NARRATIVE REPORT FOR:

REDFIELD MUNICIPAL AIRPORT MASTER PLAN

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ACRONYM'S

AC	Advisory Circular
AIP	Airport Improvement Program
ALP	Airport Layout Plan
CATEX	Categorical Exclusion
EA	Environmental Assessment
EIS	Environmental Impact Statement
FAA	Federal Aviation Administration
GPS	Global Positioning System
IFR	Instrument Flight Rules
LIRLs	Low Intensity Runway Lights
LITL	Low Intensity Taxiway Light
MIRL	Medium Intensity Runway Lighting
PAPI	Precision Approach Path Indicator
ROFA	Runway Object Free Area
ROFZ	Runway Obstacle Free Zone
RSA	Runway Safety Area
RPZ	Runway Protection Zone
SD-DOT	South Dakota Department of Transportation
SRE	Snow Removal Equipment

Chapter One – Introduction

The City of Redfield, in recognizing the need for a comprehensive plan for the future development of its airport, contracted with Helms and Associates to complete an Airport Layout Plan (ALP) and Mini-Master Plan.

The overall objective of this airport master plan is to provide a tool for the airport sponsor that can be used in long term planning and as a reference for current operations of the airport. This is accomplished by examining the existing conditions of the airport and community and providing for future growth and expansion of both. The plan must be reasonable with enough flexibility to allow adaption to unforeseen events and developments.

An ALP, which is a graphical representation of the current layout along with a staged development to accommodate growth within the Federal Aviation Administration (FAA) standards for the airport, will be provided to the airport sponsor. Accompanying the ALP is the Master Plan which explains the ALP and clarifies some of the issues shown on the ALP. The Master plan also gives the background for the decision making process used to produce the ALP.

Chapter Two – Current Inventory

This chapter will discuss the current facilities of the airport. These include the airside facilities such as the runway, taxiways, aprons, etc., and the landside facilities such as the access road, parking, fencing, etc.

Background

The Redfield Municipal Airport is located on approximately 180 acres situated on the south edge of the City of Redfield in Spink County. It is bordered on the east side by US Highway 281. Figure 2-1 shows the location of the airport in relation to the City and surrounding area with the existing property boundary in red.

The land the airport is sitting on was obtained by the City in the fall of December 1964 and the airport was constructed in the following year. The original runway was situated in a north-south alignment parallel to the highway and east of its current location. Some of the hangar buildings from this original layout remain in the northeast corner of the property.

The airport serves the City of Redfield and the surrounding area. The City's population has fluctuated over the last 20 years and is currently around 2,900 people. Spink County's population has declined from nearly 12,000 people in 1960 to around 7,500 people according to the 2000 census. The largest employers in the City are the SD Developmental Center, Redfield Public School District, Community Memorial Hospital and Beverly Health Care. The SD Developmental Center is a State owned and run training and care facility with the following mission statement.

> "The mission of the South Dakota Developmental Center is to provide individualized intensive treatment services to people with developmental disabilities and challenging behaviors only when appropriate services are not available in a less restrictive environment."

The Hospital is a 25-bed facility and the clinic has 4 doctors and 2 physician's assistants. There are also two nursing homes in the City with a total of 117 beds and assisted living facilities with 46 beds.

All of these facilities rely on the airport to fly in various staff and specialists. The airport also allows for air ambulance service for patients who require care that cannot be provided in Redfield.

There are several other airports near the Redfield Municipal Airport. Within a 50 mile radius of the Airport there are 6 total airports; one is a private airstrip, three are small general aviation airports, and two are the air carrier airports at Aberdeen (approximately 45 miles north) and at Huron (approximately 40 miles south).

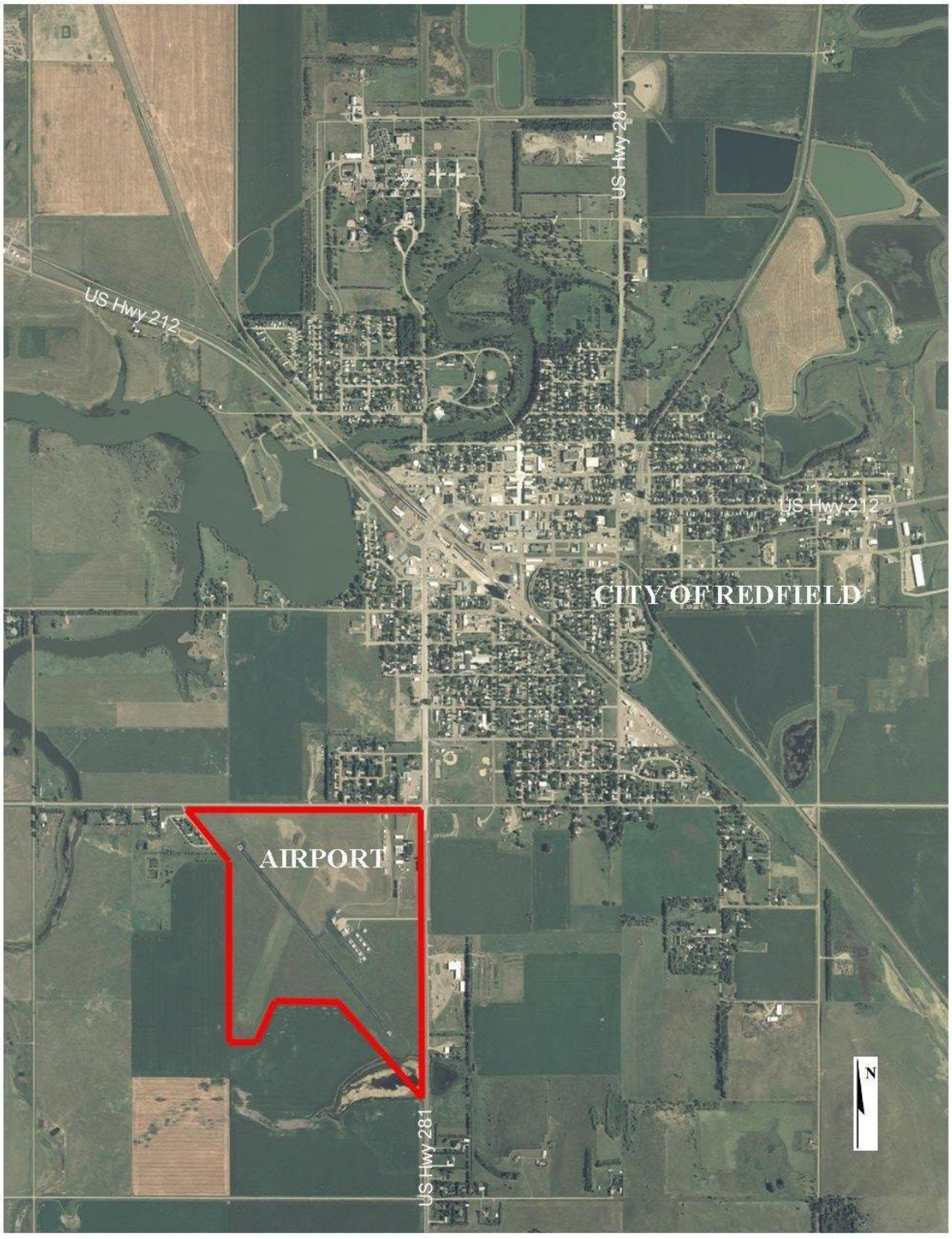


FIGURE 2-1 CITY OF REDFIELD

Facilities

The airport facilities include all the infrastructure of the airport that allows aircraft to land, taxi, park, load, unload and transition their cargo or passengers to ground transportation. Each of these items and its current condition will be described below. These items can also be found on the ALP.

