



URBAN PLANNING STUDY

FOR

**S11, T01 N, R26 E, S 13 AC & W OF RY IN S2SW
(LESS 3,303 SF BENCH ROW)(15)
BILLINGS, MONTANA**

PREPARED FOR:
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November 13, 2015

Project Number: 14059.01

Table of Contents

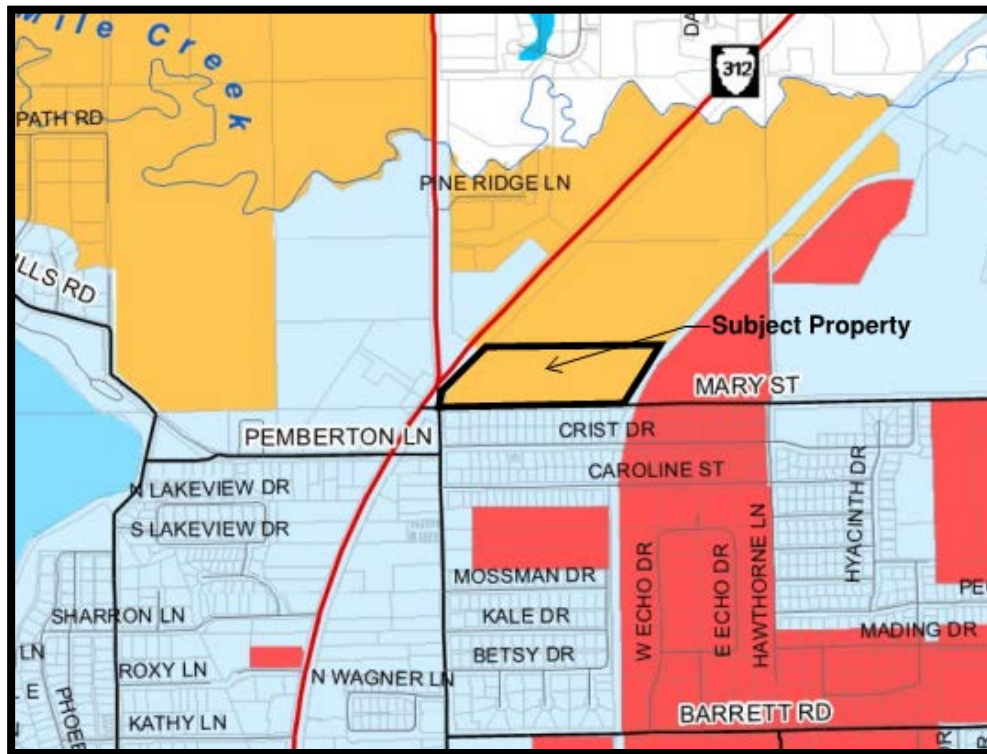
Executive Summary.....	2
Land Use	2
Existing	2
Proposed.....	3
Projected and Estimated Population	3
Development Timelines	3
Land Characteristics	3
Topography and Geology	3
Soils	3
Effects on Agriculture	4
Historic Sites	4
Effects of Urbanization on the Existing Environment.....	4
Public Service Evaluation	5
Water/Sewer Assumptions	5
Water Service	5
Sanitary Sewer	5
Stormwater Management	6
Solid Waste	6
Parks, Recreation, and Public Lands	7
Public Safety.....	8
Public Schools.....	9
Transportation Systems Impacts	10
Streets and Intersections	10
Anticipated Trip Generation	10
Method of Funding Public Improvements	11
System Development Fees.....	11
Special Improvement District.....	11
Property Tax Revenues.....	11
Conclusion	11
Exhibits	
Exhibit A: Property Location	
Exhibit B: Available Services	
Appendices	
Appendix A: Soils Report	
Appendix B: Selected Figures from Billings Bypass EIS	

Executive Summary

The Zella Yegen Trust B & C Land Urban Planning Study addresses the property at 2411 Bench Blvd, legally described as:

1. S11, T01 N, R26 E, S 13 AC & W of RY in S2SW (Less 3,303 SF Bench ROW)(15)

This study area is just under 13 acres of land. The site is currently open agricultural land, and has been used to grow alfalfa. 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.



A portion of the Limits of Annexation Map is shown with the study area indicated.

