SANDERSON STEWART

URBAN PLANNING STUDY

FOR

STALEY AND FORBES PROPERTIES - GENERALLY DESCRIBED AS:
AMENDED TRACT 2A, AMENDED TRACTS 2 AND 3,
CERTIFICATE OF SURVEY NO. 2465
AND TRACT 1, CERTIFICATE OF SURVEY NO. 1871
BILLINGS, MONTANA

PREPARED FOR:
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175 NORTH 27th STREET, SUITE 900
BILLINGS, MONTANA 59101

AND

CITY OF BILLINGS
210 N. 27TH STREET
BILLINGS, MT 59102

November 10, 2016
Project Number: 16064

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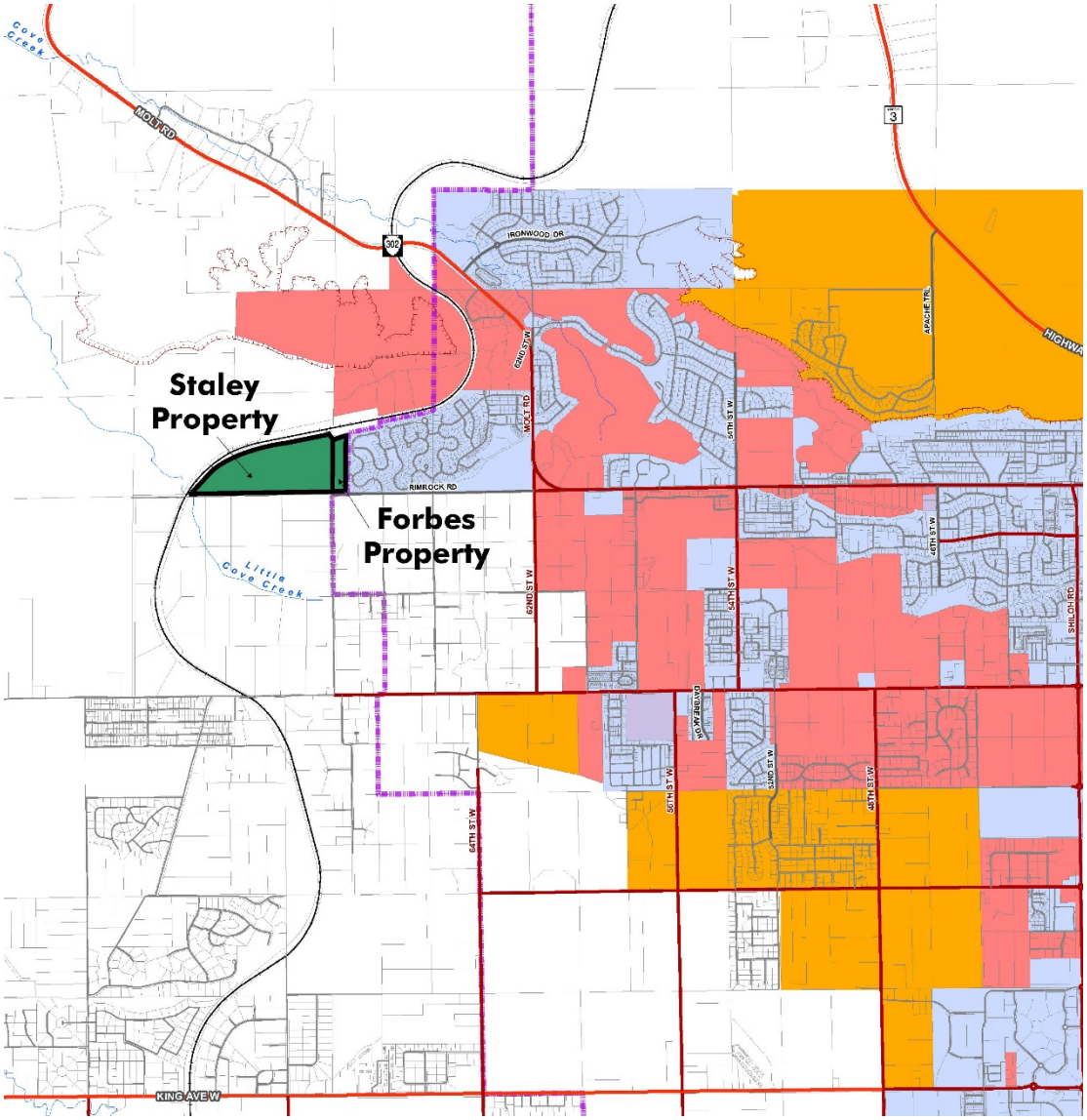
Executive Summary

The Staley and Forbes Properties Urban Planning Study has been prepared for two parcels of land currently under contract by Mr. Gary Oakland. The two properties are legally described as:

1. Tract 2A, Amended Tract 2 and 3, Certificate of Survey Number 2465 (a 14.50-acre property, known as the Forbes Parcel), and
2. Tract 1, Certificate of Survey Number 1871 (a 101.68-acre property, also known as the Staley Parcel).

This study area is approximately 116.18 acres of land. The site is currently non-irrigated agricultural land, and has been used to grow dryland grain. The owners are in the early stages of planning for the future use of this property and are requesting that the City's Limits of Annexation Map be amended to locate the study area into the "red area", which would allow for future annexation within the next year.



A portion of the Limits of Annexation Map is shown with the Study Area as indicated above. Previous Studies incorporating and including the subject property area include:

	Study	Date	Author	Commissioned By
1.	W.O. 16-14 West Billings Stormwater Development Plan	2016	DOWL	City of Billings Public Works
2.	Potential Alternative Feasibility Study West Billings Flood Mitigation and Groundwater Recharge Study	2011	Atkins	City of Billings Planning Department
3.	West Billings Flood Mitigation and Groundwater Recharge Study	2010	PBS&J	City of Billings Planning Department
4.	Integrated Water Plan Implementation Water Master Plan Update	2015	Morrison-Maierle	City of Billings Engineering Department
5.	Northwest Trunk Water and Sanitary Sewer	2001	Engineering, Inc.	City of Billings Public Utilities Department

Land Use

Existing

The Study Area encompasses approximately 116.18 acres of farmland outside of the existing planning and zoning jurisdiction. The site has exclusively been used for agricultural purposes, primarily for growing dry land grains.
Exhibit A shows an aerial exhibit of the Study Area.

Proposed

The two properties in the Study Area are currently under contract for purchase. The new owner wishes to develop a single-family detached neighborhood with the possibility of including a limited number of duplex units. This proposed development will be an extension of the existing Copper Ridge Subdivision, located immediately east of the subject property. Copper Ridge continues grow and is close to being built out with few lots left for development. The location of the Copper Ridge Subdivision, and the product type offered in this project, has been very well received by the market. It is anticipated the demand for housing in the west end of Billings will continue to be strong. Since the subject property is associated with the future expansion of the Copper Ridge, the developer expects to continue his development program on this adjacent property.
A copy of the conceptual plan is found at the back of this Study and referred to as Exhibit C.

Projected and Estimated Population

As previously stated, it is intended that the property will ultimately be planned for new single family residential development. In estimating the projected population, a conceptual site plan study has been prepared envisioning an extension of the existing Copper Ridge residential project that is contiguous with the eastern boundary of the subject properties. The density proposed for this future residential project is approximately 3.5 dwelling units per gross acre or 4.83 units/net acre excluding right-of-way and park. The Water and Wastewater Facilities Master Plan 2006 (Master Plan),

prepared for the City of Billings by HDR, Inc., HKM, Inc., and JGA, Inc., assumes 2.3 persons per dwelling unit. Using this estimation, the buildout of the combined properties would result with an estimated population of about 874 residents (380 single family dwelling units times 2.3 persons per dwelling unit).

Development Timelines

As a continuation of the existing Copper Ridge project, the development of these subject properties would potentially begin when all permits and entitlements are obtained from the City of Billings. The first phase of this project would be anticipated mid-to-late 2017 if the entitlement process proceeds according to plan. Should the City move this property into the "red area", the owner/developer would sequentially finalize a conceptual master plan and continue the process to further their goals and objectives. The overall project has an eight to ten year build out for the 380 units, and will not occur at one time.

Land Characteristics

Topography and Geology

As mentioned previously, the study area covers approximately 116.18 acres of relatively level property and is bounded by the Burlington Northern Santa Fe Railroad right-of-way along the northern property line, which then arcs along further defining the western edge of the Staley Parcel. From the higher portions of the site along the rail bed, the property gently slopes to the south and east with an approximate a 50-foot elevation change with less than a 3-percent slope gradient.

Soils

According to the United States Department of Agriculture, Natural Resources Conservation Service, there are five soils types in the study area. Each of these five categories fall within sandy loam to fine sandy loam classifications. The majority of the site is composed of Glenberg (Gh) and McRea (Mo), both identified as fine, sandy loam soils. These are fast draining soils that have some shrinkage when dry and then wetted. With best management practices associated with proper over excavation and compaction, the site is suitable for land development and building construction.
A copy of the Soils Resource Report is included in Appendix A.

Effects on Agriculture

The study area is outside of the planning jurisdiction and subsequently not zoned within Yellowstone County. This being the case, future land uses could include several categories other than traditional agricultural development. Based on the NRCS Soil Data Farmland Classification Map, this land is suitable for agriculture as classified by the NRCS soil data. Lands within the study area are considered prime farmland under certain circumstances if irrigated. Given the limited agricultural production yields historically generated by the subject property (due to the lack of irrigation), the location of the railroad separating the subject property from a larger field, and the increasing demand for residential development, the expansion of urban services into the study area will have a limited impact on agriculture in the region.

Historic Sites

The National Historic Preservation Act declared that the preservation of our irreplaceable heritage was in the nation's interest, and called upon federal agencies to partner with states, Indian Tribes, local governments and the public in a spirit of stewardship. Montana's State Antiquities Act also

makes provision for the safeguarding of our collective heritage. The Montana State Historic Preservation Office (SHPO) was created to ensure the state's cultural and historic resources are protected for future generations.
Recent correspondence from Damon Murdo (October 2016), SHPO Cultural Records Manager provided the following information:

"I have conducted a cultural resource file search for the above-cited project located in Sections 25,26, T1N R24E. According to our records there have been a two previously recorded sites within the designated search locales. Site 24YL0243 is the historic Great Northern Railroad, and site 24YL0276 is the historic Cove Irrigation Ditch. The absence of more cultural properties in the area does not mean that they do not exist but rather may reflect the absence of any previous cultural resource inventory in the area, as our records indicated none.

It is SHPO's position that any structure over fifty years of age is considered historic and is potentially eligible for listing on the National Register of Historic Places. If any structures are to be altered and are over fifty years old, we would recommend that they be recorded and a determination of their eligibility be made.

As long as there will be no disturbance or alteration to structures over fifty years of age we feel that there is a low likelihood cultural properties will be impacted. We, therefore, feel that a recommendation for a cultural resource inventory is unwarranted at this time. However, should structures need to be altered or if cultural materials be inadvertently discovered during this project we would ask that our office be contacted and the site investigated."

Effects of Urbanization on the Existing Environment

The Staley and Forbes properties are located in an area already influenced by growth and development within the City of Billings. As the City expands toward the west, this area will become increasingly urbanized. Adjacent property located east of the study area is currently within the City limits and already is under construction as a new residential neighborhood. Planning of the subject property has already begun at a conceptual level and presumably would continue based on the findings of the Urban Planning Study and the subsequent annexation of the property by the City of Billings.

Public Service Evaluation

Water/Sewer Assumptions

The *Water and Wastewater Facilities Master Plan 2006* (Master Plan), prepared for the City of Billings by HDR, Inc., HKM, Inc., and JGA, Inc., assumes 2.3 persons per dwelling unit. Utilizing this estimation, the full build-out for the subject property would support an estimated population of about 874 residents.

The Master Plan referenced the following information or assumptions, which were utilized in estimating the sewer and water impacts relating to the subject property. Furthermore, the Master Plan included the subject property in the review area.

