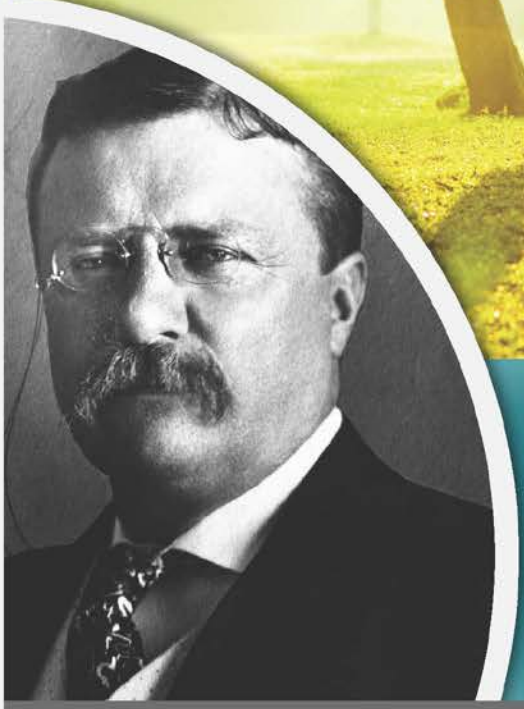
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Introduction
Chapter I



Executive Summary

Roosevelt City is responsible for providing public service to its customers within its municipal boundary. It also provides water to customers beyond the current borders of its City limits. The current municipal boundary of Roosevelt City (City) is approximately 4,364 acres. Over the next 25 years, it is anticipated this service area will grow by an estimated 2,175 acres to a total of 6,539 acres (10.2 square miles).

This document is a compilation of the city master plan and long term public facilities plan hereafter collectively called the "Master Plan". This Master Plan document combines these elements into one comprehensive study.

Expected population growth in Roosevelt City has increased the demand on the existing public facilities throughout the City. To continue to adequately service the City's increasing population, the public facilities, which consist of culinary water, sanitary sewer, streets, storm drainage, secondary water, parks & trails, and cemetery, were analyzed and reported in this document. This document recommends capital improvements necessary to increase the capacity of these facilities in order to meet the demands of the projected population through the year 2045 and to maintain the current Level of Service (LOS) for said facilities.

Below is a summary of expected costs along with the associated improvement period.

1-5 year improvements	$34,138,450
6-10 year improvements	$28,989,743
11-15 year improvements	$46,161,658
16-25 year improvements	$194,823,777

These improvements, which total $304,113,626 are unrealistic within a 25 year window. For this reason each chapter and appendix prioritizes realistic projects within the first two 5 year windows (1-5 year and 6-10 year). The majority of the projects contained in that latter two windows (11-15 year and 16-25 year) are for developments. If a developer were to come into the City, they would need to know the type, and the scope of infrastructure needed to service their development. It is understood that most will not be realized, but analysis of all possibilities during the 25 year buildout and beyond was necessary to identify all immediate and future potential improvements.

It is estimated that of the 6-10 year improvements, approximately $1,136,351 would be developer influenced, therefore should be paid for by developers. The estimated developer contributions for the 11-15 and 16-25 year improvements is estimated at $15,352,054 and $77,297,209. These development type of improvements should only be explored if annexation and development does indeed become a reality during the planning period. Further detail of expected costs can be examined in **Section 1.4** of this Chapter, and in each individual Chapter and Appendix.

This document also includes a land use element, economic development plan, moderate income housing, detailed traffic studies, a public survey, Utah LTAP Survey (performed by others), and a Drinking Water Source Contingency Plan.

The organization of the Master Plan Document is as follows:

Master Plan Contents

Chapter 1 – Introduction

Chapter 2 – Land Use

Chapter 3 – Economic Development Plan

Chapter 4 – Transportation Master Plan

Chapter 5 – Moderate Income Housing

Chapter 6 – Recreation Master Plan

Appendices

Appendix A – Cemetery Master Plan

Appendix B – Culinary Water Master Plan

Appendix C – Secondary Water Master Plan

Appendix D – Sewer Master Plan

Appendix E – Storm Drain Master Plan

Appendix F – Detailed Traffic Studies

Appendix G – Roosevelt City Master Plan Survey

Appendix H – Utah LTAP Survey

Appendix I – Drinking Water Source Contingency Plan and Updated Drinking Water Source Protection Plans

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Chapter 1

1.1 Roosevelt City

The following provides a brief summary of Roosevelt which can be found on the City's website at http://www.rooseveltcity.com/175/History-of-Roosevelt-City.

In 1861, a vast space of land was set apart in Utah to accommodate the Ute Indian Nation. As Utah continued to grow, the Ute Reservation was opened to white settlers, as dictated by the U.S. Congress in 1905. This act led to a rapid growth on the land, both in settlers and resources. With all this growth happening in the State, some find it hard to believe that one could lay some interest in a land located in the middle of nowhere with nothing growing besides shad scale, rabbit brush, and desert grass. Ed Harmston, an engineer and mathematician, chose this land to become his homestead. With not much to offer at the time, this land became the City of Roosevelt.

Harmston's sons, Craig and Floyd, took over the purchase of land their father Ed had made and began preparing the City by introducing an irrigation system, defining the layout of the streets, and installing pipelines. Before they knew it, a town was shaped and running. Roosevelt quickly became the principal trading center for all western area of the Uintah Basin.

At first, citizens were in deep need of a railroad across the City, but after cars came along, a railroad didn't seem to serve them a purpose. People in the area found it appropriate to start growing cash crop in order to pay for their taxes and other dues. The ownership of livestock allowed Roosevelt to expand by selling dairy products. Though things seemed great at the time, World War 1 struck and the sales lowered immensely. However, with the unexpected growth of alfalfa seed, the town regained hope for sales and Roosevelt was back on its feet.

With a rich history, Roosevelt today stands as a thriving and modern community. Roosevelt today provides a Technology Center with one of the finest nursing programs in the State. It is one of the cities with the best medical facilities in Rural Utah. Roosevelt also is host to an 18 hole golf course, Moon Lake Electric Inc., Strata Networks, and others. Roosevelt continues to show a strong pattern of growth and development, this plan pursues improvement in the transportation system to sustain growth caused by commercial and technology development.

1.1.1 Purpose of the General Plan

The Roosevelt City General Plan is designed to accomplish three goals. First, it provides a vision for the future of Roosevelt City and its residents. This includes identifying goals and means to accomplish them. Second, it serves as a planning tool to guide future City decisions, such as requests for annexation or zoning changes. It also allows the City to plan for future growth, including provision of utilities and

public services. Third, it complies with Utah State Code, which requires the preparation and adoption of a comprehensive, long-range general plan.

A general plan is required to contain elements regarding land use, transportation, and moderate-income housing (U.S.C., 10-9a-403). In addition to these required elements, Roosevelt City has also chosen to prepare plans for economic development, recreation (including parks and trails), the cemetery, and public infrastructure (culinary water, secondary water, sewer, and storm drain).

The effectiveness of this plan depends on the continued interest, enthusiasm, and support of elected officials, Planning and Zoning commissioners, and City staff. Without sustained effort to realize the vision identified in the following chapters, the plan will have little influence on the future of Roosevelt.

1.1.2 Vision

Vision Statement: Roosevelt is the Energy Hub of Utah, and the heart of the Uintah Basin.

Mission Statement: Roosevelt City will be economically friendly to business, industry and promote the entrepreneurial spirit; by providing essential services that create a safe environment for all citizens to raise their families, worship, enjoy recreational opportunities, and serve in the community.

Guiding Principles:

1. **Reliability** – We actively learn from the past, perform in the present, and plan for the future of City owned infrastructure through utilizing sound analysis, efficient practices, and leveraging our resources.
2. **Community Health & Safety** – We promote healthy lifestyles, advocate good citizenship, foster freedom, and encourage complete cooperation with City service providers, and emergency personnel.
3. **Communication** – We promote open, honest, and respectful communication.
4. **Cooperation** – We promote consistent treatment, trustworthiness, respect, and teamwork among our elected officials, City employees, residents, business leaders, neighboring jurisdictions, and other governmental agencies.

Utah State Code, Section 10-9a-401 requires that "each municipality shall prepare and adopt a comprehensive, long range general plan for: (a) present and future needs of the municipality, and (b) growth and development of all or any part of the land within the municipality."

1.1.3 Previous Plan

The City Council adopted and implemented the previous Roosevelt City General Plan on April 13, 2010. The City completed public infrastructure and transportation plans in 2012. The plan included sections on transportation and capital facilities that included sewer, culinary water, secondary water, and storm drain. A number of goals were identified, and some were implemented, for each subject, which were evaluated during the development of this plan.

1.1.4 Roosevelt Today

Roosevelt is a city of approximately 7,000 residents located centrally in the Uintah Basin, midway between Duchesne and Vernal at the junction of US Highway 40 and State Road 121. The City is at an elevation of 5,250 feet. The City is near the Uintah and Ouray Reservation of the Ute Indian Tribe. Businesses in Roosevelt serve surrounding communities and agricultural areas in eastern Duchesne and western Uintah Counties. Agriculture and the oil industry form the basis of the regional economy. With Union High School, Uintah Basin Technical College (UBTech), and Utah State University-Uintah Basin, Roosevelt is also an educational center in the Uintah Basin. The City is also the home of the largest independent rural healthcare system in Utah, Uintah Basin Healthcare.

1.1.5 History of Roosevelt

In 1861, much of the Uintah Basin was set apart to accommodate the Ute Indian Nation. As Utah continued to grow, the Ute Reservation was opened to white settlers by congressional act in 1905.

Ed Harmston, along with his sons Craig and Floyd, homesteaded the area of Roosevelt in September 1905 and by the spring of 1906 had laid out a townsite. Despite a lack of accessible water, the town, supported by the Dry Gulch Irrigation Company, grew quickly. A school was established on land donated by the Harmston's and the tents and shanties were replaced by more substantial buildings. The town was incorporated during a mass meeting of 44 citizens on February 21, 1913 and by 1914, the residents of Roosevelt had developed a municipal system to provide a more dependable source of water.

The town grew quickly and eclipsed the rival towns of Myton and Duchesne commercially. Located on the main road between Price and Vernal, distributing mail for the Ute reservation, and offering a more diverse service economy than the other towns, Roosevelt became known, as early resident A.C. Harmston referred to it, as the "hub of the whole Uintah Basin."

Surrounding areas were most suited to raising livestock. Cattle and sheep were raised and driven for sale at Colton, Price, and Thompson Spring. Dairies were founded, serving as many as six creameries in Roosevelt alone. Early residents campaigned for the construction of a railroad through the Basin, but the demand for transport of passengers and goods was eventually served by the increasing popularity of motor vehicles.

Following World War I, prices for agricultural products declined and a depression struck the area. Banks closed and many farms were foreclosed. As the town struggled, it was found that alfalfa seed produced in the area was very high quality, and the economy was rescued based on the success of the "Billion Dollar Crop."

Although the presence of hydrocarbons in the Uintah Basin was known in the 1800s, little exploration for oil took place until after World War II. As the energy crisis struck the nation in the 1970s, successful wells were drilled near Altamont and other places in the basin. Oil and gas production quickly became a major contributor to the local economy, and remains so today.

Roosevelt today is a thriving and modern community. It offers higher education, one of the best medical facilities in rural Utah, recreational facilities, and is home to most of the utilities serving the region.

1.2 Demographic Overview

This demographic overview draws primarily from the US Census American Community Survey data for 2017. This data draws from surveys in the community and is therefore not as exact or detailed as census data.

1.2.1 Population

The estimated population in 2017 was 6,843. This represents an increase of 797 over the population of 6,046 reported in the 2010 Census, an increase of 13% or 1.88% annually. In 2012, the Governor's Office of Planning and Budget (GOPB) produced municipal population projections through 2060. The annual growth rate from 2010 to 2040, which is near the end of the planning period was determined to be 1.1%, however, this rate of annual population increase is well below the growth rate of the City over the last 19 years, which ranges from 1.88-2.8%. For instance, the City grew by approximately 59 percent between 2000 and 2017, from a population of 4,299 residents to approximately 6,843 residents; an increase of 2.8% annually. In addition, updated county-level projections produced by the Kem C. Gardner Institute in 2015 show a higher growth rate for Duchesne County overall.

Master plan recommendations based on population projections typically follow GOPB or some other governmental agency like an association of governments, to establish a population estimate over a certain planning period. The resulting estimated population is analyzed and is used to determine what improvements and recommendations are required during the planning period. In this case the City felt that the GOPB doesn't fully represent what is likely expected over the next 25 years, which is evidenced by rates of increase between 1.88% and 2.8% during the last two decades. For this reason, a growth rate of approximately 1.88%, requested by the City, was used in this Master Plan.

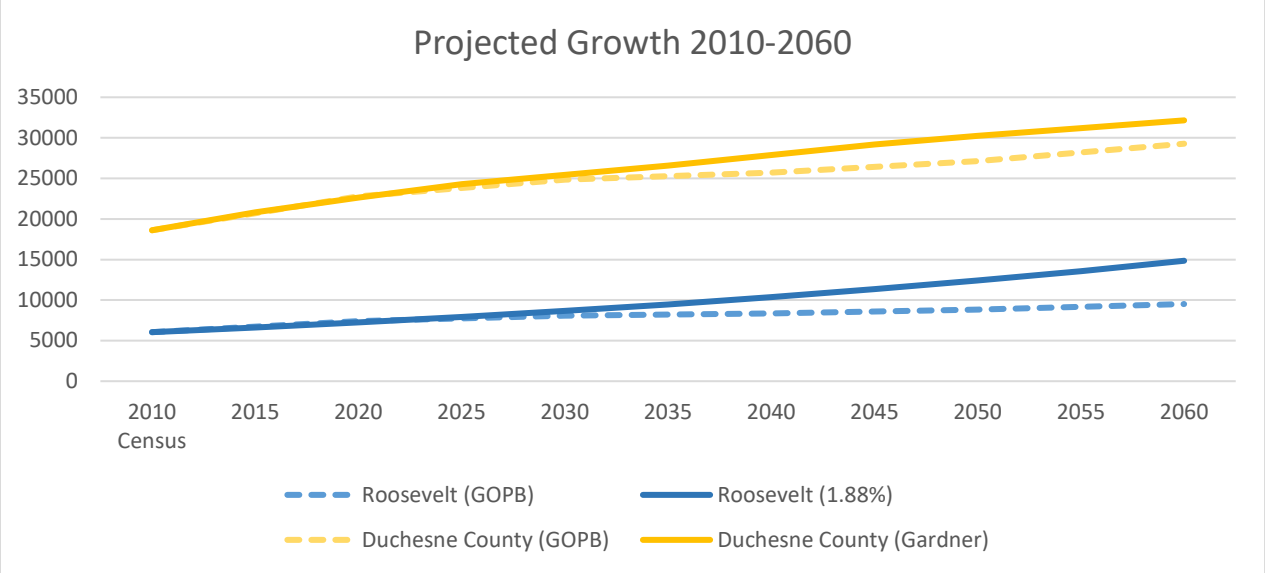
These higher growth rates are used to allow the City to plan conservatively for utilities and services needed for future growth. These projections for Roosevelt and Duchesne County can be found in Table 1-1.

Table 1-1. Population Projections, 2010-2060

	2010 Census	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
Roosevelt (GOPB)	6,046	--	7,407	--	8,070	--	8,358	--	8,813	--	9,512
Roosevelt (1.88%)	6,046	6,614	7,236	7,916	8,660	9,474	10,365	11,339	12,405	13,571	14,847

	2010 Census	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
Duchesne County (GOPB)	18,607	--	22,797	--	24,836	--	25,721	--	27,123	--	29,275
Duchesne County (Gardner)	18,607	20,821	22,653	24,277	25,422	26,596	27,893	29,178	30,259	31,205	32,154

Figure 1-1 Population Projections, 2010-2060



1.2.2 Age Distribution

The estimated median age in Roosevelt is 27.5 years. This is a small increase over the 2010 Census (25.9 years), but below the median age for Utah (30.5 years), and over a decade younger than the United States as a whole (37.6 years).

1.2.3 Households

The estimated median household size in Roosevelt is 3.08 occupants, very near the statewide median household size of 3.14. The median household income is $62,408, which is close to the state median of $65,325.

1.3 City Code

Roosevelt City Municipal Code implements the goals and plans contained in this general plan. It can be found online at https://www.codepublishing.com/UT/Roosevelt/#!/Roosevelt17/Roosevelt17.html. The municipal code currently includes the following titles:

Title 1 General Provisions
Title 2 Administration and Personnel
Title 3 Revenue and Finance
Title 4 (Reserved)
Title 5 Business Licenses and Regulations
Title 6 Animals
Title 7 (Reserved)
Title 8 Health and Safety
Title 9 Public Peace, Morals, and Welfare
Title 10 Vehicles and Traffic
Title 11 (Reserved)
Title 12 Streets, Sidewalks, and Public Places
Title 13 Public Services
Title 14 (Reserved)
Title 15 Buildings and Construction
Title 16 Subdivisions
Title 17 Zoning

1.4 Cost Analysis

1.4.1 Summary of Capital Improvement Costs

Recommended capital improvements to existing facilities were analyzed and reported in their respective chapters and appendices. These improvements are necessary to maintain the current LOS to Roosevelt city residents during future growth. Projects which may improve existing LOS are paid for by operating funds and/or acquired State or Federal funds.

Estimated costs of the recommended improvements are summarized in Table 1-2 by facility type. The improvement costs are 2019 dollars and are costs for all public facilities during the 25-year planning period. Contingencies, engineering (design and CM), environmental, right of way, legal and administrative fees are also included. These improvements will be funded through a combination of developer contributions, City operating funds, and other funds such as grants/loans, or other public entity funds.

Table 1-2: Estimated Cost of Recommended Improvements

Facility	Estimated Cost of Recommended Improvements (2019 dollars)	1-5 Year	6-10 Year	11-15 Year	16-25 Year
Culinary Water	$45,385,081	$6,347,245	$5,940,675	$13,623,064	$19,474,098
Sanitary Sewer	$31,992,931	$841,705	$1,259,890	$13,361,619	$16,529,178
Streets	$150,725,186	$4,619,900	$0	$5,861,100	$140,244,186
Storm Drain	$16,941,000	$6,115,000	$2,598,000	$4,114,000	$4,114,000
Secondary Water	$16,909,428	$3,677,100	$7,098,678	$436,875	$5,696,775
Parks and Trails	$38,585,000	$10,462,500	$11,692,500	$8,215,000	$8,215,000
Cemetery	$3,575,000	$2,075,000	$400,000	$550,000	$550,000
TOTAL	$304,113,626	$34,138,450	$28,989,743	$46,161,658	$194,823,777

All public facilities projected through the 25-year planning period were determined based on the need created by both future residential and non-residential growth. The cost of each facility was determined from sound estimating procedures using historic construction cost records for each particular facility, current land acquisition costs, typical engineering costs, and normal construction contingencies. The cost distributions and totals can be seen in each chapter or appendix in the table listing the estimated cost of each improvement.

1.4.2 Summary of Fees

Table 1-3: Expenditure Plan Summaries

	2020-2025 5-Year					
Facility	**Revenue (City Budget Estimates)**	**Developer Contributions [1]**	**Grants/ Loans**	**Capital Improvement Costs**	**Expenses (City Budget Estimates)**	**Balance**
Culinary Water	$2,051,400	$0	$5,725,000	-$6,347,245	-$1,426,300	$2,855
Sanitary Sewer	$1,054,400	$0	$730,000	-$841,705	-$942,900	-$205
Streets	$371,200	$0	$4,785,000	-$4,619,900	-$536,100	$200
Storm Drain	$104,600	$0	$6,100,000	-$6,115,000	-$85,500	$4,100
Secondary Water	$565,500	$0	$3,700,000	-$3,677,100	-$581,420	-$6,980
Parks and Trails	$710,300	$0	$11,250,000	-$10,462,500	-$1,503,990	-$6,190
Cemetery	$47,500	$0	$2,225,000	-$2,075,000	-$201,230	-$3,730
				-$34,138,450		
	2025-2030 5-Year					
Facility	**Revenue [2]**	**Developer Contributions [1]**	**Grants/ Loans**	**Capital Improvement Costs**	**Expenses [3]**	**Balance**
Culinary Water	$2,241,639	$0	$5,275,000	-$5,940,675	-$1,574,750	$1,214
Sanitary Sewer	$1,186,435	$629,945	$485,000	-$1,259,890	-$1,041,038	$452
Streets	$390,135	$0	$200,000	$0	-$591,898	-$1,763
Storm Drain	$109,936	$42,819	$2,535,000	-$2,598,000	-$94,399	-$4,645
Secondary Water	$706,105	$171,275	$6,865,000	-$7,098,678	-$641,935	$1,767
Parks and Trails	$746,532	$292,313	$12,315,000	-$11,692,500	-$1,660,526	$818
Cemetery	$49,923	$0	$575,000	-$400,000	-$222,174	$2,749
				-$28,989,743		

Facility	Revenue [2]	Developer Contributions [1]	Grants/ Loans	Capital Improvement Costs	Expenses [3]	Balance
2030-2035 5-Year						
Culinary Water	$2,845,449	$4,444,219	$8,075,000	-$13,623,064	-$1,738,652	$2,952
Sanitary Sewer	$1,694,403	$9,499,272	$3,325,000	-$13,361,619	-$1,149,390	$7,666
Streets	$410,036	$0	$6,100,000	-$5,861,100	-$653,503	-$4,567
Storm Drain	$115,543	$1,028,500	$3,075,000	-$4,114,000	-$104,224	$819
Secondary Water	$1,381,182	$174,688	$0	-$436,875	-$708,748	$410,247
Parks and Trails	$784,613	$205,375	$9,060,000	-$8,215,000	-$1,833,355	$1,633
Cemetery	$52,470	$0	$750,000	-$550,000	-$245,298	$7,171
				-$46,161,658		
2035-2045 10-Year						
Culinary Water	$3,161,538	$14,250,187	$4,180,000	-$19,474,098	-$2,119,407	-$1,780
Sanitary Sewer	$1,888,488	$10,569,911	$5,475,000	-$16,529,718	-$1,401,100	$2,582
Streets	$452,935	$46,429,486	$94,160,000	-$140,244,186	-$796,616	$1,618
Storm Drain	$127,632	$1,028,500	$3,090,000	-$4,114,000	-$127,049	$5,083
Secondary Water	$1,549,697	$4,813,750	$200,000	-$5,696,775	-$863,960	$2,713
Parks and Trails	$866,701	$205,375	$9,375,000	-$8,215,000	-$2,234,850	-$2,774
Cemetery	$57,959	$0	$800,000	-$550,000	-$299,017	$8,942
				-$194,823,777		

[1] Master plan improvements required to accommodate development within planning period.
[2] Includes fees collected for additional served throughout planning period, includes 1% estimated annual increase of current revenue.
[3] Includes 2% estimated annual increase of current expenses.

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Land Use
Chapter 2



CHAPTER 2 Table of Contents

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2.3 Balanced Growth and Development 1
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2.5 Research and Technology 3
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2.6.1 Residential Land Uses 3
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Chapter 2

2.1 Introduction

A land use element is a required portion of a general plan (U.C.A., 10-9a-403). It guides growth and development in the City and helps to promote quality of life and balance in community growth.

