2.9. These dimensions were based on the current Airport hangar layout and FAA regulations. Proposed utility layouts for electric, gas, storm sewer, and sanitary sewer locations are shown in Appendix B.

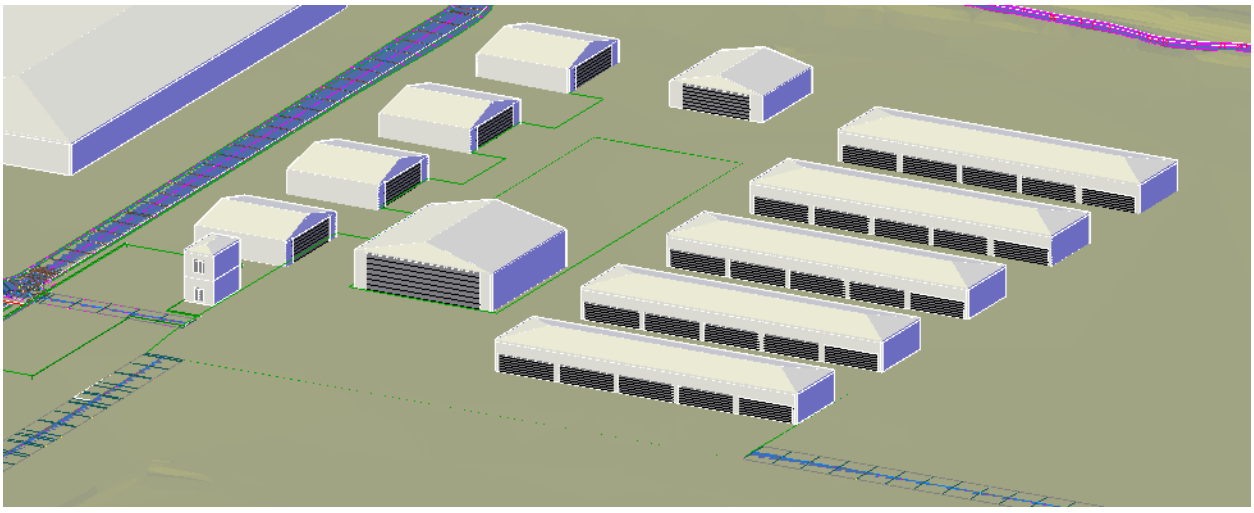

Figure 6.2.6: 3-D Airport Rendering, Hangar Area

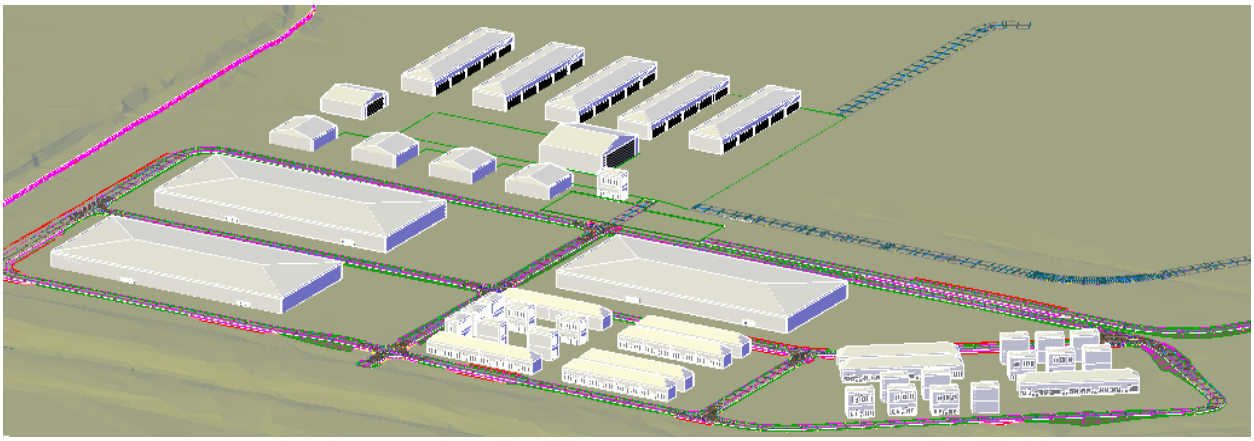

Figure 6.2.7: 3-D Airport Rendering, From Southeast

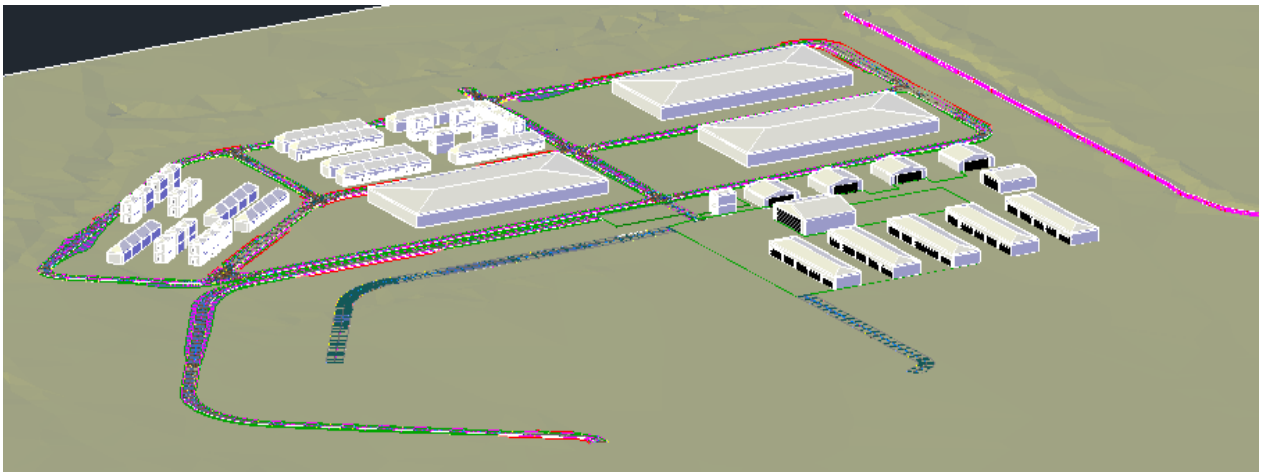

Figure 6.2.8: 3-D Airport Rendering, From Northeast

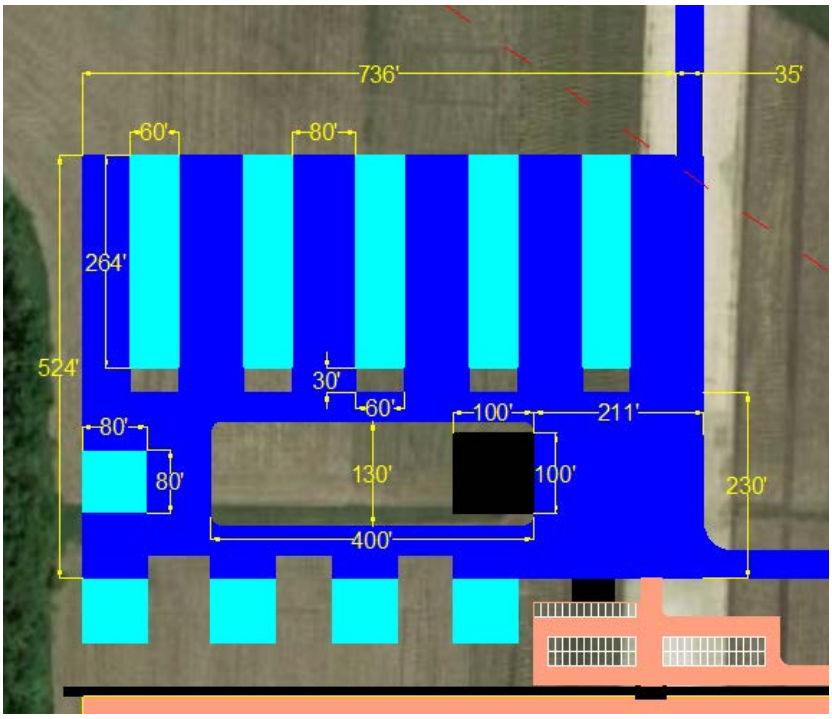

Figure 6.2.9: Hangar Layout with Relevant Dimensions

In an attempt to keep the theme of sustainability as a core concept in this project, the possibility of using renewable energy sources was pursued during the design process. Two sources of renewable energy were focused on: solar panels to provide electricity and a geothermal temperature controlling system to provide heating and cooling to the hangars and Airport office building. However, due to the time constraints of this project, the design of these systems was never fully completed, so they are not mentioned in this report. It is the firm's intention for this Redevelopment Plan that these options are considered in the future as the design plans are further refined and eventually implemented. Incorporating these renewable energy sources into the design would eliminate the need of gas lines and reduce the hangar's reliance on the electric grid. The possibility of selling electric power from the solar panels to Mid-American Energy could also be pursued if that system is installed.

7.0. Opinion of Probable Cost

A detailed cost analysis was required for this Redevelopment Plan, to be used in the letting process when the Airport and City of Iowa City opens up bidding to contractors. The firm's OPC is located in Table 7.0.1. Unit costs were referenced from RS Means and other redevelopment plans, and hangar estimates were provided by hangar pre-engineering firm Erect-A-Tube. The OPC is broken down into three segments, which will be used to phase in the developments over 30 years. This phasing plan is expanded upon further in Section 8.0 of this report. The firm's OPC for Phase 1, 2, and 3 is $5.07 Million, $2.21 Million, and $3.59 Million, respectively, bringing the total cost to $10.89 Million in 2015 dollars.

Table 7.0.1: Opinion of Probable Cost

		Phase 1		Phase 2 (added to Phase 1)		Phase 3 (added to Phase 2)		
		Est. Year of Construction = 2015		Est. Year of Construction = 2030		Est. Year of Construction = 2045		
		Total Dev. = 5.82 acres (plotted)		Total Dev. = 3.60 acres (plotted)		Total Dev. = 8.40 acres (plotted)		
Line Item	**Unit Cost**	**Area / Length**	**Cost**	**Area / Length**	**Cost**	**Area / Length**	**Cost**	**Total Cost**