Land Use

Existing

The Study area encompasses approximately 13 acres of farmland zoned as Open Agricultural. The original farm house and several out buildings are located on the west end of the property, with a driveway access from Bench Boulevard. The remainder of the site is used for agricultural purposes, primarily for growing alfalfa.

Exhibit A shows an aerial exhibit of the study area.

Proposed

The planning of the future Billings Bypass corridor is advancing the need for planning of future land uses within this area of Billings Heights. The bypass would provide a route for traffic from Main Street to I-90. The preferred alternative for the alignment of the Bypass would parallel Mary Street, and connect to Old Highway 312 and Highway 87.

While still in early design stages, it is anticipated that the bypass will have impacts to the study area. In 2015, the owners of the property hired Sanderson Stewart to prepare a project impact and conceptual plan as a result of the proposed Billings Bypass, which will run through the southern portion of the property. Figures from the Billings Bypass EIS that relate to this project are shown in Appendix B.

Given the proximity to Main Street and the new bypass, it is anticipated that the property owners would seek commercial zoning and development of the property for commercial use. Development of this conceptual plan will enable the owners of the property to work with the designers of the Billings Bypass to ensure that access and utility connections to this property are incorporated into the design of the Bypass.

Projected and Estimated Population

It is intended that the property will ultimately be used for commercial development, therefore there will be no additional population. The development of this property as a commercial site, will serve the existing residential neighborhoods to the south, as well as County residents to the north.

Development Timelines

Development of the subject property would be a long term endeavor. Should the city move this property into the red area, the owners should carry forward with their conceptual master plan and take the next steps to further their goals and objectives. Development would be phased as the Bypass is developed, and access to the site becomes available.

Land Characteristics

Topography and Geology

The study area covers approximately 13 acres of relatively level property located just to the East of Main Street/Old HWY 312. The site slopes slightly to the north.

Soils

According to the United States Department of Agriculture, Natural Resources Conservation Service, there are three soils types in the study area.

The majority of the site is Keiser silt clay loam. This soil provides a good source of topsoil to a depth of ten inches, and overall medium compressibility, low bearing capacity, high frost-action potential, moderately slow permeability, and high erodibility of embankments.

The next soil type found on this site is Bew clay. Bew clay is limited in building due to its shrink-swell nature. This soil is mainly composed of clay with some clay loam and is slow permeability, highly erodible, and low bearing capacity.

Finally, the third soil type found on the property is gravel pit. Gravel is characterized by a high permeability, low elasticity, low erodibility nature. This soil type covers a small percentage of the property and lies along the northern edge of the site.

The majority of the site is suitable for building and construction with some limitations in the lower southwest corner due to the Bew clay. A detailed geotechnical investigation and report is typically required by the City of Billings at the time of subdivision of the property.

A copy of the Soils Resource Report is included in Appendix A.

Effects on Agriculture

The study area is currently zoned as open agricultural. 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, potential impacts of the bypass right-of-way, and adjacent residential uses, development of the study area at urban densities should have limited effect on agriculture.

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.

SHPO maintains a cultural resource annotated bibliography system. A historic/cultural study will be completed at the time of development of the study area.

Effects of Urbanization on the Existing Environment

This is a growing part of the greater Billings area. As the City grows and looks to build the bypass, this area will become more urbanized. Land to the south of the study area is within the City limits and developed or is in a prime location for urban development. Master planning of this property has already begun at a conceptual level and would continue based on the findings of the urban planning study and the annexation of the property by the city.

Development to the south has been residential at this point. Areas to the west are Commercial or Light Industrial. With the implementation of the Billings Bypass project, there will be a large effect on land use in this area due to the inflow of vehicular traffic.

Public Service Evaluation

Water/Sewer Assumptions

If annexed, the subject area would receive public sanitary sewer and water services from the City. Nearby utility mains are shown on Exhibit B.