Runways

Runway 13/31

Runway 13/31 is the primary runway for the airport. It is 3,300 feet long by 60 feet wide. The length is sufficient for 75% of small aircraft. The runway has a design strength of 12,500 lbs and consists of asphalt surfacing. The design group and category for this runway are A & B I. The runway was reconstructed in 1998 with 2 ½ inches of Asphalt surfacing on top of approximately 12 inches of base course.

The runway is marked as a visual runway and there are no published approaches for either end. The runway has low intensity runway lights (LIRL) that are pilot controlled through the Unicom frequency of 122.8. There are no visual or electronic navigation aids for this runway.

The wind coverage for the runway with a 10.5 knot allowable crosswind component is 84.81% as shown on sheet 2 of the ALP. This coverage decreases to 82.6% if only weather conditions requiring instrument flight rules (IFR) are considered. To view the wind roses and data used to generate these percentages please refer to Appendix A. Since there is no weather reporting equipment at the Redfield Airport, wind data from Aberdeen Regional Airport was used.

Runway 01/19

Runway 01/19 is the crosswind runway for small aircraft that cannot land on the primary runway due to a high crosswind. This runway is a turf landing strip 2,565 feet long by 120 feet wide. This strip is unlighted, but has "A" frame style markers on the ends and along the edges.

Photo 1 - Crosswind Runway Marker

This design group and category for this runway are A & B I. The runway length is approximately 80% of the primary runway, which was a common practice at the time this strip was constructed.

There are no visual or electronic navigational aids for this landing strip and it has no published approaches to either end. The wind coverage using a 10.5 knot allowable crosswind component is 65.46% for all weather conditions.

Taxiways

Exit Taxiway

This is the most heavily used taxiway for the airport. It is the only way for aircraft to access the runways from the apron and hangar area. This taxiway is designed for A & B I aircraft. It is 40 feet wide and approximately 200 feet long. The taxiway was reconstructed in 1998 along with the runway. It is surfaced with 2 ½ inches of asphalt on top of approximately 12 inches of base course. This taxiway has a 6 inch centerline stripe and runway holding position markings.

Photo 2 - Hold Position Sign

There is also an unlighted Hold Position sign (Photo 2) on the left side (when approaching the runway) of the taxiway in line with the runway holding position markings. The taxiway has low intensity taxiway lighting (LITL) along the edge.

Hangar Taxilanes

The airport has several hangar taxilanes that allow aircraft access from the apron to the hangar area. These taxilanes are laid out with a main truck line and three branches to where the hangars are built. All taxilanes are 25 feet wide with the main trunk line approximately 200 feet long and the branches each approximately 400 feet long. Each taxilane has a 6 inch centerline stripe, but there is no edge lighting. These taxilanes are design for 12,500 pounds and consist of 2 ½ inches of asphalt surfacing on 11 inches of base course.

Navigational Aids

The airport currently has only two electrical aids to navigation and they are both of the visual type. The first is the airport beacon located adjacent to the parking area. The second is the externally lighted windcone (Photo 3) located to the west of the runway across from the exit taxiway.

Photo 3 - Externally Lighted Windcone

Apron

The Redfield Municipal Airport has two aprons. The first and largest is approximately 460 feet by 115 feet. It has a taxilane centerline marked across the west edge of it for aircraft taxiing to the hangar taxilane. The apron is asphalt surfacing 2 ½ inches thick on top of 10 inches of base course. This pavement was reconstructed in 1998 with the other pavements on the airport. The apron edge has no marking and is not lighted. There is a flood/security light in the eastern edge next to the fueling system to provide light during night operations.

The second apron is smaller and set back farther from the runway centerline. It is approximately 90 feet by 120 feet and extends off the northeast corner of the larger apron. There are three aircraft tie-downs located on this apron and the tie-downs are marked with a 6 inch yellow stripe. There is no edge lighting or security/flood lighting on this apron.

Hangars

The airport currently has twelve hangars. Two of which are located on the larger apron and the remaining ten are located in the hangar area and access the apron by one of the hangar taxilanes. They vary in size, age and condition but all are serviceable. The hangars are privately owned and the land that they sit on is leased from the airport on a yearly basis. There are additional spaces available for new hangars to be built if needed.

Facilities

The facilities of an airport are all the items remaining that are necessary or helpful in the day to day operations of the airport. Items in this section will be anything from the automobile parking lot to perimeter fencing.

First, the airport is not attended so there is no one present to greet arriving planes, answer questions, and assist in the operation. However, the airport has 100LL aviation fuel available 24 hours a day through an automatic fueling system(Photo 4) located on the east side of the larger apron between the two hangars.

Photo 4 - 24-hour Fueling System

This is a self service system with a credit card reader so that pilots can use it anytime they need fuel. Also, there is a small terminal building which can be used by people to get out of the weather while waiting for a ride or for their airplane.

Photo 5 - Terminal Building

This building is approximately 20 feet by 16 feet but has reached the end of its useful life. As can be seen in the photo (Photo 5) the building has deteriorated to the point that it is no longer usable. The parking lot is adjacent to this building and is approximately 150 feet by 100 feet. The parking lot and access road (Photo 6) are gravel surfaced.

Photo 6 - Access Road to Parking Lot

Access onto the airport is limited by a 5-strand barbed wire fence that runs around the perimeter of the airport property. The apron can be accessed by pedestrians through two walk gates located between the terminal building and the southern hangar. Access to the hangar area and apron by vehicles is controlled by an approach and swing gate off the access road just east of the parking lot. This road ties into the hangar taxilane. Ground transportation is available through prior arrangement by calling a number that is posted at the airport and on the airport's website.

Based Aircraft

The airport reported twelve based aircraft in 2007 on its form 5010, ten single engine and two multi-engine aircraft. They also reported 9,000 estimated operations with 6,000 local and 3,000 itinerant. From observations the traffic at the airport is a mix of aerial applicators, air ambulance, private and public business aircraft, government aircraft and private general aviation aircraft.

Chapter Three – Airport Requirements

In this chapter we will identify the areas of need for the airport and ways to address these needs in the future. These areas will be both current problems and future needs as the activity and airport grow.

Future Activity

We will not make any attempt to forecast future activity at the airport other than to take a common sense view that over the lifespan of the airport, use will continue and in all likelihood it will increase and change in amount and type. In view of this, the ALP and master plan were developed by keeping future flexibility as one of the key components. When considering alternatives for addressing a problem, if all other things were equal, but one alternative gave us more flexibility for future growth, we chose that alternative.