10 Unit T Hangar	$220,000	1 Hangar	$ 220,000	2 Hangars	$ 440,000	2 Hangars	$ 440,000	$ 1,100,000
80'x80' Box Hangar	$180,000	2 Hangars	$ 360,000	1 Hangar	$ 180,000	2 Hangars	$ 360,000	$ 900,000
100'x100' Maintenance Box Hangar	$280,000	N/A	-	N/A	-	1 Unit	$ 280,000	$ 280,000
Hangar Foundation Area	$7.57 / sf	28,640 sf	$ 216,805	38,080 sf	$ 288,266	56,480 sf	$ 427,554	$ 932,625
24'x43' Office Area	$250/$88 / sf	1,032 sf	$ 160,800	N/A	-	N/A	-	$ 160,800
Office Foundation Area	$7.57 / sf	1,032 sf	$ 7,812	N/A	-	N/A	-	$ 7,812
Concrete Apron Area	$7.57 / sf	124,170 sf	$ 939,967	57,923 sf	$ 438,477	124,414 sf	$ 941,814	$ 2,320,258
Internal Roadways	$3.58/ sf	110,478 sf	$ 395,511	112,947 sf	$ 404,350	46,929 sf	$ 168,006	$ 967,867
Gate and Fence	$19.17 / lf	2032.8 ft + 38 ft gate	$ 39,681	N/A	-	N/A	-	$ 39,681
Parking Areas	$3.58 / sf	93,575 sf	$ 334,999	36,782 sf	$ 131,680	100,759 sf	$ 360,717	$ 827,396
Levee System	$170 / lf	10,000 feet	$1,700,000	N/A	-	N/A	-	$ 1,700,000
Tree Removal	$1600 / acre	9.2 acres	$ 14,720	N/A	-	N/A	-	$ 14,720
Site Grading, Preparation, and Drainage	$3.27 / sf	152,810 sf	$ 499,689	96,003 sf	$ 313,930	180894 sf	$ 591,523	$ 1,405,142
Gas Lines	$6.50 / lf	1,451 feet	$ 9,431	202 feet	$ 1,313	882 feet	$ 5,733	$ 16,477
Electrical Lines	$24.00 / lf	3,702 feet	$ 88,848	490 feet	$ 11,760	768 feet	$ 18,432	$ 119,040
Water Lines	$25 / lf	865 feet	$ 30,625	N/A	-	N/A	-	$ 43,625
Sanitary Sewer	$30 / lf	1,654 feet	$ 49,620	N/A	-	N/A	-	$ 49,620
Total Cost			**$5,068,508**		**$ 2,209,776**		**$ 3,593,779**	**$ 10,885,063**

8.0. Construction Phasing

Due to the large nature of the project and the lack of current demand for all aspects of the Redevelopment Plan, the entire plan will not be implemented at once. Rather, it will be phased in over the design life of 30 years, to allow for the Airport to plan their finances accordingly and to allow for customer demand for hangar space to keep up with what the Airport's facilities have to offer. A breakdown of the construction phasing is detailed further below, and offers a plan of how the large scale plan could be implemented over a number of years. This plan is based on the based aircraft requirement projections detailed in Section 2.0 of the report. Estimated hangar revenues are also provided for each phase. These are based on average hangar lease rates currently used by the Airport. Lease rates for a single unit in T-hangars range from $144/month to $230/month, with an average of $187/month. The average lease of an 80'x80' bulk hangar has been determined to be around $1200/month based on unit costs per square foot of other sized bulk hangars currently at the Airport.