1.	Average day per capita water use (gallons per day - gpd):	219.00
2.	Billings 2005 maximum day water demand (million gallons per day - MGD):	43.20
3.	Average day to maximum day water use ratio:	2.20
4.	Maximum day to peak day water use ratio:	1.50
5.	Average day per capita wastewater (WW) flow (gpd):	100.00
6.	Average maximum month to average month WW flow ratio:	1.17

7.	Billings 2000 max month average day WW flow (MGD):	7.33
8.	Persons per dwelling unit:	2.30

Water Service

Water service to the property can be provided by an extension from the existing 12-inch diameter main stub in Rimrock Road to the east of the proposed development near the intersection of West Copper Ridge Loop as well as a 12-inch stub at the Copper Bluffs Drive terminus. The Master Plan shows the property is located within service area, which is an extension of Zone 4 to the west. The *Design Report Zone 4 Reservoir and Zone 5W Pump Station* (Design Report), prepared for the City of Billings by HDR, Inc. in 2009, summarizes additional improvements made to these zones since the Master Plan was released.

The domestic water demand for the proposed residential portion of subject property is estimated based on the per capita water use times the population for the anticipated nature of the development.

Water demands from the subject property are summarized below:

Estimated Land Use	Total Pop.	Ave. Day Demand (gpd)	Ave. Day Water Demand (gpd)	Max. Day/Ave. Day Water Demand Ratio	Max. Day Water Demand (MGD)
Residential	874	219/capita	191,406	2.20	0.42

Treatment Capacity

Based on information within the Master Plan, the capacity of the Billings water treatment plant is 60 MGD. The year 2005 maximum day water day for the City of Billings was 43.2 MGD. Therefore, the maximum day water demand from the subject property (0.42 MGD) would represent 2.5 percent of the remaining (16.8 MGD) capacity of the water treatment plant: (based on the 2006 Master Plan)

$$[0.42\ MGD/(60\ MGD - 43.2\ MGD)] * 100\% = 2.5\%$$

Distribution

Adequate water pressure and the ability to convey required fire flows are dependent upon having adequately sized transmission and distribution mains. The Design Report states that the improvements made to the Zone 5 West pump station provides the necessary pressure and fire flows needed for the area in which this development is included. The new Ironwood storage tank constructed in 2011 provides additional storage for the subject property area. Static pressure at the west terminus of Rimrock Road is currently about 90 psi. Anticipated static pressures on the Staley and Forbes properties are between 55 and 90 psi, at the highest and lowest elevations on the property, respectively.

Sanitary Sewer

Wastewater collection from the subject property can be provided by an extension of the existing 18-inch sewer trunk main stub in Rimrock Road to the east of the property near the intersection of West Copper Ridge Loop as well as an 8-inch stub at the terminus of Copper Bluffs Drive. Figure 4-3 of the Master Plan shows the property within the area that can be serviced by the Grand Avenue interceptor sewer main, via an 18-inch trunk main such as the one in Rimrock Road. The subject

property area is also included as part of Area #4 in the 2002 Grand Avenue Trunk Water and Sewer Extension (Engineering, Inc. 2002). That study also shows the extension of an 18-inch sewer lateral to serve the subject property. A copy of that exhibit is included in Appendix.

Consistent with the determination of the water demand, sanitary sewer flows are estimated based on the per capita wastewater flow times the population for the likely nature of the development. Wastewater flows from the subject property are summarized below:

Land Use	Total Pop.	Ave. Day Flow (gpd)	Ave. Day Flow (gpd)	Max. Demand Ratio	Max. Day Demand (MGD)
Residential	874	100/capita	87,400 *(61 gpm)*	1.17	0.10

Treatment Capacity
The capacity of the Billings wastewater treatment plant is 26 MGD. The year 2000 maximum month average day City wastewater flow is 7.33 MGD. Therefore, maximum month average day wastewater flows from the subject property (0.10 MGD) would represent 0.5 percent of the available wastewater treatment plant capacity: (based on 2006 Master Plan)

*[(0.10 MGD)/(26 MGD – 7.33 MGD)] * 100% = 0.5%*

Upgrades to the treatment plant are currently underway, with initial improvements starting in 2016. These improvements, when completed, will boost the plant capacity to 70 MGD.

Collection
The City of Billings generally requires sewer mains to be sized with adequate capacity to convey design flows when flowing two-thirds full. Sanitary sewer design flows are typically equal to peak hourly flow conditions. Peak hour flows are estimated using an equation relating to the average flows and estimated population as outlined in DEQ design Circular DEQ-2. Based on an estimated population of 874 persons, this ratio equals approximately 3.84. Therefore, the peak hourly flow from the subject area equals:

*(61 gpm * 3.84) = 234 gpm*

DEQ requires that the internal collection system of a subject property be comprised of minimum 8-inch diameter collection mains. 8-inch diameter collection mains flowing two-thirds full at minimum allowable slopes (0.004 ft/ft) have a capacity of approximately 270 gpm. The peak hour wastewater flowrate based on 234 gpm can be served by an 8-inch main.

Stormwater Management

The subject property is currently non-irrigated farmland and slopes to the southeast where the runoff flows generally south and east toward 70th Street and Rimrock Road and then ultimately to the Cove Ditch. The design standards governing any future development within this study area are found in the City of Billings *Stormwater Management Manual (SWMM),* dated May 2015.
The primary design requirements that would currently apply to any future subdivision development include:

- All subdivisions must evaluate the 100-year, 24-hour storm and ensure storm water does not run off the subdivision at a rate greater than the historic natural conditions runoff prior to development.

- Subdivisions must implement low impact development (LID) practices that infiltrate, evaporate, or capture for reuse the first 0.5-inch of rainfall from the 24-hour storm. The runoff from this 0.5-inch rainfall storm must be entirely retained on site.

Based on the master plan conceptual site layout, there are three storm water detention areas planned to accept and detain storm water from the site. These areas would be separate from the required parkland, but would be integrated. Similarly, these areas would not be counted toward the required park land dedication requirement. Also, with this development there is an opportunity to secure an easement for the Little Cove Creek stormwater impoundment area as identified in the West Billings Flood Mitigation and Groundwater Recharge Study by Atkins (2011). This easement would allow the City of Billings the opportunity to construct a future stormwater storage facility and restrict the stormwater discharge from the Little Cove Creek drainage basin.

The City of Billings is currently undertaking a west-end storm water study under contract with DOWL (2016). That study is anticipated to outline strategies of local and regional storm drain piping and collection, with discharge to regional stormwater conveyance and detention facilities. That study is anticipated to be completed in the Spring of 2017. The Staley and Forbes properties are included in that study area boundary.

The storm drainage system for the subject property will comply with applicable standards at the time of subdivision review. Any project will require a detailed comprehensive drainage plan to be prepared at the time of development.

Solid Waste

Solid waste disposal facilities for the study area and the greater region are already provided by the City of Billings' landfill located off of Jellison Road, south of the City limits. The City collection and disposal facility has the necessary capacity to continue to accept solid waste from this area upon further development. The Landfill Master Plan shows the landfill will be available for continuous operation at current growth rate projections until the year 2042. The total capacity of the landfill for its projected "life" is 20,000,000 tons. The landfill has currently had 4,000,000 tons of waste placed, which leaves 16,000,000 tons of capacity available.

The existing Copper Ridge Subdivision is currently served by the City of Billings. It is anticipated that once the property is annexed and developed, the City will extend the same service area west from Copper Ridge.

Parks, Recreation, and Public Lands

Parks 2020: The Billings Parks, Recreations, and Open Space Plan (Parks 2020) was adopted in 1997 by the City Council to establish a 20-year plan to guide future decision making regarding the community's parks, open spaces, and recreational opportunities. Parks 2020 acknowledges that change in the community is inevitable and managing the change in order to provide parkland opportunities for current and future generations is the challenge. The goal of the park plan is to deal with the continual battle of doing more with less, and creating a sustainable park system that would "balance

the diverse and sometimes competing objectives of social equality, the environment, and economics." Ultimately, it acknowledges that failure to actively pursue a plan would result in overall decline in recreational opportunity and quality of life for the Billings' community.

A Master Plan map was created to illustrate the service areas for existing and recommended parks, and to create a spatial framework for planning. Service areas differ for different types of parks, including regional, community, neighborhood, and subdivision parks. All of the service areas overlap to create the park system which contains park lands with multiple user functions, including recreation, conservation, special uses, and multi-functional.

Nearby Parks
Within a 2.5-mile radius of the property, there are several existing park lands identified on Map 1 of the Parks 2020 plan. These include the following city parks:

Phipps Park
Byron Nelson Park
Yellowstone Meadows Park
Cynthia Park

In addition to the parks described in the 2020 Plan, a new neighborhood park was constructed in 2016 for the Copper Ridge project east of the Study Area. This new addition to the City's park program is a neighborhood park with several amenities intended to serve the newly developed projects in west Billings. Another facility not identified on the 2020 Plan is an undeveloped regional park referred to as Cottonwood Park.

Park and Recreation Needs
In recent meetings with the Parks Department (October 2016), a request for a new approximately 5-acre neighborhood park was made due to the demand created by the development of the subject property. One option being explored at this time is a combination of land and cash-in-lieu of land for park development. If this approach were acceptable to the Parks Department, the cash-in-lieu component would be applied to the larger Cottonwood Regional Park. The developer recognizes the need for park and open space amenities and will continue to work with the City on a preferred option.

Public Safety

Police
If annexed, the study area would receive police protection from the City of Billings Police Department. The City of Billings Police Department is located at City Hall in the Billings Central Business District (approximately 9.5 miles to the Study Area) with a satellite police station located in Fire Station No. 7.

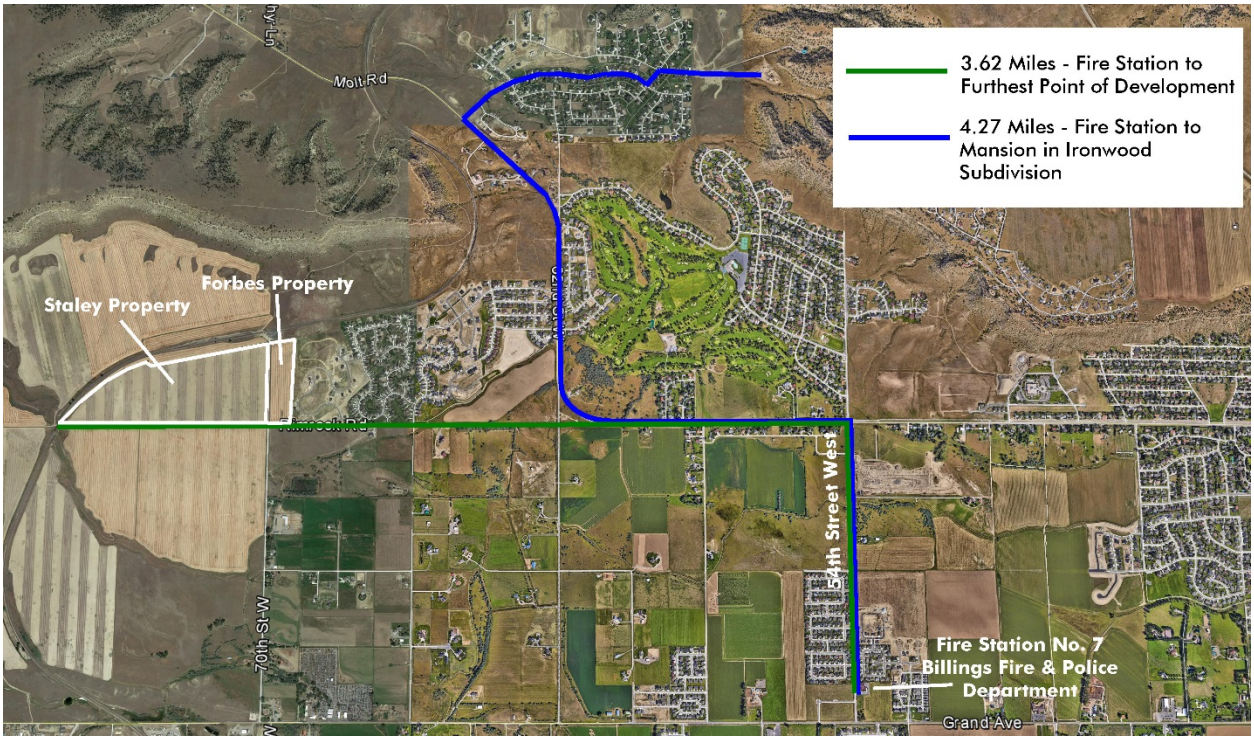
Response time to the area would vary depending on the location of the mobile patrol unit in the general area at the time of need. If annexed, the study area would be included in an assigned area or beat for police officers. Police protection is already provided immediately to the east in Copper Ridge. If annexed, the Billings Police Department would expand its service boundary to serve this development.