2.2 Annexation Area

The Future Land Use Map (Figure 2-1) includes large annexation limit boundaries that would more than double the size of Roosevelt City if completed. Annexation involves the incorporation of land into the City that has previously been located outside its boundaries. Residents of an area to be annexed are able to express their views on potential annexation through the circulation of an annexation petition. If the petition gains enough signatures and the annexation is accepted by the City, the residents of the newly annexed area become residents of the City and share in the benefits and responsibilities of the community.

The annexation limit boundaries shown on Figure 2-2 were created through discussion with City officials. It includes parcels that are expected to be annexed into the City by the year 2045. It is important to note that parcels cannot be annexed unless they border the existing City boundary. Although many of the proposed annexation parcels do not currently border the City boundary, it is anticipated that annexations during the planning period will eventually result in other parcels having the opportunity to annex, so no islands are created. Development of all areas within the annexation boundary is not anticipated during the planning period.

The annexation plan includes the annexation and development of commercial areas along Highway 40 and surrounding agricultural areas (see Figure 2-2, Roosevelt Annexation Area). The general plan and associated public service plans make provision to provide City services to these areas to be annexed, including transportation (see Chapter 4 and Traffic Studies in Appendix F), parks and recreation (Chapter 6), cemetery (Appendix A), culinary water (Appendix B), secondary water (Appendix C), sewer (Appendix D), and storm drainage (Appendix E). Public service plans can provide motivation to property owners to request annexation as they illustrate the services that could be provided to the property.

Figure 2-1, Future Land Use Plan, shows the proposed land use designations for properties within the annexation area.

2.3 Balanced Growth and Development

The goal of Roosevelt City is to promote balanced growth and development in the community. This includes economic development to provide jobs to current and future residents, provisions to encourage

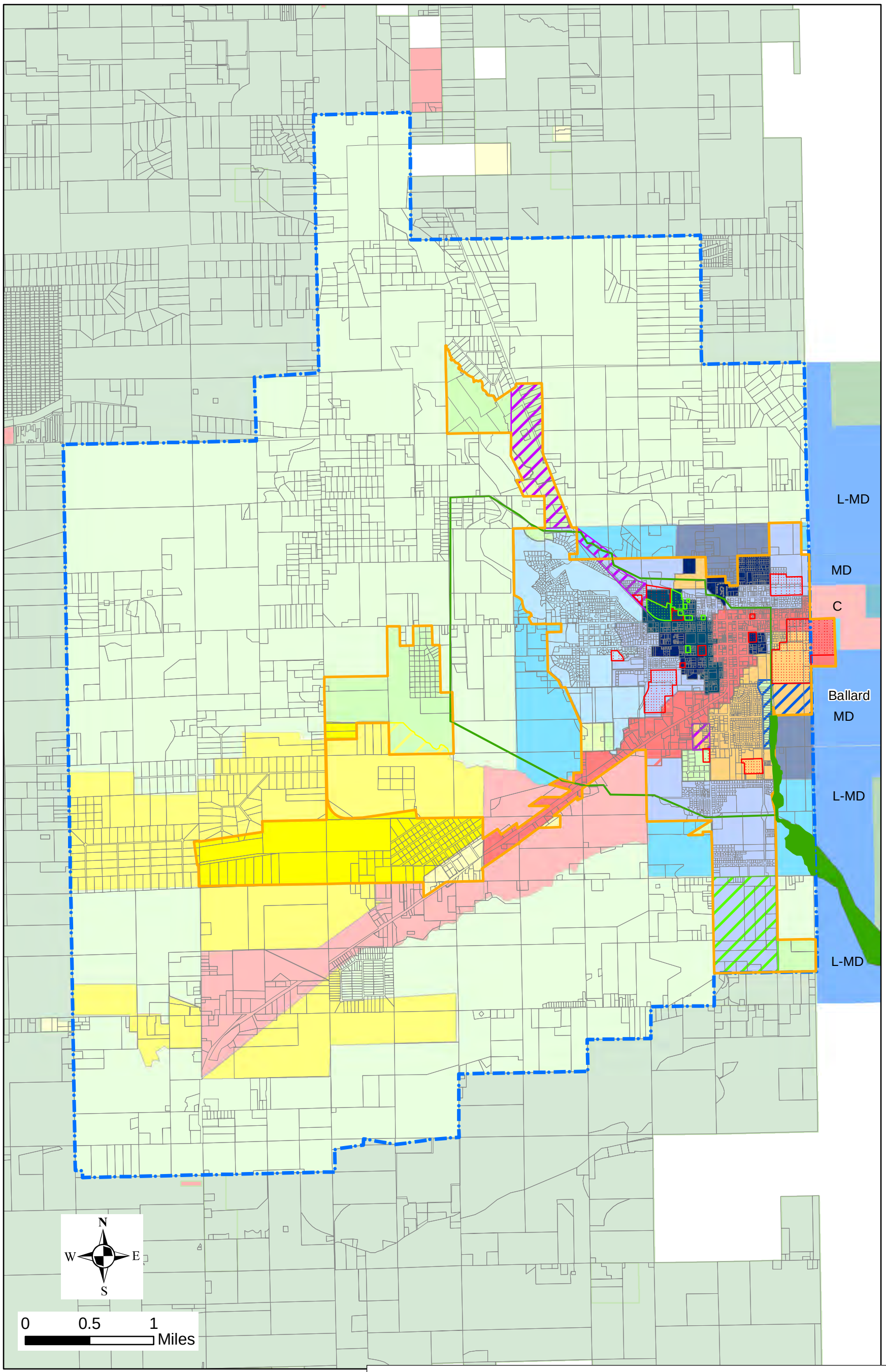


Figure 2-1
Future Land Use Map

Roosevelt City, Utah
November 9, 2019

Future Land Use
- Commercial
- Manufacturing
- Medium Density
- Low Density
- Very Low Density

- City Boundary
- Annexation Boundary
- Change to Manufacturing
- Change to Commercial
- Change to Very Low Density
- Change to MD - Office
- Change to MD
- Open Space

Zoning
- Commercial (C)
- Manufacturing (M-1)
- Manufacturing (M-2)
- Very Low Density (R-1-20)
- Very Low Density (R-R-1)
- Low Density (R-1-10)
- Low Density (R-1-6)
- Medium Density - Office (PO-R)
- Medium Density (R-M-13)
- High Density (R-M-18)
- Institutional
- Research & Technology

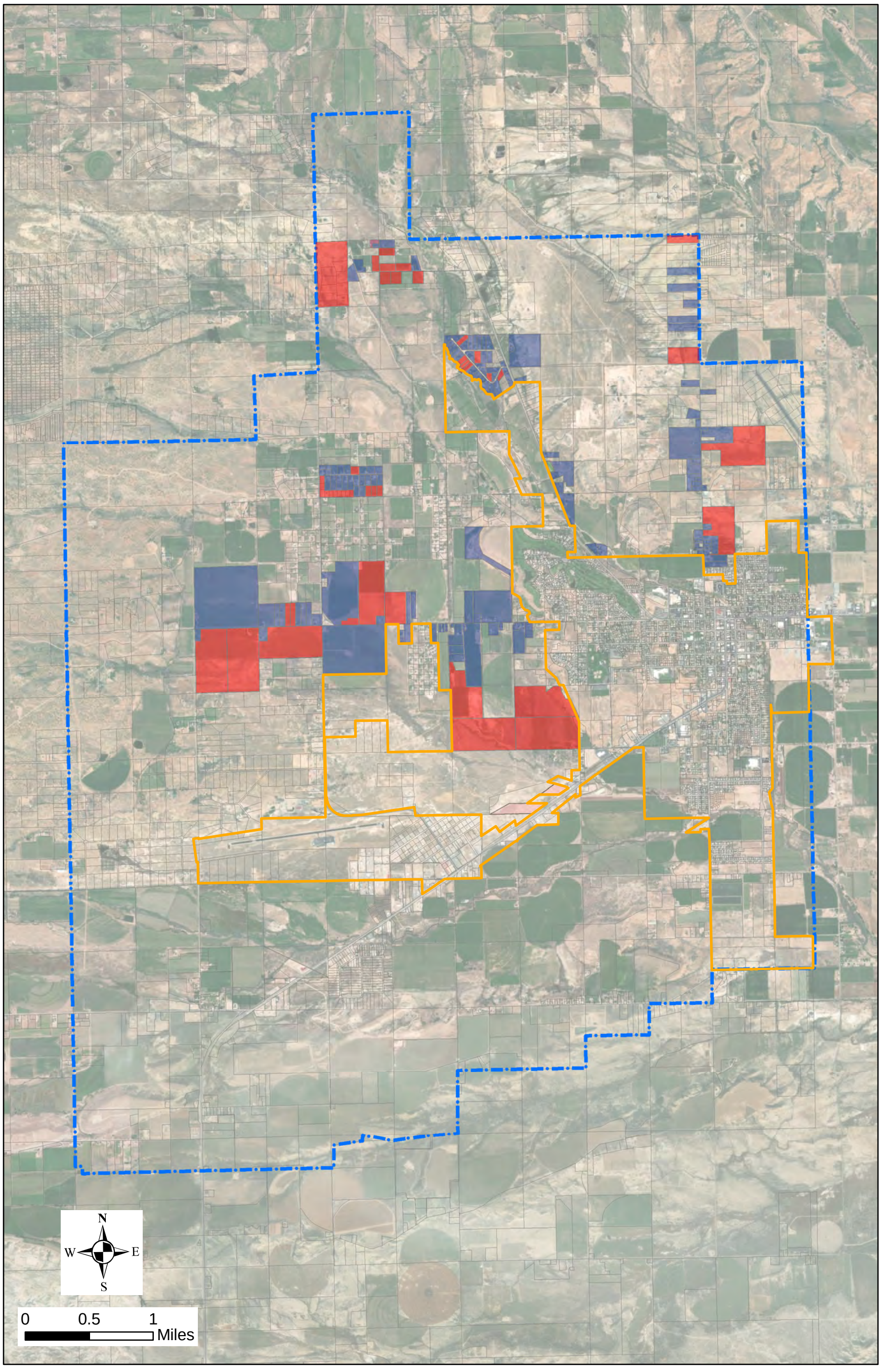


Figure 2-2
Annexation Parcels Map

Roosevelt City, Utah
September 24, 2019

- City Boundary
- Nonvacant Commercial Parcel
- Nonvacant Manufacturing Parcel
- Nonvacant Residential Parcel
- Vacant Commercial Parcel
- Vacant Residential Parcel
- Annexation Boundary

moderate income housing, and the encouragement of neighborhoods to provide a high quality of life. The Roosevelt City Municipal Code (Titles 16 and 17) contains development standards to ensure attractive and stable residential and non-residential uses.

On-site storm water retention or detention shall be required for all new development. Title 16 (Subdivisions) shall be amended to reflect this requirement.

An Economic Development Plan can be found in Chapter 3 and a Moderate Income Housing Plan can be found in Chapter 5.

2.4 Neighborhood Quality of Life

Roosevelt City proposes to maintain and develop neighborhood quality of life through appropriate zoning to limit the mixing of incompatible land uses and through requirements for new growth areas to be connected to the rest of the City by obvious and orderly streets, sidewalks, and trails.

Roosevelt also encourages infill development in areas where transportation and utility infrastructure has already been constructed in order to improve the connectedness of the community and to use public resources most efficiently and effectively. It is estimated that the majority of currently vacant lots within the City will be developed by 2045. The remaining projected growth is expected to occur in the Cove (45%), South Town (35%), and North Crescent (20%). Table 2-1 shows the projected population growth.

Table 2-1 Summary of Roosevelt City's Development by 2045

Year	Estimations		
2015	Estimated Population	6,614	
2019	Estimated Population	7,112	
2020	Estimated Population	7,236	
2025	Estimated Population	7,916	
2030	Estimated Population	8,660	
2035	Estimated Population	9,474	
2040	Estimated Population	10,365	
2045	Estimated Population	11,339	
	Growth rate	1.88%	
	Population Increase	4,228	
	Town (fill vacant parcels)	870	
	Remaining	3,357	
			Percentage of Remaining Population Increase
	South Town	1,175	35%
	Cove	1,511	45%
	N. Crescent	672	20%
	Total (less Town)	3,357	100%

2.5 Research and Technology

As part of the Economic Development Plan (see Chapter 3), Roosevelt City encourages the growth and development of research and technology-related land uses. With high-quality fiber-optic infrastructure and low-cost electrical power, as well as locally-trained expertise through USU - Uintah Basin and the Uintah Basin Technical College, Roosevelt is attractive for both remote employees and technical facilities.

2.6 Land Use Designations

Roosevelt City land uses are divided into residential, commercial, and manufacturing categories. In addition, Roosevelt allows professional offices to be located in some residential areas. A map of proposed land uses by category can be found in Figure 2-1.

2.6.1 Residential Land Uses

The City's objective is that all residential areas will be developed or improved with an emphasis on creating safe, attractive neighborhoods. These neighborhoods will include adequate open spaces (see Chapter 6) and will be linked to schools, commercial areas, parks, and other areas of the City by landscaped pedestrian ways, bicycle/multi-use paths, and residential-scale streets.

Residential uses include the following categories:

- Very Low Density Residential: The Very Low Density Residential (VLD) designation is for residential uses in areas where a rural atmosphere, open space preservation, and agricultural uses are encouraged. Housing density should not exceed 2 units per acre. Zones include R-R-1 (1 unit per acre) and R-1-20 (2 units per acre).
- Low Density Residential: The Low Density Residential (LD) designation is for neighborhoods with single-family homes on individual building lots. The housing density is typically between 2 and 7 units per acre. Zones include: R-1-10 and R-1-6.
- Medium Density Residential: The Medium Density Residential (MD) designation is for suburban and urban neighborhoods with a mix of housing styles and character. The designation can include smaller individual home lots and multiple family housing units, including duplexes, twin homes, town homes, and other similar small-scale attached housing units. The housing density is between 7 and 13 units per acre. Zones include R-M-13 and Professional Office-Residential (PO-R).
- High Density Residential: The High Density Residential (HD) designation is for multi-family developments, including apartment and condominium complexes. The housing density is between 13 and 18 units per acre. Zones include R-M-18.

The PO-R zone listed under Medium Density Residential above allows the location of professional offices within and intermingled with residential development. Roosevelt City's current zoning map can be found in Figure 2-3.

N
W E
S

0 0.5 1
Miles

Figure 2-3
Current Zoning Map

Roosevelt City, Utah
September 24, 2019

Zoning

- Commercial (C)
- Manufacturing (M-1)
- Manufacturing (M-2)
- Very Low Density (R-1-20)
- Very Low Density (R-R-1)
- Low Density (R-1-10)
- Low Density (R-1-6)
- Medium Density - Office (PO-R)
- Medium Density (R-M-13)
- High Density (R-M-18)

2.6.2 Commercial Land Uses

The City's objective is that Commercial areas in Roosevelt satisfy the shopping needs of the overall community, particular neighborhoods, the surrounding area, and visitors passing through the City. Commercial land uses provide for general retail shopping and commercial centers, light commercial manufacturing, larger retail developments, and highway-related commercial activities. Zones include PO-R (also allows medium density residential development) and C.

2.6.3 Manufacturing Land Uses

The City's objective is that manufacturing areas in Roosevelt be located in appropriate areas. Manufacturing is encouraged in order to contribute to the economic development of the City. Manufacturing land uses provide for a range of industrial and manufacturing uses including clean and low-intensity industrial, manufacturing and technological uses, and warehousing. Facilities and operations in this designation must be designed to protect the environmental quality of adjacent areas. Zones include M-1 and M-2.

2.7 Implementation

Title 16 (Subdivisions) and Title 17 (Zoning) of the Roosevelt City Municipal Code contain the ordinances which implement the principles contained in this Chapter. Other sections of the City Municipal Code may also carry out portions of the land use element.

2.8 Projected Development

To determine future impacts to the City from expected growth, the City developed projections of where population growth would occur. It is estimated that because of the population increase from 2019 to 2045 of 4,228, the majority of the existing vacant parcels near the central part of town will be filled. The remaining population will be distributed to the following locations with their respective percentages: The Cove, South Town, and North Crescent at 45%, 35%, and 20%. The Cove is located west of Roosevelt City. South Town is located on the south side of the City, bound by 800 South, Highway 40, Pole Line Road, and 1500 East. North Crescent is north of the City, north of 700 North between 500 West and 1500 East.

Table 2-2 explains in detail how the population estimates for Town, South Town, North Crescent, and The Cove were developed.