Phase 1

The first phase of this redevelopment plan is intended to be implemented in the near future as funds become available, which is further detailed as the year 2015 for the purpose of clarity. This diagram of the first phase is pictured in Figure 8.0.1. This phase will involve implementing the flood mitigation strategy in its entirety, as that is the first real challenge that must be overcome before any development can occur. Without first addressing the high flood risks from Willow Creek, all developments on the south quadrant of the Airport property will be vulnerable to flood damage.

In addition to implementing the flood mitigation strategy, the initial framework for the Airport hangar area will be laid out. One 10 unit T-hangar and two 80'x80' box hangars will be constructed in the orientation as shown in Figure 8.0.1, along with a 43'x24' general airport building containing a restroom for public use. Access to this area by aircraft will be provided by a taxiway located on the refurbished Runway 18-36, as shown below. This hangar configuration will provide the Airport with 18 additional spaces to lease out to aircraft owners, satisfying the short term based aircraft needs of a projected 15 additional spaces needed in year 2020. A new road will be constructed connecting Mormon Trek Boulevard to this new hangar space, acting as the central roadway in the commercial development area.

The Phase 1 plan for the commercial redevelopment area is to focus the development on those properties that will be most attractive to business entities and real estate investors. These properties are located along the main external roads surrounding the Airport, Mormon Trek Boulevard and Oak Crest Hill SE. As shown below, four potential lots divisions will be made, two of 1.38 acres each and two of 1.53 acres each. However, these lots could be modified to accommodate commercial entities. All land development tasks and utility hookups will be provided to the lots, in an effort to make the process as simplified as possible for any entity interested in the land. Parking and internal roadway access will be provided in this phase. Likewise, a fence will be built that will separate the new commercial area from the hangar area, and a mechanical gate with access code will be located along this fence, keeping the two zones separate. The estimated cost (in 2015 dollars) of the Phase 1 upgrades is $5.07 Million, of which roughly $1.7 Million is for the Willow Creek improvements.

Based on the unit costs mentioned in the beginning of Section 8.0, the estimated revenue in the scenario that the two box hangars and T-hangar spaces are fully occupied immediately is $1,870/month for the T-hangars and $2,400/month for the box hangars. The estimated yearly revenue is $51,240, in 2015 dollars.

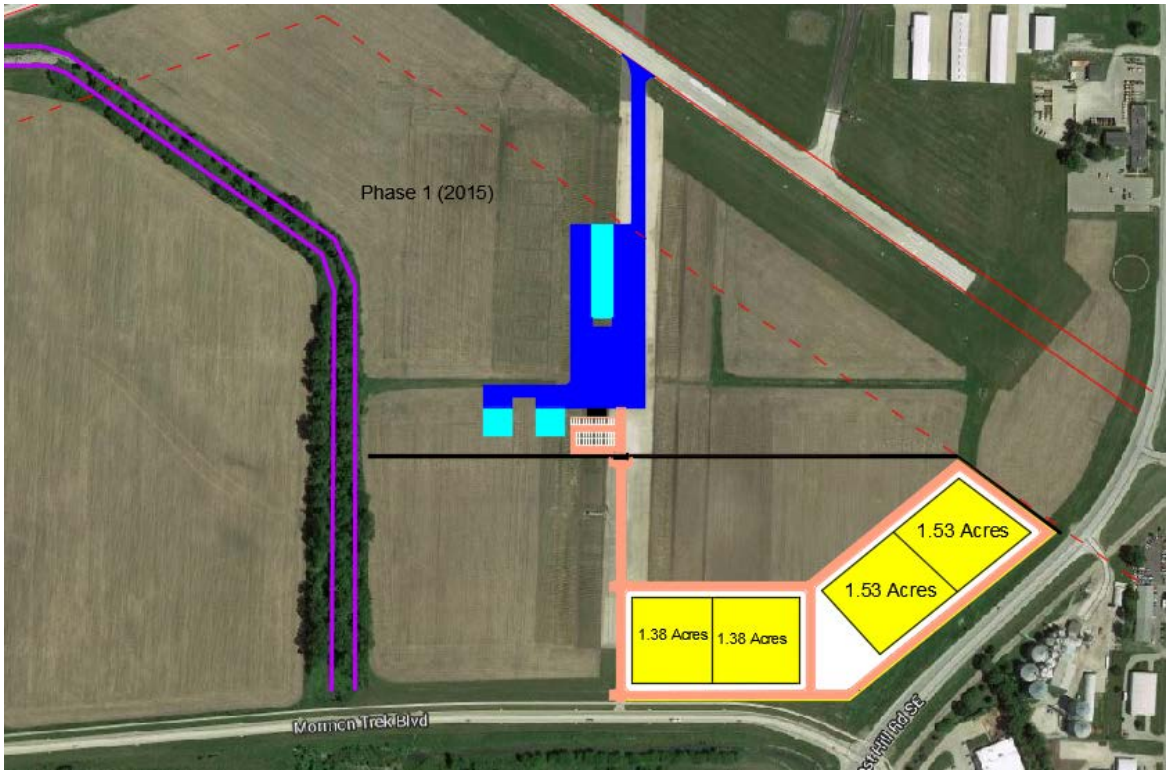

Figure 8.0.1: Phase 1 of the Redevelopment Plan Implementation

Phase 2

The second phase of this redevelopment plan is intended to be implemented in the near-mid future, approximately in the year 2030, or as demand for growth is sensed. This phase is visually detailed further in Figure 8.0.2. This phase will build upon the improvements that were made in the first phase. This part of the upgrade will involve construction of two 10 unit T-hangars and one 80'x80' box hangar, providing an additional 24 hangar spots, bringing the total hangar spots to 42, surpassing the projected 2030 based aircraft requirement of 31 spaces needed. Additionally, an internal roadway will be constructed connecting the current Airport facilities to the new hangar area. This road will be constructed within the Airport boundary, and it will not travel through any areas with geographical FAA restrictions. Within the newly added gate, additional parking spaces will be provided for hangar tenants who will be accessing the new hangar area via the Mormon Trek Boulevard entrance.

The commercial development area will also be expanded upon during this phase, if demand calls for it. In keeping with the theme to capitalize from the premier real estate plots within the area, the next plots that will be developed will be those that are west of the new access road, along Mormon Trek Boulevard. This area will contain two lots, each 1.80 acres,

but could be combined or split down further depending on what is desired by developers. Internal roadways and parking lots will also be constructed to service these buildings. The estimated cost (in 2015 dollars) of the Phase 2 upgrades is roughly $2.21 Million.