Runways

There are several areas of consideration for runways. First is orientation, which is driven primarily by wind coverage, but can be influenced by geography, development, land availability, etc. There is no weather reporting station in Redfield from which wind data could be obtained to evaluate the coverage of the runways, therefore weather data from the Aberdeen Regional Airport was used for the wind coverage calculations.

Second, is the runway's physical dimension. These are based on the requirements of the aircraft using the airport. The existing airport is designed to handle 75% of A & B I aircraft. These are aircraft with wingspans up to 49 feet and approach speeds up to 121 knots. The runway length is based on the FAA's design program for required runway length. A complete printout of the results of this program is included in appendix B. Please note that the FAA no longer has a category for 75% length, the standard now for airports is a length that meets 95% of small aircraft demands.

The last major consideration is the approach category and minimums the runway has or could have. This part of the planning is the most complicated in that it involves different requirements on each end and changes the physical requirements of the runway and the imaginary surfaces that need to be protected for safe aviation.

13/31

Wind coverage for the primary runway should be 95% for a 10.5 knot crosswind. The current orientation of 13/31 only provides 84.81% coverage. Therefore to meet the FAA's requirement of 95% wind coverage would require a crosswind runway. As the runway length is increased the wind coverage does not change so even in the future this runway orientation will require a crosswind runway to provide the wind coverage.

The current length of runway 13/31 (3,300') does not meet the requirements of 95% of the small aircraft fleet. A runway of 3,500 feet is needed to have the length required by 95% of the small aircraft fleet for the mean maximum temperature and elevation of the Redfield Airport. This should be the current length of the Airport's primary runway to meet FAA standards for runway length as stated in Advisory Circular (AC) 150/5325-4B. The ultimate length of the primary runway at Redfield should be able to meet the requirements of 100% of the small aircraft fleet and the length required for this is 4100 feet.

Next are the required surfaces that need to be clear or protected to provide safety for both aviation and the people and property on the ground. There are multiple surfaces and areas that must be evaluated and addressed in this section. To be consistent with the ALP this section will be divided into the Runway Design Surfaces (ALP sheet 4), Part 77 Imaginary Surfaces (ALP sheet 5) and Appendix 2 Approach/Departure Surfaces (ALP sheet 6).

Runway Design Surfaces

These design surfaces are defined in FAA AC 150/5300-13. First is the Runway Protection Zone (RPZ). This is an area off the end of the runway designated to protect people and property on the ground. This area is required to be controlled by the airport and kept clear of any incompatible uses. These uses are typically defined as any occupied structure or area of congregation of people, or storage of hazardous materials. In general it is best to keep these areas clear of any development. The size of the RPZ is listed in Table 2-4 in the AC and is based on the categories of aircraft that use it and visibility minimum for the approach to that runway end.

For the 13 end the RPZ is the smallest size, 1000 feet long, 250 feet wide at the end nearest the runway and 450 feet wide on the far end. The City does not own or control approximately half of this RPZ that lies on the north side of the county road. However, there currently are no incompatible uses in this RPZ. If and when in the future, a Global Positioning System (GPS) based approach procedure is published for this runway end it will not change the size unless the visibility minimum is below 1-mile. If the approach visibility is lowered below 1-mile but above ¾-mile then the RPZ gets much larger to 1700 feet long, 1000 feet wide at the near end and 1510 feet wide on the far end. If it were this size, there would be approximately 10 existing houses that would be in the RPZ. These would not be allowed and therefore either the houses would have to be purchased and removed or the approach would be limited to 1-mile visibility.

For the 31 end, the RPZ is the same as on the 13 end. Again the City does not own approximately half of this area, which lies across Highway 281 to the east. However, there are currently no incompatible uses in the existing RPZ but just recently a house was built just to the east of the end of the RPZ, so this area is seeing some development pressure. A larger RPZ due to a future approach would have the same effect at this end of the runway in that approximately 4 existing houses would be in the larger RPZ.

The other primary design surfaces are the Runway Safety Area (RSA), Runway Object Free Area (ROFA or just OFA) and the Runway Obstacle Free Zone (ROFZ or OFZ). These surfaces are dependent on the aircraft design group (maximum wingspan), the approach category, and

visibility. The dimensions for these surfaces are listed in Table 3-1 in AC 150/5300-13. The current dimensions for the RSA are 120 feet wide centered on the runway and 240 feet beyond each end of the runway. This surface is required to be shaped to certain allowable grades as listed in the AC and be constructed of a material that would support the runway design aircraft during dry conditions. The RSA size does not change for this runway unless the approach minimums are below ¾-mile or the design aircraft is one over 12,500 lbs., therefore the current RSA will meet the future demands of the airport. The OFA dimensions for this runway are 250 feet wide centered on the runway and 240 feet beyond both runway ends. This surface is to be clear of all objects that protrude above the RSA edge elevation, except those items such as navigational aids that are fixed by function. The airport currently meets this standard and the size of this surface would not change unless the approach minimum was lower than 3/4-mile or the design aircraft is increased to over 12,500 lbs. Finally, the OFZ is a flat surface that is at the elevation of the runway centerline and should be clear of any objects that penetrate it unless they are navigational aids mounted on frangible bases that are fixed by function. For the current runway this surface is 250 feet wide centered on the runway and extends 200 feet beyond both ends of the runway. This surface also does not change in size unless the approach visibility is lowered below ¾-mile or the design aircraft is increased over 12,500 lbs.

Part 77 Imaginary Surfaces

Part 77 of the Federal Aviation Regulations covers how obstructions to aviation are determined and the notification requirements of developers who are proposing a structure. These surfaces are evaluated as part of an ALP to make the airport aware of any existing obstructions so that they can be dealt with, and to show where any future development either airport expansion or off airport development may create an obstruction. Part 77 defines the following surfaces; horizontal, conical, primary, approach, and transitional. Each of these surfaces protects a different phase or area of air traffic. Figure 3-1 shows each surface graphically.

The Horizontal surface is an imaginary plane 150 feet above the airport elevation and extending approximately 5,000 feet away from the runway ends. This would increase to 10,000 feet if the design aircraft for the airport was increased to over 12,500 lbs. This surface is depicted on sheet 7 of the ALP. There are no obstructions currently to this surface.