Table 2-2 Projected Areas of Development

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zon-ing	Lot size (sf)	Dens - ity	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Town	00-0002-8765	Uintah Basin Applied	701 S Harrison Ave							1.00	3.20	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zon-ing	Lot size (sf)	Dens - ity	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
		Technology College										
Town	00-0002-8766	Uintah Basin Applied Technology College	710 S 500 E							1.00	3.20	Y
Town	00-0002-8781	C Ray Grant	739 S Harrison Ave							1.00	3.20	Y
Town	00-0002-8799	C Ray Grant	749 S Harrison Ave							1.00	3.20	Y
Town	00-0034-9870	Red Brick Investing LLC	App. Harrison Ave							1.00	3.20	Y
Town	00-0034-9865	Poco Loco Properties LLC	App. 470 E 810 S							1.00	3.20	Y
Town	00-0034-9866	Poco Loco Properties LLC	App. 470 E 820 S							1.00	3.20	Y
Town	00-0034-9867	Poco Loco Properties LLC	App. 470 E 830 S							1.00	3.20	Y
Town	00-0034-9868	Poco Loco Properties LLC	App. 470 E 840 S							1.00	3.20	Y
Town	00-0034-9861	Poco Loco Properties LLC	App. 470 E 815 S							1.00	3.20	Y
Town	00-0034-9862	Poco Loco Properties LLC	App. 470 E 825 S							1.00	3.20	Y
Town	00-0034-9863	Poco Loco Properties LLC	App. 470 E 830 S							1.00	3.20	Y
Town	00-0034-9864	Poco Loco Properties LLC	App. 470 E 835 S							1.00	3.20	Y
Town	00-0034-9876	Poco Loco Properties LLC	App. South Poco Drive							1.00	3.20	Y
Town	00-0034-9877	Poco Loco Properties LLC	App. South Poco Drive							1.00	3.20	Y
Town	00-0034-9878	Poco Loco Properties LLC	App. South Poco Drive							1.00	3.20	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zon-ing	Lot size (sf)	Dens - ity	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Town	00-0034-9879	Poco Loco Properties LLC	App. South Poco Drive							1.00	3.20	Y
Town	00-0034-9888	Poco Loco Properties LLC	App. 410 E 800 S							1.00	3.20	Y
Town	00-0034-9889	Poco Loco Properties LLC	App. 420 E 800 S							1.00	3.20	Y
Town	00-0034-9890	Poco Loco Properties LLC	App. 430 E 800 S							1.00	3.20	Y
Town	00-0034-9891	Poco Loco Properties LLC	App. 440 E 800 S							1.00	3.20	Y
Town	00-0034-9892	Poco Loco Properties LLC	App. 450 E 800 S							1.00	3.20	Y
Town	00-0034-9894	Poco Loco Properties LLC	App. 460 E 800 S							1.00	3.20	Y
Town	00-0034-9895	Poco Loco Properties LLC	App. 470 E 800 S							1.00	3.20	Y
Town	00-0002-8336	Uintah Basin Applied Technology College	350 E N. Poco Dr							1.00	3.20	Y
Town	00-0002-8161	Douglas Phillips	650 S 500 E							1.00	3.20	Y
Town	00-0034-9137	OSZ Capella II LLC	App. 710 S 200 E							1.00	3.20	Y
Town	00-0034-9138	OSZ Capella II LLC	App. 712 S 200 E							1.00	3.20	Y
Town	00-0034-9139	OSZ Capella II LLC	App. 714 S 200 E							1.00	3.20	Y
Town	00-0028-3857	Hadden Chase	1282 S Spruce Dr							1.00	3.20	Y
Town	00-0002-9136	Gilbert Robert B/Rebecca W	App. 500 E 775 S							1.00	3.20	Y
Town	00-0002-9177	Phillips Douglas M II (JT)	725 S 500 E							1.00	3.20	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zon-ing	Lot size (sf)	Dens - ity	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Town	00-0002-7247	Soto Silviano	481 E 600 S							1.00	3.20	Y
Town	00-0002-7379	Richards Justin V	470 E 500 S							1.00	3.20	Y
Town	00-0030-7250	Unruh Earl (JT)	App. 252 E 575 S							1.00	3.20	Y
Town	00-0002-7775	Bozarth Marvin/Rosie	App. 225 E 550 S							1.00	3.20	Y
Town	00-0029-6883	Bozarth Marvin/Rose Mary	App. 225 E 550 S Roos-evelt Circle							1.00	3.20	Y
Town	00-0002-7619	Harmon Gary	480 S 450 E							1.00	3.20	Y
Town	00-0002-7601	JJ Echo LLC	460 S 450 E							1.00	3.20	Y
Town	00-0002-7460	Powers Cyrus L	451 S 450 E							1.00	3.20	Y
Town	00-0002-7494	Burke Barbara Trustee	441 S 450 E							1.00	3.20	Y
Town	00-0002-7502	Richens Sherry F	421 S 450 E							1.00	3.20	Y
Town	00-0002-7049	Roosevelt City	415 S 500 E							1.00	3.20	Y
Town	00-0002-4269	Martinez Sarah D	425 E 400 W							1.00	3.20	Y
Town	00-0001-4708	Wolf Investments	App. 100 E 150 S							1.00	3.20	Y
Town	00-0001-3387	Shepherd Johnny K	56 N State							1.00	3.20	Y
Town	00-0002-1521	Estrada Maria Isabel	App. 350 N 300 E							1.00	3.20	Y
Town	00-0002-1448	Wall Joseph K	304 E 400 N							1.00	3.20	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zoning	Lot size (sf)	Density	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Town	00-0002-0721	McKay Frances Trustee	340 N 600 E							1.00	3.20	Y
Town	00-0001-9202	Hernandez Anselmo Macais	551 E 500 N							1.00	3.20	Y
Town	00-0001-6240	Uintah Basin Medical Center	56 S 100 W							1.00	3.20	Y
Town	00-0001-6570	Patterson K Brandon (H/W)	57 N 200 W							1.00	3.20	Y
Town	00-0028-4640	Larsen Connie	8 S 200 W							1.00	3.20	Y
Town	00-0001-6687	Winn Ronald S Trustee	390 W Lagoon St							1.00	3.20	Y
Town	00-0001-7040	Johnson Lavon Kay	466 W Lagoon St							1.00	3.20	Y
Town	00-0002-9649	Miller Bart	180 N 600 W							1.00	3.20	Y
Town	00-0002-9656	Miller Bart	160 N 600 W							1.00	3.20	Y
Town	00-0002-9862	Miller Bart	148 N 600 W							1.00	3.20	Y
Town	00-0002-9870	Miller Bart	130 N 600 W							1.00	3.20	Y
Town	00-0002-9888	Miller Bart	110 N 600 W							1.00	3.20	Y
Town	00-0002-9896	Miller Bart	80 N 600 W							1.00	3.20	Y
Town	00-0003-0027	Miller Bart	620 W 75 N							1.00	3.20	Y
Town	00-0003-0035	Miller Bart	App. 550 W 75 N							1.00	3.20	Y
Town	00-0003-0043	Miller Bart	624 W 150 N							1.00	3.20	Y
Town	00-0003-0050	Miller Bart	App. 550 W 75 N							1.00	3.20	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zon-ing	Lot size (sf)	Dens - ity	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Town	00-0034-9985	Miller Bart	App. 550 W 75 N							1.00	3.20	Y
Town	00-0002-9904	Richard Thomas D/Marilyn	625 W 75 N							1.00	3.20	Y
Town	00-0034-9992	Miller Bart	App. 600 W 200 N							1.00	3.20	Y
Town	00-0034-9991	Miller Bart	App. 600 W 200 N							1.00	3.20	Y
Town	00-0034-9990	Miller Bart	App. 600 W 200 N							1.00	3.20	Y
Town	00-0034-9988	Miller Bart	App. 600 W 200 N							1.00	3.20	Y
Town	00-0034-9989	Miller Bart	App. 600 W 200 N							1.00	3.20	Y
Town	00-0034-9986	Miller Bart	App. 600 W 200 N							1.00	3.20	Y
Town	00-0034-9987	Miller Bart	App. 600 W 200 N							1.00	3.20	Y
Town	00-0035-0250	Glines Larry M (J/T)	App. 525 W 290 S							1.00	3.20	Y
Town	00-0035-0249	Glines Larry M (J/T)	App. 536 W 290 S							1.00	3.20	Y
Town	00-0035-0241	Glines Larry M (J/T)	App. 300 S Park Place Dr.							1.00	3.20	Y
Town	00-0035-0240	Glines Larry M (J/T)	App. 301 S Park Place Dr.							1.00	3.20	Y
Town	00-0026-2877	Ivie Kent R	App. 40 S 550 W							1.00	3.20	Y
Town	00-0002-2958	Harmston Gregg/Melody	36 S Georgia Cr.							1.00	3.20	Y
Town	00-0002-1844	Edmunds Clifford G/Marilyn	681 W Lagoon St.							1.00	3.20	Y
Town	00-0002-1760	BCE Resources Inc.	90 N Skyline Dr							1.00	3.20	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zon-ing	Lot size (sf)	Dens - ity	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Town	00-0028-4145	Winn Ronald S Trustee	App. 50 S King Arthurs Court							1.00	3.20	Y
Town	00-0028-4152	Norton Shirley Co-Trustee	App. 70 S King Arthurs Court							1.00	3.20	Y
Town	00-0034-9470	Freston Randy L II (JT)	App. 1141 W Park Ridge Drive							1.00	3.20	Y
Town	00-0002-6553	Labrum Lynn W (JT)	650 W 200 N							1.00	3.20	Y
Town	00-0002-6363	Labrum Nancy	230 N Gates Dr							1.00	3.20	Y
Town	00-0002-6397	Lot 112 Golf Course Subd Series Russ & Cathy Witt	280 N Gates Dr							1.00	3.20	Y
Town	00-0002-6405	Nelson Ellen R	290 N Gates Dr							1.00	3.20	Y
Town	00-0002-6439	McKee Shayne (J/T)	334 N Gates Dr							1.00	3.20	Y
Town	00-0002-6454	Lee Ronald E	378 N Gates Drive							1.00	3.20	Y
Town	00-0034-8724	Snow Darren L	349 W 950 N							1.00	3.20	Y
Town	00-0005-6256	McKee Sandra Huber Trustee	351 N Nelson Ave							1.00	3.20	Y
Town	00-0034-9755	Duncan Nelson H Trustee	App. 331 Nelson Ave							1.00	3.20	Y
Town	00-0029-2197	Zubiate Orlando Trustee	301 N Nelson Ave							1.00	3.20	Y
Town	00-0002-0507	Betts M Wade	App. 820 W 200 N							1.00	3.20	Y
Town	00-0002-0549	Cooper Milton L	950 W 200 N							1.00	3.20	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zon-ing	Lot size (sf)	Dens - ity	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Town	00-0002-0556	Jiminez Antinio	App. 200 N 975 W							1.00	3.20	Y
Town	00-0002-0564	Jiminez Antinio	App. 200 N 990 W							1.00	3.20	Y
Town	00-0002-6140	Secrest Kenneth Wayne	951 W Gates Dr							1.00	3.20	Y
Town	00-0034-2848	Forsyth Scott M (JT)	App. 314 N 1000 W							1.00	3.20	Y
Town	00-0032-3060	Christensen Lynn V	310 N Bonnie Dr							1.00	3.20	Y
Town	00-0030-1527	Richman Val R/Kala Sue	App. 1061 W 250 N							1.00	3.20	Y
Town	00-0002-1331	Kuhr Rodrick	App. 271 N Bonnie Dr							1.00	3.20	Y
Town	00-0034-8468	Anderton Christopher	300 N Areva Road							1.00	3.20	Y
Town	00-0034-8467	Wilson Dean James Trustee	340 N Areva Road							1.00	3.20	Y
Town	00-0034-5128	Burdick Charles Park Trustee	350 N Areva Road							1.00	3.20	Y
Town	00-0034-8480	West Robert S	1165 Grayhawk Loop							1.00	3.20	Y
Town	00-0034-8479	West Robert S	1175 Grayhawk Loop							1.00	3.20	Y
Town	00-0034-8478	West Robert S	1187 Grayhawk Loop							1.00	3.20	Y
Town	00-0034-8476	West Robert S	1205 Grayhawk Loop							1.00	3.20	Y
Town	00-0002-6108	Snow Joseph Richard	1055 W Gates Dr							1.00	3.20	Y
Town	00-0002-6090	Snow S Richard	1061 W Gates Dr							1.00	3.20	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zon-ing	Lot size (sf)	Dens - ity	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Town	00-0002-6082	Snow S Richard	1075 W Gates Dr							1.00	3.20	Y
Town	00-0034-6384	Simonton James A Trustee	430 N Areva Rd							1.00	3.20	Y
Town	00-0034-8475	West Robert S	1216 Gray-hawk Loop							1.00	3.20	Y
Town	00-0034-8496	West Robert S	1210 Gray-hawk Loop							1.00	3.20	Y
Town	00-0034-8495	West Robert S	1204 Gray-hawk Loop							1.00	3.20	Y
Town	00-0034-8494	West Robert S	1198 Gray-hawk Loop							1.00	3.20	Y
Town	00-0034-8493	West Robert S	1192 Gray-hawk Loop							1.00	3.20	Y
Town	00-0034-8492	West Robert S	1186 Gray-hawk Loop							1.00	3.20	Y
Town	00-0034-8491	West Robert S	1180 Gray-hawk Loop							1.00	3.20	Y
Town	00-0034-8490	West Robert S	1174 Gray-hawk Loop							1.00	3.20	Y
Town	00-0034-8489	West Robert S	1168 Gray-hawk Loop							1.00	3.20	Y
Town	00-0034-8488	West Robert S	1162 Gray-hawk Loop							1.00	3.20	Y
Town	00-0034-8487	Angus Barry John (JT)	1156 Gray-hawk Loop							1.00	3.20	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zoning	Lot size (sf)	Density	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Town	00-0034-8486	West Robert S	1150 Gray-hawk Loop							1.00	3.20	Y
Town	00-0034-8485	West Robert S	1144 Gray-hawk Loop							1.00	3.20	Y
Town	00-0034-8484	Smith Kael (JT)	1138 Gray-hawk Loop							1.00	3.20	Y
Town	00-0002-6009	Labrum Bill Trustee	595 N Areva Rd							1.00	3.20	Y
Town	00-0002-5969	Labrum Bill Trustee	525 N Mason Cr							1.00	3.20	Y
Town	00-0002-5712	Snow Alva Lynn Trustee	565 N Areva Rd							1.00	3.20	Y
Town	00-0002-5746	Nelson Ethan Lee/Louise M Trst	533 N Areva Rd							1.00	3.20	Y
Town	00-0032-3690	Stevens David O (J/T)	536 N Fairway Circle							1.00	3.20	Y
Town	00-0032-3710	Snow Alva Lynn Trustee	523 N Fairway Circle							1.00	3.20	Y
Town	00-0032-3720	Snow Alva Lynn Trustee	548 N Riviera Dr							1.00	3.20	Y
Town	00-0032-3890	Denver Charles H Trustee	1367 W Riviera Dr							1.00	3.20	Y
Town	00-0032-3900	Welborn Jeffrey J (JT)	1355 W Riviera Dr							1.00	3.20	Y
Town	00-0032-3750	Oberhansly John D	588 N Riviera Dr							1.00	3.20	Y
Town	00-0032-3790	Yack Steven James Trustee	603 N Riviera Dr							1.00	3.20	Y
Town	00-0032-3770	Phatts Constructio n Inc	622 N Riviera Dr							1.00	3.20	Y
Town	00-0034-4428	Buckskin Enterprises LLC	??600 N Hayden Way							1.00	3.20	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zoning	Lot size (sf)	Density	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Town	00-0034-4439	Buckskin Enterprises LLC	660 N Hayden Way							1.00	3.20	Y
Town	00-0031-2847	Mitchell Gilman N	1415 Alexia Ln							1.00	3.20	Y
Town	00-0031-2821	Chatterleigh Enterprises LC	1453 Alexia Ln							1.00	3.20	Y
Town	00-0031-2805	Huber Brett (JT)	1409 Alexia Ln							1.00	3.20	Y
Town	00-0030-7458	Robison Carmen R AKA	1452 W Memory Lane							1.00	3.20	Y
Town	00-0002-5340	Teem John Michael	930 W Clubhouse Dr							1.00	3.20	Y
Town	00-0002-5332	Teem John Michael	920 W Clubhouse Dr							1.00	3.20	Y
Town	00-0002-5274	Fitzgerald J Dean (JT)	820 W Clubhouse Dr							1.00	3.20	Y
Town	00-0002-6777	Brooks Allan	401 N Hillcrest Dr							1.00	3.20	Y
Town	00-0002-8419	Sprouse Niles C	760 S Poco Dr							1.00	3.20	Y
Town	00-0034-9883	Poco Loco Properties LLC	App. 775 S Poco Cr							1.00	3.20	Y
Town	00-0034-9882	Poco Loco Properties LLC	App. 775 S Poco Cr							1.00	3.20	Y
Town	00-0034-9886	Poco Loco Properties LLC	App. 775 S Poco Cr							1.00	3.20	Y
Town	00-0034-9887	Poco Loco Properties LLC	App. 775 S Poco Cr							1.00	3.20	Y
Town	00-0034-9880	Poco Loco Properties LLC	App. 775 S Poco Cr							1.00	3.20	Y
Town	00-0034-9853	Poco Loco Properties LLC	App. 775 S Poco Cr							1.00	3.20	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zon-ing	Lot size (sf)	Dens - ity	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Town	00-0034-9851	Chhour Siv	App. 775 S Poco Cr							1.00	3.20	Y
Town	00-0034-9855	Poco Loco Properties LLC	App. 775 S Poco Cr							1.00	3.20	Y
Town	00-0034-9856	Poco Loco Properties LLC	App. 775 S Poco Cr							1.00	3.20	Y
Town	00-0002-8476	Chhour Siv	App. 775 S Poco Cr							1.00	3.20	Y
Town	00-0034-9858	Poco Loco Properties LLC	App. 775 S Poco Cr							1.00	3.20	Y
Town	00-0034-9859	Poco Loco Properties LLC	App. 775 S Poco Cr							1.00	3.20	Y
Town	00-0034-9567	White Douglas H Trustee	App. 600 S State St #22-2							1.00	3.20	Y
Town	00-0034-9568	White Douglas H Trustee	App. 600 S State St #22-3							1.00	3.20	Y
Town	00-0034-9569	White Douglas H Trustee	App. 600 S State St #22-4							1.00	3.20	Y
Town	00-0034-9566	White Douglas H Trustee	App. 600 S State St #22-5							1.00	3.20	Y
Town	00-0034-9570	White Douglas H Trustee	App. 600 S State St #22-6							1.00	3.20	Y
Town	00-0034-9565	White Douglas H Trustee	App. 600 S State St #22-7							1.00	3.20	Y
Town	00-0034-9571	White Douglas H Trustee	App 600 S State St #22-8							1.00	3.20	Y
Town	00-0001-5531	White Douglas H Trustee	App. 600 S State St #22-9							1.00	3.20	Y
Town	00-0034-7362	Larsen Connie	App. 300 W 100 S							1.00	3.20	Y
Town	00-0034-7351	Larsen Connie	App. 300 W 100 S							1.00	3.20	Y
Town	00-0034-7340	Larsen Connie	App. 300 W 100 S							1.00	3.20	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zon-ing	Lot size (sf)	Dens - ity	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Town	00-0034-8290	Uintah Basin Association of Govern-ments	App. 300 W 100 S							1.00	3.20	Y
Town	00-0034-8291	Uintah Basin Association of Govern-ments	App. 300 W 100 S							1.00	3.20	Y
Town	00-0034-8292	Uintah Basin Association of Govern-ments	App. 300 W 100 S							1.00	3.20	Y
Town	00-0034-8289	Uintah Basin Association of Govern-ments	App. 300 W 100 S							1.00	3.20	Y
Town	00-0034-8288	Uintah Basin Association of Govern-ments	App. 300 W 100 S							1.00	3.20	Y
Town	00-0034-8287	Uintah Basin Association of Govern-ments	App. 300 W 100 S							1.00	3.20	Y
Town	00-0034-8286	Uintah Basin Association of Govern-ments	App. 300 W 100 S							1.00	3.20	Y
Town	00-0034-8285	Uintah Basin Association of Govern-ments	App. 300 W 100 S							1.00	3.20	Y
Town	00-0034-8284	Uintah Basin Association of Govern-ments	App. 300 W 100 S							1.00	3.20	Y
Town	00-0034-8283	Uintah Basin Association of Govern-ments	App. 300 W 100 S							1.00	3.20	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zon-ing	Lot size (sf)	Dens - ity	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Town	00-0034-3097	Uintah Basin Association of Govern-ments	App. 300 W 100 S							1.00	3.20	Y
Town	00-0034-8083	Uintah Basin Association of Govern-ments	App. 300 W 100 S							1.00	3.20	Y
Town	00-0034-8072	Uintah Basin Association of Govern-ments	App. 300 W 100 S							1.00	3.20	Y
Town	00-0034-8061	Uintah Basin Association of Govern-ments	App. 300 W 100 S							1.00	3.20	Y
Town	00-0034-8050	Uintah Basin Association of Govern-ments	App. 300 W 100 S							1.00	3.20	Y
Town	00-0034-8049	Uintah Basin Association of Govern-ments	App. 300 W 100 S							1.00	3.20	Y
Town	00-0034-8038	Uintah Basin Association of Govern-ments	App. 300 W 100 S							1.00	3.20	Y
Town	00-0002-0606	Betts M Wade	App. 900 W 250 N							1.00	3.20	Y
Town	00-0033-1969	Betts M Wade	App. 900 W 250 N							1.00	3.20	Y
Town	00-0002-6942	Ross Max Leon Trustee	670 W Hillcrest Dr							1.00	3.20	Y
Town	00-0002-6959	Holland Charles	660 W Hillcrest Dr							1.00	3.20	Y
Town	00-0002-6975	Ansel Benjamin E Trustee	640 W Hillcrest Dr							1.00	3.20	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zoning	Lot size (sf)	Density	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Town	00-0002-6983	Ansel Benjamin E Trustee	620 W Hillcrest Dr							1.00	3.20	Y
Town	00-0002-7007	Brockbank Family Holdings LLC	590 W Hillcrest Dr							1.00	3.20	Y
Town	00-0002-7015	Brockbank Family Holdings LLC	580 W Hillcrest Dr							1.00	3.20	Y
Town	00-0002-6918	Ross Max Leon Trustee	651 W Hillcrest Dr							1.00	3.20	Y
Town	00-0002-6892	Joe Lori	621 W Hillcrest Dr							1.00	3.20	Y
Town	00-0002-6876	Murray Mark L	595 W Hillcrest Dr							1.00	3.20	Y
Town	00-0002-6868	Murray Mark L	585 W Hillcrest Dr							1.00	3.20	Y
Town	00-0034-7950	Glines Larry M (J/T)	App. 500 West 200 S							1.00	3.20	Y
Town	00-0032-8310	Stewar Percy E. Jr. Trustee	App. 500 West 200 S							1.00	3.20	Y
Town	00-0013-3656	Freston Jessie D (JT)	App. 1750 N SR 121							1.00	3.20	Y
Town	00-0013-3623	Rasmussen Larry S JT	1744 N SR 121							1.00	3.20	Y
Town	00-0013-3615	Rasmussen Larry S JT	1700 N SR 121							1.00	3.20	Y
Town	00-0013-3599	Morris Leroy (J/T)	1630 N SR 121							1.00	3.20	Y
Town	00-0013-3581	Knight Jessie	1596 SR 121							1.00	3.20	Y
Town	00-0013-3565	Pratt Eric P	1518 N SR 121							1.00	3.20	Y
Town	00-0005-7566	DBK Kettle Land LLC	App. 500 S 800 E	39.19	R-M-13		MD	13	10.0%	50.95	163.03	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zon-ing	Lot size (sf)	Dens - ity	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Town	00-0035-1354	Bell Trent J	App. Lagoon Street Const. Dr							1.00	3.20	Y
Town	00-0035-1352	Bell Trent J	App. Lagoon Street Const. Dr							1.00	3.20	Y
Town	00-0035-0939	Bell Trent J	App. Lagoon Street Const. Dr							1.00	3.20	Y
Town	00-0035-0938	Bell Trent J	App. Lagoon Street Const. Dr							1.00	3.20	Y
Town	00-0035-0942	Bell Trent J	App. Lagoon Street Const. Dr							1.00	3.20	Y
Town	00-0035-0941	Bell Trent J	App. Lagoon Street Const. Dr							1.00	3.20	Y
Town	00-0035-0940	Bell Trent J	App. Lagoon Street Const. Dr							1.00	3.20	Y
Town	00-0002-0994	Law David Dee	760 E 100 N							1.00	3.20	Y
Town	00-0002-1000	Law David Dee	770 E 100 N							1.00	3.20	Y
Cove	00-0034-7073	Hanson Terri	App. Hancock Cove							1.00	3.20	Y
Cove	00-0034-7106	Robert S. West Enterprises	132 S 2200 W							1.00	3.20	Y
Cove	00-0034-7572	Yack George Lane	App. Hancock Cove							1.00	3.20	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zoning	Lot size (sf)	Density	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Cove	00-0034-7605	Miller Colt D. (JT)	App. Hancock Cove							1.00	3.20	Y
Cove	00-0034-7715	Russell Austin	2270 W 280 S							1.00	3.20	Y
Cove	00-0034-8653	McMullin Heating Cooling & Refrigeration Inc	2264 W 350 S							1.00	3.20	Y
Cove	00-0003-7445	Robert S. West Enterprises	App. Hancock Cove							1.00	3.20	Y
Cove	00-0034-8665	Robert S. West Enterprises	2272 W 440 S							1.00	3.20	Y
Cove	00-0034-8677	Knight Bradley T.	2264 W 520 S							1.00	3.20	Y
Cove	00-0034-8679	Forster Monty	2307 W 520 S							1.00	3.20	Y
Cove	00-0034-8680	Thain Brandon	App. Hancock Cove							1.00	3.20	Y
Cove	00-0034-7671	Townsend Dean	261 S 2200 W							1.00	3.20	Y
Cove	00-0034-8682	Cook Heath (JT)	App. Hancock Cove							1.00	3.20	Y
Cove	00-0034-8683	Robert S. West Enterprises	App. Hancock Cove							1.00	3.20	Y
Cove	00-0028-1190	Luck Trevor C	App. 200 North 3000 West							1.00	3.20	N
Cove	00-0029-8830	Zufelt Elwin Ray (JT)	3230 W S Cove Road							1.00	3.20	N
Cove	00-0029-8681	Zufelt Elwin Ray (JT)	3272 W S Cove Road							1.00	3.20	N
Cove	00-0006-0644	Ostler Gene Louis Trustee	App. 200 N 3000 W	77.24	R-1-20	20,000	VLD	2.18	10.0%	16.8	53.8	N
Cove	00-0031-4074	Ostler Gene Louis Trustee	App. 200 N 3000 W	74.78	R-1-20	20,000	VLD	2.18	10.0%	16.3	52.1	N

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zoning	Lot size (sf)	Density	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Cove	00-0006-0438	Ostler Troy Devere	App. 200 N 3000 W	74.12	R-1-20	20,000	VLD	2.18	10.0%	16.1	51.7	N
Cove	00-0005-7178	Sprouse Tom	App. 200 N 3000 W	63.03	R-1-20	20,000	VLD	2.18	15.0%	20.6	65.9	N
Cove	00-0005-7152	Ross Kenneth G. Trustee	App. 200 N 3000 W	26.94	R-1-20	20,000	VLD	2.18	15.0%	8.80	28.2	N
Cove	00-0005-7244	R.S. West Enterprises	App. 200 N 2300 W	159.36	R-R-1	40,000	VLD	1.09	15.0%	26.0	83.3	Y
Cove	00-0033-9137	R.S. West Enterprises	App. 400 S 2300 W	20.07	R-R-1	40,000	VLD	1.09	20.0%	4.37	14.0	Y
Cove	00-0027-3973	Ostler Troy Devere	App. 3000 W 300 S	34.75	R-R-1	40,000	VLD	1.09	20.0%	7.57	24.2	Y
Cove	00-0027-7719	Mountain Prime LLC	App. 3000 W 500 S	79.37	R-R-1	40,000	VLD	1.09	20.0%	17.3	55.3	Y
Cove	00-0005-7368	Bar Mesa Resources Inc	650 S Summer all LN	67.09	R-1-10	10,000	LD	4.36	35.0%	102	327	N
Cove	00-0005-7434	Murphy Merlan	1040 W 1000 S	77.93	R-1-10	10,000	LD	4.36	35.0%	119	380	N
Cove	00-0005-7467	Lisonbee James M	App. 700 S 1875 W	57.34	R-1-20	20,000	VLD	2.18	23.5%	29.4	94.0	N
Cove	00-0005-7442	Bryan Arthur Properties LLC	App. 800 S 1875 W	80	R-1-20	20,000	VLD	2.18	24.0%	41.8	134	N
Cove	00-0035-1082	Darren Snow	2832 1000 N							8.00	25.6	N
Cove	00-0031-9640	Crozier Amanda H	2740 W 1200 N							1.00	3.20	N
Cove	00-0031-1872	Rowley Veldon	App. Upper Hancock Cove 2700 W							1.00	3.20	N
Cove	00-0031-1856	Park Jed	App. Upper Hancock Cove 2700 W							1.00	3.20	N