Again, assuming the scenario that the two added T-hangars and single box hangar are filled with tenants immediately after construction, the monthly revenue added onto Phase 1 is $3,740 for the T-hangars and $1,200 for the box hangar. This would add an additional $59,280 to the Airport's yearly revenue, bringing the first two phase revenue totals to $110,520, in 2015 dollars.

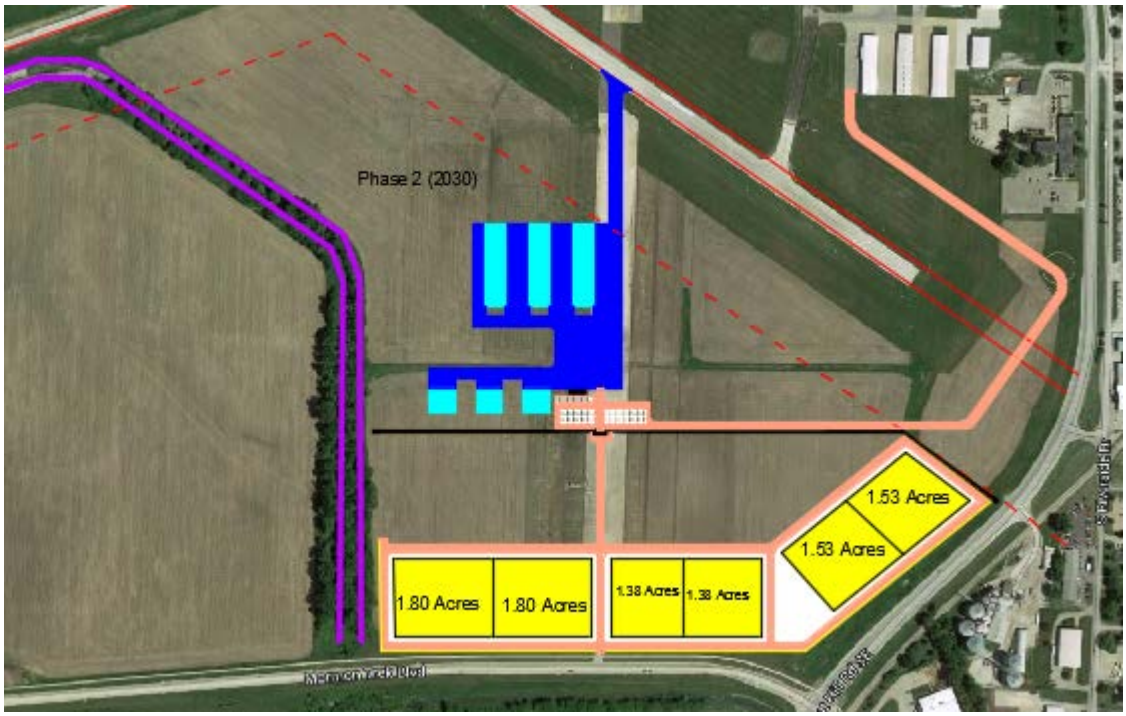

Figure 8.0.2: Phase 2 of the Redevelopment Plan Implementation

Phase 3

The third phase of this redevelopment plan is intended to be implemented in the far future, approximately in year 2045, otherwise noted as the end of the 30 year design life. This phase is detailed further in Figure 8.0.3. This phase will involve finishing out the hangar additions, with two 10 unit T-hangars and two 80'x80' box hangars being added, along with a 100'x100' box hangar designated for use as a maintenance facility. This phase will add an additional 24 hangar spaces available for lease, bringing to total number of added hangar spots to 70, exceeding the projected based aircraft requirement of 67 spots. A second access taxiway to the new hangars will be provided for aircraft from the SE end of Runway 12-30. This ensures that entrance to the hangars will always be available, even in the event that one of the access taxiways needs to be temporarily shut down so that maintenance can be performed. The commercial development area will also be finalized in this phase. The remaining four plots, ranging from 0.92 acres to 4.24 acres, will have all land development

tasks completed and utility access installed during this final stage of the upgrade. Internal roadways and parking lots will be provided for these buildings as well. The cost of the Phase 3 upgrades, in 2015 dollars, comes to roughly $3.59 Million, bringing the grand total of the Redevelopment Plan to $10.89 Million.

After the implementation of the third phase, the two T-hangars will bring in an estimated $3,740/month and the two bulk hangars will generate an estimated $2,400/month, for a yearly combined revenue of $73,680. This brings the total estimated annual revenue for the entire aviation-related developments to $184,200. This is under the assumption that the hangars are completely full and will continue to stay full for the remainder of their lives. Again, this amount is in 2015 dollars.

Figure 8.0.3: Phase 3 of the Redevelopment Plan Implementation

9.0. Breakeven Analysis

Once the yearly estimated revenue from the hangars was determined, a rough breakeven analysis was performed. As previously mentioned, all revenue estimates were developed under the assumption that the hangars began to generate revenue immediately after they were constructed.

To perform this analysis, some assumptions were made out of necessity. As previously mentioned, past Airport improvement projects have received 90% of project funds from the FAA and the remaining 10% was provided by the Airport and/or City of Iowa City. The one FAA requirement for this 90/10 split is that the project must be aviation related. In the case of this Redevelopment Plan, the hangar development area is most certainly aviation related, and the commercial and/or development area is likely not. Thus, the hangars will likely be eligible for the 90/10 funding split. The cost of upgrading Willow Creek is split about 50/50 between

aviation related developments and non-aviation related ones, so the FAA will most likely only provide 50% of the funding for that specific part of the overall Redevelopment Plan. Table 9.0.1 breaks down the expected share of funding the Airport and/or City of Iowa City will be expected to provide for each line item.