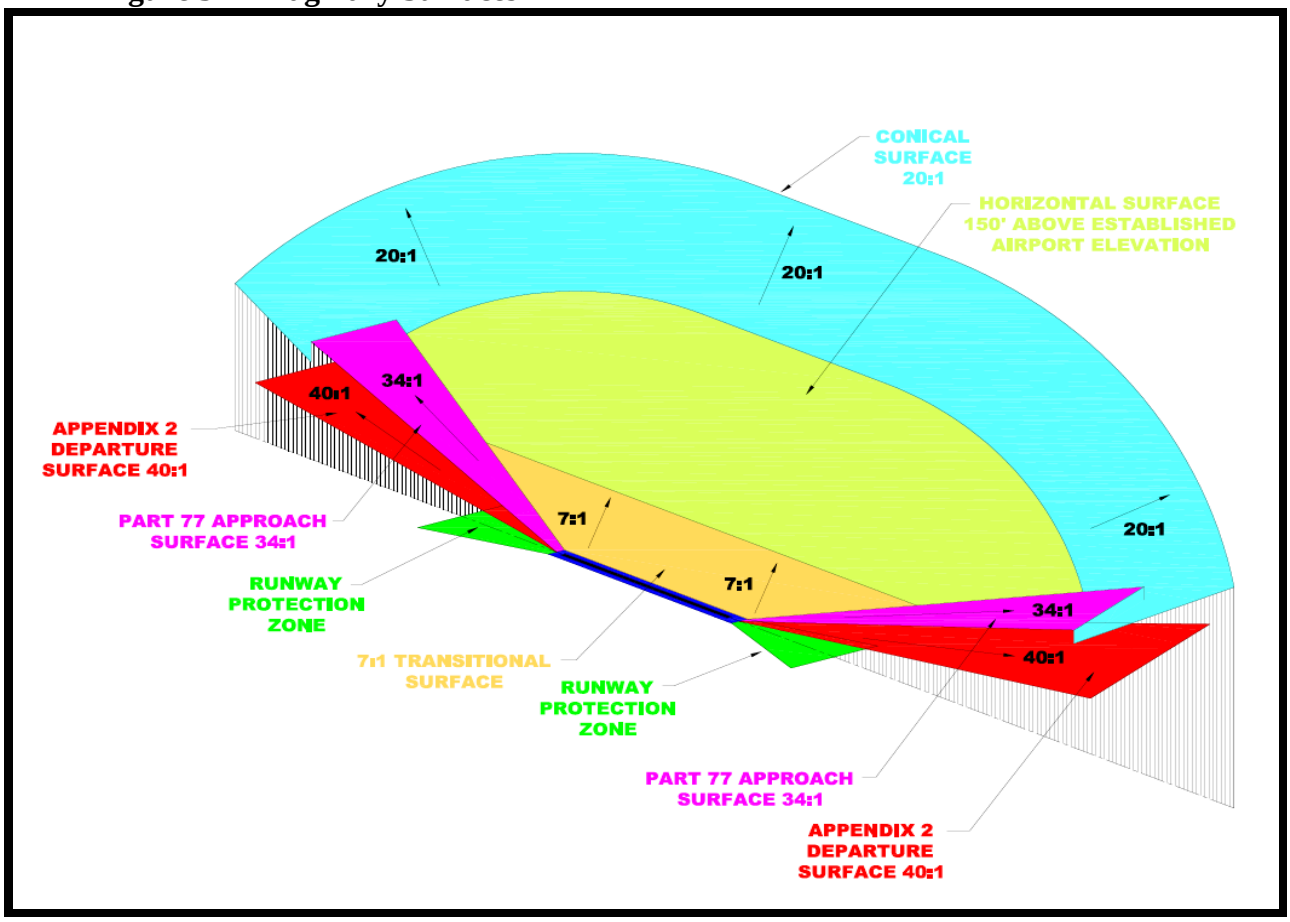
The Conical Surface extends from the horizontal surface a distance of 4,000 feet horizontally and upwards at a 20:1 slope, which means for every 20 feet horizontal it goes up 1 foot so that at the end of the 4,000 feet it will be an additional 200 feet above the airport elevation. This surface is also depicted on sheet 7 of the ALP. There is one tower located to the northeast of the airport in the City that penetrates this surface by 152 feet. This tower was studied by the FAA and allowed to penetrate. This surface would only change in the future if the horizontal surface size changed.

The Primary Surface is currently 250 feet wide centered on the runway and extends 200 feet beyond the runway ends at the elevation of the nearest point on the runway centerline. This surface would increase to 500 feet wide if a nonprecision approach is published for runway 13/31. Currently there are no penetrations to the primary surface for runway 13/31. If it were increased to 500 wide it would extend into the larger apron and preclude parking aircraft on it.

The Approach Surface is centered on the extended runway centerline and extends upward and outward from the end of the primary surface. Currently, for runway 13/31 the approach surface is 250 feet wide at the inner edge and expands to 1,250 feet wide 5,000 feet away from the end of the primary surface. The current approach surface also slopes upward at a 20:1 slope. The approach surface on runway end 13 has no penetrations. The approach surface on the 31 end is penetrated by US Highway 281 by approximately 3 feet. The actual pavement of the highway does not penetrate the surface, but to allow for vehicles traveling on the highway, a height of 15 feet is added to the surface elevation, and it is this height that penetrates the approach surface. Therefore the only real penetration to the surface is when a vehicle over 12 feet tall is traveling down the highway in this area. Ultimately the FAA will evaluate this penetration as part of the evaluation of this ALP and Master Plan and make a determination whether this penetration is a hazard to aviation. If that is the case, then an alternative to eliminate this penetration will have to be developed.

The Transitional Surface extends outward and upward at right angles to the runway centerline at a slope of 7:1 from the sides of the primary surface and the approach surfaces. Runway 13/31 does not have any penetrations to the transitional surface along the primary surface, but there is a tree that penetrates on the 13 end approximately 22 feet off the west side of the approach surface. This tree is off airport property so the City personnel would have to negotiate with the land owner to get permission to remove the tree or trim it below the surface. However, as stated in the paragraph on the primary surface, if an instrument approach is published for runway 13/31, the primary surface goes to 500 feet wide. This means that the transitional surface starts farther out, and then all the hangars along the apron and in the front row of the hangar area would be penetrations to this surface. These penetrations would vary from 1 to 6 feet. As was discussed previously, part of the front apron would be in the primary surface and the remaining portion would be under the transitional surface and practically any aircraft parked on the apron would be a penetration to this surface.

Figure 3-1 Imaginary Surfaces



Appendix 2 Surfaces

The last set of surfaces that must be evaluated for a runway/airport are the surfaces listed in Appendix 2 of FAA AC 150/5300-13 Airport Design. These surfaces deal with siting the end of the runway to provide adequate obstacle clearance for approaches and departures. Table A2-1 Approach/Departure Requirements Table defines the size of these surfaces and which are applicable to each runway end.

The first and easiest surface to define is the departure surface. This surface starts centered on the runway end and extends outward and upward along the extended runway centerline. The surface slopes upward at a 40 to 1 slope from the elevation of the runway centerline at the threshold, it is 1,000 feet wide at the runway end and widens to 6,466 feet at its end which is 10,200 feet from the end of the runway. This surface is the same for all runways that have an instrument departure procedure. Therefore, this surface is not applied to runway 13/31 currently, but would be applied to both ends if a departure procedure is published in the future. If applied to runway end 13 there would be multiple penetrations. Some of the hazards would be trees to the west of the runway that would penetrate up to 40 feet and power poles in the same area that would penetrate up to 11 feet. On the 31 end, a portion of US Highway 281 would penetrate this surface up to 16 feet when the additional 15 feet of elevation is included to adjust for the

presence of vehicles. There are also several trees that would penetrate this surface up to 16 feet on the east side of the highway and a house in the same area that would penetrate the surface by approximately 3 feet. Keep in mind this surface only applies if an instrument procedure is published for the runway, and even then, the obstruction may or may not require a change to the departure procedure.