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zoning	Lot size (sf)	Density	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
Cove	00-0031-1864	Collins Steven C	App. Upper Hancock Cove 2700 W							1.00	3.20	N
Cove	00-0035-0662	Kendall Mike	App. 3000 W 2755 N							10.0	32.0	N
Cove	00-0021-2344	Hyder John Wayne (JT)	App. 2275 N 2500 W							1.00	3.20	N
Cove	00-0021-2377	Hyder John Wayne (JT)	App. 2275 N 2500 W							1.00	3.20	N
Cove	00-0021-2351	Hyder John Wayne (JT)	App. 2275 N 2500 W							1.00	3.20	N
Cove	00-0021-2450	Murray Calvin	App. 2275 N 2500 W							1.00	3.20	N
Cove	00-0026-2224	RJN Investments LLC	App. 2275 N 2500 W							1.00	3.20	N
Cove	00-0026-2232	RJN Investments LLC	App. 2275 N 2500 W							1.00	3.20	N
Cove	00-0026-2257	RJN Investments LLC	App. 2275 N 2500 W							1.00	3.20	N
South Town	00-0027-6356	Snow Gordon E Trustee	App. 975 South 400 West	54	R-1-6	6,000	LD	7.26	32.0%	125.45	401.45	Y
South Town	00-0005-7749	Titan Development LLC	App. 1200 S 250 E	21.71	R-1-6	6,000	LD	7.26	30.0%	47.28	151.31	Y
South Town	00-0005-7939	Titan Development LLC	App. 550 E 1035 S	5	R-1-6	6,000	LD	7.26	32.0%	11.62	37.17	Y
South Town	00-0026-6522	Bird Properties LLC	App. 1500 S 250 E	25.47	R-1-6	6,000	LD	7.26	25.0%	46.23	147.93	Y
South Town	00-0028-6785	Alvey Vaughn T Trustee	App. 1800 S 250 E	19.56	R-1-6	6,000	LD	7.26	22.5%	31.95	102.24	Y
South Town	00-0034-9711	S & M Homestead Enterprises LLC	AppApp. 2500 S 250 E	69.13	R-1-20	20,000	VLD	2.18	15.0%	22.58	72.27	Y
South Town	00-0032-6850	The Roger Brockbank Legacy LLC	App. 2500 S 300 E	23.64	R-1-20	20,000	VLD	2.18	15.0%	7.72	24.71	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zon-ing	Lot size (sf)	Dens - ity	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
South Town	00-0035-0838	Robert S West Enterprises LLC	App. 250 E Pole Line	8.37	R-1-6	6,000	LD	7.26	25.0%	15.19	48.61	Y
South Town	00-0005-7699	Robert S West Enterprises	App. 400 E Pole Line	4	R-1-6	6,000	LD	7.26	15.0%	4.36	13.94	Y
South Town	00-0005-7699	Robert S West Enterprises	App. 500 E Pole Line	13.5	R-1-6	6,000	LD	7.26	15.0%	14.70	47.04	Y
South Town	00-0034-8974	Chrysalis Co	1186 S 50 E							1.00	3.20	Y
South Town	00-0034-8972	Chrysalis Co	1214 S 50 E							1.00	3.20	Y
South Town	00-0034-8971	Chrysalis Co	1228 S 50 E							1.00	3.20	Y
South Town	00-0034-8967	Chrysalis Co	42 E River Bend Rd							1.00	3.20	Y
South Town	00-0034-8966	Chrysalis Co	56 E River Bend Rd							1.00	3.20	Y
South Town	00-0034-8987	Chrysalis Co	1241 S 50 E							1.00	3.20	Y
South Town	00-0034-8985	Chrysalis Co	58 E 1200 S							1.00	3.20	Y
South Town	00-0034-8984	Chrysalis Co	76 E 1200 S							1.00	3.20	Y
South Town	00-0034-8983	Chrysalis Co	94 E 1200 S							1.00	3.20	Y
South Town	00-0034-8981	Chrysalis Co	120 E 1200 S							1.00	3.20	Y
South Town	00-0034-8980	Chrysalis Co	123 E 1200 S							1.00	3.20	Y
South Town	00-0034-8979	Chrysalis Co	109 E 1200 S							1.00	3.20	Y
South Town	00-0034-8977	Chrysalis Co	75 E 1200 S							1.00	3.20	Y
South Town	00-0034-8572	Thorson Rhea N Trustee	127 E 1700 S							1.00	3.20	Y

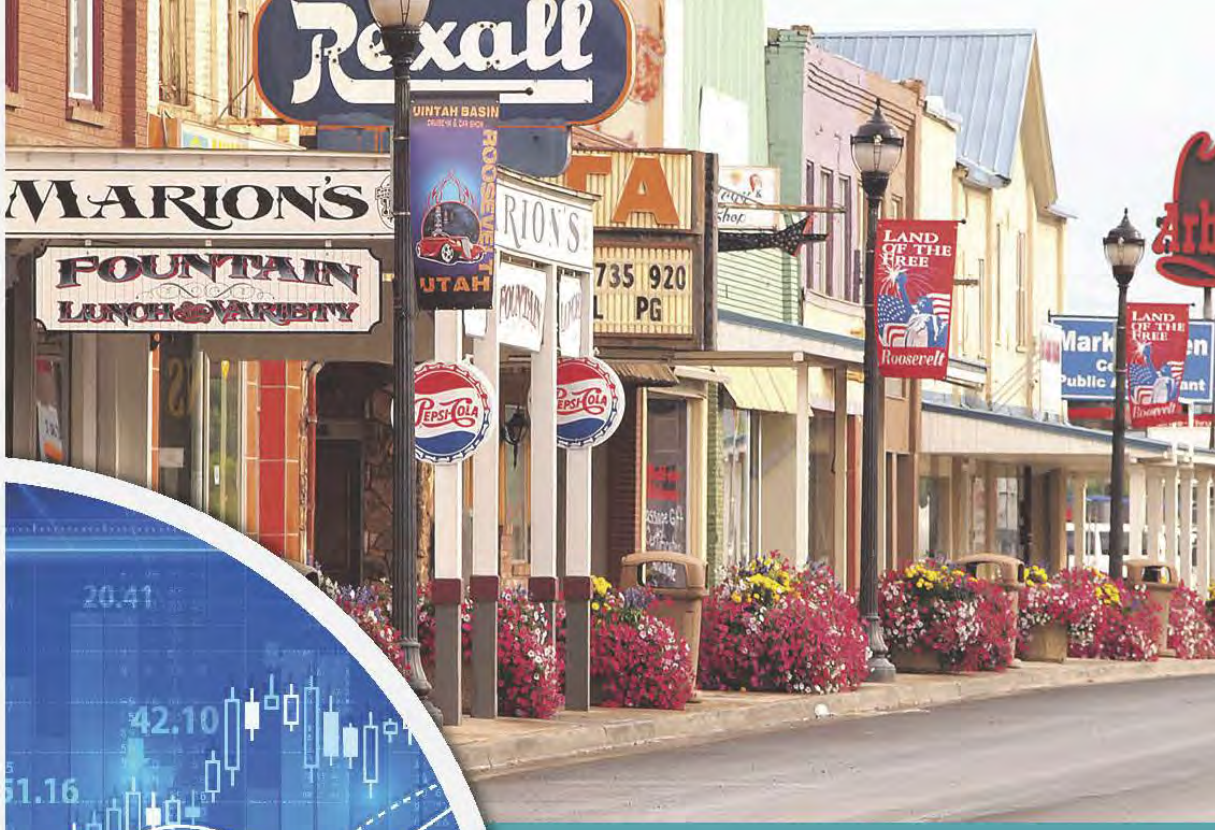
Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zoning	Lot size (sf)	Density	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
South Town	00-0034-8577	Thorson Rhea N Trustee	126 E 1700 S							1.00	3.20	Y
South Town	00-0034-8574	Thorson Rhea N Trustee	179 E 1700 S							1.00	3.20	Y
South Town	00-0034-8575	Thorson Rhea N Trustee	176 E 1700 S							1.00	3.20	Y
South Town	00-0034-9711	S and M Homestead Enterprises	App. Pole Line Road 223 E							1.00	3.20	Y
South Town	00-0034-971	S and M Homestead Enterprises	App. Pole Line Road 221 E							1.00	3.20	Y
South Town	00-0034-8865	The Roger Brockbank Legacy LLC	App. 2500 S 250 E	20	R-1-20	20,000	VLD	2.18	10.0%	4.36	13.94	Y
South Town	00-0028-4582	Huckelberry Holdings LLC	App. 2500 S 250 E	5.01	R-1-20	20,000	VLD	2.18	10.0%	1.09	3.49	Y
South Town	00-0035-1768	Huckelberry Holdings LLC	App. 2500 S 250 E	9.55	R-1-20	20,000	VLD	2.18	10.0%	2.08	6.66	Y
South Town	00-0005-8911	Loeffler Herman	App. 2500 S 250 E	6.45	R-1-20	20,000	VLD	2.18	10.0%	1.40	4.50	Y
South Town	00-0026-6506	Rasmussen Dale M Trustee	App. 400 E Pole Line Road	7	R-1-20	20,000	VLD	2.18	10.0%	1.52	4.88	Y
South Town	00-0031-2987	Ross Lanny W	2113 S 450 E	16.63	R-1-20	20,000	VLD	2.18	10.0%	3.62	11.59	Y
South Town	00-0034-9112	The Roger Brockbank Legacy LLC	App. 2200 S 450 E	4	R-1-20	20,000	VLD	2.18	10.0%	0.87	2.79	Y
South Town	00-0035-1214	Miller Timothy C (JT)	App. 500 E 1080 S							1.00	3.20	Y
South Town	00-0035-1215	Miller Timothy C (JT)	App. 500 E 1080 S							1.00	3.20	Y
South Town	00-0035-1216	Titan Development LLC	App. 500 E 1080 S							1.00	3.20	Y

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zoning	Lot size (sf)	Density	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
South Town	00-0035-1211	Titan Development LLC	App. 500 E 1080 S							1.00	3.20	Y
South Town	00-0035-1212	Miller Timothy C (JT)	App. 500 E 1080 S							1.00	3.20	Y
South Town	00-0035-1213	Miller Timothy C (JT)	App. 500 E 1080 S							1.00	3.20	Y
N. Crescent	00-0027-6992	Chalmers Kenneth	App. 3000 North State Street	10	R-1-20	20,000	VLD	2.18	70.0%	15.25	48.79	N
N. Crescent	00-0029-1181	Stringham Clyde A (J/T)	App. 2400 North State Street	20	R-1-20	20,000	VLD	2.18	64.3%	28.01	89.63	N
N. Crescent	00-0005-5909	Winterrose Jill Trustee	App. 1000 North State Street	67	R-1-20	20,000	VLD	2.18	64.0%	93.39	298.86	N
N. Crescent	00-0026-4584	Perry L H Investments	App. 850 North State Street	47.49	R-1-20	20,000	VLD	2.18	64.0%	66.20	211.83	N
N. Crescent	00-0032-9720	Dunsmore Jillie	App. 2210 Cotton-wood Loop							1.00	3.20	N
N. Crescent	00-0013-4241	Bird Roddie Irvin Jr	App. 1981 Cotton-wood Loop							1.00	3.20	N
N. Crescent	00-0013-4258	Bird Roddie I JR (J/T)	App. 1981 Cotton-wood Loop							1.00	3.20	N
N. Crescent	00-0032-9760	Bird Roddie I JR (JT)	App. 1981 Cotton-wood Loop							1.00	3.20	N
N. Crescent	00-0013-4373	Tanner Peter Lee Trustee	App. 1876 Cotton-wood Cir							1.00	3.20	N

Location	Parcel ID	Owner	Property Address	Parcel Size (acres)	Zon-ing	Lot size (sf)	Dens - ity	Density (Units per acre)	% Build-out	Lots	Pop.	In Current Municipal Boundary
N. Crescent	00-0032-3490	Reary Shane A.	1742 Cotton-wood Loop							1.00	3.20	N
N. Crescent	00-0013-4324	Nolte John Dennis Trustee	1587 Cotton-wood Loop							1.00	3.20	N
										Total	**4,228**	

VLD=Very Low Density (see "Density" column)
LD=Low Density (see "Density" column)
MD=Medium Density (see "Density" column)

HORROCKS ENGINEERS





Economic Development Plan

Chapter 3



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Chapter 3

3.1 Introduction

Roosevelt is located in the heart of the Uintah Basin which includes Daggett, Duchesne, and Uintah counties and, as such, has unique economic development opportunities in the region. This Economic Development chapter of the Roosevelt General Plan is intended to provide direction for the City to maintain sustainable economic growth while preserving its historic character and natural environment. A stable and diverse economy supporting high-quality job growth plays a significant role in maintaining the vitality and quality of life within a community. A healthy tax base is essential to providing schools, parks, infrastructure, public safety, and other public facilities and services.

Roosevelt has many strengths, including good economic infrastructure for fiber, low power rates, an excellent rural medical system, and good educational opportunities. While Roosevelt currently lacks rail lines or a major interstate, it can focus on the economic strengths it has by bringing more and more technology-related jobs to the Uintah Basin. This will help to diversify the regional area's reliance on the energy industry, relieve some of the impact of economic downturns, and thereby strengthen existing businesses in the area.

This chapter is organized to first present an overview of current economic conditions and basic demographic and employment data in the region, followed by a hands-on review of economic development trends, opportunities, and strategies for the City.

3.2 Current Conditions

3.2.1 Population Growth

Roosevelt has the second largest population in the Uintah Basin, surpassed only by Vernal. The City has grown 59 percent between 2000 and 2017 - from a population of 4,299 residents to approximately 6,843 residents, which includes annexation.

The town of Ballard is Roosevelt's eastern neighbor across the Duchesne and Uintah County border and is immediately adjacent to Roosevelt. If these two communities combined their growth since 2000, the area would be the fastest- growing community in the region with a population increase of just over 3,000 people. The growth in Ballard directly affects Roosevelt City more than any other community because of their shared proximity.

Table 3-1: Historical Population Data of Roosevelt and Surrounding Cities

Description	2000	2017	Absolute Growth
Altamont	178	225	47
Duchesne	1,408	1,690	282
Myton	539	569	30
Roosevelt	4,299	6,843	2,544
Tabiona	149	165	16
Unincorporated Duchesne County	7,798	10,534	2,736
Ballard	566	1,040	474
Naples	1,300	2,048	748
Vernal	7,714	10,291	2,577
Unincorporated Uintah County	15,644	19,209	3,565

Source: 2000 US Census, 2017 5-Year ACS

Vernal, currently the largest city in the area, is only expected to grow by 2,118 people by 2045, while Roosevelt City is projected to grow by 4,496. Ballard, which shares an immediate border with Roosevelt, is not expected to see any significant growth. This means Roosevelt will continue to be the second largest city in the two-county area, but the population gap between Vernal and the City will be reduced by about 69 percent.

Table 3-2: Projected Population Growth In Roosevelt And Surrounding Areas

Description	2017	2045	2017 Percent of County Total	2045 Percent of County Total
Altamont	225	320	1.1%	1.1%
Duchesne	1,690	2,400	8.4%	8.2%
Myton	569	808	2.8%	2.8%
Roosevelt	6,843	11,339	34.2%	38.9%
Tabiona	165	243	0.8%	0.8%
Unincorporated Duchesne County	10,534	14,067	52.6%	48.2%
Ballard	1,040	1,094	3.2%	2.5%
Naples	2,048	2,396	6.3%	5.4%
Vernal	10,291	12,409	31.6%	27.9%
Unincorporated Uintah County	19,209	28,592	58.9%	64.3%

Source: Governor's Office of Management and Budget, 2017 5-Year ACS, Zions Public Finance

3.2.2 Employment and Wages

During 2017, Roosevelt had an average of 3,724 employees based at approximately 279 firms citywide. The average monthly wage in the City is $3,304 and is approximately 15 percent lower compared to the State's average monthly wage of $3,811 and approximately 13 percent lower compared to Duchesne County's average monthly wage of $3,738. The Department of Workforce Services reported the

employment statistics of three cities in Duchesne and Uintah Counties. Of the three cities, Roosevelt ranked second in average yearly wage and last in jobs per capita.

Table 3-3: Employment and Wages

Description	Average Employment	Population	Jobs per Capita	Average Yearly Wage
Duchesne	1,001	1,690	0.59	$32,664
Roosevelt	3,724	6,843	0.54	$39,648
Vernal	7,112	10,291	0.69	$40,116

Source: Annual Report of Labor Market Information, 2017 (Department of Workforce Services)

Industries in Roosevelt with the largest numbers of employees in 2017 were Government, Trade, Transportation & Utilities, and Mining. The industry with the most firms in Roosevelt is the Trade, Transportation & Utilities industry. Education & Health Services has the second most and Mining claims the third most firms.

Table 3-4: Employment by Industry in Roosevelt

Description	Average Employment	Percent of Total	# of Firms	Percent of Total
Government	1,273	34.2%	28	10.0%
Trade, Transp. & Utilities	813	21.8%	68	24.4%
Mining	383	10.3%	29	10.4%
Leisure & Hospitality	294	7.9%	16	5.7%
Education & Health Services	287	7.7%	37	13.3%
Construction	185	5.0%	22	7.9%
Information	168	4.5%	3	1.1%
Professional Business Services	123	3.3%	28	10.0%
Financial Activities	120	3.2%	28	10.0%
Other	62	1.7%	15	5.4%
Manufacturing	16	0.4%	5	1.8%
Total	**3,724**	**100%**	**279**	**100%**

Source: Annual Report of Labor Market Information, 2017 (Department of Workforce Services)

Table 3-5 shows the largest employers in Roosevelt City. Uintah Basin Medical Center is the largest employer in the City, employing between 500-999 personnel. Other major employers in the City are Stewart's Market, R. Chapman Construction, Inc., and STRATA Networks.

Table 3-5: Roosevelt Employers by Number of Employees

Employee Range	Companies
500-999	Uintah Basin Medical Center
100-249	Duchesne County School District Stewart's Market R Chapman Construction, Inc. STRATA Networks Roosevelt City
50-99	Berry Petroleum Company, LLC Davis Food & Drug Delsco Northwest, Inc. Jim Nebeker Trucking L and L Motor Co. Inc. McDonalds Moon Lake Electric Association, Inc. Peak Well Service Savage Services Uintah Basin Technical College Uintah Basin Association of Governments Villa Uintah Basin Rehab

Source: FirmFind, Utah Department of Workforce Services 2018, ZPFI

3.2.3 Sales Leakage

A sales leakage analysis is conducted in order to identify economic development opportunities for a community by evaluating the total purchases made by residents inside and outside of the community. A sales leakage analysis first identifies sales within the State of Utah for each major North American Industry Classificaiton System (NAICS) code category and then calculates the average sales per capita in each NAICS category. Per capita sales in Roosevelt are compared to average per capita sales statewide to estimate what portion of resident purchases are being made within City boundaries and what purchases are being made by residents outside of the City.

The percent of purchases being made within a City's boundary is the capture rate. Therefore, a capture rate less than 100 percent indicates that residents are leaving the City to purchase goods elsewhere and may represent an opportunity for the City to recapture some of these lost sales. A capture rate of over 100 percent indicates that residents from surrounding areas are coming into the City to purchase goods and services and represents areas of strength on which the City can build. Corresponding sales leakage amounts show the amount of lost sales annually when the capture rate is less than 100 percent. A positive sales leakage amount, which corresponds to a capture rate above 100 percent, indicates the City is capturing more than its proportionate share of sales compared to other communities in the State.

Roosevelt City has an overall capture rate of 31 percent, which means that Roosevelt residents make an estimated 69 percent of their purchases outside of City boundaries, or about $621 million annually.

These are lost sales of goods and services for the City and its businesses. The City has leakage in the majority of categories, indicating there may be opportunities in many categories for the City to recapture lost sales. The Main Street area provides the best capture opportunity for the City as the traffic on Highway 40 is continuous on most days.

Roosevelt's Top 3 Captured Categories:

1. Food and Beverage Stores (364%)
2. Repair and Maintenance (256%)
3. Gasoline Station (244%)

The City has a strong capture rate of 364 percent in the Food and Beverage Stores category, indicating that the City captures local grocery sales and has an ability to capture the business of those coming into and through it. The City also has a capture rate over 200 percent in the Motor Vehicle and Parts Dealers, Repair and Maintenance, and Gasoline Stations categories, indicating that one of the City's major strengths is its ability to help service automobiles and other machines. The amount of spending within these industries may be caused by the influence that the energy industry has on the City, as that industry relies heavily on machinery which requires gas, parts, and maintenance to sustain peak performance.

The majority of 2017 leakage resulted from lost sales in General Merchandise Stores where Roosevelt City is losing $10,296,836 in direct taxable sales annually. These stores can sell common household goods, general grocery items, and basic appliances. Family Dollar and Dollar Tree are examples of local businesses that fall under this category. The lost taxable sales may be due to the lack of larger General Merchandise Stores (Costco, Target, Kohls, etc.) which tend to have a wider selection of goods. Residents may be leaving the City to purchase those goods in other cities as a result. Also, the City only has a capture rate of four percent in the Accommodation industry, which is primarily comprised of hotels. There are five hotels/motels in the City's immediate area, but only two of them are within the City's boundaries. The other three are directly east of the City in Ballard which limits the City's ability to capture hotel revenues.

Additional opportunities to capture lost sales where there is leakage between $2,000,000 and $6,000,000 annually include the Building Material and Garden Equipment and Supplies Dealers, Clothing and Clothing Accessories Stores, and Sporting Goods, Hobby Book, and Music Store industries. The table below shows the 2017 leakage by category.

Table 3-6: 2017 Sales Leakage and Capture Rates in Roosevelt

Category	2017 Leakage	2017 Capture Rate
General Merchandise Stores	($10,296,836)	31%
Building Material, Garden Equipment, and Supplies Dealers	($5,235,225)	30%
Accommodation	($4,107,353)	4%
Clothing and Clothing Accessories Stores	($3,408,633)	17%
Sporting Goods, Hobby, Book, and Music Stores	($2,130,899)	11%
Electronics and Appliance Stores	($1,899,451)	18%
Amusement, Gambling, and Recreation Industries	($1,494,545)	1%
Furniture and Home Furnishings Stores	($1,124,698)	51%

Category	2017 Leakage	2017 Capture Rate
Health and Personal Care Stores	($969,089)	23%
Miscellaneous Store Retailers	($821,391)	78%
Performing Arts, Spectator Sports, and Related Industries	($244,152)	3%
Museums, Historical Sites, and Similar Institutions	($122,785)	0%
Personal and Laundry Services	$813,446	201%
Food Services and Drinking Places	$845,022	108%
Non-store Retailers	$1,709,097	154%
Gasoline Stations	$3,914,798	244%
Repair and Maintenance	$4,369,704	256%
Motor Vehicle and Parts Dealers	$20,141,567	243%
Food and Beverage Stores	$27,344,130	364%
Total	**$27,282,707**	**31%**

Source: Utah State Tax Commission, ZPFI

An analysis of the historical sales leakage in the City also shows that some categories have seen improvement over the past three years while others have continued to fail in capturing potential sales. Electronics and Appliance Stores is one specific industry which has seen a large reduction, dropping from 58 percent in 2015 to below 20 percent in 2016 and 2017. The Building Material, Garden Equipment, and Supplies Dealers industry has also seen a decrease in its capture rate between 2015 and 2017. Table 3-7 shows a breakdown of each category's performance between 2015 and 2017.