Table 9.0.1: Cost Breakdown Based on Airport's Expected Contribution

Line Item	Total Cost	Airport Expected Share (%)	Airport Expected Share ($)
10 Unit T Hangar	$ 1,100,000	10%	$ 110,000
80'x80' Box Hangar	$ 900,000	10%	$ 90,000
100'x100' Maintenance Box Hangar	$ 280,000	10%	$ 28,000
Hangar Foundation Area	$ 932,625	10%	$ 93,263
24'x43' Office Area	$ 160,800	10%	$ 16,080
Office Foundation Area	$ 7,812	10%	$ 781
Concrete Apron Area	$ 2,320,258	10%	$ 232,026
Internal Roadways	$ 967,867	75%	$ 725,900
Gate and Fence	$ 39,681	10%	$ 3,968
Parking Areas	$ 827,396	100%	$ 827,396
Levee System	$ 1,700,000	50%	$ 850,000
Tree Removal	$ 14,720	50%	$ 7,360
Site Grading, Preparation, and Drainage	$ 1,405,142	75%	$ 1,053,857
Gas Lines	$ 16,477	50%	$ 8,239
Electrical Lines	$ 119,040	50%	$ 59,520
Water Lines	$ 43,625	50%	$ 21,813
Sanitary Sewer	$ 49,620	50%	$ 24,810
		Sum	**$ 4,153,011**

The full breakeven analysis calculation is shown in Table C.1 in Appendix C. From that table, it was determined that the year when the cumulative revenue from hangar leases will exceed the Airport's share of the capital costs for the Master Redevelopment Plans (roughly $4.15 Million) in the year 2054, nearly 40 years after the Phase 1 construction is expected to begin. However, this calculation is not highly scientific, as it was based on a set of major assumptions. Chiefly, this calculation assumed that the hangar additions began to bring in revenue as soon as they were constructed. In reality, this almost certainly will not be the case. It will take a few years, or even longer, for that level of demand to be generated.

The second major factor that was assumed for this calculation was that the commercial redevelopment area was completely empty with no outside developments. In reality, this will also not be the case. Once the land is developed, it will be attractive for real estate developers and investors, and the hope is that business will start to move operations to the property and will provide an additional source of revenue for the Airport. The current Airport lease rates from the North Commerce Park area are between $0.50 and $1.00 per square foot per year of unimproved land, which translates into $21,780 to $43,560 per acre per year. It is reasonable to assume that the south development areas will generate similar levels of revenue. The properties that will be in the highest demand, which are those along Mormon Trek Boulevard and Riverside Drive, may be closer to the $1.00/ square foot figure while the interior plots of land may be closer to the $0.50/ square foot figure. However, the exact dollar amount that these properties will bring in is

currently unknown and will be business specific, so it was not included in this calculation. This assumption had a much larger impact on the calculation than the full hangar assumption did. Thus, it is relatively safe to say that the breakeven point for the Airport will be sooner than the year 2054.

10.0. Conclusion

The Iowa City Municipal Airport Master Redevelopment Plan will involve installing a levee system that will control the flooding of Willow Creek to remove the Airport property from the 100-year floodplain and expand Airport operations into the southern quadrant of the property. The development of the area around the old Runway 18-36 will incorporate both aviation and non-aviation related expansions in an effort to increase the revenue generation capabilities of the Airport. The Redevelopment Plan was developed for the long term, allowing the upgrades to be phased in over the course of roughly 30 years to allow for proper financial planning by the Airport and to keep pace with user demand.

When fully implemented, the Plan will have added the following aviation related upgrades in the northern half of the development area: five 10-unit T hangars, five 80’x 80’ box hangars, an Airport office building, and a 100’ x 100’ maintenance facility. In the southern half of the development area, the land will be subdivided into lots with internal roadways, parking lots, and utility hookups via land development approaches. Ten lots of various acreages will be created, providing a total of 17.82 acres to be developed further by business entities. The total project cost, in 2015 dollars, is estimated at $10.89 Million.

11.0. Appendices

Appendix A: Willow Creek 100-year Flood Velocity Calculation

$$Q = V * A$$

$$2600\ cfs = V * 772\ ft^2$$

$$V = 3.37\ ft/s$$

Appendix B: Utility Locations

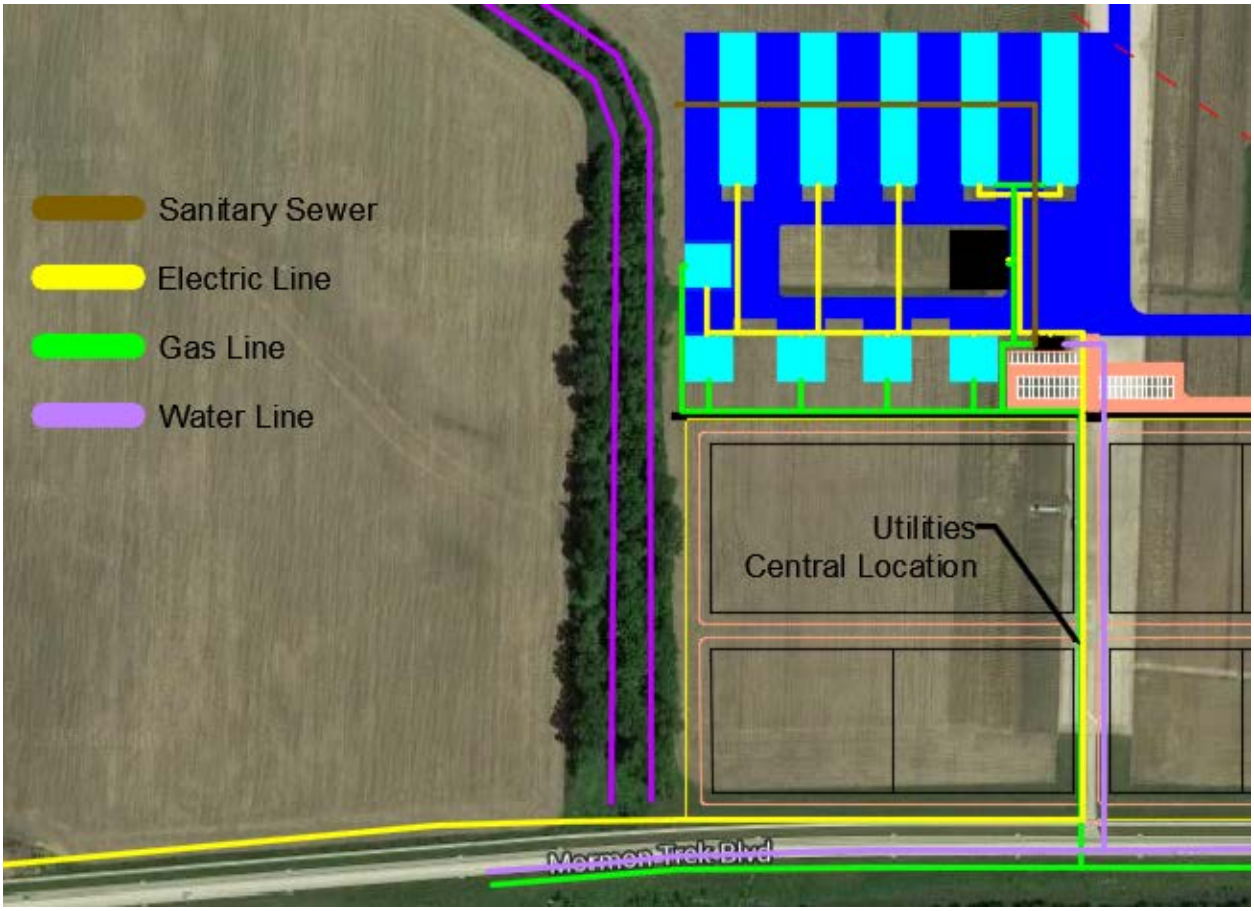

Figure B.1: Estimated Utility Locations for Hangar Area.