The Approach Surface is a lot more complicated. Table A2-1 lists 10 different approaches depending on the type of aircraft, and type of approach. In general the approach surface starts at the runway end or 200 feet out from it and extends outward and upward away from the runway end centered on the extended runway centerline. The existing approach surface for both ends of runway 13/31 starts at the runway end, is 250 feet wide, widens to 700 feet wide at 2, 250 feet out, and maintains this width for an additional 2,750 feet where it ends. The approach surface slopes upward at a constant 20 to 1 slope. This approach surface is for visual runways serving small airplanes only with approach speeds of 50 knots or more.

However with the proliferation of GPS equipment the usefulness of the airport would greatly increase in the future by having a GPS approach with a visibility minimum of 1-mile. Even more useful is a GPS approach that also provides vertical guidance. For the former, the surface would increase to 400 feet wide closest to the runway and widen to 3,800 feet wide at 10,000 feet out. The slope remains a 20 to 1. And for the latter, the surface decreases to 130 feet wide at the end of the runway, and expands to 760 feet wide 10,000 feet out. The slope changes to a 30 to 1, and because it is flatter would now be penetrated by many more objects that did not penetrate the 20 to 1 surface.

Finally, the lighting system on the primary runway should be upgraded to a Medium Intensity Runway Light (MIRL) system. These lights have multiple steps of intensity (brightness) that can be adjusted by the pilot. These lights are also required for an approach with a visibility minimum less than 1-mile.

1/19

This runway was closed to air traffic during the process of completing this ALP update because several obstructions were found in the approach surface to the 19 end. These items will be address more completely in this section and alternatives to correct this situation will be discussed in the next chapter.

Due to the lack of 95% wind coverage by the primary runway a crosswind runway for the aircraft that cannot handle a crosswind over 10.5 knots was constructed. Runway 1/19 is a turf strip to be used for these aircraft. When used in combination with runway 13/31 these two runways provide 97.78% wind coverage for a 10.5 knot crosswind. Therefore, the airport has adequate wind coverage with these two runways.

The current length of runway 1/19 is 2,565 feet. It is not known why this was the length built. One possibility is that an old rule of thumb for crosswind runway length was 80% of the primary runway. Using this with the 3,300 foot long primary you would get 2,640 feet which is very close to the actual length. That being said, the FAA's standard for crosswind length is the length

required by the aircraft needing the crosswind runway. Therefore, at the Redfield Municipal Airport the crosswind runway should be long enough to handle the small A & B I aircraft during crosswind conditions. This length when calculated based on serving 95% of this category and group of aircraft is the same as for the primary runway or 3,500 feet. To get to this length for the current alignment the runway would need to be extended almost 1,000 feet to the southwest. This extension would require the purchase of land and the earthwork to construct the additional land strip.

Runway Design Surfaces

The RPZs for both ends of runway 01/19 are the same size. It starts 200 feet from the end of the landing strip, is 250 feet wide at the closest end and expands to 450 feet wide 1,000 feet farther out. On the 01 end, while the airport does not own or directly control all of the RPZ, there are no incompatible uses in the area. However, the City should look at either purchasing this property, which is preferred, or to zone the land to preclude any incompatible uses. On the 19 end the majority of the RPZ is outside the airport property. There are approximately eight houses that are at least partially in the RPZ. These are incompatible uses and the City needs to look at alternatives to remove them from the RPZ or move the RPZ so that the houses are outside it.

The RSA for this runway is 120 feet wide centered on the landing strip centerline and extends 240 feet beyond the runway end. No large inconsistencies to the grading in this area were noted during the survey portion of this ALP update. The OFA and OFZ for this runway both have the same dimensions of 250 feet wide and 240 feet beyond the runway ends. There were no penetrations noted to these surfaces.

Part 77 Imaginary Surfaces

The Horizontal surface is the same for runway 01/19 as it is for 13/31, the plane 150 feet above the airport elevation and extending approximately 5,000 away from the runway ends. There are no obstructions currently to this surface.

Again, the Conical Surface extends from the horizontal surface a distance of 4,000 horizontally and upwards at a 20:1 slope. This surface is also depicted on sheet 7 of the ALP. The same tower listed above is the only penetration to this surface. This surface would only change in the future if the horizontal surface size changed.

The Primary Surface is currently a plane 250 feet wide centered on the runway and ends at the runway end and is at the elevation of the nearest point on the runway centerline. There are no penetrations to the primary surface.

The Approach surface to both ends of runway 01/19 starts at the runway end, is 250 feet wide and extends outward and upward at a 20 to 1 slope to 1,250 feet wide, 5,000 feet from the runway end. There are no penetrations to the surface on the 01 end. However, on the 19 end there are several trees that penetrate the surface by up to 19 feet. These penetrations create a hazard to aviation and the trees must be removed prior to the use of this runway. As stated earlier this runway is closed pending the outcome of this ALP update. Alternatives to remove these penetrations will be discussed in the next chapter.

The Transitional Surface slopes up at 7 to 1 from the edge of the primary surface and approach surface. For runway 01/19 this surface is clear and would not change unless the either of the other surfaces changed.

Appendix 2 Surfaces

There is no departure surface shown for runway 01/19 on this ALP. The reason for this is that the departure surface is intended for runways that support instrument departure procedures. This runway is not to be used for instrument departures. Also, if the departure surface was added to this runway the number of penetrations on the 19 end would increase and include not only the trees that penetrate the approach surface but the asphalt road and several houses/buildings.

As shown on sheet 12 of the ALP there are several trees that penetrate the approach surface on the 19 end. This approach surface is at a 20 to 1 slope, starts at the runway end is 250 feet wide at the beginning and expands to 700 feet wide, 2,250 feet out from the runway and maintains that width another 2,750 feet. This approach surface cannot be changed to anything more restrictive unless the runway is paved and marked. Then an approach procedure could be published for the runway, but that is only possible if the obstructions were removed.

Taxiways

All of the taxiways are currently built to A & B I standards.

Exit Taxiway

The current exit taxiway meets the needs of the aircraft using the airport. The surfacing is actually wider than FAA standards require for design group I aircraft. However, this is not a violation and does make it easier for larger aircraft to taxi and turn on the taxiway. This large size does increase pavement maintenance costs and may not all be eligible for an FAA Airport Improvement Program (AIP) grant when it comes time to reconstruct or rehabilitate the taxiway. The edge lights on the exit taxiway should also be upgraded to medium intensity along with the primary runway lights.

Parallel Taxiway

The airport does not have a parallel taxiway, and the amount of traffic combined with the fact that the runways are for visual approaches only, does not support the need for one. However, in the future, when the airport gets a non precision approach, the runway should have at a minimum turnarounds on the end that allow aircraft to get clear of the runway when turning around and going through preflight checks. These turnarounds are typically 250 feet long and 80 feet wide. This also places the turnarounds in line with a future parallel taxiway.

A parallel taxiway is required for a GPS approach with a visibility minimum under 1-mile.