Table 3-7: Historical Sales Leakage and Capture Rates in Roosevelt

Category	2015 Capture Rate	2016 Capture Rate	2017 Capture Rate
General Merchandise Stores	30%	27%	31%
Building Material, Garden Equipment, and Supplies Dealers	47%	34%	30%
Accommodation	4%	6%	4%
Clothing and Clothing Accessories Stores	13%	11%	17%
Sporting Goods, Hobby, Book, and Music Stores	12%	11%	11%
Electronics and Appliance Stores	58%	19%	18%
Amusement, Gambling, and Recreation Industries	10%	0%	1%
Furniture and Home Furnishings Stores	61%	44%	51%
Health and Personal Care Stores	14%	25%	23%
Miscellaneous Store Retailers	59%	81%	78%
Performing Arts, Spectator Sports, and Related Industries	3%	0%	3%
Museums, Historical Sites, and Similar Institutions	0%	0%	0%
Personal and Laundry Services	261%	249%	201%
Food Services and Drinking Places	108%	105%	108%
Non-store Retailers	112%	105%	154%
Gasoline Stations	290%	243%	244%
Repair and Maintenance	313%	228%	256%
Motor Vehicle and Parts Dealers	211%	183%	243%
Food and Beverage Stores	388%	362%	364%

Category	2015 Capture Rate	2016 Capture Rate	2017 Capture Rate
Total	**36%**	**19%**	**31%**

Source: Utah State Tax Commission, ZPFI

3.2.4 Major Industries

Roosevelt is positioned in the middle of some of the area's largest oil fields, making it the "energy-hub" of the Basin. This prime location has encouraged oil companies to become some of the City's main workforce providers, whether it be through the direct extraction of oil at the well sites, through transportation of the crude oil to refineries, or through one of the many other positions needed in the oil industry.

The Utah Department of Workforce Services' (UDWS) Annual Report of Labor Market Information indicated that the Trade, Transportation and Utilities industry had the second highest average employee count in the City with 813 employees in 2017. The Mining industry employed the third most people with 383 average employees. These two industries combined to employ 32 percent of Roosevelt's workforce. The table below shows the UDWS report's breakdown of employment in the City.

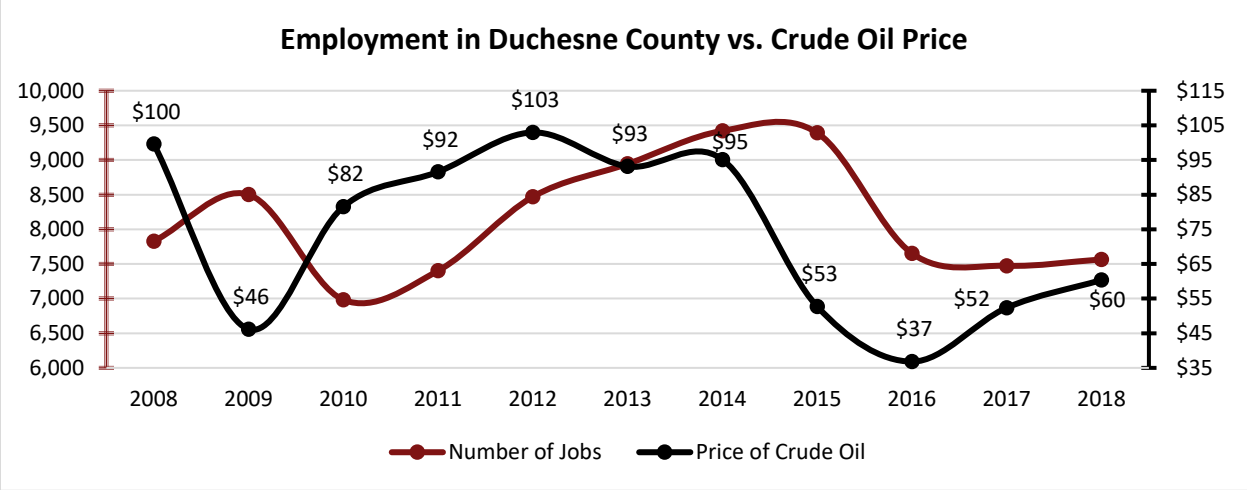
Table 3-8: Total Employment by Industry Sector

Description	Total Employment	Percent of Total
Government	1,273	34.2%
Trade, Transp. & Utilities	813	21.8%
Mining	383	10.3%
Leisure & Hospitality	294	7.9%
Education & Health Services	287	7.7%
Construction	185	5.0%
Information	168	4.5%
Professional Business Services	123	3.3%
Financial Activities	120	3.2%
Other	62	1.7%
Manufacturing	16	0.4%
Total	**3,724**	**100.0%**

Source: Utah Department of Workforce Service, 2017

This heavy reliance on industries which depend on oil prices has caused economic booms and busts for the City and its economic environment in the past. This can be seen in trends reported by the UDWS and data provided by the Federal Reserve Bank of St. Louis (FRED). Figure 3-1 shows the relationship between the price of crude oil and the total number of jobs in Duchesne County. When crude oil drops in price, the number of jobs declines the next year.

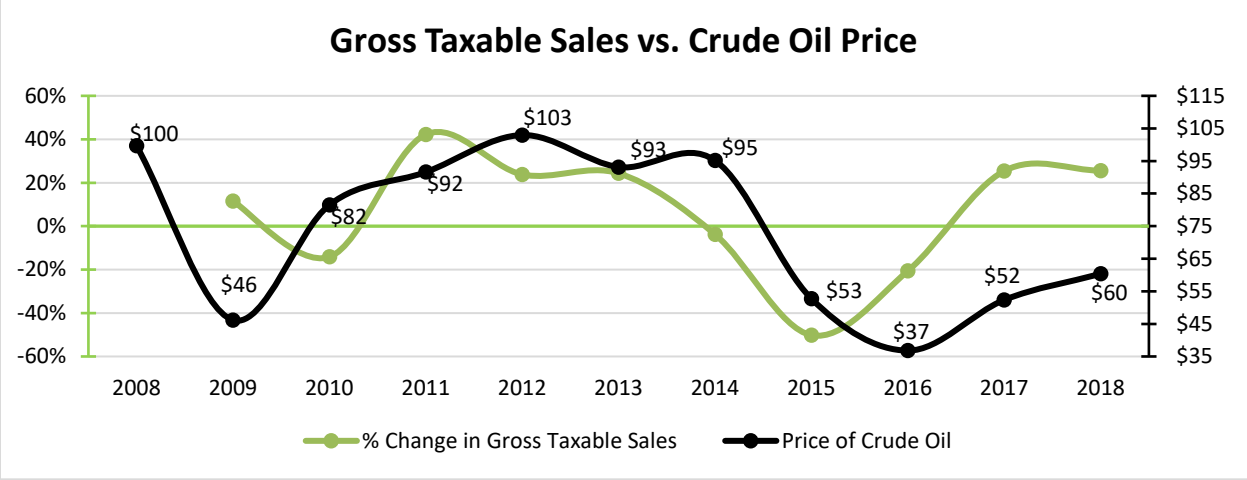
Figure 3-1



Source: Utah Department of Workforce Services, Federal Reserve Economic Research

The decrease in the number of jobs available to residents of Duchesne County, where Roosevelt makes up 34.2 percent of the population, also has a large effect on the amount of taxable sales that are captured by the County. Therefore, a decrease in oil prices leads to a decrease in jobs, which then leads to less spending in the local markets which has the potential to negatively affect local businesses. This relationship is depicted in Figure 3-2.

FIGURE 3-2

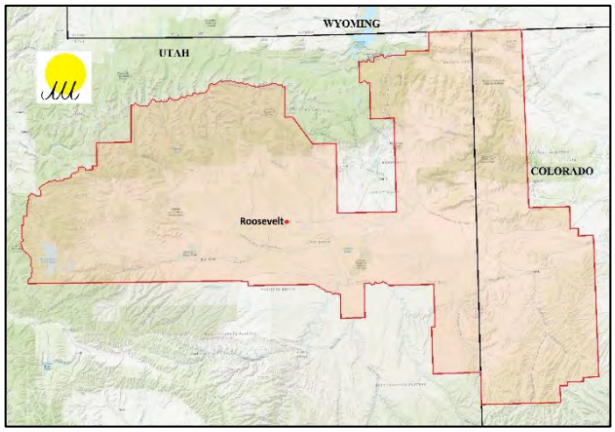


Source: Utah Department of Workforce Services, Federal Reserve Economic Research

3.3 Economic Infrastructure

While presently lacking a railroad and a major interstate, Roosevelt does have other significant infrastructure which can play a substantial role in attracting economic development: low power costs, high-quality fiber, top-notch medical care and good educational opportunities.

Roosevelt has exceptional technology-related infrastructure – both electric power and fiber. Moon Lake Electric Association (MLEA) is a local cooperative which provides electric power at a very reasonable cost. Rates were increased within the last year, but it was the first rate increase imposed by MLEA in 32 years. MLEA's service territory has grown to an expansive area over the past 81 years with a total of 21,000 members. The area includes 4,074 miles of line and 71,000 poles. The map to the right shows MLEA's service area They are headquartered in Roosevelt with 77 of their 90 total employees located within the City. When compared to the only other energy provider's rates, MLEA provides service to residential units at a $0.05/kWh rate, which is about 44 percent lower.



Source: Moon Lake Electric Association (Service Territory)


Moon Lake Electric Association Headquarters in Roosevelt

Fiber is fast becoming a game-changer for rural Utah. In 2000, the Uinta Basin Telephone Association established a telephone cooperative with about 35 employees. The cooperative has now evolved into STRATA Networks and its employee count has swelled to about 250. It was the first area in Utah to install remote fiber networks. This is very high-quality fiber and is said to provide comparable service to fiber networks in the Salt Lake Valley. STRATA Networks sees this high level of service as an opportunity for Roosevelt to become an extension community of the Wasatch Front in the Uintah Basin.


STRATA Networks Headquarters

While STRATA Networks does draw some local clientele through being a homegrown company, the local market has become more and more competitive due to large national providers extending their brand of service further into rural Utah. This increased competition has not hindered STRATA Networks growth over the past 20 years and with growth comes an increased need for workers. They have teamed with the Uintah Basin Technical College to help design IT certification classes with a goal to provide highly-skilled, homegrown workers to continue to support the local service provider.

STRATA Networks also has plans and outreach programs designed to try to attract more trained professionals to the area to help provide high-quality service.

Roosevelt can attract companies that are highly reliant on fiber, such as data centers and technology companies, because of the excellent quality of fiber. Spectra was founded in 2014 and is a subsidiary of STRATA Networks. It provides informational and operational business technology services while utilizing the City's fiber network.

This economic infrastructure is allowing Roosevelt to diversify its economy so that it is not so heavily reliant on the oil and gas industry, which has great swings in its economic cycles. Another example of fiber attracting jobs to the area is through a company called Entrada which is a massive owner of condos, resorts and timeshares across the country. Entrada has hired about 150-200 people to work from home in the Roosevelt area. While these jobs pay only entry-level wages, they offer full benefits.



Uintah Basin Healthcare

Healthcare is also considered an important asset for economic development in a community. Uintah Basin Healthcare is the largest rural healthcare system within Utah and is the largest employer in the City, with over 700 employees reported by the Utah Department of Workforce Services. The national outlook for rural hospitals has not been positive for the past several years with 95 rural hospitals closing since 2010, as reported in a recent study by Navigant Consulting, Inc.[1] This national trend has not affected Utah's rural hospitals. The report indicated that of the nation's 430 hospitals in high financial risk, none of Utah's hospitals made the list. In fact, Uintah Basin Healthcare currently has plans to open a large new building as well. This indicates that Uintah Basin Healthcare, one of the largest employers in the City, should remain a dependable source of employment moving forward.



Union High School opened 2018

The Duchesne County School District has recently opened the doors to the new Union High School located in Roosevelt. The school offers new and improved security features to ensure the safety of students while attending classes. There is also new equipment in classrooms throughout the school such as new sound systems for the music department, a new auditorium which can host school and public events, and improved workspace for workshop students within the

[1] "Rural Hospital Sustainability: New Analysis Shows Worsening Situation for Rural Hospitals, Residents – February 2019

agricultural, mechanical, and life-science programs. These new facilities are attractive to current residents and families looking to move to the region.

Roosevelt has the Uintah Basin campus of Utah State University, which offers bachelor's degrees in 33 different areas to approximately 1,000 students. The USU – Uintah Basin campus also offers master's degrees in several programs and several doctorates in a wide variety of subjects. Popular subjects such as engineering, computer science, and animal, dairy, and veterinary sciences are only partially offered in Roosevelt. Many students pursuing these types of degrees can complete many classes at the local campus but do eventually have to attend a larger campus with more facilities. Utah State University confirmed in an interview that most of these students do return to Roosevelt upon completion of these classes.

Current Roosevelt Students:

- Uintah Basin Technical College: 1,601
- Utah State University Uintah Basin: 1,000

In addition, Roosevelt has a local campus associated with the Uintah Basin Technical College (UBTech) which provides career training to adults and high school students. In 2018, UBTech reported a headcount of 1,501 with that number increasing to 1,601 total students in 2019. Some of the more popular certifications include IT, Nurse Assistant, Pharmacy Technician, Practical Nursing, and Welding.

As mentioned previously, UBTech has a great partnership with STRATA Networks. The company has helped design the scope of the IT certification course to help fit its specific needs in hopes that current employees will enroll with ambitions to move up internally. There is also the hope that other graduates of the course can move straight into positions at the company. This allows graduates to remain within the local community and current employees to better increase their value.



Uintah Basin Technical College, Roosevelt Campus

The medical certification courses also see many graduates find local jobs at Uintah Basin Healthcare. The Nurse Assistant, Pharmacy Technician, and Practical Nursing courses are often in such high demand that they are filled to the legal capacity and UBTech must impose a selection process to determine which students will be admitted. UBTech has indicated that a legislative change to approve larger class sizes would benefit the students as it would allow more students to begin working towards their career sooner.

The Welding certification course is the most popular course at UBTech by far and has produced some of the best welders in the nation. Over just the past three years, multiple students who have attended the course have competed in national welding tournaments and one has travelled as far as Abu Dhabi in the United Arab Emirates to compete in the World Skills competition. Welding jobs in the local economy are primarily-maintenance focused, which means they can withstand the boom-and-bust cycle. Another

draw to this course is the attractive salary which averages $75,000 -$80,000/year with the most skilled welders making approximately $150,000/ year.

3.4 Economic Opportunities

10 percent of state employees will be in rural Utah by 2025

The State of Utah has made a commitment that by 2025, 10 percent of State jobs will be in rural Utah. As new jobs become available, the State plans on offering them in rural Utah. The State of Utah is the largest employer in the State with 234,800 employees in September 2018 per the U.S. Bureau of Labor Statistics (BLS). This means that at least 23,480 State-related jobs will be located in rural Utah by 2025, and this number is expected to grow as the population of the State is rapidly-growing and there are more demands placed on State services. While these rural jobs will take calls from all over the State, their offices will be based in rural Utah. State jobs pay good wages and have good benefits. The BLS reported that the State of Utah paid an average annual wage of just under $50,000 as of September 2018.

The remote employees hired by Entrada in the Roosevelt area are a good example of the potential that the City has to host remote workers due to the benefits that come from low-cost energy and high-quality fiber. The Utah Governor's Office of Economic Development (GOED) currently offers grants under the Rural Economic Development Incentive (REDI) program. This program offers $4,000 - $6,000 for each new high-paying position created by a business, up to $25,000 per year, for counties that have a population of 31,000 or less. For Duchesne County, a business could potentially create 5 remote positions annually with a minimum annual salary of $49,342[2] and receive $25,000 for doing so. A similar expansion the following year would allow another $25,000 to be collected. This program is especially beneficial to Roosevelt in that Duchesne County qualifies for the grant funds, while Uintah County is too large to qualify.

The energy industry is becoming more reliant on technology than ever before. This bodes well for the Uintah Basin as it combines its strengths in energy with those in technology. It also bodes well for the entire State of Utah as 75 percent of the money raised by Utah School and Institutional Trust Lands Administration (SITLA) has come from the oil and gas industry. The funds generated by SITLA are used to provide additional revenues for Utah schools.

Recently, the Seven County Infrastructure Coalition began looking into the feasibility of a railway system into the Uinta Basin and has signaled its intention to move forward with the railway. According to the Uinta Basin Railway, the railway would provide a cheaper and more efficient way to move oil and other goods produced in the Uinta Basin as one freight train is estimated to carry as much cargo as 240 long haul trucks. By removing the need for these trucks, the railway would reduce highway congestion and maintenance costs created by the many trucks which transport oil and other goods through Roosevelt. This may initially remove truck driving jobs from the City, but the Uintah Basin Railway also anticipates

[2] https://business.utah.gov/wp-content/uploads/2019/08/GOED_ORD_REDIOnePager_080119_v3.pdf

that the railway would produce 100 new rail jobs through Carbon, Duchesne, and Uintah counties with an additional 300 jobs produced in other industries.

The railway would offer new transportation benefits to Roosevelt and other communities in the area and may provide an incentive which could attract more businesses. It would provide a more cost-efficient mode of transporting necessary equipment into the area for industrial companies, while also allowing for more agricultural, industrial, and commercial exports as well. This growth in businesses would lead to an increased demand for workers which would also mean more residential growth. The current Uintah Basin Railway schedule estimates a completion date of 2023.

3.5 Challenges

Roosevelt faces several challenges to economic development, most notably the lack of access to a major interstate highway or rail line. These services allow for movement of goods and are key to attracting companies to the city. A lack of services can potentially hinder growth.

Roosevelt is immediately adjacent to Ballard, yet Ballard is in Uintah County while Roosevelt is in Duchesne County. This can pose some problems with equity regarding the provision of certain services such as parks and recreation, community events (and associated costs such as extra policing), traffic on streets (yet no accompanying revenue from adjoining City) and branding/image of community (where does one stop and the other end for a visitor?).



Roosevelt Municipal Golf Course

As an example, Roosevelt spent over $2,000,000 on parks, recreation, and public property. Some of these facilities do collect charges on their service but, after factoring in these revenues, the services provided still net the City a cost of just over $1,000,000 per Roosevelt's 2017 actual budget. This is a cost of over $154 per capita on an annual basis. Roosevelt offers several parks, sports facilities, and a full 18-hole golf course. Ballard doesn't have a golf course or any sports facilities, and it is highly likely that residents often travel to Roosevelt to use the City's facilities due to their relatively close location as compared to other cities with similar facilities. These facilities are noticed by tourists visiting the area and could be further used to host activities and attract more business from outside of the City. It would be beneficial for the City to improve facilities like the golf course and other parks as they are a popular attraction for tourists and residents alike.

Three of the larger hotels are located about a mile east of Roosevelt, in Ballard. The tax cost per $100,000 in Ballard is $1,460/annually verses $1,610/annually in Roosevelt. Hotel buildings are commonly valued at over a million dollars so the lower rate in Ballard means saving hundreds of dollars

in taxes every year. It should be noted that land availability and prices may have also played a role in where these hotels are located.

Vernal is located about 30 miles to the northeast of the City and is home to a wide variety of retail and general merchandise stores. This draw effectively pulls hundreds of thousands of dollars in taxable sales to Vernal and away from the other local municipalities, Roosevelt included. In 2017, Vernal effectively captured 411 percent of general merchandise retail sales, whereas Roosevelt was only able to capture 30 percent of this category. Vernal has established itself as the regional retail center as it was able to report a capture rate of over 100 percent in every category except non-retail stores. This presents a significant challenge to the City as it makes it hard to draw retailers to Roosevelt over such an established center of commerce.

Absentee ownership in downtown Roosevelt is another challenge for the City. The City has zoned the entire Main Street area, from just west of mile marker 112 to the City's eastern boundary, as commercial. A parcel analysis of this commercial zone indicates that just over 31 percent of the parcels in this area are owned by someone who lives outside of the City. A more detailed analysis of parcels with storefronts directly on Main Street showed that just under 42 percent of properties were owned by someone outside of Roosevelt. While these numbers don't always mean that these properties are neglected by their owners, an assumption can be made that buildings with distant owners are more likely to fall into disrepair. These owners may also feel less inclined to invest in the community because they don't live there.

It is also notable that the county seat is in Duchesne City which sits in the center of Duchesne County. Due to its status and location, Duchesne City is the site of many county events such as the Duchesne County Fair. These events draw many people from all over the county to Duchesne City where they support local businesses while they are in the area. This presents a challenge to Roosevelt because Duchesne City is 30 miles away so there is no chance of the City capturing any sales from these events. Many residents may leave the City to attend the events in Duchesne City as well, which removes even more business from the City on event dates.

3.5.1 The Main Street Area

In a recent survey, many respondents mentioned that revitalizing the downtown area should be the top priority of the City's recently established Economic Development Committee. While some businesses are viable and doing well in Roosevelt's downtown, others are struggling. The purpose of this section is to offer some general guidelines for downtown, while being careful not to place unrealistic expectations or demands on existing business owners.



Main Street, Roosevelt

First, the more employment that can be located in downtown, the more buying power there will be for lunchtime eating and other shopping in the downtown area. The City may want to consider creating a community reinvestment area (CRA) in downtown to offer incentives to businesses to locate in the downtown area. However, tax increment (used for incentives) only occurs when property values increase. Data centers, call centers, and technology companies all provide good employment that could strengthen the retail buying power of downtown. These types of businesses are considered "anchor tenants" that provide the stability and population to help downtown businesses thrive.


Aerial Photo of Main Street Roosevelt

Gathering places, events and attractions located in downtown will also help to strengthen existing businesses and potentially attract new businesses. Even something as simple as good signage coming into downtown can make a difference in the impression that a passer-by has of the downtown area. The portion of Highway 40 that travels north and south through downtown was reported by Utah Department of Transportation (UDOT) to facilitate 11,000 traffic counts per day in 2017. The count increased to 16,000 traffic counts per day between the 200 North and Main Street intersection, and where the road leaves Duchesne County heading towards Vernal.

In the survey mentioned above, respondents also indicated that there needed to be beautification efforts to make the Main Street area more attractive and enticing to travelers driving through town. However, how do you motivate struggling store owners to fix up their property when it is just not financially feasible for them? Some cities have set up


Example of Main Street Renovation (Before and After)

grant façade programs and have used CDBG funds for this purpose. There are also funds available through UDOT's State Infrastructure Bank Loan Fund which can be used to make improvements on roads and sidewalks. Some cities give grants up to $25,000, with no matching funds required. Others require a 50-50 match of funds or establish revolving loan funds with no interest rates. The difference in not only appearance, but also in sales, can be dramatic when a building gets a facelift as shown in the photos on the previous page.

Another important asset for downtown can be a committed investor, with the patience to work through issues in the area. Not all cities are fortunate enough to have such investors, but they can and do make huge differences in downtowns. The beautification efforts outlined in the City's recent Main Street Revitalization Plan may have the potential to attract outside investors who anticipate potential financial gains from the coming aesthetic and functional improvements to the downtown area.

In the survey, about 69 percent of respondents indicated that the City could improve the number of sit-down restaurants and cited that they felt there were plenty of fast-food options already available. There were also many responses that noted that there needed to be more options for family activities. Roosevelt should consider additional types of development in downtown, other than just retail.

Downtowns are continually evolving. Many downtowns have found that they are no longer strong retail centers for a community, but have found a "second life" by becoming entertainment centers with a variety of development such as sports centers, museums, family fun centers, family history centers, art/craft classes, restaurants, dinner theater, community theater, escape rooms, social ax-throwing, virtual reality, fitness centers, educational centers, etc.