Appendix C: Breakeven Analysis Calculation

Table C.1: Breakeven Analysis

	Estimated Revenue	Cumulative Revenue
2015	$ 51,240	$ 51,240
2016	$ 51,240	$ 102,480
2017	$ 51,240	$ 153,720
2018	$ 51,240	$ 204,960
2019	$ 51,240	$ 256,200
2020	$ 51,240	$ 307,440
2021	$ 51,240	$ 358,680
2022	$ 51,240	$ 409,920
2023	$ 51,240	$ 461,160
2024	$ 51,240	$ 512,400
2025	$ 51,240	$ 563,640
2026	$ 51,240	$ 614,880
2027	$ 51,240	$ 666,120
2028	$ 51,240	$ 717,360
2029	$ 51,240	$ 768,600
2030	$ 110,520	$ 879,120
2031	$ 110,520	$ 989,640
2032	$ 110,520	$ 1,100,160
2033	$ 110,520	$ 1,210,680
2034	$ 110,520	$ 1,321,200
2035	$ 110,520	$ 1,431,720
2036	$ 110,520	$ 1,542,240
2037	$ 110,520	$ 1,652,760
2038	$ 110,520	$ 1,763,280
2039	$ 110,520	$ 1,873,800
2040	$ 110,520	$ 1,984,320
2041	$ 110,520	$ 2,094,840
2042	$ 110,520	$ 2,205,360
2043	$ 110,520	$ 2,315,880
2044	$ 110,520	$ 2,426,400
2045	$ 184,200	$ 2,610,600
2046	$ 184,200	$ 2,794,800
2047	$ 184,200	$ 2,979,000
2048	$ 184,200	$ 3,163,200
2049	$ 184,200	$ 3,347,400
2050	$ 184,200	$ 3,531,600
2051	$ 184,200	$ 3,715,800
2052	$ 184,200	$ 3,900,000
2053	$ 184,200	$ 4,084,200
2054	$ 184,200	$ 4,268,400