Water Service

The Billings Heights Water District has indicated that the District would serve the property upon annexation into that District. Water service to the subject property could be provided by an 8” water main that currently runs parallel to Mary Street. For the proposed commercial development, it is assumed that average daily demand will be 1,150 gpd/acre of developed property. Water demands from the subject property are summarized below. Since the boundaries of the Billings Bypass Right-of-Way are not established, the entire area of 13 acres is calculated to show a worst-case-scenario. The anticipated demands are as follows:

Estimated Land Use	Area (acres)	Pop. Density (persons/ac)	Total Pop.	Ave. Day Demand (gpd)	Ave. Day Water Demand (gpd)	Max. Day/Ave. Day Water Demand Ratio	Max. Day Water Demand (MGD)
Commercial	13	NA		1,150/acre	14,950	2.20	0.033

Sanitary Sewer

Wastewater collection from the subject property could be provided by an 8” sanitary line that runs along the south.

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

Land Use	Acres	Pop. Density /acre	Total Pop.	Ave. Day Flow (gpd)	Ave. Day Flow (gpd)	Max. Demand Ratio	Max. Day Demand (gpd)
Commercial	13			1,150/acre	14,950	1.17	17,492

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 (0.017 MGD) would represent 0.09-percent of the available wastewater treatment plant capacity: (based on 2006 Master Plan)

$$[(0.017 \text{ MGD}) / (26 \text{ MGD} - 7.33 \text{ MGD})] * 100\% = 0.09\%$$

Collection

The City of Billings generally requires sewer mains to be sized with adequate capacity to convey design flows when flowing two-thirds full. The existing 8-inch sewer main constructed at minimum DEQ allowable slopes has a carrying capacity of approximately 270 gpm when flowing two-thirds full. Sanitary sewer design flows are typically equal to peak hourly flow conditions. Peak hour flows are estimated using a peaking factor of 4. Therefore, the peak hourly flow from the subject area equals:

$$(10.38 \text{ gpm} * 4) = 41.5 \text{ gpm}$$

Therefore, the design wastewater flow from the subject property would use approximately 16.5-percent of the carrying capacity of the 8-inch sewer constructed at minimum allowable slopes:

$$(41.5 \text{ gpm} / 270 \text{ gpm}) * 100\% = 16.5\%$$

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 have a capacity of approximately 270 gpm. The peak hour wastewater flowrate based on 41.5 gpm can be served by an 8-inch main.

Stormwater Management

The subject property is currently farmland and slopes to the north where the runoff flows towards the Holling Drain and ultimately Five Mile Creek. 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 apply to any future subdivision development include:

- All subdivisions must evaluate the 100-year, 24 hour storm and ensure stormwater 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 storm must be entirely retained on site.

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.

A private hauler currently serves the study area. Consequently, the City of Billings might not assume responsibility for the solid waste collection to those areas for up to 5 years after annexation under the provisions of 7-2-4736, MCA, which specifically states:

Preservation of existing garbage or solid waste service in the event of annexation. (1) A municipality that annexes or incorporates additional area receiving garbage and solid waste disposal service by a motor carrier authorized by the public service commission to conduct such service may not provide competitive or similar garbage and solid waste disposal service to any person or business located in the area for 5 years following annexation except: (a) upon a proper showing to the public service commission that the existing carrier is unable or refuses to provide adequate service to the annexed or incorporated area; or (b) after the expiration of 5 years, if a majority of the residents of the annexed or incorporated area sign a petition requesting the municipality to provide the service. (2) If a proper showing is made that the existing carrier is unable or refuses to provide adequate service to the annexed or incorporated area or, after the expiration of 5 years, if a majority of the residents sign a petition requesting service from the municipality, the municipality may provide garbage and solid waste disposal service to the entire annexed or incorporated area. (3) For the purposes of determining whether an existing motor carrier provides adequate service, those services provided by the carrier prior to annexation are considered adequate service.

If after five years the residents of the area were to petition for solid waste collection service from the City, the City would assume the responsibility and provide weekly service. Depending on the number of clients in the new service areas the Solid Waste Division may need to add additional staff and equipment.

Parks, Recreation, and Public Lands

Parks 2020: The Billings Parks, Recreations, and Open Space Plan (Parks2020) 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. Parks2020 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 as identified on Map 1 of the Parks 2020 plan. These include the following city parks:

Hawthorne Park
Primrose Park
Walden Grove Park
Clevenger Park
Arrowhead Park
Uinta Park
Edgerton Park
Walsh Park
Castlerock Park
Frances Park

In addition to these parks, there is also a 64-acre Reservoir that has been designated as a state park, Lake Elmo. This recreation area boasts swimming, boating, sailboarding, fishing, picnicking, birdwatching, and a 1.4 mile trail system.