3.5.2 Proposed Library and Surrounding Area

The County is considering the construction of a new library near the new Roosevelt Aquatic Center. This would be in the heart of the City on the block between State Street and 200 West and between Lagoon Street and 100 North. The county library is located on the same block and currently hosts community events on a regular basis. The new library would also be able to host these events and would offer the City brand new equipment and facilities to increase the experience had by attendees.

These new facilities will expand the City's overall appeal and help provide space for community activities, but the area directly surrounding them could be improved. These improvements could be as simple as adding trees between the sidewalks and the ballparks to act as a buffer and provide shade to spectators, or some additional walkways to connect the park features and the new library. Walkability moves people into the park area and away from the road and provides a more enjoyable experience for visitors who want to visit all that the area has to offer. The City may also look into larger improvements, such as a splash pad that could provide entertainment to those already coming to the Roosevelt Aquatic Center. Splash pads are a popular park feature and provide fun and relief to visitors on warm summer days.

3.6 Goals and Strategy

Overall, Roosevelt has some very impressive strengths which should be built on and some challenges that do need to be addressed. The City can take some actions to build on its strengths and meet challenges. This will allow Roosevelt to continue to build towards a strong economic future.

3.6.1 Diversify the Local Economy

Goal: Promote a range of industries, other than energy, in Roosevelt, with a focus on remote jobs.

Strategy: Continue to support high-quality fiber and low-cost energy to attract new companies to the area and diversify the industries found within the City.

Strategy: Consider creating a remote technology hub in downtown to encourage the development and incubation of small businesses in technology-related jobs.

Goal: Increase ability to capture and attract tourists to the City

Strategy: Survey tourists at hotels within the City to determine the reason for their visit.

Strategy: Host events within the City which will attract visitors to the area.

Strategy: Improve and maintain City facilities such as the golf course and other parks to sustain and increase the recreational features which attract tourists to the City.

3.6.2 Job Creation

Goal: Promote good-paying jobs in a wide range of industries.

Strategy: Educate potential employers about grant funds available through the REDI program which pays employers for creating jobs in rural counties.

Strategy: Market the network availability within the City to companies looking to expand.

Strategy: Promote the ability that local educational institutions have to produce high-quality, local employees which reduce relocation costs for expanding companies.

Strategy: Foster coordination between businesses and educational institutions to constantly update and align business needs with educational skills and training.

3.6.3 Main Street Improvement

Goal: Improve the appearance and attractiveness of downtown in order to capture more visitors and shoppers to the area.

Strategy: Encourage the development of public gathering spaces and events in downtown that will attract visitors to the area.

Strategy: Use CDBG funds to ensure landscaping, signage, and street furniture and State Infrastructure Bank funds to ensure roads and sidewalks in the downtown area are in good repair and appealing.

Goal: Strengthen existing downtown businesses.

Strategy: Encourage downtown employment growth through anchor businesses that will provide more buying power and more foot traffic in the area.

Strategy: Consider establishing grant funds through CDBG or other sources to businesses for façade renovations.

Strategy: Educate businesses on sales leakage data, stressing that areas with leakage represent areas of opportunity to recapture lost sales.

Strategy: Hire a marketing consultant to conduct a "downtown walk-through" providing advice to businesses on how they can improve their store window displays and signage.

Goal: Encourage new businesses to locate in downtown.

Strategy: Provide attractive promotional pieces regarding the availability of space in downtown, rents, etc.

Strategy: Consider the creation of a Community Reinvestment Area (CRA) and the use of tax increment funds, when necessary, in order to attract a major employer to Roosevelt rather than a competing city.

Strategy: Consider redeveloping land near the downtown area into a consolidated shopping center. For example, the Drive-In could be redeveloped into a strip mall.





Transportation Master Plan

Chapter 4



ROOSEVELT CITY

HORROCKS ENGINEERS

CHAPTER 4- TRANSPORTATION

A transportation element is a required portion of a general plan (U.C.A., 10-9a-403). It allows the City to provide a framework to develop a good transportation system that provides effective circulation and traffic regulation and that provides for future growth.

Introduction

This Transportation Master Plan (TMP) contains an analysis of the existing transportation network and conditions within Roosevelt, Utah. The goal is to identify deficiencies within the transportation network, and discuss possible improvement or mitigation alternatives. To this end, an analysis of future roadway conditions for the year 2045 was completed with both existing roadway conditions and future planned roadway improvements. An update to the Roosevelt City Transportation Master Plan was prepared as part of the overall General Plan update and can be found in this chapter. This plan update evaluates current transportation conditions in the City, accounts for current and future growth in the City, addresses the transportation needs of areas included in the City's annexation plan, and discusses specific issues such as intersections.

Roadway Network Objectives

It is the objective of the City to have both safe and beautiful streets while maintaining effective circulation and traffic regulation. It is also the objective of the City to build roadways to serve future growth.

Safety

Roosevelt City follows the American Association of State Highway and Transportation Officials *A Policy on Geometric Design of Highways and Streets, 7th Edition* in planning city roadways. Roadways proposed by additional development should follow these guidelines, as updated in Roosevelt City Municipal Code.

The City completed an intersection traffic control analysis in May 2019 to evaluate traffic flow and safety conditions at various intersections within the City. The results of this analysis recommend replacement of most yield signs with stop signs and the placement of a number of additional stop signs at intersections throughout the City. A copy of this analysis is located in Appendix F.

The City also completed an analysis of traffic conditions around Union High School in May 2019. As part of this analysis, the signalization of the intersection of Lagoon Street and 600 East was evaluated. At the time, signalization was not recommended as it would not provide safety or traffic benefits beyond those provided by an all-way stop. A copy of that analysis is located in this report (Appendix F).

Circulation and Growth

To provide effective circulation throughout Roosevelt, a new arterial along 800 South between the eastern edge of the City and US-40 will be built. New collector roads would be provided in currently undeveloped areas as development occurs.

Transit

Transit in Roosevelt City is provided by the Basin Transit Association (BTA), which provides bus service for Duchesne and Uintah Counties. Currently, two bus routes connect Roosevelt to Vernal and Duchesne. As Roosevelt grows, the City encourages BTA to consider the addition of a circulator route within Roosevelt.

Active Transportation

The City encourages the use of bicycles and walking for transportation, recreation, and public health. Although bicycle facilities within the City are limited, this plan includes provision for additional facilities. These include a multi-use trail circling the City and trails serving parks and schools in the City core. Additional detail on proposed active transportation facilities can be found in Chapter 6 – Parks and Recreation.

Implementation

The principles contained in this chapter will be implemented through the normal Roosevelt City budgeting process. Specific improvements will be funded according to present needs of the City.

TMP CHARACTERISTICS AND METHODOLOGY

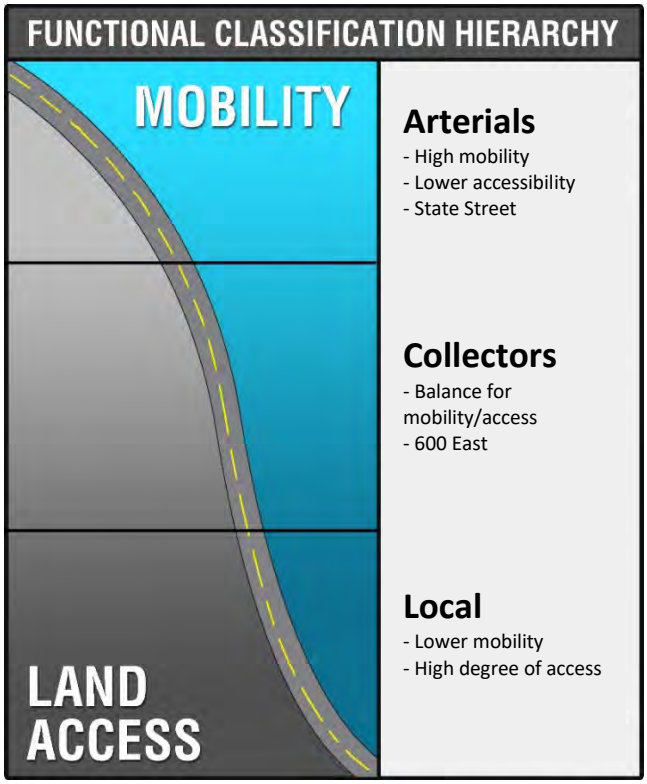
This chapter describes the fundamental basics regarding roadway classification, performance and analysis. It lays out the methodologies used to determine existing and future roadway performance. The following is included in this chapter:

- Roadway Functional Classification
- Roadway Performance for Roadways and Intersections
- Traffic Analysis using the Statewide Travel Demand Model

Roadway Functional Classification

All trips include two distinct functions: mobility and land access. Mobility and land access share an inverse relationship, meaning as mobility increases land access decreases. Street facilities are classified by the relative amounts of through and land-access service they provide. There are three primary functional classifications that apply to all roadways in Roosevelt: Arterial, Collector and Local Streets. A representation is shown in **Figure 4-1.** The roadway network in Roosevelt includes Arterial and Collector roadways which are owned and operated by either the state, county or the City. The following paragraphs describing the classifications in more detail apply to every road in the City. For identification purposes, the roadways are referenced throughout the document with the prefix "State", County" or "City" to indicate the owner of the roadway. Characteristics of each functional class are found in **Table 4-1**.

Figure 4-1: Mobility vs. Land Access Representation



Arterials – Arterial facilities provide service primarily to through-traffic movements. All traffic controls and facility design are intended to provide efficient through movement of vehicles. There are limited land access points provided by these facilities. For example, US-40.

Collectors – Collector facilities are intended to serve both through movements of vehicles and land-access functions in relatively equal proportions. They are frequently used for shorter through movements associated with the distribution and collection portion of trips. For example, 800 South.

Local – Local roads facilities primarily serve land-access functions. The design and control facilitates the movement of vehicles onto and off of the street system from land parcels. For example, 400 North.

Table 4-1: Street Functional Classification

Characteristic	Functional Classification		
	Arterial	Collector	Local
Function	Traffic movement, land access	Collect and distribute traffic between streets and arterials, land access	Land access
Typical % of Surface Street System Mileage	5-10%	10-20%	60-80 %
Continuity	Continuous	Continuous	None
Spacing	¼-2 miles	¼-1 mile	As needed
Typical % of Surface Street System Vehicle-Miles Carried	40-65%	10-20%	10-25 %
Direct Land Access	Limited: major generators only	Restricted: some movements prohibited; number and spacing of driveways controlled	Safety controls access
Minimum Roadway Intersection Spacing	½ mile	300 feet-¼ mile	300 feet
Speed Limit	40-50 mph in fully developed areas	30-40 mph	25 mph
Parking	Approved Areas Only		Permitted
Comments	Backbone of street system	Collects traffic from Local roads to Arterial roads	Through traffic should be discouraged; Subject to traffic calming

Roadway Cross-Sections in Roosevelt

For each functional classification, there are typical cross-sections that are built to maintain uniformity and assist with identifying the appropriate roadway capacity. **Table 4-2** shows the typical cross-sections for roadways based on the classification and number of lanes. In Roosevelt, the 3-5-lane Arterial is owned and maintained by the state (HWY 40 & SR-121). The 2-lane and 3-lane Arterials and Collectors have roadways owned and maintained by both the county and the City.

Table 4-2: Typical Cross Sections

Functional Classification	Number of Lanes	Right of Way Width (ft.)	Pavement Width (ft.)
Local	2	56-66	56
Collector	2	66	44
Arterial	2-3	80	58
Arterial	5	100	82

Each functional classification is color coded based on the number of lanes on each street. Maps showing the existing functional classifications for the inner City and County and the surrounding area are shown in **Figure 4-2** and **Figure 4-3**.

Roosevelt City is currently in the process of developing Streetscape Design Vision guidelines. When the Streetscape Design Vision guidelines for Roosevelt are adopted, it is recommended that these guidelines be implemented for all future roadway projects in the City.

Kings Peak Elementary

East Elementary

Union High School

JR High

Centennial Elementary

N

0.5 0 0.5 Miles

Legend

Signals
- Existing

Existing Network
- Arterial
- City Arterial
- City Collector
- City Local
- County Arterial
- County Collector

- Cemetery
- Church
- Hospital
- Library
- School
- CityBoundary
- AnnexationBoundary

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Inner City Existing Roadway Network

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Figure 4-2

N

H

Legend

Functional Classification

- City Arterial
- City Collector
- Residential
- Arterial
- County Collector
- County Arterial

- Library
- School
- Hospital
- Cemetery
- Church
- HAWK Signal

- Existing Signal
- CityBoundary
- AnnexationBoundary

0.5 0 0.5 Miles

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Outer City and County Functional Classification

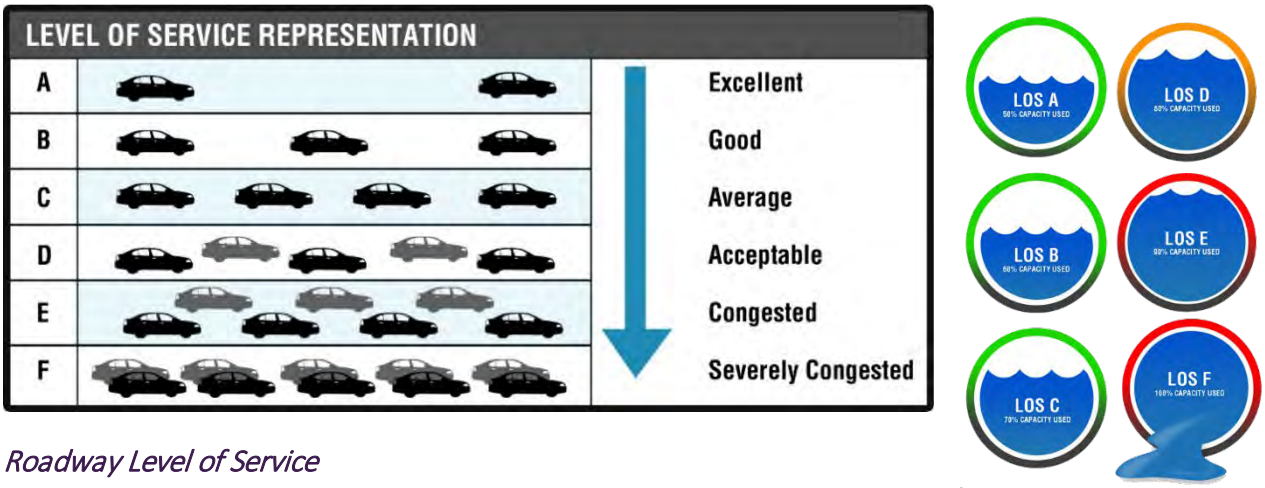
Roosevelt City Transportation Master Plan

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Figure 4-3

Roadway Performance

The adequacy of an existing street system can be quantified by assigning Levels of Service (LOS) to major roadways and intersections. As defined in the *Highway Capacity Manual (HCM),* a document published by the Transportation Research Board (TRB), LOS serves as the traditional form of measurement of a roadway's functionality. The TRB identifies LOS by reviewing elements, such as the number of lanes assigned to a roadway, the amount of traffic using the roadway and the time of delay per vehicle traveling on the roadway and at intersections. Levels of service range from A (free flow where users are virtually unimpeded by other traffic on the roadway) to F (traffic exceeds the operating capacity of the roadway) as shown in **Figure 4-4**. Also shown in **Figure 4-4** are representations of LOS using pipe flow. As traffic volumes increase, the pipe continues to fill until, at LOS F, the pipe reaches capacity and begins to overflow.

Figure 4-4: Level of Service Representation



Roadway Level of Service

Roadway LOS is used as a planning tool to quantitatively represent the ability of a particular roadway to accommodate the travel demand during the peak hours of the day. Typically, the afternoon peak hour is from 4:00 PM to 6:00 PM as shown in **Table 4-3** for collector and arterial streets. LOS is assigned during the peak hour based on the number of lanes and the lane capacity. Lane capacity is different based on the functional classification of the roadway. Roadway segment LOS can be mitigated with geometry improvements, additional lanes, two-way-left turn lanes, and access management. Intersections are not included when analyzing roadway LOS and therefore the LOS indicates if the existing number of lanes, lane widths and functional classifications are adequate for the traffic volumes.

Table 4-3: Estimated LOS based on Functional Classification

Arterial Streets

Lanes	LOS C	LOS D	LOS E
2-3	12,000	15,500	19,500
4-5	22,000	28,000	33,000

Collector Streets

Lanes	LOS C	LOS D	LOS E
2	7,500	9,500	12,000

LOS D is approximately 80 percent of a roadway's capacity and is a common goal for urban streets during peak hours. A standard of LOS D for system streets (collectors and arterials) is acceptable for future planning.

Attaining LOS C or better on these streets would potentially be cost prohibitive and may present societal impacts, such as the need for additional lanes and wider street cross-sections. LOS D suggests that, for most times of the day, the roadways will be operating well below capacity. The peak times of the day will likely experience moderate congestion characterized by higher vehicle density and slower than free flow speeds. The model uses traffic volumes during the peak hour of the day to achieve the highest traffic volumes for the analysis of the road

Intersection Level of Service

Whereas roadway LOS considers an overall picture of a roadway's capacity to estimate operating conditions, intersection LOS looks at each individual vehicle movement at an intersection and provides a more precise method for quantifying operations. Since intersections are typically a source of bottlenecks in the transportation network, a detailed look into vehicle delay at each intersection should be performed on a regular basis. The methodology for calculating delay at an intersection is outlined in the *Highway Capacity Manual* (HCM) and the resulting criteria for assigning LOS to signalized and un-signalized intersections is outlined in **Table 4-4**. LOS D is considered the industry standard for intersections in an urbanized area. LOS D at an intersection corresponds to an average control delay of 35-55 seconds per vehicle for a signalized intersection and 25-35 seconds per vehicle for an un-signalized intersection.

Table 4-4: Intersection Level of Service

LOS*	Signalized Intersection (sec)	Stop-Controlled/ Roundabout (sec)
A	≤10	≤10
B	>10-20	>10-15
C	>20-35	>15-25
D	>35-55	>25-35
E	>55-80	>35-50
F	≥80	≥50

*LOS F when traffic volumes exceed capacity

At a signalized intersection under LOS D conditions, the average vehicle will be stopped for less than 55 seconds. This is considered an acceptable amount of delay during the times of the day when roadways are most congested. As a general rule, traffic signal cycle lengths (the length of time it takes for a traffic signal to cycle through each movement in turn) should be below 90 seconds. An average delay of less than 55 seconds suggests that, in most cases, no vehicles will have to wait more than one cycle before proceeding through an intersection.

Un-signalized intersections are generally stop-controlled. These intersections allow major streets to flow freely, and minor intersecting streets to stop prior to entering the intersection. In cases where traffic volumes are more evenly distributed or where sight distances may be limited, four-way stop-controlled intersections are common. LOS for an un-signalized intersection is assigned based on the average control of the worst approach (always a stop approach) at the intersection. An un-signalized intersection operating at LOS D means the average vehicle waiting at one of the stop-controlled approaches will wait no longer than 35 seconds before proceeding through the intersection. This delay may be caused by large volumes of traffic on the major street resulting in fewer gaps in traffic for a vehicle to turn, or for queued vehicles waiting at the stop sign. Roundabout LOS is also measured using the stop-controlled LOS parameters.

Intersection and roadway segment LOS problems must be solved independently of each other, as the treatment required to mitigate the congestion is different in each case. Intersection problems may be mitigated by adding turn lanes, improving signal timing, and improving corridor signal coordination.

Travel Demand Modeling

Introduction

The Statewide Travel Demand Model (TDM) is used by State authorities to assist in forecasting demand on State-owned roads. It links all major roads in the State together, providing a high-level analysis tool to determine areas of congestion and identify potential projects which would improve the transportation network. The TDM incorporates demographic data as well as land use information to determine the number of trips that will take place on roads within the network.

Traffic Analysis Zones (TAZ)

In order to generate vehicle trips, sections of the City are split into geographical sections called Traffic Analysis Zones (TAZ). Each TAZ contains socioeconomic and demographic data including the number of households, employment opportunities, and average income levels. Also included in the TAZ data are general and land use data for each City. This data is used to generate existing and future vehicle trips that originate in the TAZ. All trips generated in the TAZ are assigned to other TAZs as shown in **Figure 4-5** based on the data within other zones. There are currently 10 TAZs within the Statewide TDM which were used in assigning traffic to Roosevelt roads.

Table 4-5: TAZ Growth Rates

TAZ Zones	2015 Model	2045 Model	Growth Rate
1	7,570	8,780	1.16%
2	3,080	5,360	1.74%
3	2,520	3,660	1.45%
4	4,860	5,740	1.18%
5	5,820	6,410	1.10%
6	4,020	5,080	1.26%
7	4,020	4,990	1.24%
8	3,180	4,640	1.46%
9	7,280	8,150	1.12%
10	1,860	3,080	1.66%

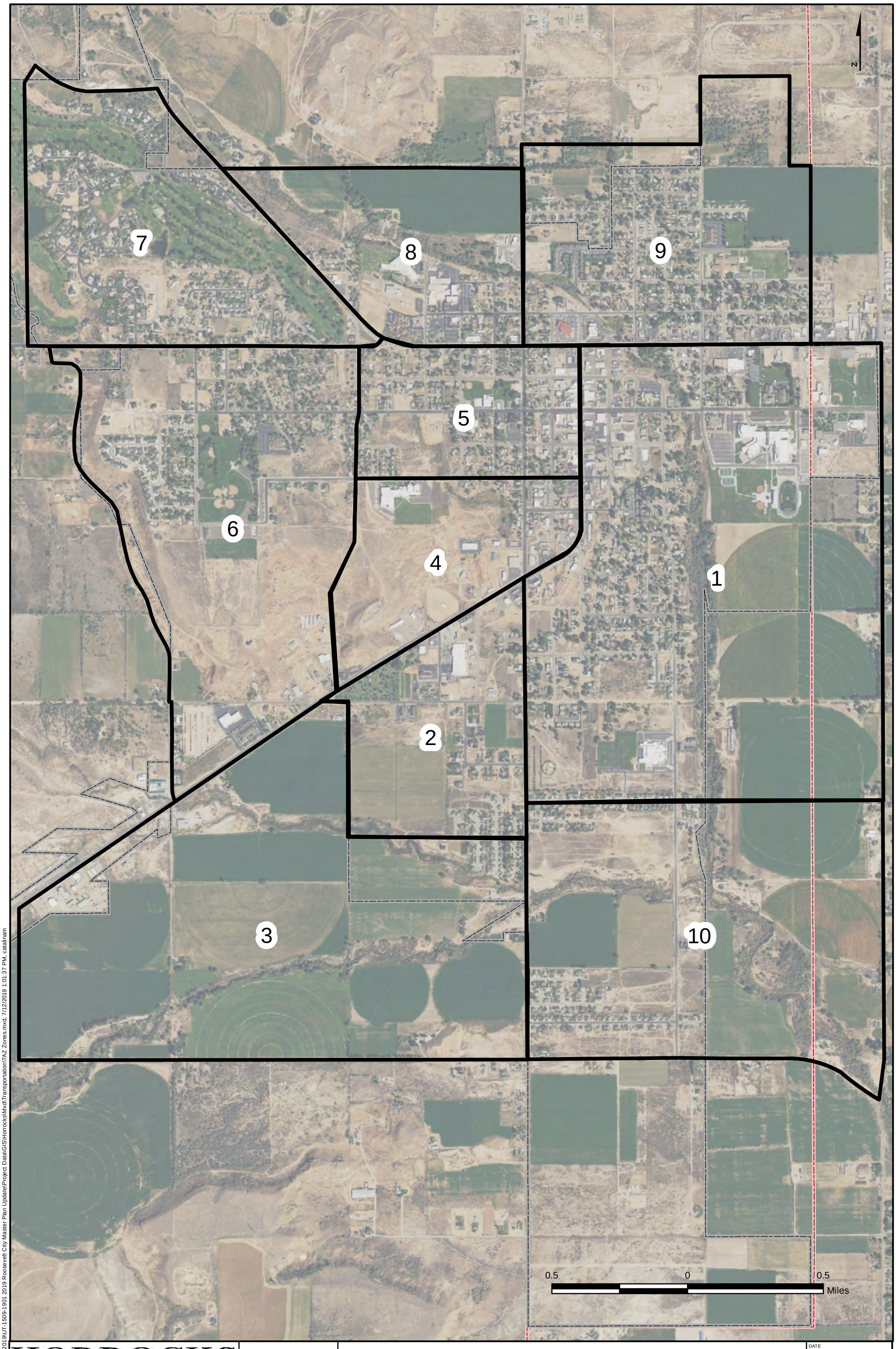
Future Growth Based on TAZ Data

The Statewide TDM is the most accurate method to estimate future traffic volumes in the City. This is a regional model used throughout the State of Utah and therefore doesn't include all roadways within Roosevelt. A growth rate for each TAZ was calculated and is shown in **Table 4-5**. This growth rate will be applied for all roadways which fall within the specific TAZ.