Appendix D: HEC-RAS Inputs and Outputs

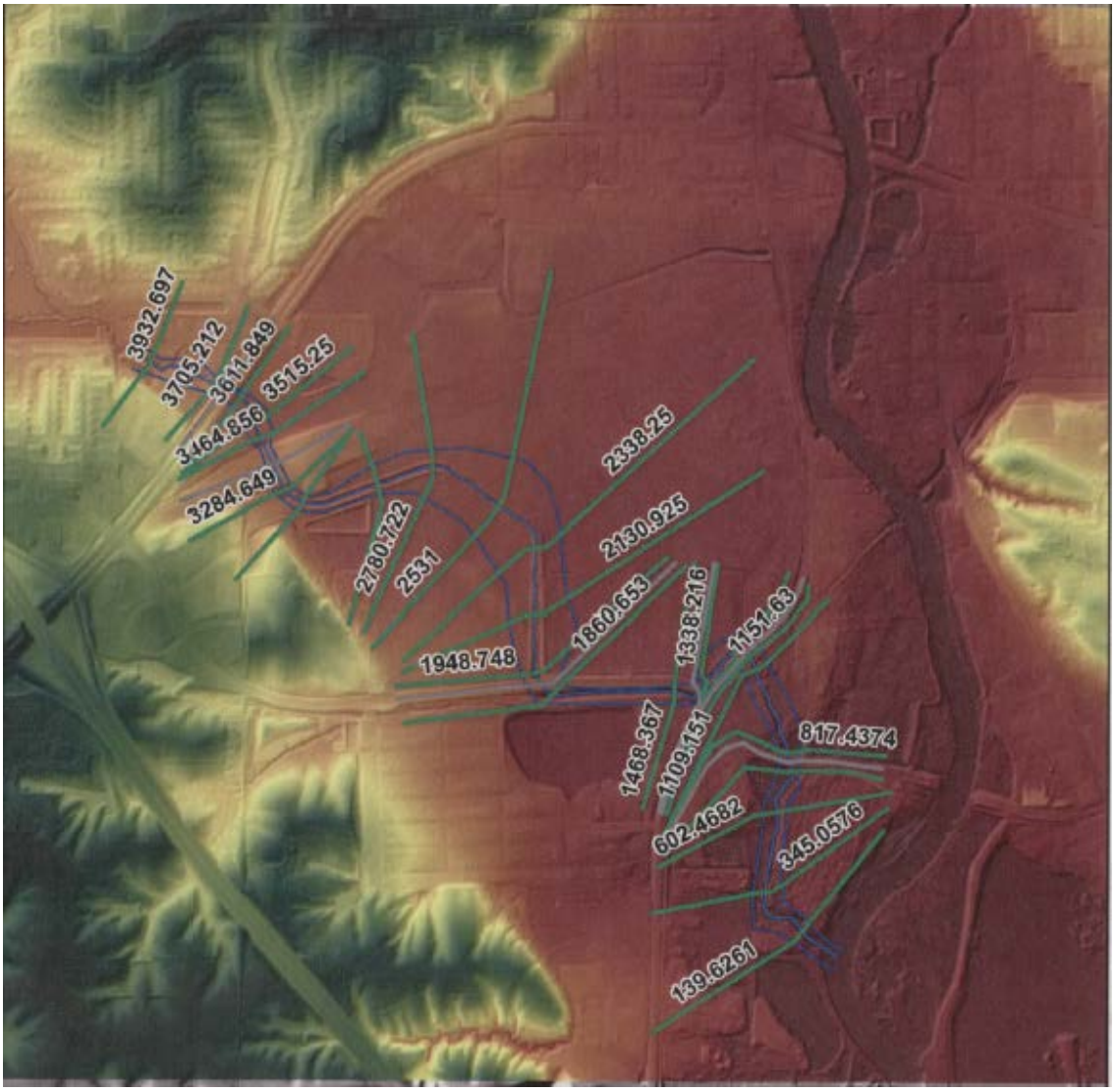

Figure D.1: ArcGIS Map Imported into HEC-RAS

Figure D.2: Willow Creek Cross Section Locations Analyzed

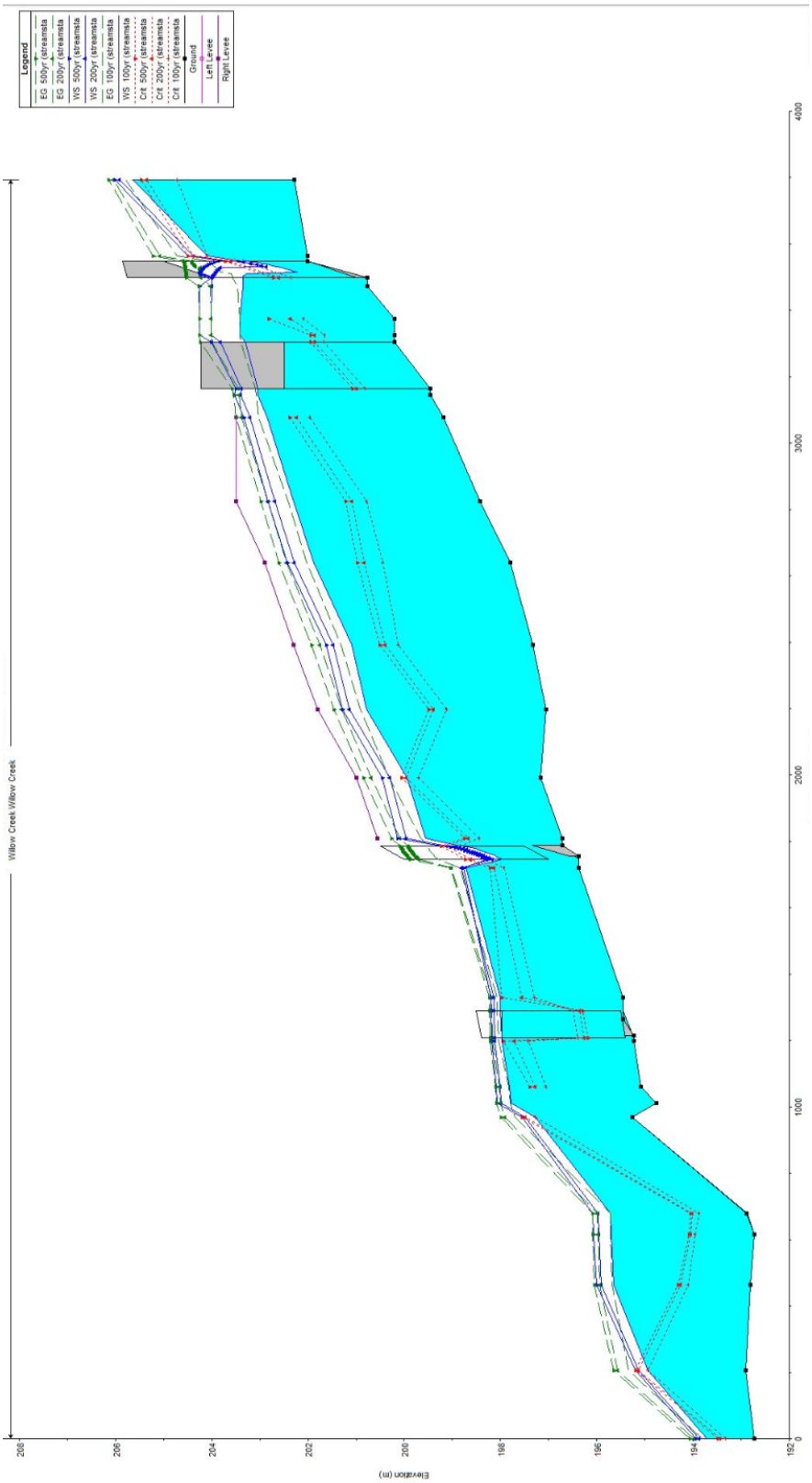

Figure D.3: Sample Willow Creek HEC-RAS Output

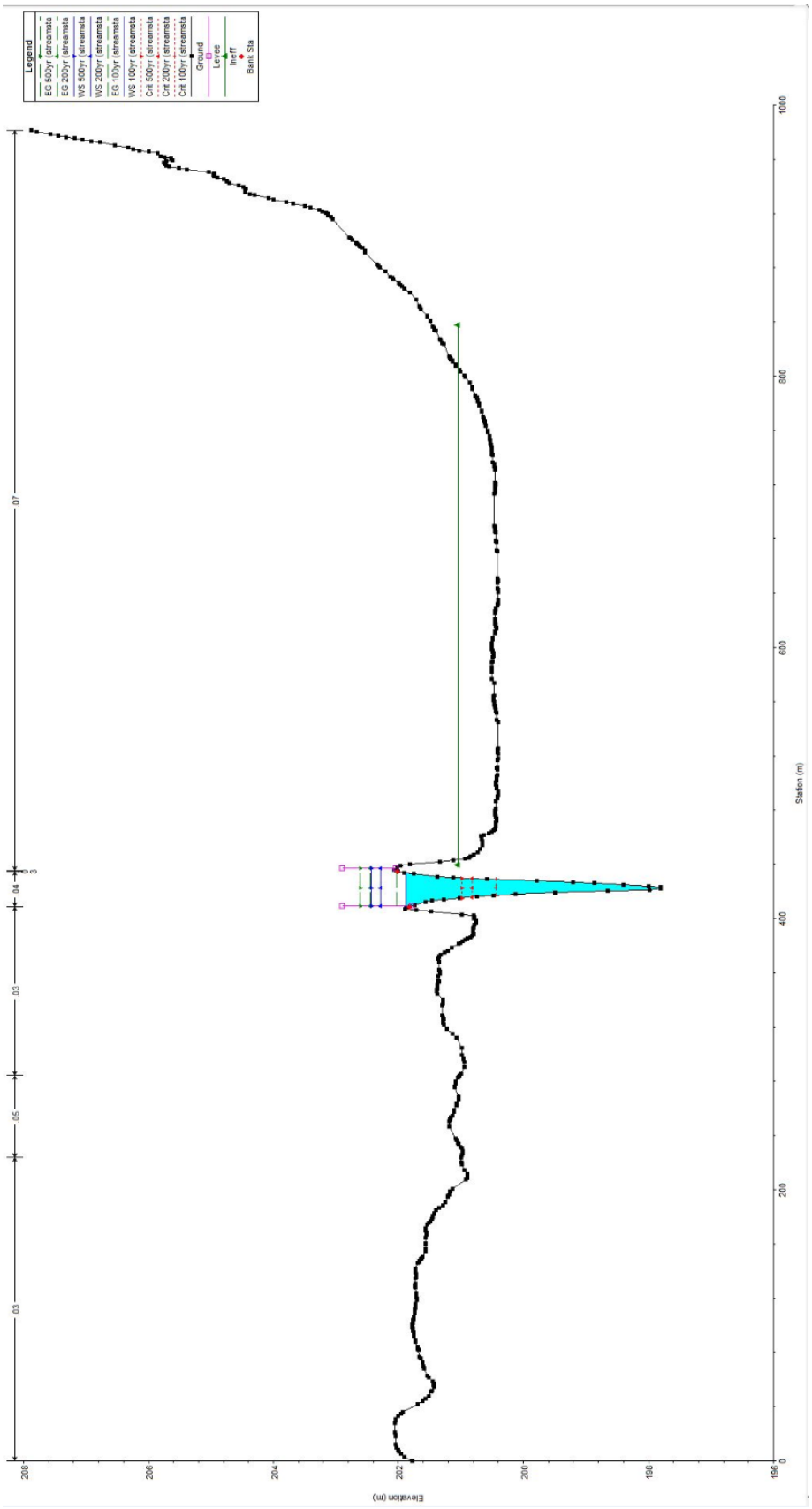

Figure D.4: Willow Creek Cross Section with Levee HEC-RAS Output

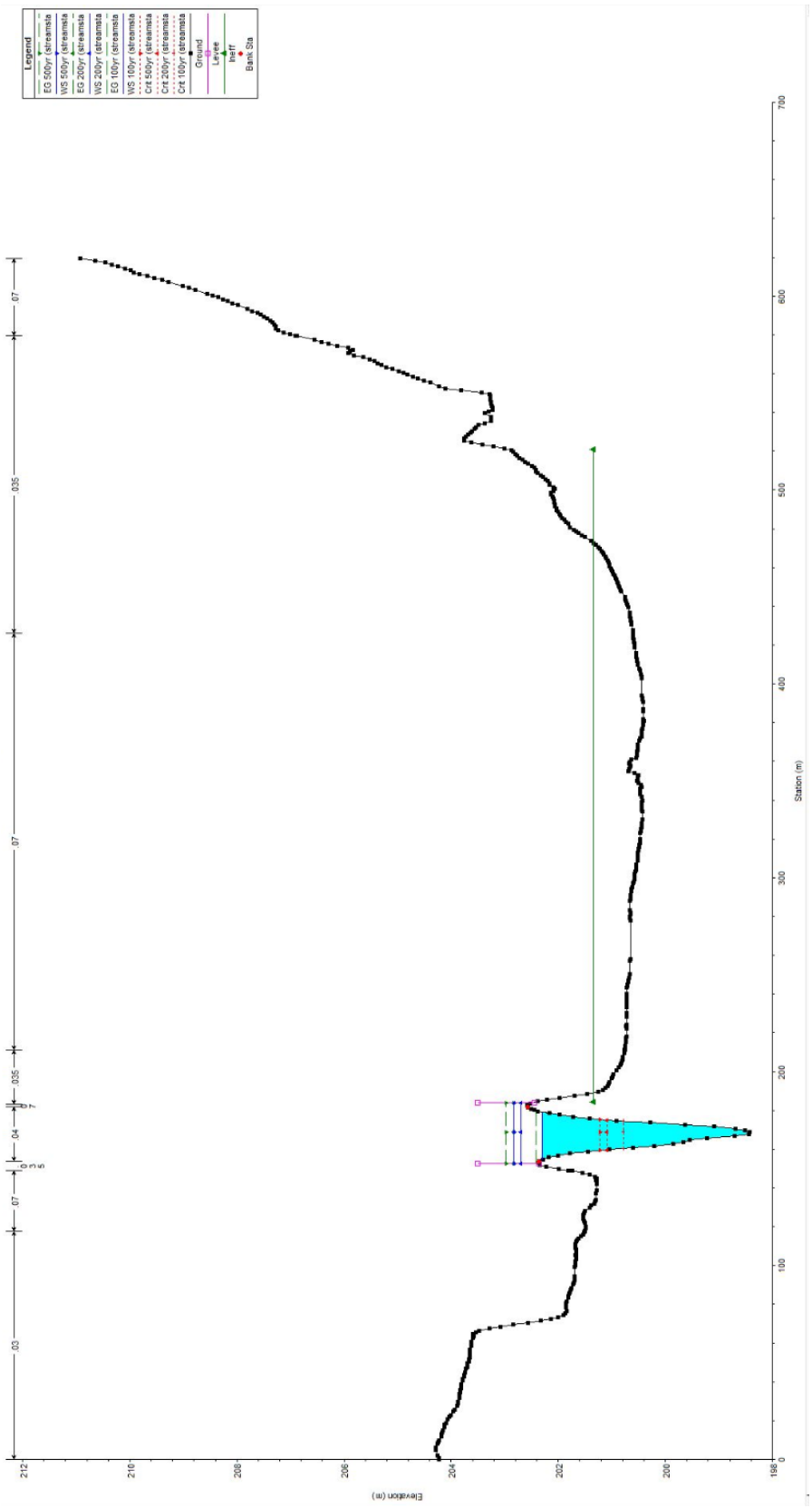

Figure D.5: Willow Creek Cross Section with Floodwall HEC-RAS Output

12.0. Bibliography

1. Iowa Department of Transportation. *Iowa Aviation System Plan, 2010-2030*. Rep. Washington, D.C.: Federal Aviation Administration, 2010. Web.
2. McClure Engineering Co. *Iowa City Municipal Airport Master Plan*. Rep. Iowa City: Iowa City Airport Commission, 1996. Web.
3. AECOM Inc. *Iowa City Municipal Airport South Airfield Planning Study*. Rep. Iowa City: Iowa City Airport Commission, 2009. Web.