The City of Billings Police Department 911 dispatch center currently receives between 4,500 and 10,000 calls per month, not including non-emergency calls, which are generally two to three times that amount. The 2014 report indicates that in 2014, the department received 84,011 calls for service, which was up 4,426 calls from the previous year. The City of Billings Police Department has indicated that expansion of the City limits would have an impact on its manpower and budget. In 2014, voters rejected a public safety mill levy that would have provided funding for additional police, firefighters and dispatchers. Recently, new plans have been passed to allow for additional police staff to help increase patrols and officer presence in Billings.

Fire

The study area is currently within the Molt Volunteer Fire District with the Billings Fire Department. Upon annexation, the property would be serviced by the Billings Fire Department. Services provided include: Fire suppression, emergency medical response, dispatch and communication services for local fire, police and ambulance services, hazardous materials response and vehicle accident extrication.

Within the Billings Fire Department, Fire Station No. 7 located at 1501 54th Street West is the closest station to the subject area approximately 2.5 miles from the study area. Station No. 7 covers the newly developing western portion of Billings and the larger BUFSA. The emergency vehicles at this station include Engine 7, Brush 7 along with two additional reserve units.



The figure above illustrates distances to Ironwood Subdivision and subject property from Fire Station No. 7.

Facts about Station 7 (from the 2013 Annual Report)

Fire Calls	EMS Calls	Non-Fire Calls	HazMat Response	Dollar Loss
39	440	209	15	$1,086,550

First In On Calls	Back-up on Calls	Total Responses
703	130	833

It should be noted that plans have been passed to add five additional fire staff members to the existing fire departments to help lessen the strain as Billings continues to grow and age.

Emergency Medical Service

Both Billings Clinic at 2813 Ninth Avenue North and St. Vincent's Hospital at 1233 North 30th Street would provide routine and emergency medical services in the area. Although a specific timeline has not been made public, both hospitals are planning new facilities to serve future west-side development.

The ambulance service for the area would be provided by private industry (American Medical Response). The impact on City services, therefore, is expected to be minimal. American Medical Response indicated that the number of calls correlate with the type of development. Based upon current trends and the existing development, it is expected any increases in ambulance needs would be absorbed under the incremental growth processes that have been previously discussed. It is expected that most of the calls would be related to traffic issues as the area becomes more crowded, with more calls during the early morning and late afternoon. The impact to the provider and their ability to provide timely service, as required by City ordinance, would become increasingly difficult with the expansion of the City limits. American Medical Response, with its existing locations, cannot meet response time requirements for the entire urban planning area. Just as has occurred with the Fire Department, American Medical Response will need to review new dispatch locations over time in order to maintain the required response times. As this service is provided through the private sector, free market enterprise will continue to dictate expansion needs.

Public Schools

Public schools have a number of purposes. They educate children, but their role within the community goes much deeper. The 2004-2005 Twenty Year School Facilities Planning Committee acknowledged in its July 2005 report that, while public education plays an essential role in enriching the personal and inner lives of children, it is also true that the community expects public schools to prepare students for lives as future taxpayers, job holders, and positive forces in the social fabric of the community. This is probably one of the most important roles an institution can have.
This responsibility comes with a host of critical resources that are necessary for its success, including facilities, staff, curriculum, equipment, supplies, and securing funding for it all. When evaluating opportunities or challenges for accommodating community growth, a school available student capacity is a basic indicator that can be used. Presumably, student capacity will take into account all of the necessary operational components for a school.

School-aged children in this area will be served by School District No. 2 for elementary, middle, and high school. State law requires that the district provide bussing services to students that are greater than three miles from the school they are required to attend.

Elementary and Middle School
Boulder Avenue Elementary School serves kindergarten through 6th grade students, and is located immediately to the east of the study area at 2202 32nd Street West. Current enrollment at Boulder Elementary is approximately 505 students. The school superintendent indicated that attendance has been growing at a rate of about 30 to 40 students per year, due in part to the reestablishment of new district boundaries and growth from newly established residential neighborhoods.

Future school-aged children living in the study area will attend a new middle school is planned to open in 2017. This new facility is referred to as Ben Steele Middle School and is planned to accommodate new residential development in the west Billings area.

High School
There are three high schools in the Billings Public School District: Billings Senior High, Billings West, and Skyview. According to the Billings Public School Demography Study, enrollment at the three high schools has been declining since 2007 and is expected to continue to decline until 2017. Even with declining enrollment, Billings West and Billings Senior High enrollment are above school capacity. The school district has recently undertaken a comprehensive redistricting process to redistrict high schools in order to align attendance with school capacity. This will now provide for the existing facilities to serve the student population without requiring additional high school construction in the near future.

Billings West High located at 2201 St. John's Avenue would serve high school students in this area. West presently serves 1,797 students in grades 9 through 12 and has over 136 staff members. The functional capacity is 1,484 students, but has served as many as 2,200 students in the past.

Student Population Impacts of Proposed Development:
The following calculations are based using an average of 0.50 children (under age 18) per dwelling unit. This percentage is recognized nationally for student yield analysis in housing studies.

- 380 dwelling units x .50 children/dwelling unit = 190 children under age 18 in total
- The number of these children that would be students in the seven grades (K-6) at Boulder Elementary could be calculated by taking 7 grades/18 years of childhood = 39 percent, therefore 74 new students.
- The number of these children in the two grades (7-8) at Ben Steele Middle School could be calculated by taking 2 grades/18 years of childhood = 11%, therefore 21 new students.
- The number of these children that would be students in the four grades (9-12) in District 2 High Schools could be calculated by taking 4 grades/18 years of childhood = 22 percent, therefore 42 new students.

Boulder Elementary School may be close to the recently expanded capacity of 500 students with full buildout of the subject property when combined with other developments in the area.

Transportation Systems Impacts

Streets and Intersections
The proposed development is located north of a projected westward extension of Rimrock Road and west of 70th Street West. Rimrock Road is classified as a Collector from 70th Street West to

62nd Street West in the City of Billings Functional Classification System and as a Major Arterial to the east of 62nd Street West. From 70th Street West to West Copper Ridge Loop, Rimrock Road has an unpaved surface with a width of approximately 25 feet. To the east of West Cooper Ridge Loop, Rimrock Road carries a paved, two-lane section with 1-foot shoulders (26-feet total width) and borrow pits for drainage conveyance. There is no posted speed limit the segment of Rimrock Road west of Molt Road.

Seventieth (70th) Street West is a County road that is classified as a local street by the City of Billings. It extends north from Grand Avenue as an unpaved road with a surface width of approximately 28 feet to its terminus north of Rimrock Road at railroad line. There is no posted speed limit on 70th Street West.

Approximately one mile to the east of the Staley property lies the trio of intersections that make up the Rimrock Road/Molt Road/62nd Street West "triangle." The triangle has long been an area of concern for the City of Billings and MDT due to the substandard geometric layout of the intersections on Molt Road and a crash history that has shown a high frequency of crashes. Sanderson Stewart has previously performed two studies of the triangle and recommended that the three intersections be consolidated into one intersection that would be controlled by a traffic signal or a roundabout. Presently, land development in the area around the Rimrock Road/62nd Street West intersection is progressing and spurring traffic growth. Although congestion is still not an issue for the intersection, safety concerns are building as the frequency of crashes increases. In response to those factors, the City of Billings has programmed the design of a roundabout for the intersection into the Capital Improvement Plan (CIP) for design in fiscal year 2018 with a construction letting date yet to be determined. There is discussion ongoing that the design and construction of the roundabout at this intersection could be accelerated to occur within the next 12 to 18 months. Once constructed, the improvements will serve that intersection well from both a safety and operations standpoint, easily accommodating the projected traffic generation from the development of the Staley property. The following section of this report discusses the current projected land usage for the Staley property and the resulting projected traffic generation characteristics.

Anticipated Traffic Generation

The current conceptual layout for this project proposes construction of 380 single-family dwelling unit lots in the configuration as illustrated in Exhibit C. Using the Institute of Transportation Engineers (ITE) *Trip Generation, 9th Edition*, which is the industry standard reference for projection of site-generated traffic, Sanderson Stewart projects that the Staley and Forbes properties project would generate approximately 3,618 one-way trips (1,809 entering/1,809 exiting) on a typical weekday. During a typical morning peak hour for area traffic, the site is projected to generate 285 one-way trips (71 entering/184 exiting). During a typical evening peak hour for area traffic, the site is projected to generate 380 one-way trips (239 entering/141 exiting). Internal capture and pass-by trips are expected to be minimal given the purely residential nature of the development. As a result, most of the generated traffic will impact external streets and intersections.

The majority of traffic will most likely come to and from the east along Rimrock Road, at least until 70th Street West is paved at some point in the future. Traffic with origins and destinations in the Laurel area may be more likely to utilize 70th Street West even in its current, unpaved state to get to Grand Avenue and beyond to the south.

Method of Funding Public Improvements

There are a number of public improvements that would be necessary if the study area were eventually annexed into the City of Billings. The improvements and public services come with costs. In addition to developer constructed infrastructure, there are several mechanisms to pay for these costs.

System Development Fees

System Development Fees, or SDFs, are charged for the impact of new development on the water and sewer infrastructure.

Special Improvement District

Special Improvement Districts (SID) are formed to allow property owners to share in costs related to infrastructure improvements, for which they all receive benefit from use of that infrastructure. An SID is a taxing district that is created to finance public improvements such as transportation infrastructures, water main, sewer main, and storm drainage. Assessment can also contribute to long-term maintenance of the improvements.

Property Tax Revenues

Funding for services, such as police and fire protection, is usually provided by property tax revenue. Future tax revenues will ultimately depend on the use and density of the property. In considering revenue growth as calculated by Assessed Valuation (AV), current assessments based on dry land agricultural uses, equate to approximately $87,435 in Assessed Value for the 116-acre subject property. Assuming buildout of the site, with an additional 380 single family lots (at 10,000 square-feet per lot.) the AV projected for this property would exceed $95,000,000. This assumption is based on current assessments found within the 2016 County Assessors records for a typical 10,000 square-foot lot with improvements, found in the existing Copper Ridge Subdivision.

Conclusion

The properties within the study area are geographically, environmentally and economically suitable to urban development and have been the subject of numerous public planning studies over the past decade. Properties located immediately east of the subject parcels are currently within City Limits. The study area is adjacent to existing development on the east. Annexation into the red of this study area will allow for future planned growth in an orderly and logical manner.

The provision for emergency services is always a concern as communities expand and grow. Adding this property to the "red area" provides time for fire and police services to study future needs for emergency services and help identify demands in these locations for emergency services.

As previously mentioned, the owner/developer of the subject property anticipates the start of construction of a small Phase I within the next 12 to 18 months. Placing the site within the "red area" allows the property owner to begin the master planning process and work with nearby property owners and the City to develop long term planning for this area of Billings.