Park and Recreation Needs

Within a ½ mile East of this property, there is a recommended neighborhood park development need as outlined in Framework A of the Parks 2020 plan. This ½ mile radius does touch the Eastern edge of this property. To the South, North, and West, there are existing neighborhood parks within a reasonable walking distance. Future growth to the North will increase the need for future park development toward the Northeast of the property.

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 5.0 miles from the study area).

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 to the Crist Acres to the South, Daniels Subdivision to the Southeast, and North Pointe Square Subdivision to the West. If annexed, this area would expand their 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. Without that additional funding, the Police Department may reduce regular patrol and/or reduce staff in future years.

Fire

The Billings Fire Department currently serves the study area within the Billings Urban Fire Service Area (BUFSA). Services provided include: Fire suppression, emergency medical response, dispatch and communication services for local fire, police and ambulance services, hazardous materials response, high angle and confined space rescue, vehicle accident extrication, fire investigations, building inspections, juvenile fire setter program, and fire education.

Fire Station No. 6 at 1601 St Andrews Drive is the closest station to the subject area at two miles from the subject area. Station No. 6 covers the heights and the BUFSA. The emergency vehicles at this station include Engine 6, Brush 6, Tender 5, and Air refillings van. This station is also a solar powered station and home for the SCBA (self-contained breathing apparatus) technicians, who are responsible for the maintenance, upkeep, and filling of oxygen tanks.

Facts about Station 6

<u>Fire Calls</u>	<u>EMS Calls</u>	<u>Non-Fire Calls</u>	<u>HazMat Response</u>	<u>Dollar Loss</u>
68	888	310	39	\$5,042,450
<u>First In On Calls</u>	<u>Back-up on Calls</u>	<u>Total Responses</u>		
1,305	80	1,385		

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. The hospitals are approximately 5.25 and 5.5 miles, respectively, from the study area. 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

With the intended use of the study area site for commercial development, there is no foreseeable increase in students in nearby schools.

Transportation Systems Impacts

In July of 2014, the Montana Department of Transportation (MDT) released a Record of Decisions regarding the Billings Bypass project. This decision chose the preferred route of the Billings Bypass to lay adjacent to Mary Street. This route will provide 5.15 miles of road connecting I-90 to Old Hwy 312 in the heights. This project is currently in the design phase and is expected to start construction in 2020.

Streets and Intersections

The site property for this project is located north of Mary Lane and east of Montana Highway 312 (MT 312). Right-of-way for the Billings Bypass will take approximately the south half of the subject parcel leaving approximately 6 acres available for development. This will also result in the Billings Bypass serving as the new south boundary for the site.

MT 312 is a Secondary State Highway that is classified by the Montana Department of Transportation (MDT) as a Minor Arterial and by the City of Billings as a Principal Arterial. It is maintained by Yellowstone County. From an alignment standpoint, MT 312 serves as a continuation of Main Street heading northeast from Billings toward Shepherd and Huntley. Adjacent to the site property, MT 312 generally carries a 5-lane section and is subject to a posted speed limit of 45 mph.

The Billings Bypass is currently in design. It is generally expected that the segment along the south edge of the site property will have a three-lane section and a posted speed limit of 45 mph. It is not yet known where access will be available to private property or how many access points may be allowed.

Adjacent intersections are also difficult to describe at this point in time, since there are various alternatives being considered, including a new interim traffic signal on MT 312, a roundabout that would replace the existing traffic signal at the Main Street-US 87-MT 312 intersection, and a dual-roundabout configuration that would replace the existing traffic signal. A traffic signal was recently installed at the Main Street-US 87-MT 312 intersection through a MDT project.

Anticipated Trip Generation

Preliminary conceptual development plans for the site property propose Community Commercial zoning with a mixture of commercial land uses for the 6-acre property. Based on an assumption of a 15% building coverage, this would result in approximately 39,200 SF of gross commercial floor area.