4. *Meeting the Criteria for Accrediting Levee Systems on NFIP Flood Maps*. Rep. Washington, D.C.: FEMA, 2008. Web. Levees: Identifying the Risk.
5. EarthTech, Inc. *Willow Creek Hydraulic Study, Summary Report*. Rep. Iowa City: Iowa City Airport Commission, 2008. Web.
6. *Standard Specifications for Storm Drainage Systems*. Rep. East Greenbush: n.p., 2009. Web.
7. *Chapter 5, Barriers, Levees, and Floodwalls*. Rep. Washington, D.C.: FEMA, n.d. Print.
8. Stanley Consultants, Inc. *Iowa City River Corridor, Flood Protection Options for Parkview Terrace and Idyllwild Neighborhoods*. Rep. N.p: City of Iowa City, 2009. Web.
9. *Cost Data: Bases, Ballasts, Pavements, and Appurtenances*. Rep. Norcross, Georgia: RS Means, 2006. Web.
10. *Floodwalls and Levees*. Rep. Washington, D.C.: FEMA, n.d. Print. Engineering Principles and Practices for Retrofitting Flood-Prone Residential Structures.
11. Underwood, Melissa. "Airport Master Plan Project Update." Master Plan Advisory Group Update. Iowa City Municipal Airport, Iowa City. 5 Mar. 2015.