EXHIBIT A: PROPERTY LOCATION

EXHIBIT A
PROPERTY LOCATION

NORTH

PREPARED FOR : GARY OAKLAND
PREPARED BY : SANDERSON STEWART

NOVEMBER, 2016
BILLINGS, MONTANA

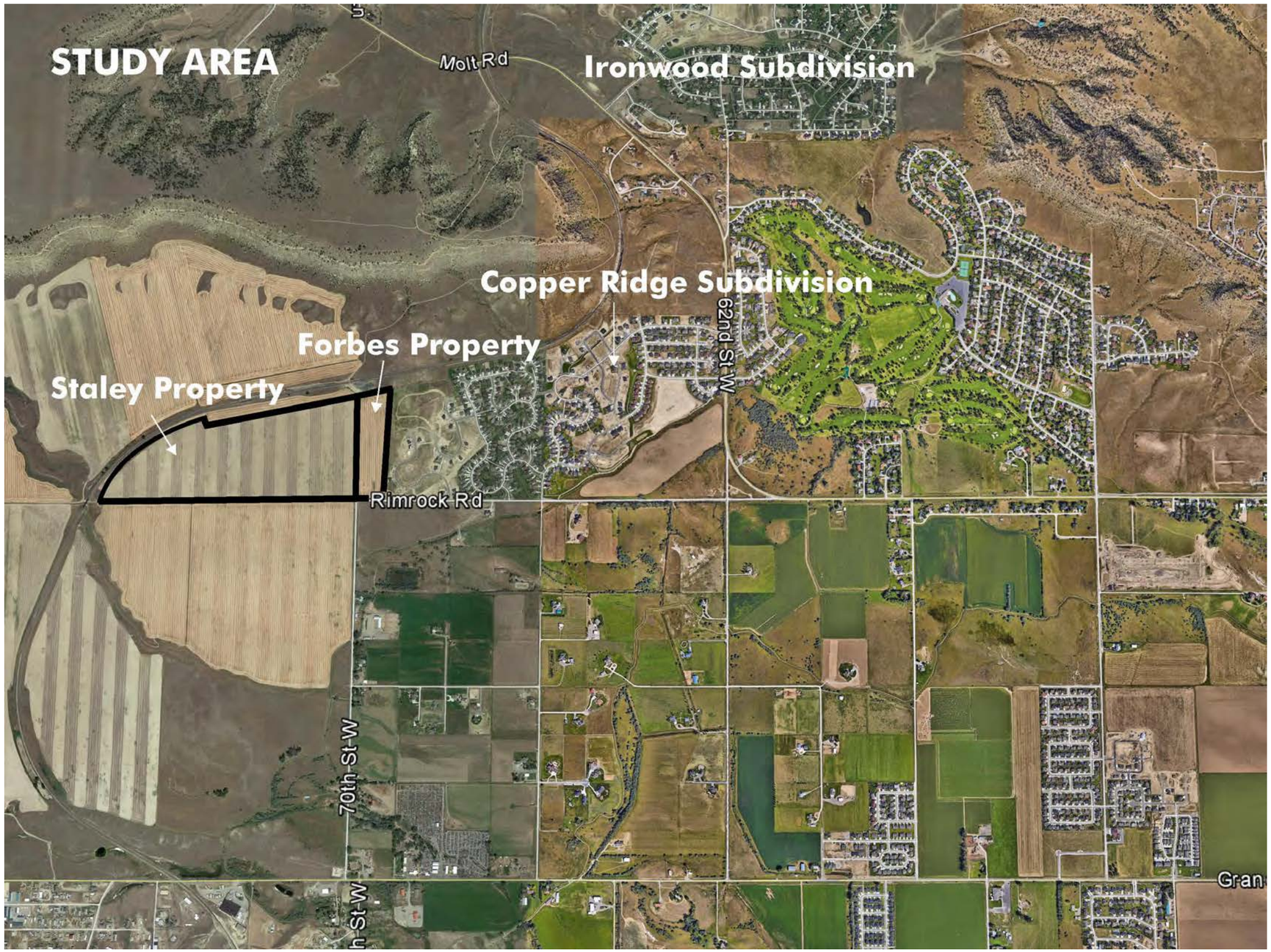


EXHIBIT B: AVAILABLE SERVICES

EXHIBIT B
AVAILABLE SERVICES

NORTH

PREPARED FOR : GARY OAKLAND
PREPARED BY : SANDERSONSTEWART

NOVEMBER, 2016
BILLINGS, MONTANA

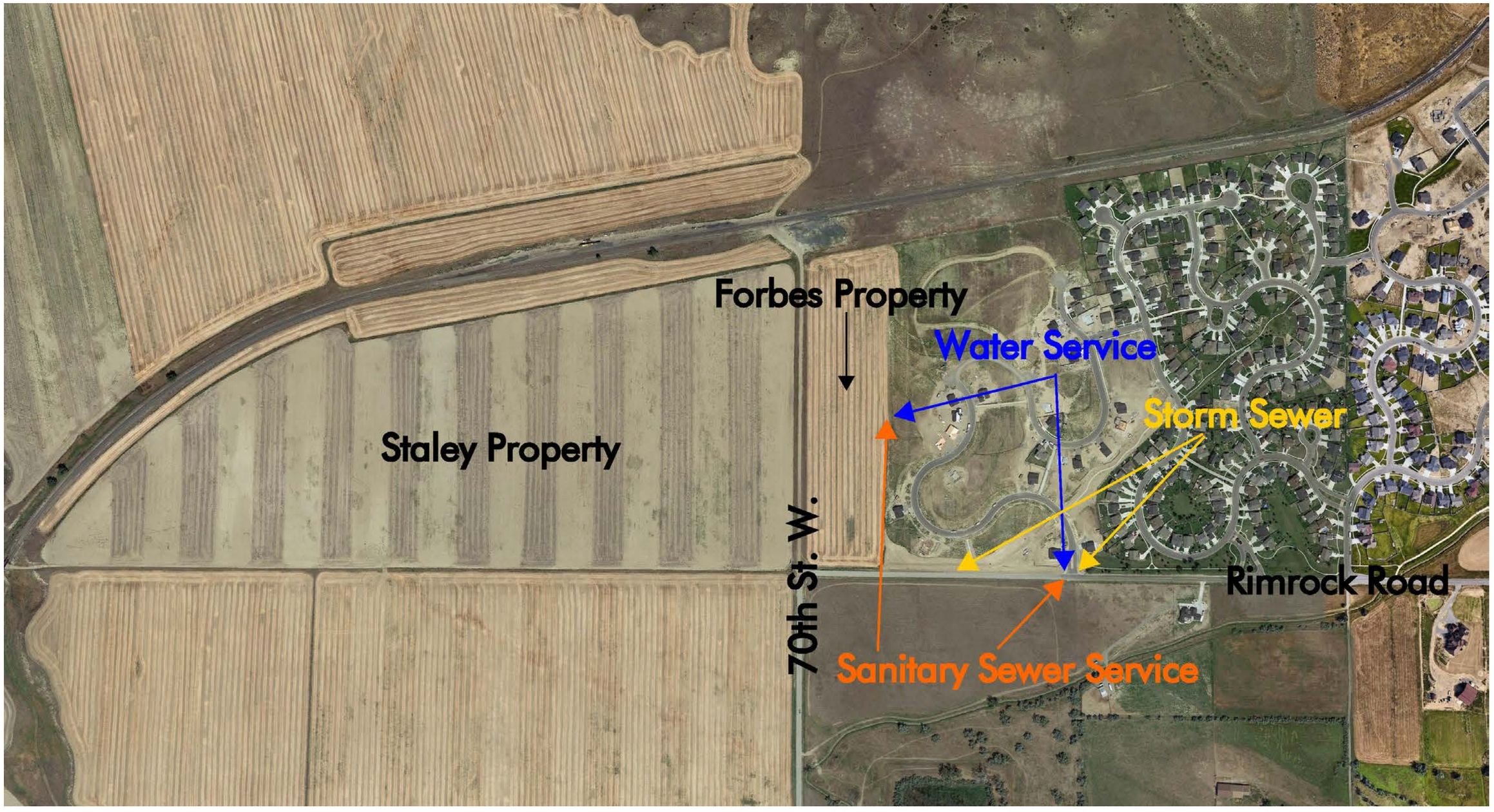


EXHIBIT C: CONCEPT PLAN

EXHIBIT C
CONCEPT PLAN

NORTH

PREPARED FOR : GARY OAKLAND
PREPARED BY : SANDERSON STEWART

NOVEMBER, 2016
BILLINGS, MONTANA

APPENDIX A: NRCS SOILS INFORMATION

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Yellowstone County, Montana

October 19, 2016

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

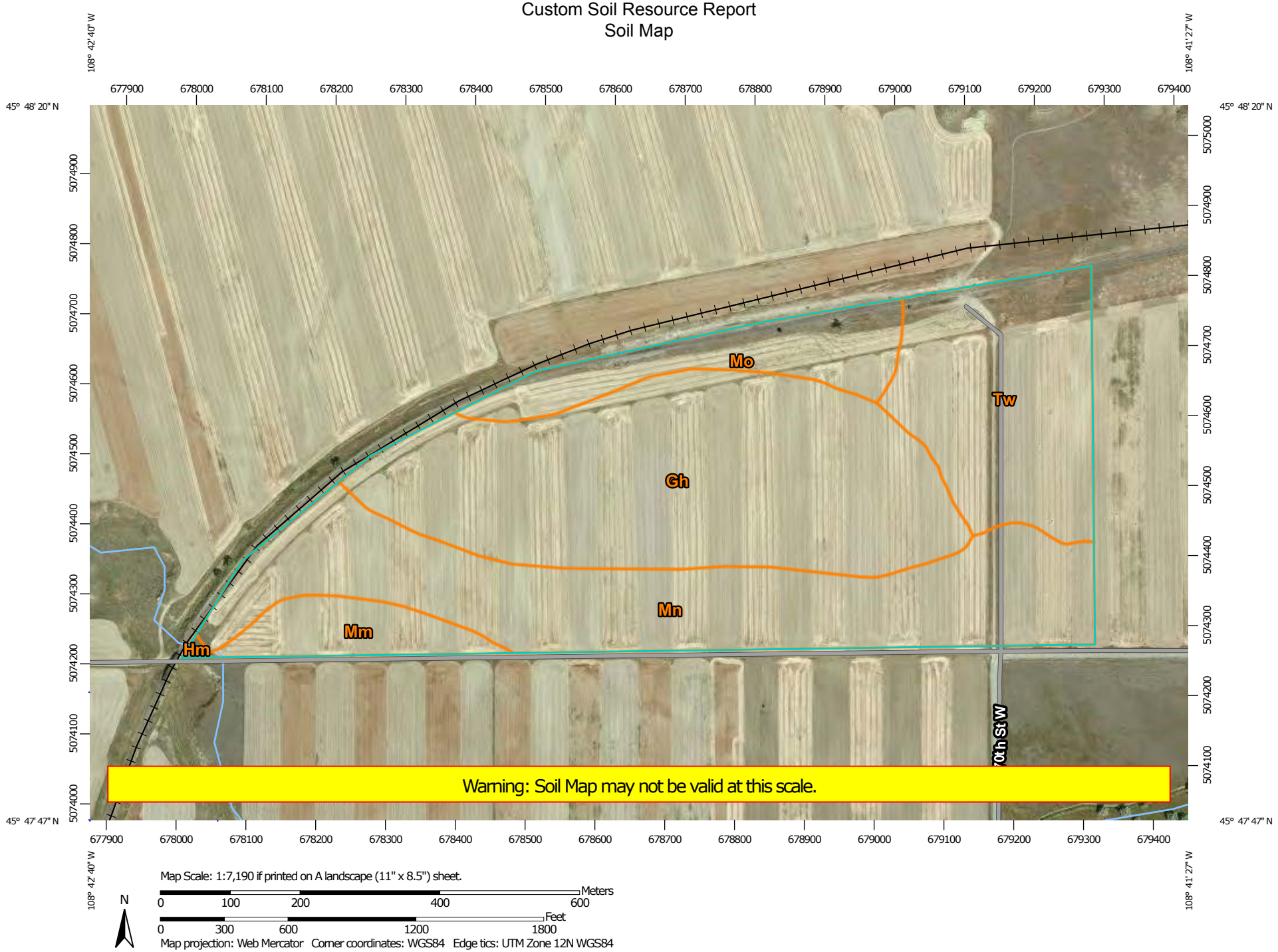
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree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

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

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:7,190 if printed on A landscape (11" x 8.5") sheet.