A reasonable projection of site-generated traffic can be estimated using Trip Generation, 9th Edition, published by the Institute of Transportation Engineers (ITE), the most widely accepted source for trip generation rates. Utilizing the Shopping Center land use category, the site would project to generate approximately 1674 trips on an average weekday, with 38 trips (23 in/15 out) during the AM peak period and 147 trips (71 in/76 out) during the PM peak period. The site would also project to generate approximately 1983 trips on a typical Saturday.

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. 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. The 2016 County Water District of Billings Heights service fees range from \$1,494.36 for a ¾” line to \$209,211.10 for an 8” service line. In addition to these fees, the heights also has Annexation buy-in fees of \$8,640.98/Acre or 19.84 cents/sq ft.

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.

Conclusion

The properties within the study area are geographically, environmentally and economically suitable to urban development. Property to the west and south is currently within city limits and property to the east currently sits in the red area of the limits of annexation map. The area of the urban planning study is situated within the long range urban planning area. This area has already been under study with the proposed Billings Bypass project and future growth is likely to accompany this transportation expansion. The study area is adjacent to development on the east, west and south, with future potential development to the north. Annexation into the red of this study area will allow for future planned growth along a newly established bypass.

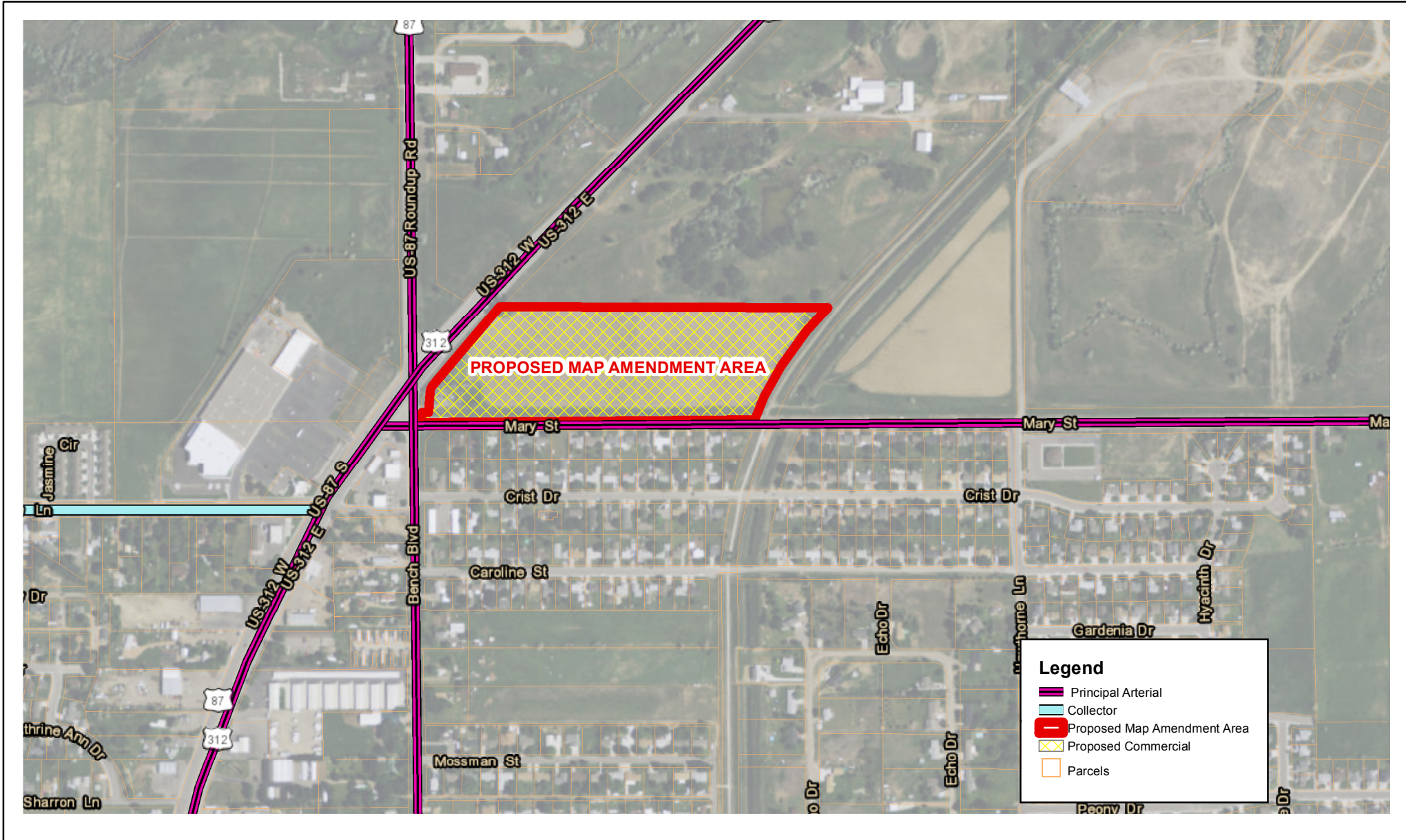
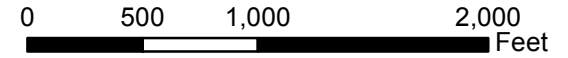
The provision for emergency services is always a concern as communities expand and grow. Adding this property to the red area provides time for the service analysis and will help identify demands for those services.