Hangar Taxilanes

The current hangar taxilanes serve the existing hangars sufficiently, although they all go to the apron by the same truck taxilane, one aircraft parked on the taxilane could block access for any

other aircraft. This situation can happen when someone pulls their aircraft out of the hangar to inspect, preflight check, wash it, or for any other reason. Fortunately, because this is a small airport this does not occur often and the plane operator is usually there to move the aircraft to allow others to get through. There are currently several spots along the taxilanes where new hangars could be built but expansion needs to be addressed to allow additional growth.

Navigational Aids

The existing beacon is in good condition and is centrally located on the airport to help aircraft locate the airport in reduced visibility. The existing windcone is shown in photo 3 and is the externally lighted type. As can be seen, the mast holding the lights is leaning and the whole assembly is reaching the end of its service life. This windcone needs to be replaced in the near future. Also, another common visual aid that enhances the safety of an airport is the installation of Precision Approach Path Indicator (PAPI) lights. These lights are set on the left of a runway and are projected upward at the approach slope for a runway. The pilot can use these lights to tell if he/she is too high or too low.

Apron

The existing apron meets the current needs of the airport. The larger apron is not set up well for parking aircraft because it is not wide enough to allow aircraft to maneuver around them. However, adding the smaller apron to the northwest gives an area to tie aircraft down and does not block the main apron for maneuvering aircraft and temporary loading and unloading. Future requirements for additional aircraft tie downs and loading of multiple aircraft will require a larger apron.

Hangars

Presently all based aircraft at Redfield Municipal Airport are kept in hangars. There are sufficient hangars to meet the current demand. There also is room for approximately five more hangars to be built along the existing hangar taxilanes. Once these spaces are filled, additional space will need to be provided by constructing a new area or expanding the existing one.

Terminal – Snow Removal Equipment Building

The terminal building has reached the end of its useful life span. While it is in a good location it no longer serves the purpose it was built for. There is no heat in it and no bathroom.

The airport does not have a place to store its snow removal equipment. A simple unheated building approximately 24 feet by 36 feet would give the airport the room for storing a snow removal vehicle and accessories.

Wildlife Hazards

No wildlife hazard assessment has been completed for the Redfield Municipal Airport. There are some conclusions that can be made based on the general area, type of habitat and the observations of the airport users. As seen in Figure 3-2 the areas on the airport not paved or

mowed are used to grow hay. Typically this is not a major attraction to wildlife species that are hazardous to aviation.

There have not been any concerns expressed by pilots about deer being on or near the runway. However, deer are always a major concern since they are most active at dawn and dusk when light conditions make them hard to see and because of their large size they can create a lot of damage if they are struck. Therefore, continued efforts should be made to keep deer off the airport. This includes maintaining no habitat for deer and constructing a 10 feet high wildlife fence to keep deer from traveling across the airport. This fence also helps to keep other large animals off the airport, such as coyotes or domestic animals like dogs. In addition it enhances the security of the airport by providing a positive barrier to any people around the edge of the airport.

The other major group of wildlife that can be especially dangerous to aviation are birds. All airports in the eastern portion of South Dakota are affected during the migration of waterfowl in the spring and fall of the year. This however, is not an isolated local problem and there is little that an airport can do to mitigate this general problem. However, as can be seen on figure 3-2 there is a large wetland just 300 feet off the end of runway 31. Waterfowl of all kinds have been observed on this wetland. Duck and geese can both be found there feeding, resting and some even nest there. Along with these, there are also seagulls and other lesser species that use this wetland.

The FAA has recognized that wetlands can be major attractants to wildlife on airports and therefore have recommended in AC 150/5200-33 Hazardous Wildlife Attractants on or Near Airports that any new airports of the size and type of Redfield be located at least 5,000 feet away from wetlands. They also recommend that the wildlife hazards from existing wetlands be mitigated in some manner. While the general presence of waterfowl and birds around the airport cannot be eliminated, steps should be taken to minimize the amount of birds in the local vicinity of the airport.

FIGURE 3-2 Wildlife Attractants

Summary of Requirements

This chapter has identified the requirements and/or issues that need to be addressed in the future of the Redfield Municipal Airport.

Chapter Four – Development Concepts

Summary of Requirements

The last chapter identified the requirements and/or issues that need to be addressed in the future of the Redfield Municipal Airport. The following is review of the items:

- Lengthen primary runway to 3,500 feet with room for future extension
- Airport does not own or control all the existing RPZs
- Eliminate penetration by the highway to the approach surface on the 31 end
- Desire for an instrument approach procedure
- PAPI lights installed on the primary runway
- Medium Intensity Light system for the primary runway and taxiway
- Multiple penetrations to imaginary surfaces would arise if an approach is published for the airport as is
- Plan for future parallel taxiway to allow the lowest approach minimums possible
- Penetrations to 19 end approach surface
- Need for crosswind runway with current alignment
- Crosswind runway closed due to appendix II penetration
- Larger apron may become unusable if approach is published due to enlarged primary surface
- Need to replace existing terminal building and provide a place to store snow removal equipment
- Install wildlife fence
- Mitigate wildlife hazard created by large wetland off 31 end

Alternatives

Several alternatives with multiple variations were considered during the process of this master plan. The major ones are listed below with a brief description.

A. Doing nothing: This leaves the airport as it is and makes no improvements to it.

B. Extend the existing runway 13/31 to 3,500 feet and shift cross wind runway to the southwest to clear the 19 end RPZ and extend the runway to 3,500 feet to meet FAA standards. Construct parallel taxiway for runway 13/31 and expand apron and hangar area to the south for expansion.

C. Construct a new primary runway 17/35, 3,500 feet long with ultimate potential to be extended to 4,100 feet. Abandon cross wind runway 1/19. Use runway 13/31 as the cross wind runway and when the current pavement reaches the end of it useful life make a determination as to what surface is most economical. Fill in the portion of the wetland that is necessary to construct the 35 end of the runway. Construct a parallel taxiway from the current exit taxiway to the 35 end of the new runway and a taxiway from the current

apron to the 17 end. Extend hangar area to the southeast and expand the apron to the northwest along the parallel taxiway.

All of these alternatives would include the installation of a 10 foot high wildlife fence around the airport and mitigation measures to reduce the use by wildlife of the large wetland to the south of the airport. They would also include the construction of a new general aviation terminal with electrical vault and a snow removal equipment building.

Each of these alternatives was evaluated on its ability to meet the requirements as set forth in the previous chapter and best match the land use and developments around the airport. This was done while still keeping the overall plan as flexible as possible to allow for unexpected changes in the future.

Alternative Evaluation

A. Leaving the airport as is does nothing to meet the current and future needs of the airport. Most importantly the loss of the existing cross wind runway lowers the usefulness of the airport to only 84% of the time due to excessive cross winds. Also, without any extension the airport does not meet the FAAs minimum requirements for length. For these reasons this alternative was not chosen as the preferred alternative.

B. Extending the runways in their current alignments would meet several of the requirements listed in the previous chapter. Specifically, it would allow the runways to meet the FAA requirements for length, PAPI lights and a MIRL system could be added to runway 13/31, a parallel taxiway could be constructed for runway 13/31, and by moving 1/19 to the southwest it would eliminate the penetration on the 19 end and meet the FAA criteria for wind coverage.