N

0 100 200 400 600 Meters

0 300 600 1200 1800 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Yellowstone County, Montana
Survey Area Data: Version 14, Sep 28, 2015

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

Date(s) aerial images were photographed: Jul 29, 2011—Aug 17, 2011

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

Map Unit Legend

Yellowstone County, Montana (MT111)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Gh	Glenberg fine sandy loam, 1 to 4 percent slopes	47.4	37.7%
Hm	Haverson and Lohmiller soils, channeled, 0 to 35 percent slopes	0.2	0.1%
Mm	McRae loam, 0 to 1 percent slopes	6.1	4.8%
Mn	McRae loam, 1 to 4 percent slopes	38.6	30.7%
Mo	McRae loam, 4 to 7 percent slopes	10.7	8.6%
Tw	Treasure fine sandy loam, 4 to 10 percent slopes	22.6	18.0%
Totals for Area of Interest		**125.6**	**100.0%**

Map Unit Descriptions

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

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

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been

observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

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

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

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

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

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

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

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

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

Yellowstone County, Montana

Gh—Glenberg fine sandy loam, 1 to 4 percent slopes

Map Unit Setting

National map unit symbol: clr7
Elevation: 1,900 to 6,000 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

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

Description of Glenberg

Setting

Landform: Fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

Ap - 0 to 6 inches: fine sandy loam
C - 6 to 40 inches: loamy fine sand
2C - 40 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 1 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 3.0 mmhos/cm)
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: Sandy (Sy) RRU 58A-C 11-14" p.z. (R058AC042MT)
Hydric soil rating: No

Minor Components

Haverson

Percent of map unit: 10 percent
Landform: Flood plains, terraces
Landform position (three-dimensional): Tread

Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: Silty (Si) RRU 58A-C 11-14" p.z. (R058AC040MT)
Hydric soil rating: No

Lohmiller

Percent of map unit: 10 percent
Landform: Flood plains, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: Silty (Si) RRU 58A-C 11-14" p.z. (R058AC040MT)
Hydric soil rating: No

Hm—Haverson and Lohmiller soils, channeled, 0 to 35 percent slopes

Map Unit Setting

National map unit symbol: clrn
Elevation: 1,900 to 6,000 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 115 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Haverson and similar soils: 40 percent
Lohmiller and similar soils: 40 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Haverson

Setting

Landform: Flood plains, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave, linear
Parent material: Alluvium

Typical profile

A - 0 to 5 inches: loam
C - 5 to 68 inches: stratified fine sandy loam to clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare

Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B
Ecological site: Silty (Si) RRU 58A-C 11-14" p.z. (R058AC040MT)
Hydric soil rating: No

Description of Lohmiller

Setting

Landform: Terraces, flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear, concave
Parent material: Alluvium

Typical profile

A - 0 to 9 inches: silty clay loam
C - 9 to 60 inches: stratified silty clay to silty clay loam

Properties and qualities

Slope: 25 to 35 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Available water storage in profile: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Silty (Si) RRU 58A-C 11-14" p.z. (R058AC040MT)
Hydric soil rating: No

Minor Components

Glenberg

Percent of map unit: 8 percent
Landform: Flood plains, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: Silty (Si) RRU 58A-C 11-14" p.z. (R058AC040MT)
Hydric soil rating: No

Grail

Percent of map unit: 7 percent
Landform: Terraces, fans, hills
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear, concave
Across-slope shape: Linear
Ecological site: Clayey (Cy) RRU 58A-C 11-14" p.z. (R058AC041MT)
Hydric soil rating: No

Hysham

Percent of map unit: 5 percent
Landform: Flood plains, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: Saline Lowland (SL) RRU 58A-C 11-14" p.z. (R058AC051MT)
Hydric soil rating: No

Mm—McRae loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: clsy
Elevation: 1,900 to 6,600 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 36 to 48 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Mcrae

Setting

Landform: Terraces, fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

Ap - 0 to 5 inches: loam
Bk - 5 to 11 inches: loam
C - 11 to 60 inches: loam

Properties and qualities

Slope: 0 to 1 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Silty (Si) RRU 58A-C 11-14" p.z. (R058AC040MT)
Hydric soil rating: No

Minor Components

Fort collins

Percent of map unit: 9 percent
Landform: Terraces, fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (Cy) RRU 58A-C 11-14" p.z. (R058AC041MT)
Hydric soil rating: No

Hysham

Percent of map unit: 6 percent
Landform: Flood plains, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: Saline Lowland (SL) RRU 58A-C 11-14" p.z. (R058AC051MT)
Hydric soil rating: No

Mn—McRae loam, 1 to 4 percent slopes

Map Unit Setting

National map unit symbol: clsz
Elevation: 1,900 to 6,600 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 36 to 48 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Mcrae and similar soils: 85 percent

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

Description of Mcrae

Setting

Landform: Terraces, fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

Ap - 0 to 5 inches: loam
Bk - 5 to 11 inches: loam
C - 11 to 60 inches: loam

Properties and qualities

Slope: 1 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Silty (Si) RRU 58A-C 11-14" p.z. (R058AC040MT)
Hydric soil rating: No

Minor Components

Haverson

Percent of map unit: 9 percent
Landform: Flood plains, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: Silty (Si) RRU 58A-C 11-14" p.z. (R058AC040MT)
Hydric soil rating: No

Fort collins

Percent of map unit: 6 percent
Landform: Terraces, fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (Cy) RRU 58A-C 11-14" p.z. (R058AC041MT)
Hydric soil rating: No

Mo—McRae loam, 4 to 7 percent slopes

Map Unit Setting

National map unit symbol: clt0
Elevation: 2,300 to 6,600 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 36 to 50 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Mcrae

Setting

Landform: Terraces, fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

Ap - 0 to 5 inches: loam
Bk - 5 to 11 inches: loam
C - 11 to 60 inches: loam

Properties and qualities

Slope: 4 to 7 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Silty (Si) RRU 58A-C 11-14" p.z. (R058AC040MT)
Hydric soil rating: No

Minor Components

Fort collins

Percent of map unit: 8 percent
Landform: Terraces, fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (Cy) RRU 58A-C 11-14" p.z. (R058AC041MT)
Hydric soil rating: No

Bainville

Percent of map unit: 7 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) RRU 58A-C 11-14" p.z. (R058AC040MT)
Hydric soil rating: No

Tw—Treasure fine sandy loam, 4 to 10 percent slopes

Map Unit Setting

National map unit symbol: clv7
Elevation: 2,000 to 5,000 feet
Mean annual precipitation: 11 to 14 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Treasure

Setting

Landform: Fans, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 5 inches: fine sandy loam
Bt - 5 to 16 inches: sandy clay loam
Bk - 16 to 60 inches: sandy loam

Properties and qualities

Slope: 4 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: Sandy (Sy) RRU 58A-C 11-14" p.z. (R058AC042MT)
Hydric soil rating: No

Minor Components

Apron

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy (Sy) RRU 58A-C 11-14" p.z. (R058AC042MT)
Hydric soil rating: No

Mcrae

Percent of map unit: 5 percent
Landform: Fans, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave
Across-slope shape: Linear
Ecological site: Silty (Si) RRU 58A-C 11-14" p.z. (R058AC040MT)
Hydric soil rating: No

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APPENDIX B:

ATKINS 2011

POTENTIAL ALTERNATIVES FEASBILITY STUDY

WEST BILLINGS FLOOD MITIGATION AND

GROUNDWATER RECHARGE STUDY (SELECTED PAGES)

POTENTIAL ALTERNATIVES FEASIBILITY STUDY
WEST BILLINGS FLOOD MITIGATION AND GROUNDWATER RECHARGE STUDY

Yellowstone County, Montana

Prepared for:

YELLOWSTONE COUNTY
PLANNING AND COMMUNITY SERVICES DEPT.
510 NORTH BROADWAY – 4TH FLOOR
BILLINGS, MT 59101

Prepared by:

ATKINS
3810 Valley Commons Drive
Suite 4
Bozeman, MT 59718

September 2011

Project No. 100013850

1.0 INTRODUCTION

This document presents a feasibility analysis of flood mitigation alternatives for the West Billings Flood Mitigation and Groundwater Recharge Study. The project is intended to identify and evaluate the feasibility of alternatives to mitigate flooding impacts in the project Study Area, shown on **Figure 1-1**, and to assess the potential of using those mitigation measures to provide recharge to groundwater in the West Billings area.

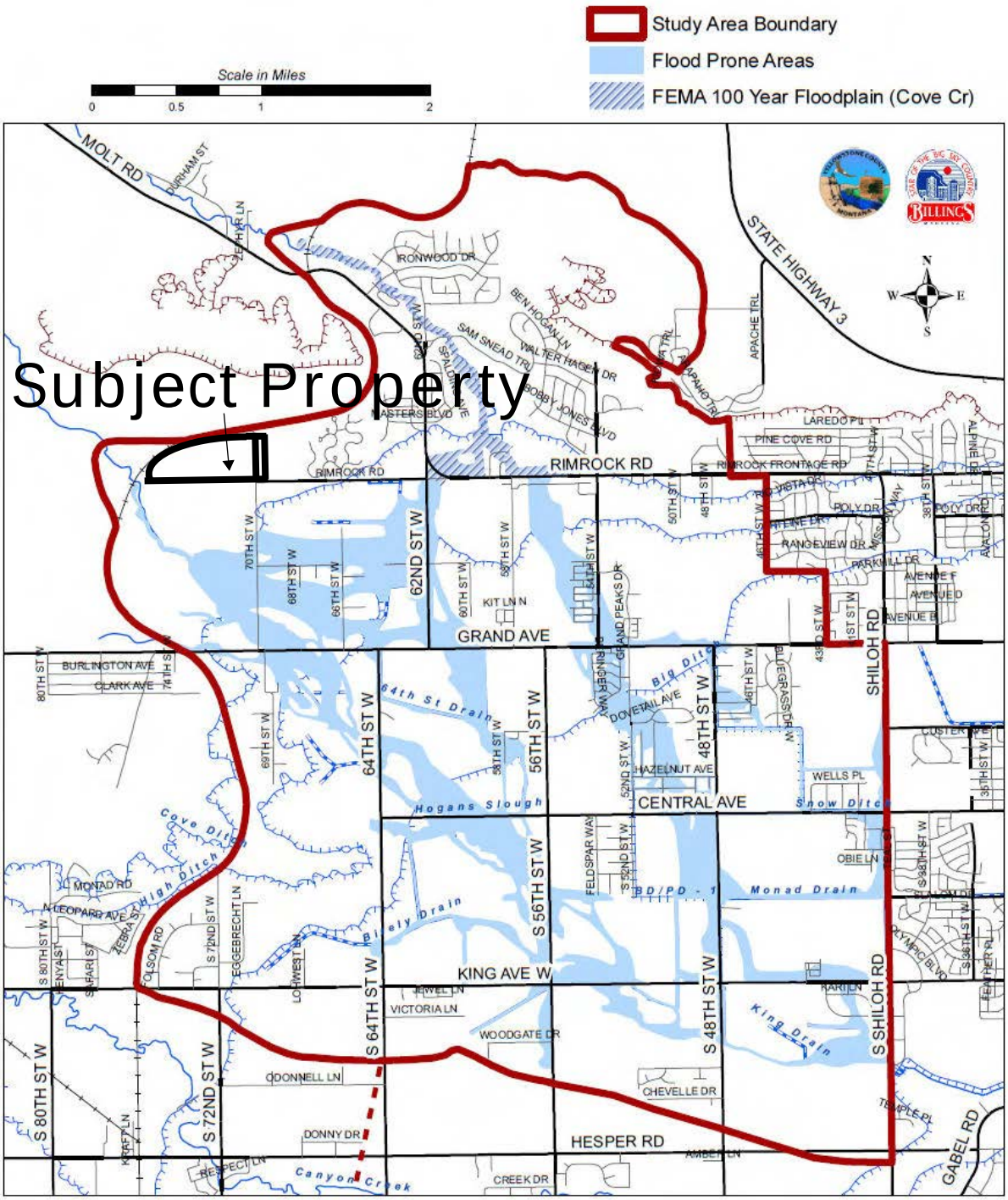


Figure 1-1. West Billings Study Area

value of 20. However, in combination with other options that decrease flood risk, it may reduce problems associated with concentrating flood flows (Greenway Development or Cove Creek Split). Considerations will need to include impacts to Canyon Creek and its capacity to accommodate the additional flow rates. Right of way and costs are also potential problems. The potential benefit of reduced flooding warrants carrying this option to second level screening.