The property within the study area does not have a specific timeframe for development. Placing it 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. It also will provide the designers of the Billings Bypass to incorporate the proposed development into their design for access and utilities to this adjacent property.

EXHIBIT A PROPOSED MAP AMENDMENT AREA

Prepared For: Zella Yegen Trust
Prepared By: Sanderson Stewart

Date: 11/13/2015
Billings, Montana



Legend

- Principal Arterial
- Collector
- Proposed Map Amendment Area
- Proposed Commercial
- Parcels

EXHIBIT B

CITY LIMITS, CURRENT ZONING, AND CURRENT UTILITIES

PREPARED FOR : ZELLAH YEGEN TRUST
PREPARED BY : SANDERSON STEWART

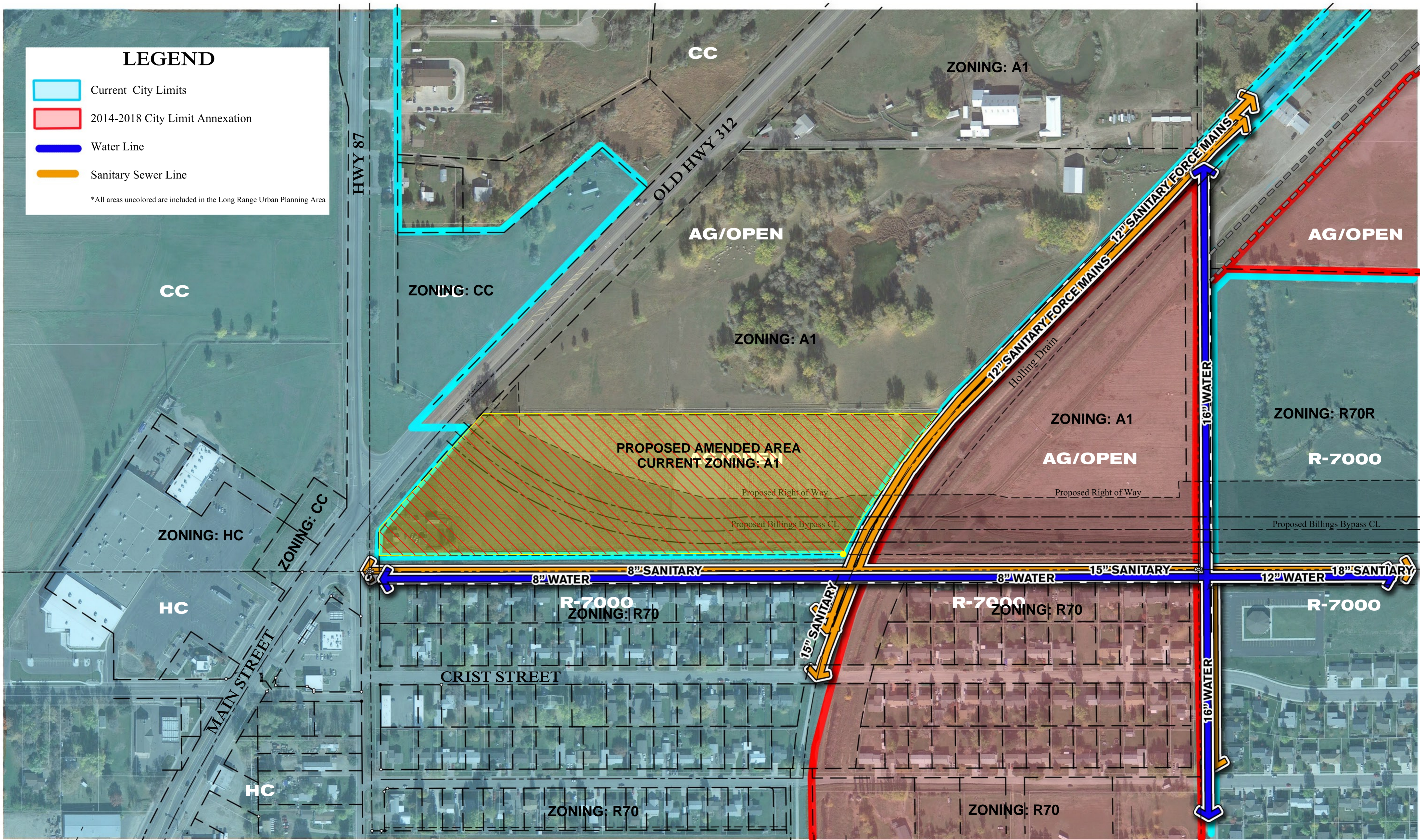
November 2015
BILLINGS, MONTANA



LEGEND

- Current City Limits
- 2014-2018 City Limit Annexation
- Water Line
- Sanitary Sewer Line

*All areas uncolored are included in the Long Range Urban Planning Area



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

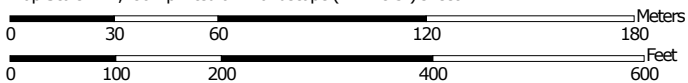
Custom Soil Resource Report for Yellowstone County, Montana



Custom Soil Resource Report Soil Map




Map Scale: 1:2,180 if printed on A landscape (11" x 8.5") sheet.




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
Bo	Bew clay, 1 to 4 percent slopes	1.5	11.6%
GP	Gravel pit	0.5	4.1%
Kc	Keiser silty clay loam, 0 to 1 percent slopes	10.9	84.3%
Totals for Area of Interest		12.9	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

Custom Soil Resource Report

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

Bo—Bew clay, 1 to 4 percent slopes

Map Unit Setting

National map unit symbol: clqf
Elevation: 1,900 to 4,500 feet
Mean annual precipitation: 11 to 14 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Bew

Setting

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

Typical profile

Ap - 0 to 7 inches: clay
Bt - 7 to 16 inches: clay
Bk - 16 to 46 inches: clay