Travel Demand Model Precautions

Roosevelt City aims to plan for and encourage responsible and sustainable growth in the City. Part of the commitment to provide a sustainable system includes encouraging a reduction in vehicle trips by providing a balance of roads, trails and bikeways, and public transit facilities by upgrading bus fleet. Today's transportation system should not only accommodate existing travel demands, but should also have built-in capacity to account for the demand that will be placed on the system in the future. While considering the socioeconomic data used in this report and the anticipated growth in the City, some precautions should be considered. First, the TAZ-specific socioeconomic data only approximates the boundary conditions of the City and is based on data provided by City and State authorities. Second, actual values may vary somewhat as a result of the large study area of the State Travel Demand Model, which includes the

unincorporated areas around Roosevelt City. Therefore, the recommendations in this report represent a planning level analysis and should not be used for construction of any project without review and further analysis. This document should also be considered a living document and should be updated regularly as development plans, zoning plans, and traffic patterns and trends change.



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Roosevelt TAZs

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Figure 4-5

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ROADWAY SYSTEM ANALYSIS

Existing Roadway Network Analysis

Existing Traffic Data and Level of Service

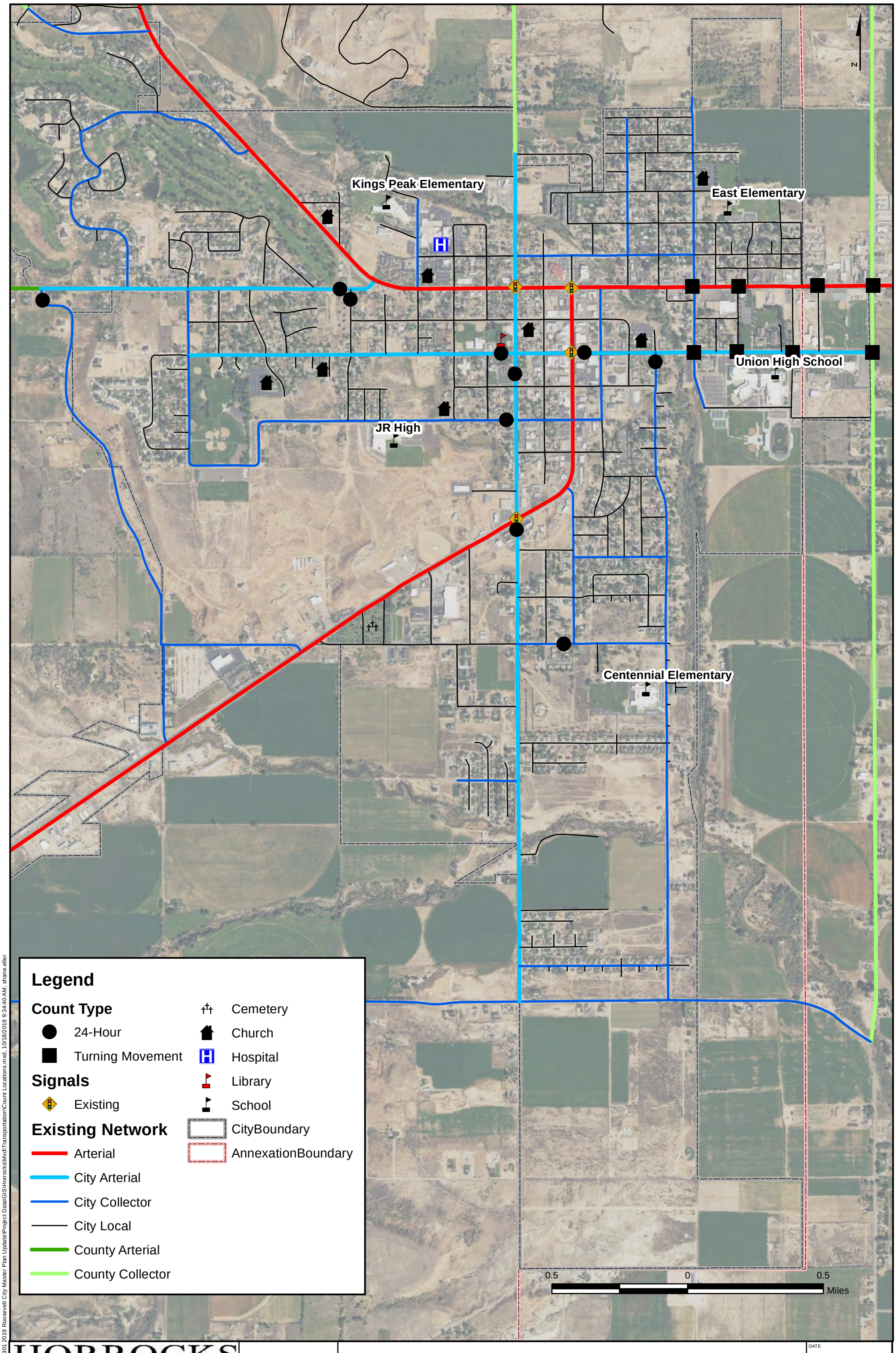
Traffic counts were collected in Roosevelt City on January, 23, 2019. All existing data used in this TMP is included in **Figure 4-6**. Existing traffic data provides a base on which to estimate future traffic volumes throughout the City. These counts are used as calibration for the Statewide TDM. To calibrate, adjustments in the model are made to ensure existing traffic matches existing count data. The calibrated TDM was used to provide existing LOS throughout the City as shown in **Figure 4-7**.

Public transit in Roosevelt is provided by Basin Transit Association (BTA). There are several current public transit routes through Roosevelt City and the neighboring towns of Vernal and Duchesne. In addition to buses, BTA provides transportation for paratransit riders. As development in Roosevelt City expands, it is anticipated that additional routes will be added by BTA to accommodate the influx of public transit riders.

Other Analyses Included in this TMP

As part of the TMP process, Horrocks completed extensive traffic studies which included analysis surrounding the high school and at yield and stop controlled intersections throughout the City. The results from both studies are included in **APPENDIX F**, which is a compilation of the following traffic studies:

- Union High School Traffic Impact Analysis – Completed 2019
- Roosevelt Intersection Traffic Control Analysis – Completed 2019
- Traffic Signal Study – SR-121 & 300 West – Completed 2019
- Areva Rd & Club House Dr Traffic Control Evaluation – Completed 2017
- Traffic Control Study - Lagoon Street & 600 East, Roosevelt – Completed 2018
- 4-Way Stop Warrant Study - 600 East and 300 North – Completed 2016



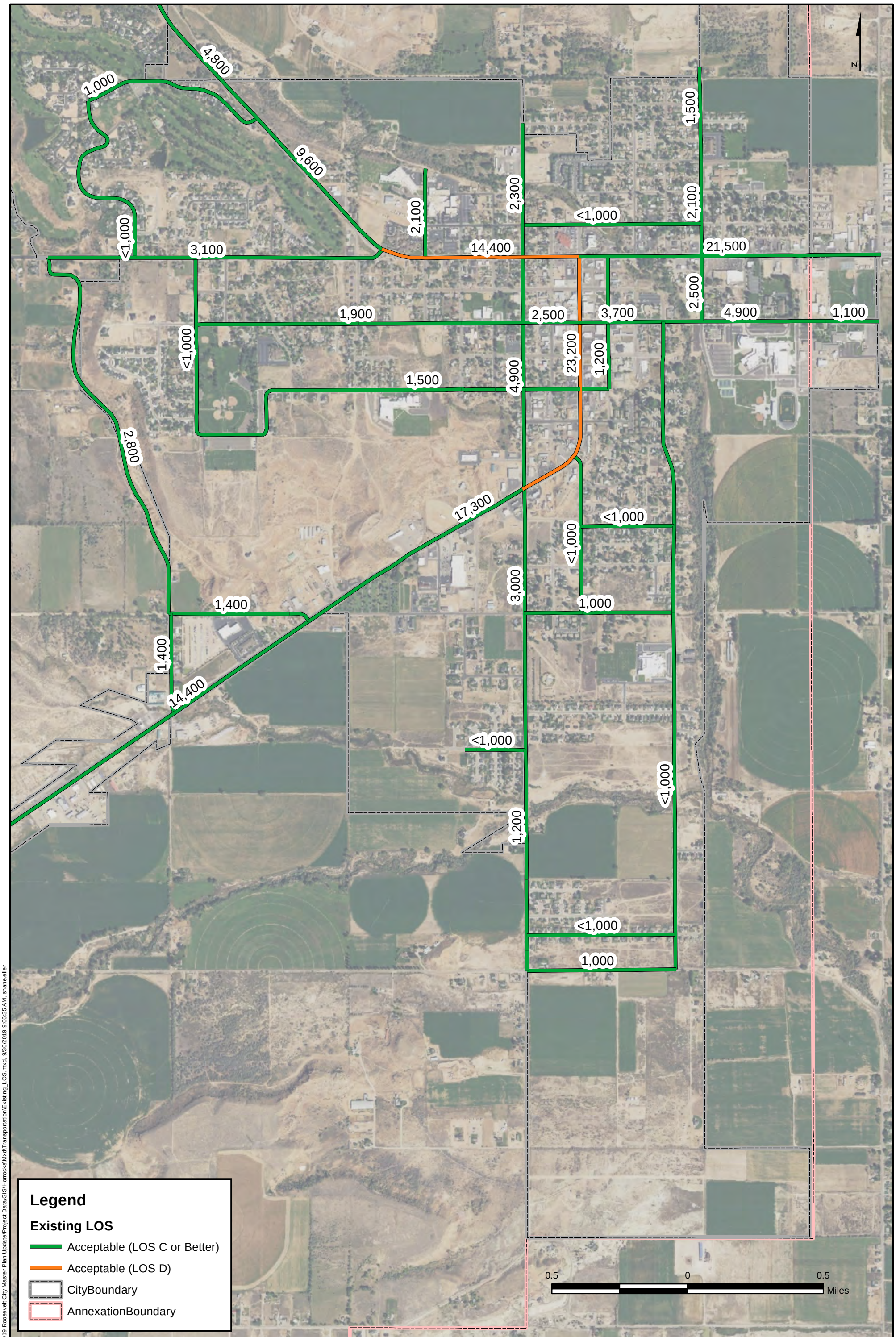
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Traffic Count Locations

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Figure 4-6

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Legend

Existing LOS

- Acceptable (LOS C or Better)
- Acceptable (LOS D)
- CityBoundary
- AnnexationBoundary

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Existing Level of Service

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Figure 4-7

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Future Roadway Network Analysis

2045 No-Build Analysis

A no-build scenario is intended to show what the roadway network would be like in the future if no action is taken to improve the City roadway network. This provides a starting point to determine future problems in the City. The travel demand model was used to predict this condition by applying the future growth and travel demand to the existing roadway network. As shown in **Figure 4-8**, the following roadways would perform at LOS E or worse if no action was taken to improve the roadway network:

- Highway 40
- SR-121

2045 Transportation Master Plan

Based on the deficiencies identified in the no-build scenario as well as City input, the following projects are required to sustain future growth in the City. These projects, also shown in **Figure 4-9** and **Figure 4-10**, will ensure a transportation network able to sustain the projected growth in Roosevelt City:

1. **800 South** – *US-40 to 1500 East*: Arterial Street for connectivity to new elementary school and an East-West corridor split into two phases for priority. Constructed in coordination with Ballard City for connection to 1500 East in Ballard.
    a. **Phase 1** - *US-40 to Rodeo Drive*: Approximately 2,600' new roadway construction and ROW acquisitions.
    b. **Phase 2**- *Rodeo Drive to 1500 East:* Approximately 1,800' new roadway construction, bridge for stream crossing, ROW acquisition and 3,800' roadway improvements
2. **Rodeo Drive** – *US-40 to 200 South*: Collector Street for connectivity near JR. high school and a North-South corridor between HWY 40 and SR-121. Approximately 2,300' new roadway construction. Includes storm drain facilities.
3. **500 West** – *200 South to US-40*: Collector Street for connectivity near JR. high school and a North-South corridor between HWY 40 and SR-121. Approximately 2,800' new roadway construction, ROW acquisition, 2,000' roadway widening. Includes storm drain facilities.
5. **1200 South** – *200 West to 1000 West*: Collector Street linking State Street to 1000 West and US-40. Project would include one stream crossing, two intersections with collectors, ROW acquisition, and approximately 4,400' new roadway construction.
6. **1000 West** – *US-40 (At Summerall Lane) to 2000 South (Pole Line Road)*: Collector street providing North-South flow from the US-40/Summerall Lane intersection to Pole Line Road. Project would include two stream crossings and approximately 5,300' new roadway construction.
7. **300 West** – *200 South to Lagoon St.*: Collector Street for connectivity near Jr. high school and a North-South corridor between Jr. High and Kings Peak Elementary with approximately 980' new roadway construction, ROW acquisition, and roadway widening.
8. **300 West** – *Kings Peak Elementary to 700 North*: Collector Street providing alternate route for existing dead-end street with congestion near the hospital and elementary school. Approximately 1,300' new roadway, a stream crossing and steep grade challenges, with ROW acquisition and existing roadway improvements anticipated.

9. **700 North** – *600 East to 1500 East*: Collector Street for northern East-West corridor for Local traffic to 1500 East in Ballard. Approximately 2,700' new roadway construction with the eastern portion pending Ballard City approval
10. **700 North** – *400 East to SR-121*: Collector Street for northern East-West corridor linking SR-121 and 1500 East. Approximately 5,500' new roadway construction including a bridge for stream crossing with the eastern portion requiring ROW acquisition and existing roadway improvements.
11. **Union Street** – *400 North to 700 North*: Collector Street in Uintah County extended to 700 North from US-40. Approximately 1,550' new roadway construction and mutually agreed upon by Roosevelt City and Ballard City.
12. **500 West** – *800 South to 2000 South (Pole Line Road)*: Collector Street providing North-South flow from US-40 to Pole Line Road. Project would include two stream crossings and approximately 5,300' new roadway construction.
13. **600 East** – *High School Access Road to 800 South*: Collector Street providing North-South flow from Lagoon Street to 800 South on the east side of Cottonwood Creek. Project would include approximately 4,300' new roadway construction and ROW acquisition.
14. **1200 South/1500 South**—*State Street to 1500 East:* Collector street providing East-West flow from 500 East to 1500 East which will include approximately 5,550' new roadway construction, ROW acquisition and a new stream crossing. Constructed in coordination with Ballard City for connection to 1500 East in Ballard.
15. **290 South** – *Park Place Drive to 500 West*: Collector Street providing East-West flow connecting Park Place Drive to 500 West. Project would include approximately 1,300' new roadway construction and ROW acquisition.
16. **550 North/600 North** – *800 East to Union Street*: Collector Street providing East-West connectivity from Union Street to residential neighborhoods and East Elementary School. Project would include approximately 1,300' new roadway construction and ROW acquisition.
17. **2500 West** – *South Cove Road to Hancock Cove Road*: Collector Street providing North-South connectivity between South Cove Road and Hancock Cove Road. With potential to annex part of this road into Roosevelt City, approximately 3,300' of new road construction and ROW acquisition will be the responsibility of Roosevelt City and 2,000' of new road construction will be Duchesne County responsibility and ROW acquisition.
18. **2000 West** – *200 North to 800 South*: Collector Street providing North-South connectivity between 200 north and 1000 South. The project will include approximately 5,300' in new roadway construction and ROW acquisition. The project spans both Duchesne County and Roosevelt City jurisdictions, with approximately 2,600' of new road located in Roosevelt City boundaries.
19. **2000 West** – *800 South to 1300 South:* Collector Street providing connection between 200 North/South Cove Road and US-40. The project will include approximately 2,800' in new roadway construction, ROW acquisition, and lies within Duchesne County jurisdiction.
20. **800 South** – *Summerall Lane to 2000 West*: Collector Street providing East-West connectivity between South Roosevelt and County land. The project will include approximately 4,400' in new roadway construction, bridge for stream crossing, and ROW acquisition and lies within Duchesne County jurisdiction.

21. **Skyline Drive Extension** – *Skyline Drive to 200 South*: Local road connecting Skyline Drive and 200 south, improving connectivity in the area. The project will include approximately 350' new roadway construction and ROW acquisition.
22. **300 South** – *3000 West to 2500 West*: Local road connecting 3000 West and 2500 West, improving connectivity in the area. The project will include approximately 2,700' in length and ROW acquisition.
23. **2500 West** – *South Cove Road to 2000 West*: Local road connecting South Cove Road and 2000 West, improving connectivity in the area and between North Cove road and 2000 West after the north leg of 2500 West is constructed. The project will include approximately 5,900' in length and ROW acquisition.
24. **Rodeo Drive** – *800 South to 1200 South*: Local road providing connectivity between 800 South and 1200 South. The project will include approximately 2000' in new roadway construction including ROW acquisition.
25. **400 West** – *800 South to 1200 South*: Local road providing connectivity between 800 South and 1200 South at the Cemetery. The project will include approximately 2000' in new roadway construction including ROW acquisition.
26. **300 East** – *Pole Line Road to 2500 South*: Local road connecting Pole Line Road and 2500 South, improving connectivity in the area. The project will include approximately 2,650' in length and ROW acquisition.
27. **2500 South** – *State Street to 1500 South*: Local road connecting State Street and 1500 South, improving connectivity in the area. The project will include approximately 5,300' in length and ROW acquisition. To be constructed in coordination with Ballard City for connectivity to 1500 East.
28. **Traffic Signal** – 600 East & Lagoon Street: Upgrade intersection to Traffic Signal.
29. **Traffic Signal** – US 40 & 200 South: Upgrade intersection to Traffic Signal.
30. **Traffic Signal** – US 40 & 800 South: Upgrade intersection to Traffic Signal.
31. **Traffic Signal** – US 40 & 1000 West: Upgrade intersection to Traffic Signal.
32. **150 North** – Existing to 600 West: Local road extending to 600 West improving connectivity in the area. The project will include approximately 200' in length.
33. **75 North** – Existing to 600 West: Local road extending to 600 West improving connectivity in the area. The project will include approximately 200' in length.
34. **600 West** – 75 North to 200 North: Local road connecting 75 North and 200 North improving connectivity in the area. The project will include approximately 550' in length.
35. **400 East** – 100 North to 200 North: Local road connecting 100 North and 200 North improving connectivity in the area. The project will include approximately 500' in length.
36. **350 East** – Existing to 1150 South: Local road extending to 1150 South improving connectivity in the area. The project will include approximately 150' in length.
37. **1150 South** – Existing to 350 East: Local road extending to 350 East improving connectivity in the area. The project will include approximately 450' in length.
38. **1825 South** – Existing to 500 East: Local road extending to 500 East improving connectivity in the area. The project will include approximately 1,000' in length.

With all of the above projects completed, the future road network will function at the LOS shown in **Figure 4-11**.

US-40 Speed Limit

With future improvements and growth expected in the areas surrounding the cemetery, the speed limit north of the cemetery should be evaluated periodically to determine if a lower speed limit in this area is appropriate.

US-40 Alternate Truck Route

Future conditions indicate heavy congestion on US-40 within the City, with vehicular volumes causing LOS E or worse conditions. One possible solution to this over-crowding could be to direct trucks in an alternate route through the Roosevelt area. This would both reduce congestion within town and help improve safety on main roads within the City. It is therefore recommended that a feasibility study for a US-40 alternate truck route be conducted with County and UDOT support.

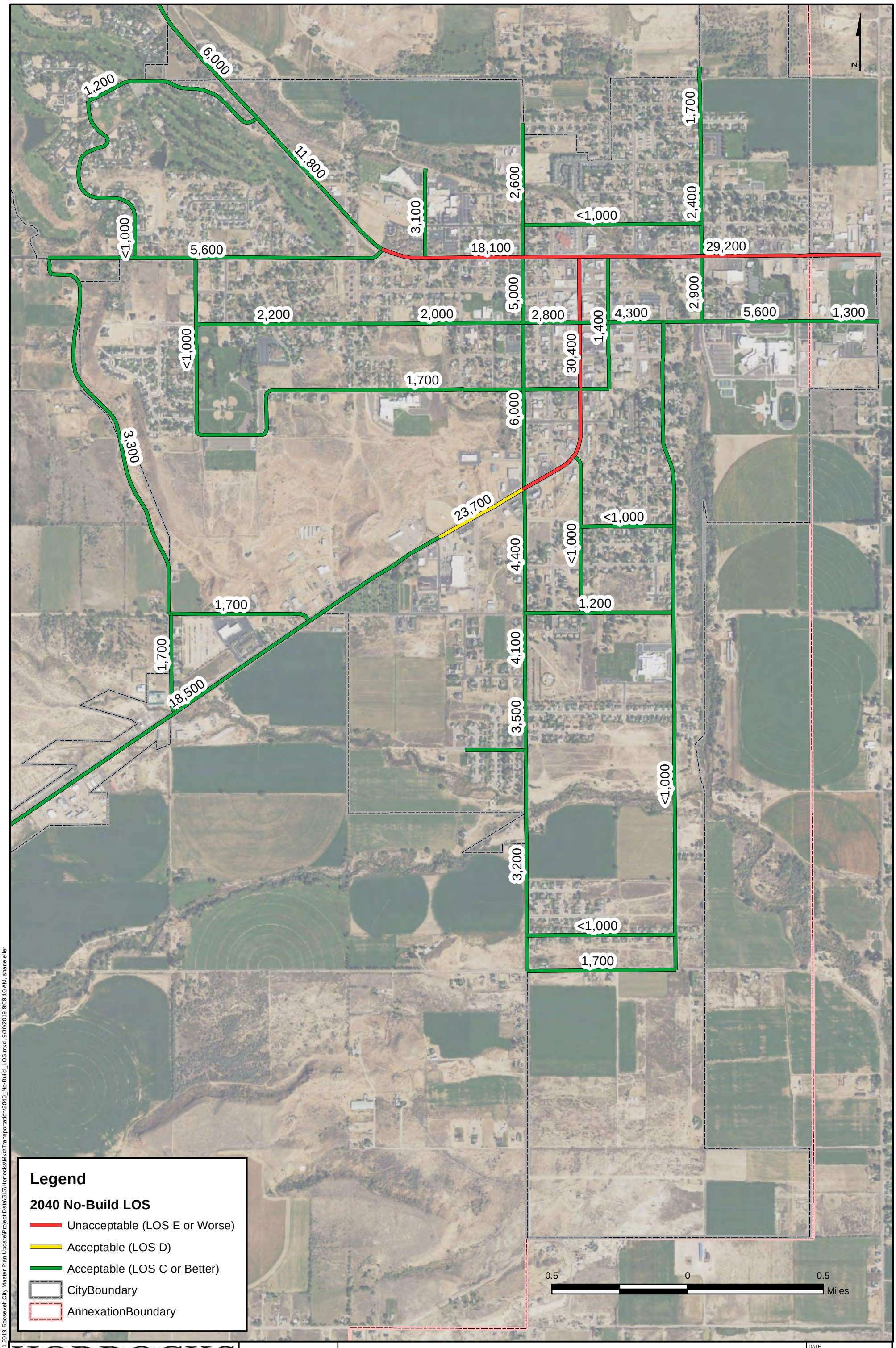
Future BTA Growth in Roosevelt City

BTA future plans include various strategies which will affect Roosevelt City. The BTA strategies include but are not limited to the diversifying of funding, conversion to clean fuel, upgrading bus fleet to large scale buses, adding park and ride areas, and adding various routes through Duchesne County including the City of Roosevelt. BTA plans to expand the existing Blue Route through Roosevelt to improve the connectivity through Roosevelt City. It is recommended to continually monitor public transit surrounding Roosevelt to meet the future needs of the community.