3.1.2 Storage Options

Small Stormwater Storage Impoundments

Description: Develop a number of small impoundments in the drainage basin with infiltration to groundwater.

Screening Score - 17: Storage impoundments require two characteristics to effectively impact flooding. The first is that they have sufficient storage capacity to impact peak flow rates downstream and second that they remain essentially empty so that their storage capacity is available during a flood event. A series of small storm water storage impoundments could be beneficial for water quality and possibly ground water recharge. However, they would have minimal impact to peak flow rates, be empty depressions the majority of the time, and due to size would have minimal recreational opportunities or ground water recharge potential. This option scores below the recommended cutoff value and it is recommended that this option be dropped from second level screening.

Large Detention Impoundments

Description: Large flood detention areas in the Cove or Little Cove Creek drainages upstream or immediately below the railroad tracks. These impounds could be either on or off channel. The structures would detain water with a slow release to downstream channels and/or ground water. One potential site is on Cove Creek immediately downstream of the railroad tracks. Other specific sites have yet to be identified.

Screening Score - 20: Large storage impoundments above the project area could greatly reduce the peak flood flow rates and thus impacts to the project area. There are several issues that could prevent the implementation of this option including: regulatory issues, land ownership, implementability and cost. Also, in order for the structures to be effective for flood mitigation, they would need to be emptied as quickly as possible to be available for the next storm event and thus would be empty the majority of the time. However, due to the potential flood reduction benefits the option will be carried into the second level screening despite these hurdles.

Shiloh Drain Stormwater Detention

Description: Use the Shiloh drainage ditch as a detention facility to store stormwater and allow groundwater recharge.

Screening Score - 14: Shiloh drain already functions in this manner to some degree. Increasing the capacity of storage to significantly impact flooding is impractical due to structural constraints of adjacent facilities. Increasing ground water recharge potential would also have minimal benefits. The drain is already providing the benefits suggested to some degree and increasing this does not appear to be cost effective. This option scores below the recommended cutoff value and it is recommended that this option be dropped from second level screening.

4.1.1 Alternative 1: Large Storage Impoundment

Large storage impoundments would be located upstream of the project area on Cove Creek and Little Cove Creek. Specific location have not been specified, but are assumed to include two large impoundments in the upper portions of the drainage. Conceptual locations are shown on **Figure C-1** in **Appendix C**. The design flood event is a summer thunderstorm. There will be little if any warning for this type of flood event and therefore the storage impoundments would need to be kept empty to maximize storage capacity. This requires that the impoundment detain (slow) rather than retain (store) flood water. The design concept includes an embankment to hold back flood waters, culvert that allows a portion of the flood water to pass through impoundment and an emergency spillway. The pass through culvert would always be open and allow a much reduced flow to continue down the drainage. A portion of the impoundment will be below the pass through culvert invert to allow wetland development and ground water recharge. For analysis purposes, both impoundments are assumed large enough to detain the design storm (100-year, 24-hour storm event) with a gradual release of flood waters to the downstream channels.

Figure C-2 presents model results for flooding after implementation of Alternative 1. Flooding is presented for areas that have general shallow flooding (depths >0.5') and regulatory depth flooding (>1'). **Figure C-3** indicates the change in flooding area between existing conditions and implementation of Alternative 1. Analysis indicates a reduction of **368 acres** (existing = 437 acres) of regulatory depth flooding and a reduction of **46 building structures** (existing = 63) impacted by flooding greater than one foot deep.

Alternative 1 received the following rankings:
3 (good) for:

- flood reduction – relatively high acreage and number of structures removed from flooding,
- downstream impacts – reduction in peak flow rates downstream,
- landownership – will be relatively few landowners to negotiate with.

2 (moderate) for:

- Implementability
- Groundwater recharge – the lower portion of the impoundments could be designed to store water for groundwater recharge. This would be filled using the first water from each storm so even smaller storms could be captured for groundwater recharge. Note that for groundwater recharge to be beneficial the modeling (PBS&J, 2010f) suggests that flood water recharge would need to be supplemented with regular annual diversions.
- Funding options – may be eligible for flood and/or wetland mitigation funding.
- Regulatory issues – will need to design impoundments to meet high hazard dam standards but regulatory requirements will not be overly stringent. Water rights might be an issue if used for groundwater recharge.

1 (poor) for:

- Future flexibility – the impoundments will need to stay empty for the majority of the time to allow storage capacity during extreme runoff events but could fill within a very short period of time. This doesn't allow for much flexibility for other uses.
- Cost – this alternative is three to four times more expensive than the other alternatives.
- Recreational opportunities and aesthetics – the impoundment will need to stay empty most of the time. There is some opportunity but it is low relative to the other Alternatives.

Alternative 1 total **unweighted** score: 20
Alternative 1 total **weighted** score: 60

5.0 CONCLUSIONS

A public meeting was held on November 18, 2010 to present the feasibility study process presented in this report and to obtain public comment on the six alternatives. Public comment is summarized in a memorandum by JGA Architects Engineers Planners and presented in **Appendix E**. The project Steering Committee met on December 8, 2010 to discuss the Alternatives and public comment. Based on public comment, the Steering Committee directed the project team to develop a preferred alternative that combine components of the Alternatives presented in Section 4 of this report. Steering Committee guidelines for the preferred alternative included:

1. Use smaller impoundments on Cove and Little Cove Creeks. Suggest sizing the impoundments to contain a storm on the order of a 50-year return interval.
2. Replace undersized culverts beneath roadways with larger or multiple culverts to relieve ponding/backwater effects.
3. Greenway Right-of Way (ROW) should not be wider than 50 feet.
4. Sharptail Pond will be needed for stormwater treatment and will not be available for flood control.
5. Cannot pass flooding problems to areas downstream of Shiloh Road therefore need to keep peak flow rate at this location the same or less than existing conditions.

The project team used an iterative process to modify the existing hydraulic model and develop a proposed Preferred Alternative that met the SC's guidelines. This new alternative was presented to the Steering Committee in a Technical Memorandum dated March 11, 2011 (**Appendix F**). The proposed alternative included the following components:

1. Detention storage impoundments on Cove and Little Cove Creek drainages. The areas within these impoundments would be dry the majority of the time and available for recreational use such as ball fields.
2. Larger outlet pipes on the proposed impoundments to reduce the required storage volume.
3. Increased number of pipes or pipe size beneath numerous roads and canals to reduce ponding upstream.
4. No greenways are utilized for flood control but could be a separate component for recreational value.
5. Neither Sharptail Pond nor Knife River gravel pit are needed for flood water storage due to the other proposed components.
6. Peak flow rate in Hogans Slough at Shiloh road decreases slightly from existing conditions.

A SC meeting was held on March 24, 2011 to discuss the proposed alternative. The project team presented flood mitigation results through comparison of existing conditions verses those of the proposed alternative (**Appendix G**). As the map in **Appendix G** indicates, the proposed alternative greatly reduces modeled flooding except to a few low lying areas. Analysis indicates a reduction of **359 acres** (existing = 437 acres) of regulatory depth flooding (not including Knife River Gravel Pit) and a reduction of **43 building structures** (existing = 63) impacted by flooding.

After discussion of the proposed components and the modeled results the SC discussion focused on the area downstream of Shiloh Road, below the project area. SC members noted that the culverts passing beneath the BBWA canal had recently been replaced. These culverts are designed to accommodate 300 cfs, the capacity of the downstream channel. The discussion concluded with the addition of a bypass channel to the preferred alternative. The bypass channel will route flow rates greater than 300 cfs to the Knife River gravel pit.

5.1 Recommended Alternative(s)

The SC directed the project team to move ahead with preparation of a 30% design for the preferred alternative. The Final Preferred Alternative includes the following components:

1. Detention storage impoundments on Cove and Little Cove Creek drainages. The areas within these impoundments would be dry the majority of the time and available for recreational use such as ball fields.
2. Larger outlet pipes on the proposed Cove and Little Cove Creek impoundments (6' diameter) to reduce the required storage volume.
3. Increased number of pipes or pipe size beneath numerous roads and canals to reduce ponding upstream (see **Table 5-1** below).
4. No greenways are utilized for flood control but could be a separate component for recreational value.
5. Bypass channel to the Knife River gravel pit to reduce peak flow rate beneath Shiloh Road to less than 300 cfs.

Table 5-1. Proposed Pipe Changes

Link	Previous Pipe Size (feet)	New Pipe Size (feet)	Pipe Length (feet)	Description
LCC_Pipe	2	6	100	Outlet from Little Cove Creek Impoundment
Cove_Pipe	2	6	100	Outlet from Cove Creek Impoundment
C-104	3	6	94.5	Birely Drain Pipe under High Ditch
C-101	4	8	52	Birely Drain Pipe under 62nd Street
C-99a	0	8	85.58	Birely Drain Pipe under Grand. Added new culvert adjacent to existing culvert C-99
C-99a	6	8	85.58	Birely Drain Pipe under Grand. Increased pipe size
C-98	4	6	62.38	Birely Drain Pipe under Broadwater (?)
C-121	2	6	106.28	Birely Drain side ditch under King Avenue. Circular
C-112	2	6	61.33	Bierly Drain under 56th. Arch
C-111	3	6	86.1	Bierly Drain adjacent to King Ave - Circular pipe under private approach.
C-110	3	6	42.09	Bierly Drain adjacent to King Ave - Circular pipe under private approach.
C-109	2.5	6	41.41	Bierly Drain adjacent to King Ave - Circular pipe under private approach.
C-108	2.5	6	30.47	Bierly Drain adjacent to King Ave - Circular pipe under private approach.
C-107	3	6	38.6	Bierly Drain adjacent to King Ave - Circular pipe under private approach.
C-129	1.5	6	72.29	50th street drain under King Ave. Circular pipe.
C-12	1 at 8'	2 at 8'	122.73	Hogans Slough under King Ave. Circular pipe.