C - 46 to 60 inches: clay 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 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: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.2 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Clayey (Cy) RRU 58A-C 11-14" p.z. (R058AC041MT)

Minor Components

Vananda

Percent of map unit: 9 percent
Landform: Terraces, fans, lakebeds (relict)

Custom Soil Resource Report

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)

Allentine

Percent of map unit: 6 percent
Landform: Terraces
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)

GP—Gravel pit

Map Unit Composition

Pits, gravel: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Kc—Keiser silty clay loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: cls2
Elevation: 2,700 to 5,000 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Keiser

Setting

Landform: Terraces, low hills
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear, concave
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 3 inches: silt loam
Bt - 3 to 9 inches: silty clay
Bk - 9 to 23 inches: silty clay loam
C - 23 to 60 inches: silt loam

Custom Soil Resource Report

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 (0.20 to 0.57 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 moderately saline (0.0 to 8.0 mmhos/cm)

Available water storage in profile: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): 2e

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C

Ecological site: Silty (Si) RRU 58A-C 11-14" p.z. (R058AC040MT)

Minor Components

Bew

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)

Shonkin

Percent of map unit: 5 percent

Landform: Terraces

Landform position (three-dimensional): Tread

Down-slope shape: Concave

Across-slope shape: Concave

Ecological site: Overflow (Ov) RRU 58A-C 11-14" p.z. (R058AC045MT)

Hesper

Percent of map unit: 4 percent

Landform: Fans, terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) RRU 58A-C 11-14" p.z. (R058AC040MT)



Figure A.8. Phase 1 Design Simulation, Mary Street Looking East from US 87 and Main Street