However, this alternative does not meet all the requirements. First, although runway 13/31 could be extended to the northwest to meet the length requirement for 95% of small aircraft it could not be extended to the next step for 100% of small aircraft. Also, US Highway 281 would still be a penetration to the Part 77 approach surface. Also to get a published approach with this alternative, either the minimums would have to be very high, or the airport would have to spend a lot of time and money to purchase and/or eliminate a number of items that would penetrate the approach and departure surfaces. A new apron to the northwest of the existing apron would need to be completed and the existing one removed if an approach is published since the apron would be in the primary surface. Finally, by keeping 13/31 as the primary runway the majority of flights would still be taking off or landing over the large wetland off the 31 end, with its inherent wildlife hazards.

Finally, this alternative does not leave much flexibility for future change. The runway cannot be lengthened any more without a costly relocation of a major road. The hangar and apron area can only be developed farther away from the runway to stay out of the imaginary surfaces. For all these reasons this alternative was not chosen as the preferred alternative.

C. Constructing a new primary runway 17/35, abandoning runway 1/19 and using runway 13/31 as the new crosswind can meet all of the requirements as listed in the previous chapter. The new runway would be constructed to 3,500 feet and give room to extend it to 4,000 feet for 100% of the small aircraft fleet. When purchasing land for the new runway the airport can also purchase the land needed to control the RPZs on runway 13/31. These would remain the smaller ones since no approach would be published for this runway. As for an instrument approach this could be published for the new runway 17/35 and the larger RPZs and imaginary surfaces can be protected from the start so that obstructions will not cause higher minima. An alignment of 17/35 was chosen because it best matched the prevailing wind and fit the site with very little impact to structures. The new wind coverage for this runway is 91.43% for a 10.5 knot allowable crosswind component, which is much higher than for 13/31. By keeping the existing runway 13/31 operational the total wind coverage goes to 96.22% to meet the FAA requirement of 95%.

By making 17/35 the primary runway, we can continue to use both of the existing aprons on the airport. When an approach is published, it will not increase the imaginary surfaces sizes on runway 13/31, so the aprons will not become obstructions. This layout also allows for the expansion of the hangar area to the southeast and the apron to the northwest. All of the existing hangars and structures could remain in their current locations and only a slightly longer taxiing time would bring them to the new runway.

Because wind coverage requirements can be met by the new runway and 13/31, runway 1/19 can be closed and abandoned. This eliminates all of the imaginary surface penetrations and non compatible land use in the RPZs for this runway. Meanwhile, runway 13/31 is a much better runway with its paved surface, longer length, pavement marking and runway lights. This runway will cost more to maintain than the old cross wind but can be kept open during the winter months thus providing twice the service as the turf landing strip. As this pavement ages and reaches the end of its useful life a decision by the airport, SD-DOT, (South Dakota Department of Transportation) and FAA, can be made as to the best way to reconstruct it within the available funds. That may be a simple overlay, a mill and overlay, or grinding and constructing a turf-aggregate runway. However, that will not need to be decided for several more years as the existing pavement is in good to very good condition.

Wildlife hazards could be reduced as the 35 end and its required safety area grading would extend through the edge of the wetland area. That portion of the wetland would be filled, thereby eliminating the wildlife attractant right off the end of the primary runway. The rest of the wetland would probably remain, but to reduce the attractiveness of the wetland to wildlife, several mitigation measures could be taken. These are commonly wires with Mylar tape, netting or harassment by airport personnel. Whichever method is used, the majority of traffic would now use runway 17/35, which does not bring them over the wetland. In addition a perimeter wildlife fence can be constructed to limit access by deer and other large animals.

There are a couple of drawbacks to this alternative. First, the penetration of runway 31's Part 77 approach surface by Highway 281 would not be eliminated. This condition has been present since the construction of the current runway and the road does not penetrate the Appendix II approach surface. In the end the FAA will need to make a determination during the airspacing of this ALP whether this penetration is a hazard that needs to be corrected or just noted so that pilots are aware of it. This alternative does improve this condition in that, this will no longer be the primary runway and the number of flights using this runway would be reduced substantially. In the end if the FAA determines that this penetration is a hazard and must be corrected, the runway end could be moved 60 feet and the runway shortened or the length maintained by adding this distance to the 13 end. Second is the cost of constructing a new runway with the required land purchases.

However, considering all the advantages in light of the few disadvantages this alternative was chosen as the preferred alternative and used to develop the ALP.

Phased Development

Since the ALP/Master plan is set up examine a 10 to 20 year time frame, the overall development of the preferred alternative may take that amount of time. This depends on several factors such as funding available, future demand, and length of time needed for planning, environmental review, and construction. Due to these reasons, the development will be in phases over a 20 year period of time. Obviously the needs and development in the near future are easier to assess and meet than those farther out. Therefore the time lines for the three phases are 0-5 years, 6-10 years, and 10-20 years.

Future Phase I (2008-2012)

This phase includes the first five years and should be the most accurate. The primary focus in this stage is to build the new primary runway 17/35. This will include the filling of that part of the wetland necessary to construct the runway and graded safety areas. In conjunction with the runway, a new MIRL system would be installed with PAPI lights at both ends of the runway. During this electrical work the existing wind cone will be replaced with a current internally lit one. Prior to any of this work, an environmental assessment must be completed to assure that there are no significant environmental impacts caused by this work. Also, the turf landing strip 1/19 will be abandoned and obliterated during this time frame and the RPZs for runway 13/31 will be acquired. Finally, the perimeter wildlife fence should be installed around the whole airfield.

Future Phase II (2013-2017)

This second phase is characterized by making secondary improvements to the airfield to compliment the phase I accomplishments. First, a new combination terminal/snow removal equipment (SRE) building should be built to replace the current terminal building. This building would be located on the apron with a lounge area for pilots and passengers to get out of the weather refresh themselves in the restroom and wait for ground transportation or flight planning.

On the backside (landside) of the building would be the SRE bay. This would house the SRE equipment with a large overhead door for access from the parking lot side. As for the parking lot and access road, these will be paved to improve access and make snow removal easier and more efficient. Also during this time frame, the new runway pavement may have started to have some cracks open up. To maximize the useful life of the pavement, these cracks should be routed and sealed to keep water and debris from entering them and deteriorating the pavement and base in these areas. Finally, by the end of this period, the pavement of the apron and taxiways will probably have deteriorated to the point that they will need to be reconstructed. During this process, if demand dictates it, the hangar taxilane and/or the apron can be expanded to accommodate the additional need.

Ultimate Phase (2018-2027)

This time frame is the hardest to plan for since so many things may have changed in the preceding 10 years. However, there are several areas that will need to be addressed during this time. First, if demand continues to grow and larger aircraft are used, the runway will need to be extended to provide service to 100% of the small aircraft fleet. This will require the purchase of additional land and the construction of the extension, including extending the lighting system. Prior to this an environmental assessment will need to be completed to ensure that there are no significant impacts caused by this project. A parallel taxiway is also planned for this phase. This taxiway is needed to allow the lowest minima to be published for a GPS approach. Finally, during this phase the existing pavement will need to have the cracks sealed and possibly a rejuvenator applied and at the end of the phase the main runway will most likely need to be resurfaced with an asphalt overlay or something similar.