APPENDIX C:

PBS&J 2010

WEST BILLINGS FLOOD HAZARD STUDY MAPS

PROJECT: WEST BILLINGS FLOOD HAZARD STUDY	PROJECT NUMBER: B20016.00	PREPARED BY: EAC/CBH	PBS&J
EXHIBIT 5: 100- AND 500-YEAR FLOODPLAIN BOUNDARIES	DATE: 05/08/2007	CHECKED BY: DEM/SH	

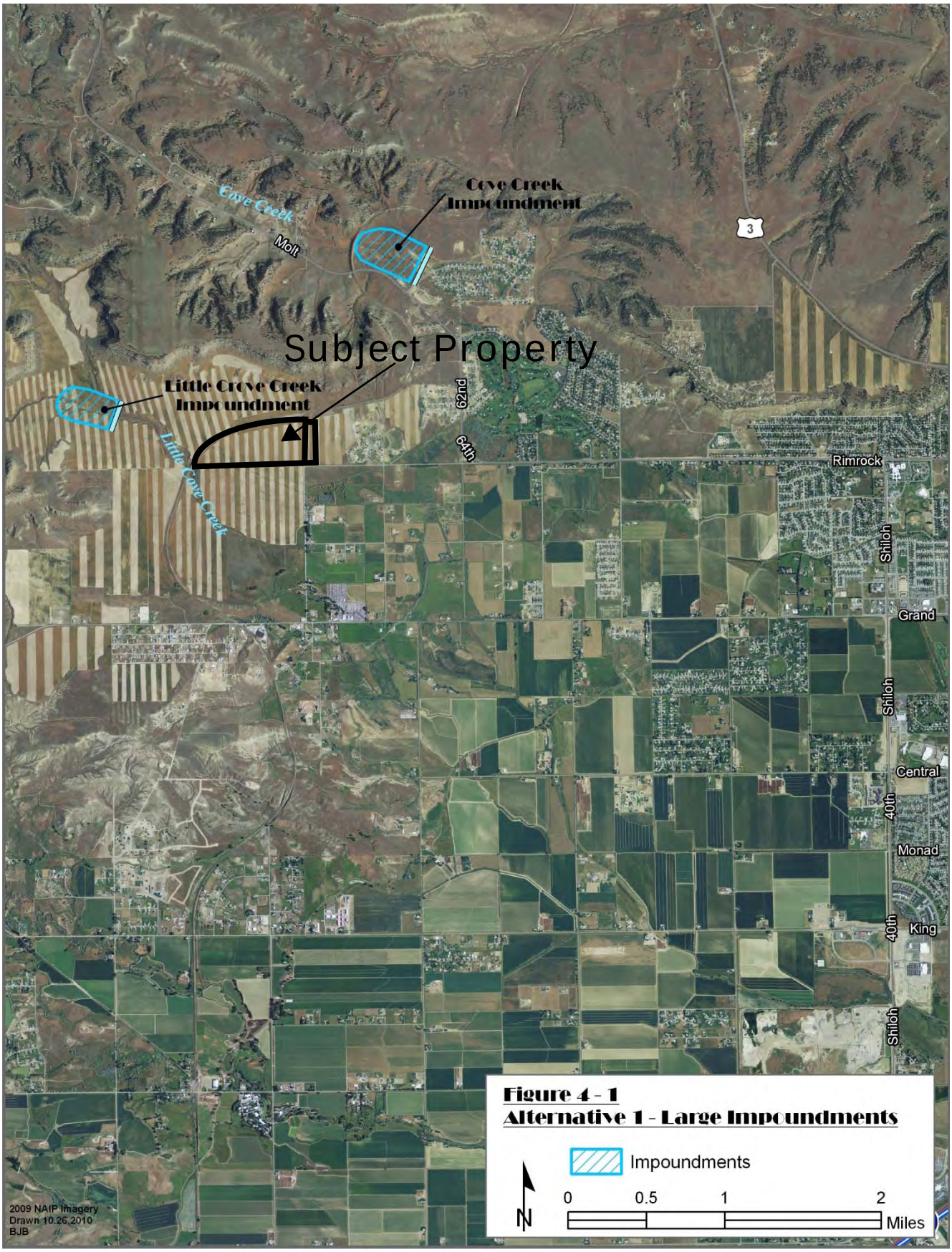


Figure C-1. Alternative 1 – Large Impoundments

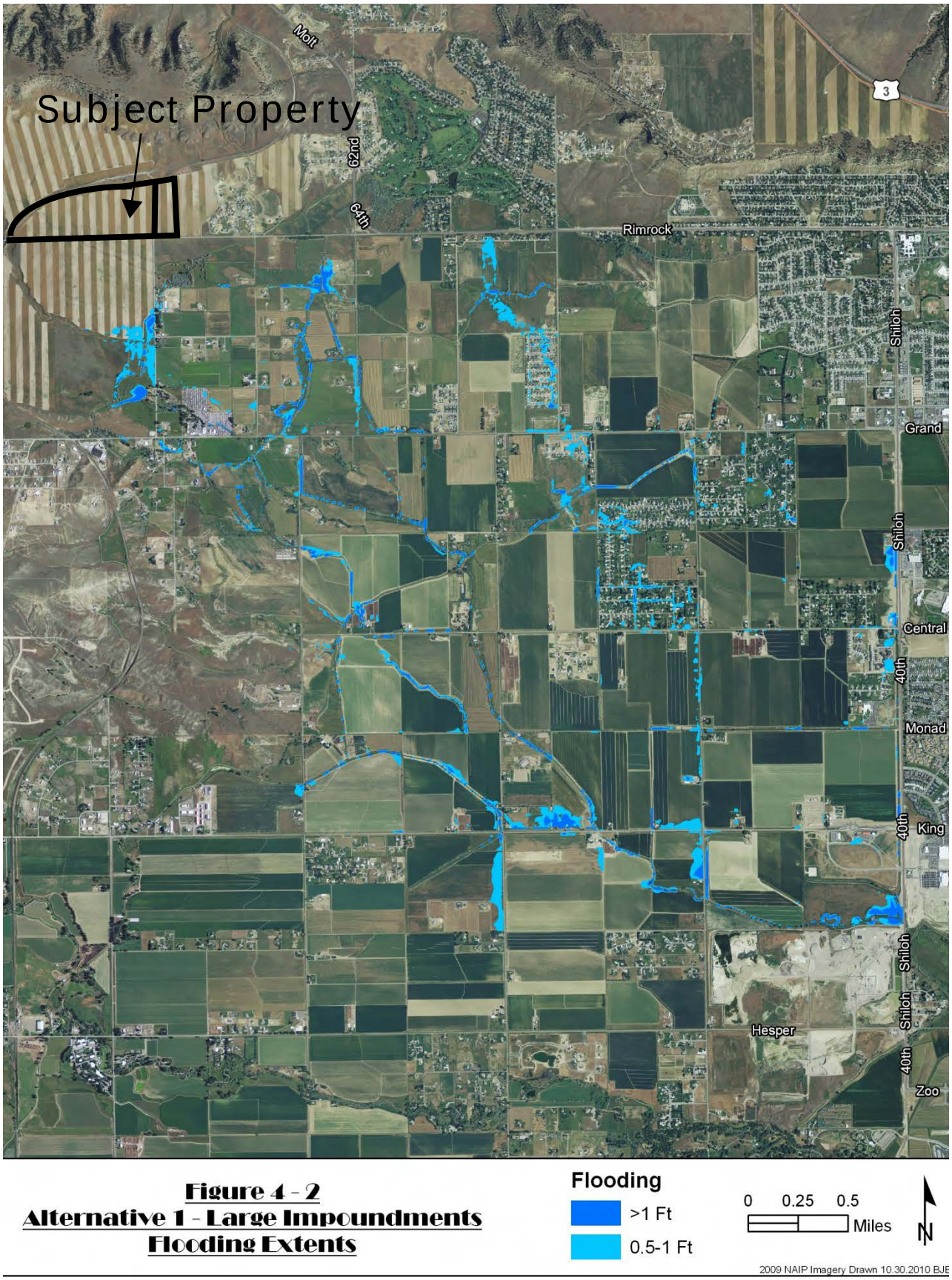


Figure C-2. Alternative 1 – Large Impoundments Flooding Events

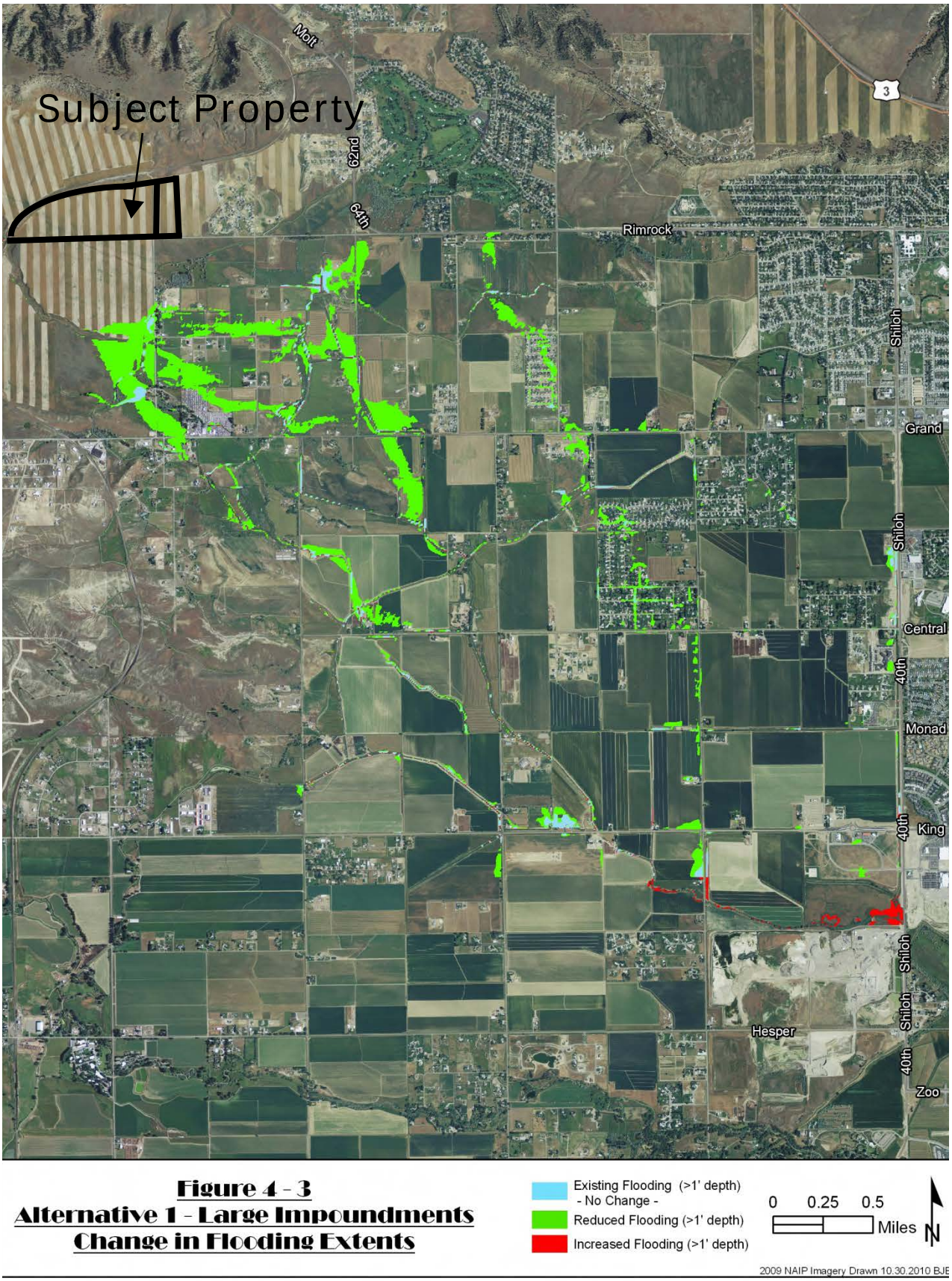


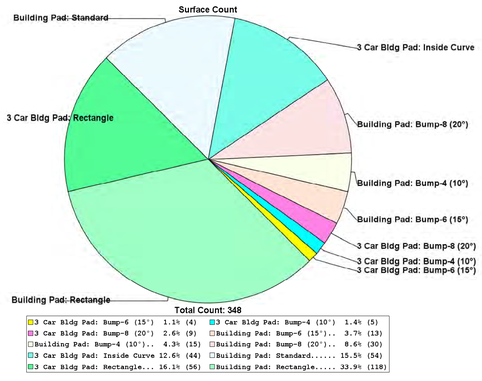
Figure C-3. Alternative 1 – Large Impoundments Chang in Flooding Events

APPENDIX D:

FULL CONCEPT MAP

1" = 100 feet

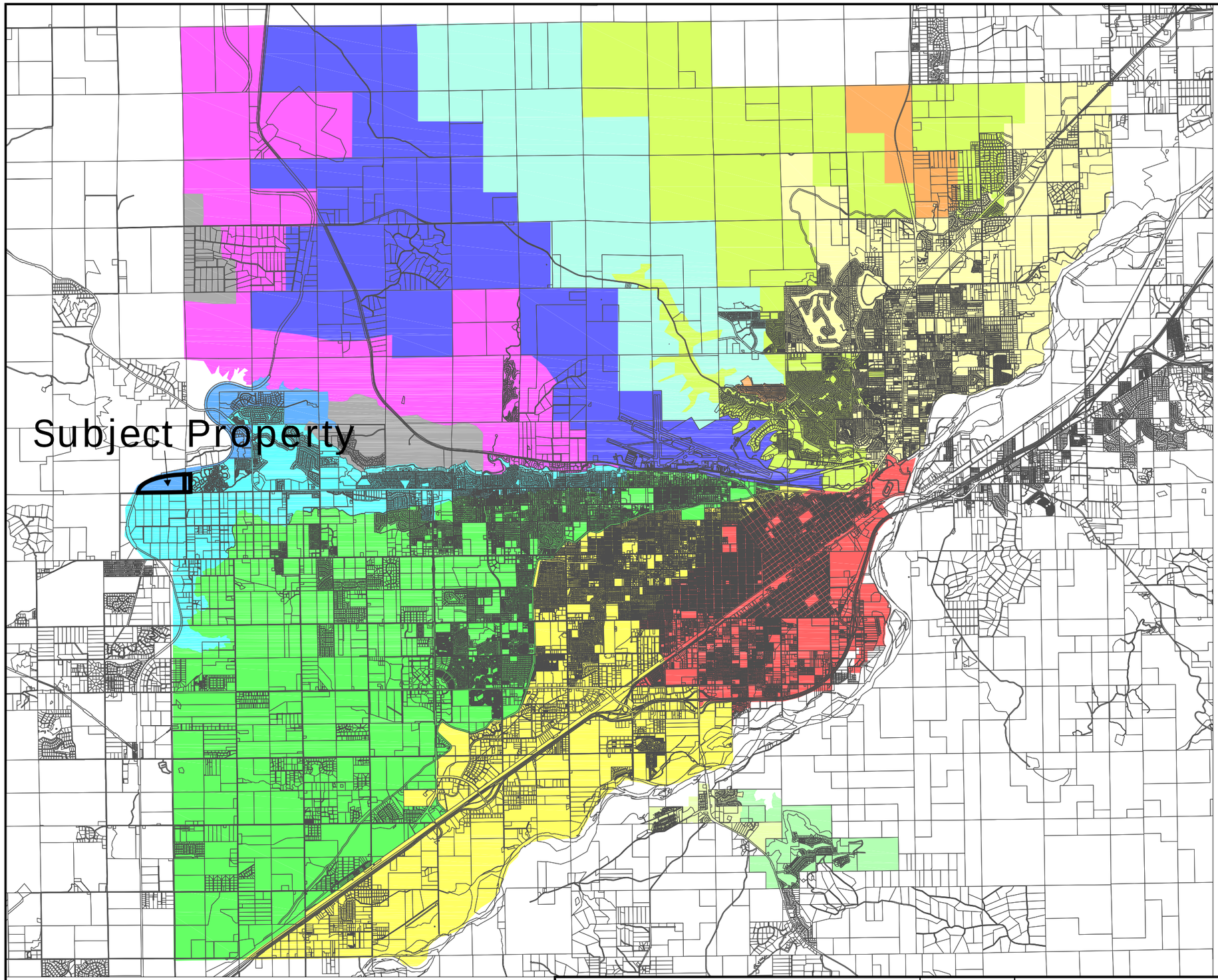

N
197,153 ft²
(4.526012 acres)
A
B
C
D
E
F
G
H
I
J
K
M
N
P
Q


Surface Count
Building Pad: Standard
3 Car Bldg Pad: Inside Curve
3 Car Bldg Pad: Rectangle
Building Pad: Bump-8 (20°)
Building Pad: Bump-4 (10°)
Building Pad: Bump-6 (15°)
3 Car Bldg Pad: Bump-8 (20°)
3 Car Bldg Pad: Bump-4 (10°)
3 Car Bldg Pad: Bump-6 (15°)
Building Pad: Rectangle
Total Count: 348
3 Car Bldg Pad: Bump-6 (15°) 1.1% (4)
3 Car Bldg Pad: Bump-4 (10°) 1.4% (5)
3 Car Bldg Pad: Bump-8 (20°) 2.6% (9)
Building Pad: Bump-6 (15°).. 3.7% (13)
Building Pad: Bump-4 (10°).. 4.3% (15)
Building Pad: Bump-8 (20°).. 8.6% (30)
3 Car Bldg Pad: Inside Curve 12.6% (44)
Building Pad: Standard..... 15.5% (54)
3 Car Bldg Pad: Rectangle... 16.1% (56)
Building Pad: Rectangle..... 33.9% (118)


Down 41 degrees
16 May 2016 12:30:30 PM

APPENDIX E:

SELECTED WATER AND SANITARY SEWER PLANNING EXHIBITS



LEGEND

- PRESSURE ZONE 1
- PRESSURE ZONE 2
- PRESSURE ZONE 2 EAST
- PRESSURE ZONE 3
- PRESSURE ZONE 3 EAST
- PRESSURE ZONE 3 SOUTH
- PRESSURE ZONE 4
- PRESSURE ZONE 4 EAST
- PRESSURE ZONE 4 NORTH
- PRESSURE ZONE 4 SOUTH
- PRESSURE ZONE 5
- PRESSURE ZONE 5 WEST
- PRESSURE ZONE 6
- PRESSURE ZONE 7

N

4000 2000 0 4000 8000

SCALE IN FEET

MORRISON MAIERLE, INC.
An Employee-Owned Company

Engineers
Surveyors
Scientists
Planners

315 N. 25th Street
Suite 102
Billings MT 59101

Phone: (406) 656-6000
Fax: (406) 237-1201

DRAWN BY: RLL
CHK'D. BY: KDD
APPR. BY: KDD
DATE: 07/2013

V:\0686\182 - Integrated Water Plan\ACAD\Exhibits\FIGURE 3-1.dwg Plotted by randy larance on Dec/17/2013

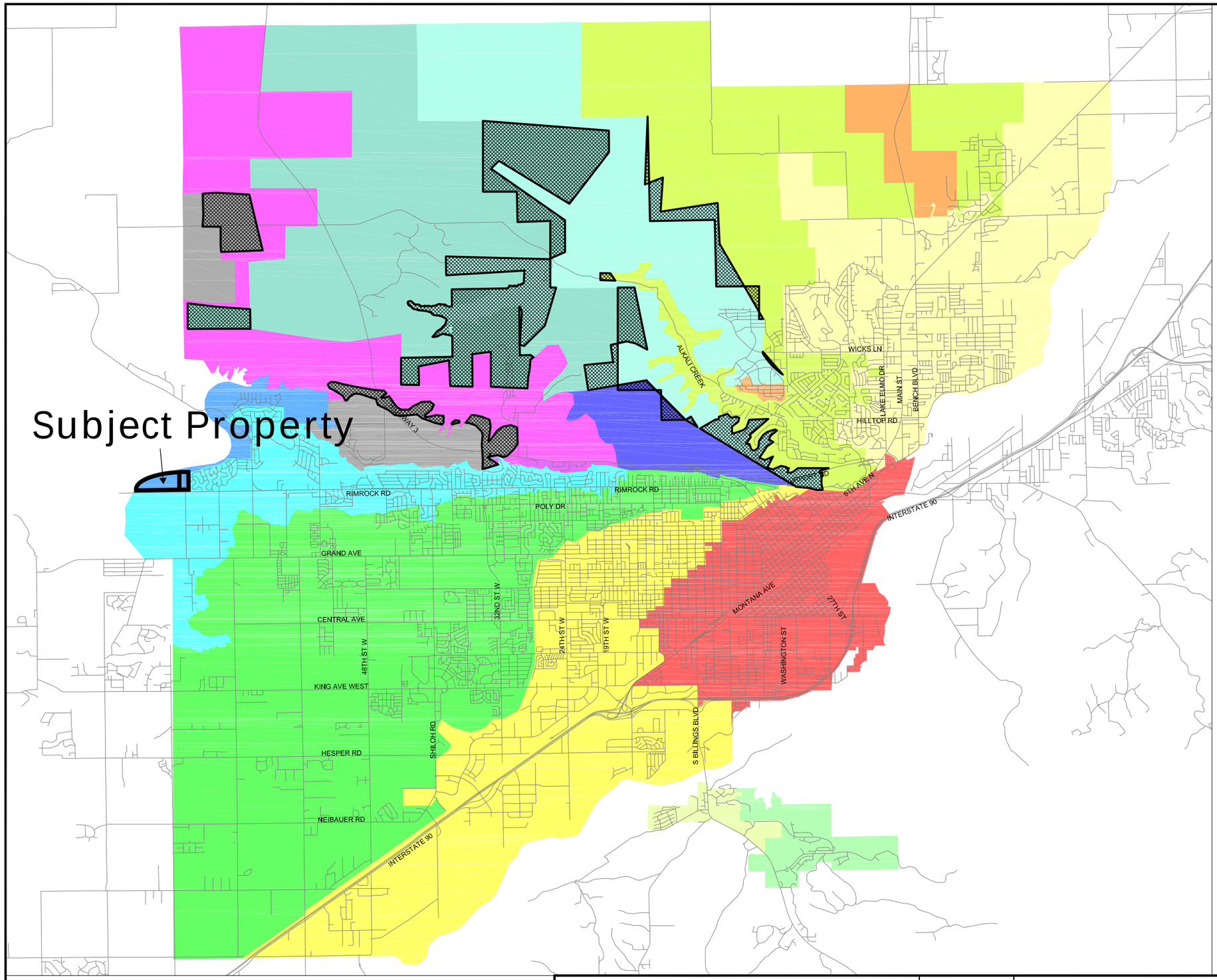
INTEGRATED WATER PLAN IMPLEMENTATION

BILLINGS MONTANA

EXISTING PRESSURE ZONES

PROJECT NO.
0686.182

FIGURE NUMBER
FIG. 3-1



LEGEND

- PRESSURE ZONE 1
- PRESSURE ZONE 2
- PRESSURE ZONE 2 EAST
- PRESSURE ZONE 3
- PRESSURE ZONE 3 EAST
- PRESSURE ZONE 3 SOUTH
- PRESSURE ZONE 4
- PRESSURE ZONE 4 EAST
- PRESSURE ZONE 4 NORTH
- PRESSURE ZONE 4 SOUTH
- PRESSURE ZONE 5
- PRESSURE ZONE 5 WEST
- PRESSURE ZONE 6
- PRESSURE ZONE 7
- PRESSURE ZONE ADJUSTMENTS

N

4000 2000 0 4000 8000

SCALE IN FEET

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DRAWN BY: RLL
CHK'D. BY: KDD
APPR. BY: KDD
DATE: 07/2013

V:\0686\182 - Integrated Water Plan\ACAD\Exhibits\FIGURE 4-2.dwg Plotted by randy larance on Dec/17/2013

INTEGRATED WATER PLAN IMPLEMENTATION

BILLINGS MONTANA

PROJECT NO. 0686.182

PRESSURE ZONE ALTERNATIVE #1

FIGURE NUMBER FIG. 4-2

ECHO CANYON AREA

IRONWOOD ESTATES SUBDIVISION

COVE RAILROAD TUNNEL

PROPOSED SEWER SERVICE AREA BOUNDARY (TYP)

AREA 1

AREA 2A

AREA 2B

AREA 3A

AREA 3B

AREA 4

AREA 5

AREA 6

AREA 7

AREA 8A

AREA 8B

Subject Property

EXISTING CITY LIMITS

PROPOSED SEWER SERVICE AREA BOUNDARY (TYP)

EXISTING CITY LIMITS

STATE HIGHWAY No. 3

ENGINEERING, INC.
CONSULTING ENGINEERS & LAND SURVEYORS
SUITE 200 CREEKSIDE
1001 SO. 24TH ST. WEST
BILLINGS, MONTANA 59106-1345
406-656-5205

NORTHWEST TRUNK WATER AND SANITARY SEWER
FOR
PUBLIC UTILITIES DEPARTMENT
BILLINGS, MONTANA

PROPOSED SEWER SERVICE AREAS

C.A.D. CMK
DATE: 11/8/01
REVISIONS:

APPROVED BY:
QUALITY ASSURANCE:

SCALE: 1"=2000'
FILE: ECHO-CANYON
PROJECT NO.: 01097
SHEET 1 OF 1

D:\project\nwbjt\nsw\plan\ECHO CANYON ... Wed Nov 14 ... 05: ... 2001