Capital Improvement Plan (CIP)

Table 4-1 shows a possible development plan with capital improvement items and estimate costs in today's dollars. Keep in mind that this is a tentative plan and can and should be revised and adapted as needed in the future.

Table 4-1

CAPITAL IMPROVEMENT PLAN
REDFIELD MUNICIPAL AIRPORT

Future Phase I: 2008-2012

Program Year	Description	Estimated Cost
2008	Environmental Assessment for New Runway 17/35, Wildlife Mitigation and purchase of 13/31 RPZs	$50,000.00
	Pavement Rehabilitation	$40,000.00
	TOTAL	**$90,000.00**
2009	Land Acquisition for New Runway and RPZs	$200,000.00
	Design for New Runway	$75,000.00
	TOTAL	**$275,000.00**
2010	Construct New Runway with MIRL system	$5,000,000.00
	TOTAL	**$5,000,000.00**
2011	No Project	$0.00
2012	Install Wildlife Fence	$300,000.00
	TOTAL	**$300,000.00**
	Future Phase I Total	**$5,665,000.00**

Future Phase II: 2013-2017

Program Year	Description	Estimated Cost
2013	Terminal/SRE building	$75,000.00
	Pave Parking lot and Access Road	$75,000.00
	TOTAL	**$150,000.00**
2014	Pavement Rehabilitation	$40,000.00
	SRE Equipment	$80,000.00
	TOTAL	**$120,000.00**
2015	No Project	$0.00

2016	No Project	$0.00
2017	Reconstruct Apron and Taxiways and expand Hangar taxilanes	$150,000.00
	TOTAL	**$150,000.00**
	Future Phase II Total	**$420,000.00**
Ultimate: 2018-2028		
Program Year	**Description**	**Estimated Cost**
2018	No Project	$0.00
2019	Environmental Assessment for Runway Extension	$50,000.00
	Pavement Rehabilitation	$60,000.00
	TOTAL	**$110,000.00**
2020	Land Acquisition for Runway 17/35 Extension	$75,000.00
	Design for Runway Extension	$65,000.00
	TOTAL	**$140,000.00**
2021	Runway 17/35 Extension including Rehabilitation of Remaining Runway Pavement	$2,000,000.00
	TOTAL	**$2,000,000.00**
2022	No Project	$0.00
2023	Design for Parallel Taxiway	$75,000.00
	Pavement Rehabilitation	$35,000.00
	TOTAL	**$110,000.00**
2024	Construct Parallel Taxiway	$750,000.00
	TOTAL	**$750,000.00**
2025	No Project	$0.00
2026	No Project	$0.00
2027	Pavement Rehabilitation/Reconstruction	$1,500,000.00
	TOTAL	**$1,500,000.00**
	Ultimate Total	**$4,610,000.00**
	Total Capital Projects	**$10,695,000.00**

Potential Funding

In general funding for projects at small general aviation airports like Redfield Municipal Airport comes from any of three sources; local city funds, South Dakota Aeronautic Trust Fund, or FAA Airport Improvement Program (AIP) grants. Currently, the FAA grants are set at a 95% federal, 3% local and 2% State share level. However, Congress is in the process of rewriting legislation that would affect how the FAA is funded and may affect how the AIP grants are structured.

The funds for the FAA's share of grants come from three different types of funds. First are entitlement funds that are designated to an individual airport and are reserved for that airport's use. Currently, Redfield receives $150,000 of FAA AIP entitlement funds per year, but this amount may change with any new legislation by Congress. These funds are dedicated to the airport by the FAA, but do not need to be spent every year. They may be retained for up to four years before the airport would lose them. Second are State apportionment funds. These are FAA funds set aside for the State to be used at any airport in the State. The State Aeronautics Commission decides the priority of projects in the State and which projects will receive a share of these funds. Third are FAA discretionary funds. These are funds the FAA uses nationally to fund large high priority projects. The FAA on a national level decides which projects to fund with these monies based on a national review.

The State's portion of the funding comes from the State Aviation Trust fund. Typically the State will participate in all projects deemed AIP eligible and funded by the FAA. Finally, the City's portion of the funding comes from its General fund.

Chapter Five – Environmental Overview

The environmental overview portion of the master plan is not a complete review or assessment of the impacts of any of the proposed alternatives. Instead it gives an overview of the environmental review process and looks at what areas may be affected by the proposed improvements.

The National Environmental Policy Act of 1969 is the basis for the requirements for environmental review of federally funded projects. To assist airport sponsors in fulfilling these requirements the FAA has published FAA Orders 1050.1E Environmental Impacts: Policies and Procedures and 5050.4B Airport Environmental Handbook. The FAA has also published an Environmental Desk Reference to assist with the review.

Typically these reviews take one of three forms. The shortest and simplest is a Categorical Exclusion (CatEx). These are actions that the FAA has reviewed in the past and ruled that they do not have significant impacts. Therefore, if a project meets the requirements for a CatEx, you must document this, but no further review is necessary. Some projects that fit this category are existing runway reconstruction, ALP approval, fencing, etc.

The next level of review is the Environmental Assessment (EA). This is performed when the project has the possibility to produce significant impacts. The final level of review is the Environmental Impact Statement (EIS). These are performed when the project has a significant impact or is controversial in nature.

Depending on the review used, the impacts are broken into the categories as shown in Table 5-1.

ENVIRONMENTAL IMPACT CATEGORY	CHAPTER
Air Quality	1
Biotic Resources	2
Coastal Barriers	3
Coastal Zone Management	4
Compatible Land Use	5
Construction	6
Section 4(f)	7
Federally-listed Endangered and Threatened Species	8
Energy Supplies, Natural Resources, and Sustainable Design	9
Environmental Justice	10
Farmlands	11
Floodplains	12
Hazardous Materials	13
Historic and Archeological	14
Induced Socioeconomic	15
Light Emissions and Visual Effects	16
Noise	17
Social Impacts	18
Solid Waste	19
Water Quality	20
Wetlands	21
Wild and Scenic Rivers	22
Cumulative Impacts	23

Table 5-1 taken from FAA's Environmental Desk Reference

Several of these categories will probably not be applicable to any of the proposed project at the Redfield Municipal Airport. These are categories like Coastal Barriers and Coastal Resources since none exist near Redfield. The same can be said for Wild and Scenic Rivers. Other impact categories are probably not applicable based on the size and usage of the airport. These would be Noise, Light Emissions and Visual Effects, Social Impacts, Solid Waste, Air Quality (other than possible construction impacts) and Environmental Justice.

The most probable area of impact is associated with the wetland to the south of the airport. Due to construction of the new runway, portions of this wetland will need to be filled, and this may affect wildlife habitat and water quality. Typically when wetlands must be filled as part of a project, the impacts can be mitigated by replacing the wetland in another area. This is accomplished in a few different ways, but usually involved restoring or creating a new wetland to replace the functions of the wetland that was lost. Other potential impacts include the loss of farmland when converted to airport use and construction impacts.

All of these areas will be reviewed as part of the environmental review associated with each project prior to receiving grant funding for the project.

Appendix A – Wind Rose Information