Future Traffic Signals

A signal warrant study was performed on September 20, 2019 by UDOT at the intersection of 200 North (SR-121) and 300 West, and found a traffic signal is not currently warranted according to MUTCD guidelines. MUTCD guidelines provide a series of warrants used to determine if a traffic signal should be installed. These warrants cover various traffic characteristics such as vehicular volume, pedestrian volume, and crash history. The September 20, 2019 study by UDOT found that vehicular volumes would need to increase by approximately 57% to satisfy the warrants. In addition, pedestrian volumes and crash history were below minimum requirements for warrants to be met.

The intersection of Lagoon Street and State Street is also a potential location for a future traffic signal as they are both classified as arterial roads. However, current traffic volumes will not meet warrants for a traffic signal. As traffic volumes increase in the future, it is recommended to monitor both the intersection of Lagoon Street and State Street and the intersection of 200 North (SR-121) and 300 West and install a traffic signal when a warrant is met.



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2040 No-Build Level of Service

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Figure 4-8

700 North
600 East
400 North
Kings Peak Elementary
East Elementary
Lagoon Street
Union High School
200 South
JR High
Hwy 40
Centennial Elementary
1000 West
1500 East
N
0.5 0 0.5
Miles

Legend

Signals
- Existing
- Proposed

Future Network

Roadway Classification
- New Ballard Collector
- New City Arterial
- City Arterial
- New City Collector
- City Collector
- County Arterial
- New County Collector
- County Collector
- Proposed Ballard Collector
- New City Local
- City Local
- Arterial
- Cemetery
- Church
- Hospital
- Library
- School
- CityBoundary
- AnnexationBoundary

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2040 Inner City Functional Classification

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Figure 4-9

N

Legend

Future Network

Functional Classification

- New Ballard Collector
- New City Arterial
- City Arterial
- New City Collector
- City Collector
- New County Arterial
- County Arterial
- New County Collector
- County Collector
- Proposed Ballard Collector
- New City Local
- City Local
- Arterial
- Cemetery
- Church
- Hospital
- Library
- School
- Existing Signal
- HAWK Signal
- Proposed Signal
- CityBoundary
- AnnexationBoundary

0.5 0 0.5 Miles

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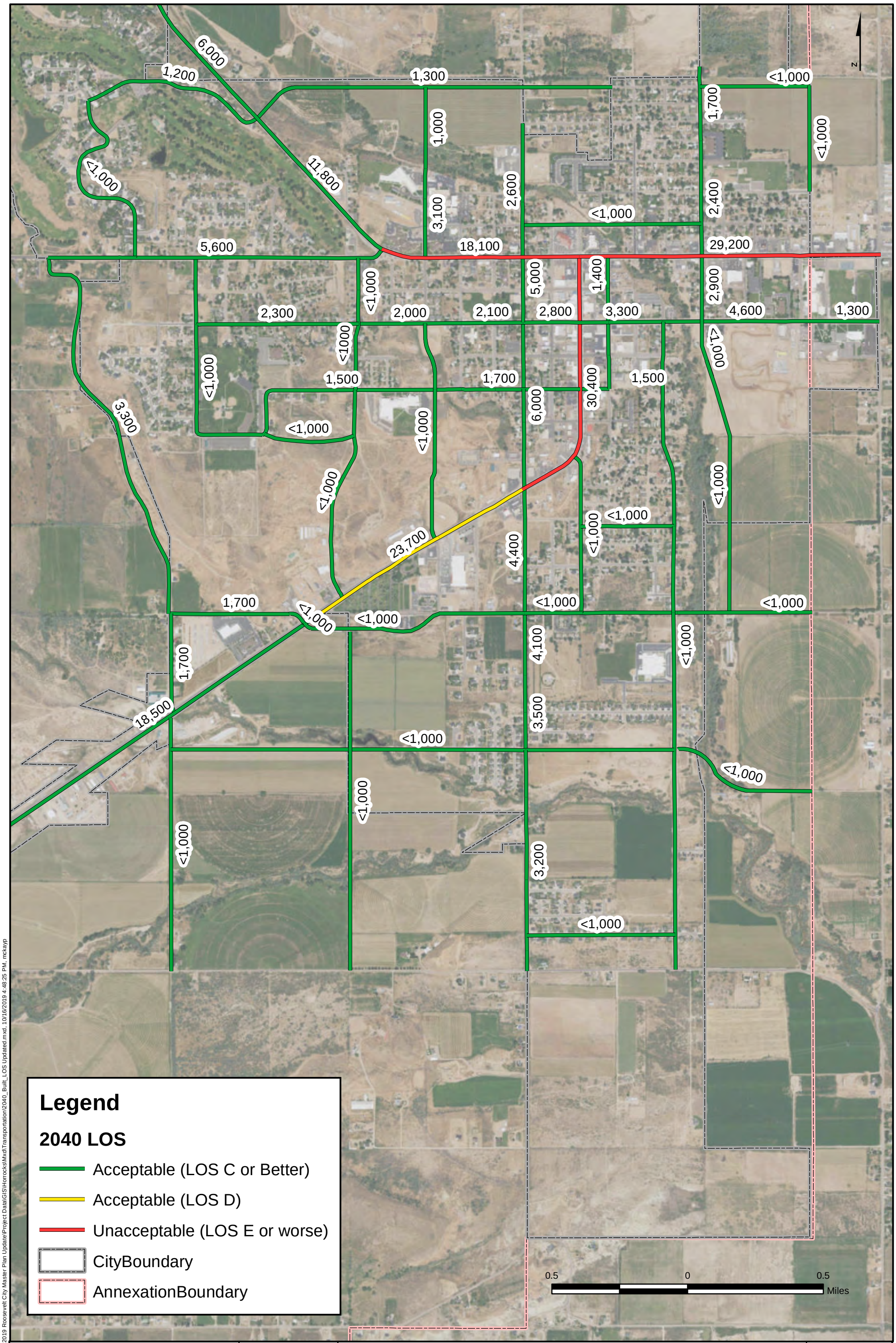
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2040 Outer City and County Functional Classification

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Figure 4-10



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2040 Build Level of Service

Roosevelt City Transportation Master Plan

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Figure 4-11

ROADWAY IMPROVEMENT PLAN

Capacity Improvements

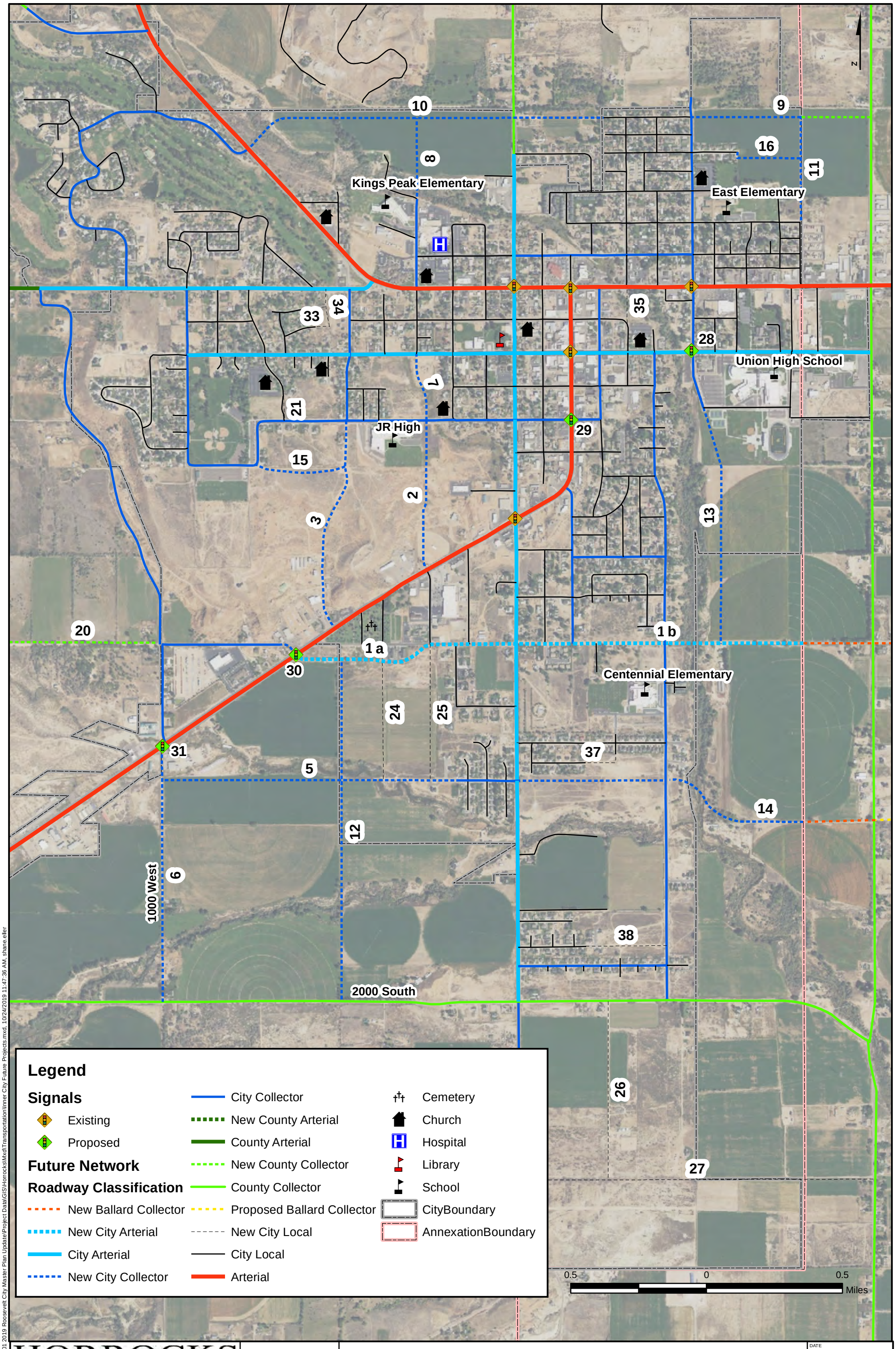
Roadway Improvements

As development occurs a portion of the improvement costs for new streets will be funded by the developers as determined by Roosevelt City. Roosevelt City should continue to enforce adopted standards and specifications for street cross sections presented in this plan and in the Roosevelt City Standards and Specifications. Money spent on annual maintenance of City streets for asset management should be funded through the City budget. Table 4-6 provides a list of roadway improvement projects, which are also shown in Figure 4-12 and Figure 4-13. Hawk Signals (High-intensity Activated Crosswalk Beacon) are used as a traffic control device for pedestrian's crossings, A Hawk signal will only stop traffic when a pedestrian actuates the signal. Included in **Table 4-6** lists each project by priority based on the Level of Service in the analysis and contains an associated estimated cost.

Table 4-6: 2045 Roadway and Intersection Improvement Projects

2045 Roadway Improvements Projects				
Ref. No.	**Location**	**Priority**	**Total Price (2019 Dollars)**	**Improvement Period**
1a	Arterial Street: 800 South (US-40 to Rodeo Drive)	High	$4,232,400	1-5 year
1b	Arterial Street: 800 South (Rodeo Drive to 1500 East)	Low	$9,070,700	16-25 year
2	Collector Street: Rodeo Drive (US-40 to 200 South)	Low	$816,100	16-25 year
3	Collector Street: 500 West (200 South to US-40)	Medium	$5,086,100	11-15 year
5	Collector Street: 1200 South (200 West to 1000 West)	Low	$7,826,900	16-25 year
6	Collector Street: 1000 West (US-40 to 2000 South)	Low	$5,628,500	16-25 year
7	Collector Street: 300 West (200 South to Lagoon St.)	Low	$691,800	16-25 year
8	Collector Street: 300 West (Kings Peak Elementary to 700 North)	Low	$4,457,000	16-25 year
9	Collector Street: 700 North (600 East to 1500 East)	Low	$1,456,000	16-25 year
10	Collector Street: 700 North (400 East to SR-121)	Low	$11,841,900	16-25 year
11	Collector Street: Union Street (400 North to 700 North)	Low	$836,200	16-25 year
12	Collector Street: 500 West (800 South to 2000 South)	Low	$7,462,700	16-25 year
13	Collector Street: 600 East (High School to 800 South)	Low	$5,641,800	16-25 year
14	Collector Street: 1200 South/1500 South (State Street East to 1500 East)	Low	$13,270,000	16-25 year

2045 Roadway Improvements Projects				
Ref. No.	Location	Priority	Total Price (2019 Dollars)	Improvement Period
15	Collector Street: 290 South (Park Place Drive to 500 West)	Low	$2,037,400	16-25 year
16	Collector Street: 550 North/600 North Extension (800 East to Union Street)	Low	$2,037,400	16-25 year
17	Collector Street: 2500 West (South Cove Road to Upper Hancock Cove Road)	Low	$8,693,500	16-25 year
18	Collector Street: 2000 West (200 North to 800 South)	Low	$8,693,500	16-25 year
19	Collector Street: 2000 West (800 South to 1300 South)	Low	$4,388,100	16-25 year
20	Collector Street: 800 South (Summerall Lane to 2000 West)	Low	$11,000,500	16-25 year
21	Local Road: Skyline Drive Extension (200 South to Skyline Dr)	Low	$597,600	16-25 year
22	Local Road: 300 South (3000 West to 2500 West)	Low	$4,114,600	16-25 year
23	Local Road: 2500 West (South Cove Road to 2000 West)	Low	$8,991,200	16-25 year
24	Local Road: Rodeo Drive (800 South to 1200 South)	Low	$3,047,900	16-25 year
25	Local Road: 400 West (800 South to 1200 South)	Low	$3,047,900	16-25 year
26	Local Road: 300 East (Pole Line Road to 2500 South)	Low	$4,038,400	16-25 year
27	Local Road: 2500 South (State Street to 1500 East)	Low	$8,076,800	16-25 year
28	New Traffic Signal: 600 East & Lagoon Street	Low	$387,500	16-25 year
29	New Traffic Signal: US-40 & 200 South	High	$387,500	1-5 year
30	New Traffic Signal: US-40 & 800 South	Medium	$387,500	11-15 year
31	New Traffic Signal: US-40 & 1000 West	Medium	$387,500	11-15 year
32	Local Road: 150 North (Existing to 600 West)	Low	$335,800	16-25 year
33	Local Road: 75 North (Existing to 600 West)	Low	$335,800	16-25 year
34	Local Road: 600 West (75 North to 200 North)	Low	$294,900	16-25 year
35	Local Road: 400 East (100 North to 200 North)	Low	$268,000	16-25 year
36	Local Road: 350 East (Existing to 1150 South)	Low	$80,400	16-25 year
37	Local Road: 1150 South (Existing to 350 East)	Low	$241,300	16-25 year
38	Local Road: 1825 South (Existing to 500 East)	Low	$536,086	16-25 year



Legend

Signals
- Existing
- Proposed

Future Network

Roadway Classification
- New Ballard Collector
- New City Arterial
- City Arterial
- New City Collector
- City Collector
- New County Arterial
- County Arterial
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- AnnexationBoundary

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Inner City Transportation Projects

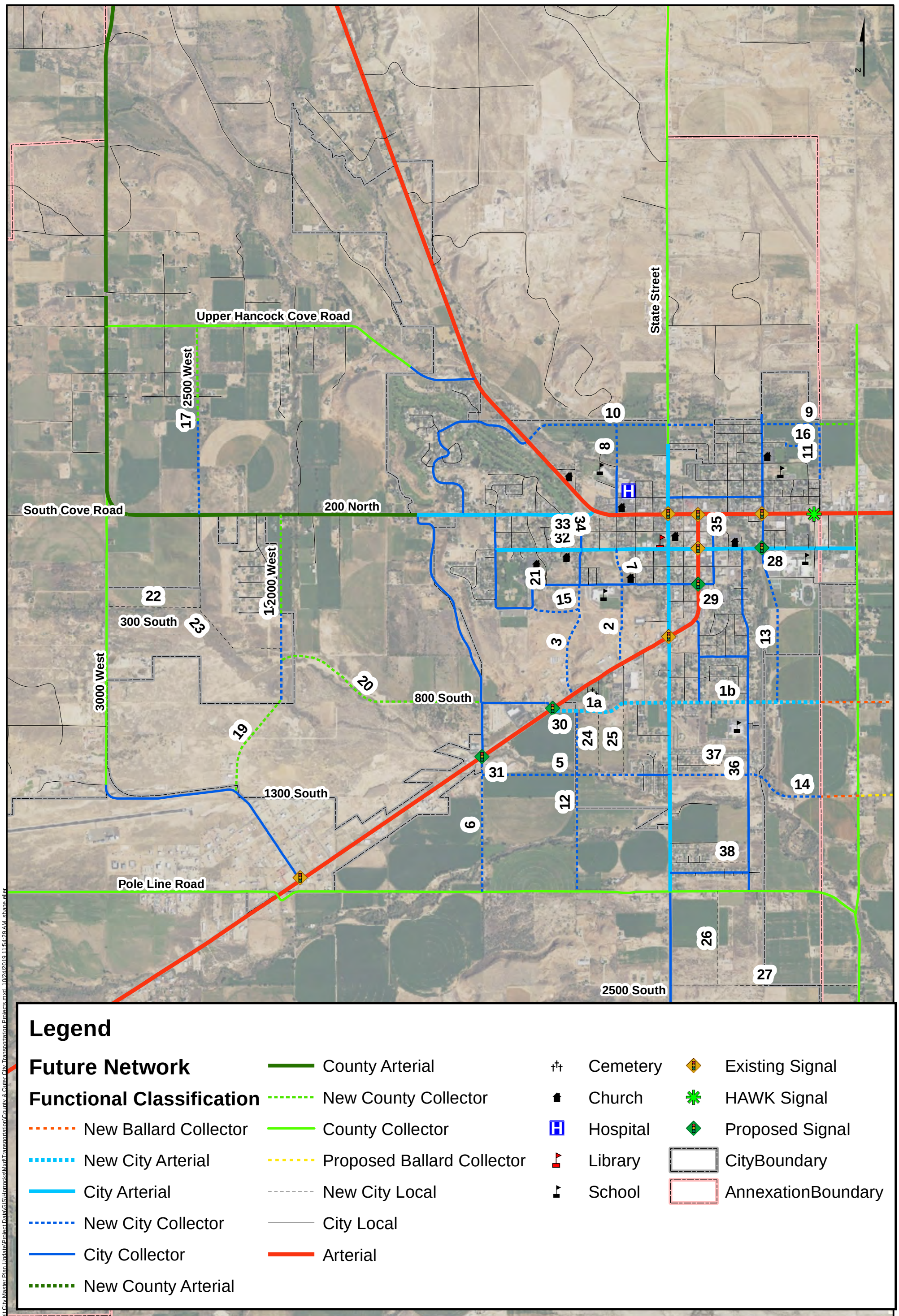
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Figure 4-12

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Legend

Future Network

Functional Classification

- New Ballard Collector
- New City Arterial
- City Arterial
- New City Collector
- City Collector
- New County Arterial
- County Arterial
- New County Collector
- County Collector
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- Library
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- HAWK Signal
- Proposed Signal
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- AnnexationBoundary

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County & Outer City Transportation Projects

Roosevelt City Transportation Master Plan

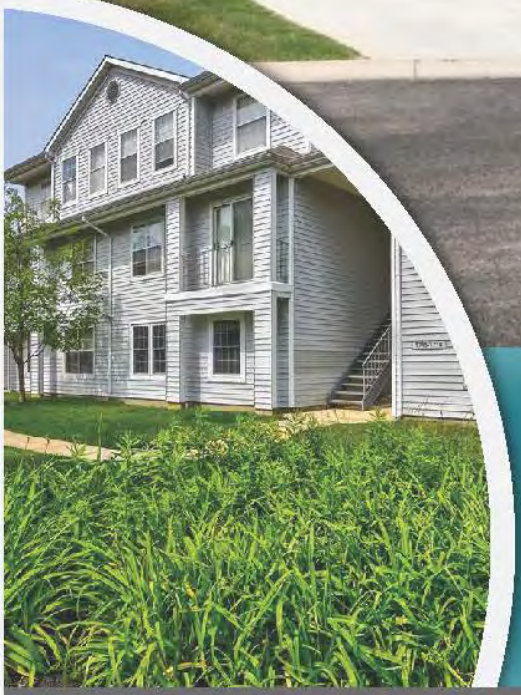
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Figure 4-13

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Moderate Income Housing
Chapter 5



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Chapter 5

5.1 Introduction

Roosevelt City ("the City") is a rural community in northeastern Utah. The demand for housing within the City has largely been affected by the energy and mining industries in the past following a "boom and bust" cycle. These cycles pose a unique planning challenge as they are difficult to predict and hard to avoid.

Facilitating proper housing development that is safe, efficient, and diverse in type and affordability can improve the economic performance in the City, promote a feeling of community, and enhance the quality of life. A community should offer a variety of housing types in order to support a population of diverse ages and cultures. A variety of housing options is also important to ensure that the needs of all stages of the lifecycle are met, including entry-level home buyers, larger households, aging populations and special needs populations. Demographic characteristics such as household size, number of children, and age play a key role in determining the type of housing desired.

This housing chapter is organized to first evaluate existing conditions in the current housing supply. Existing and future needs are then presented and matched with supply and demographics in order to best determine the greatest needs and priorities for Roosevelt.

5.2 Summary of Findings

The most popular type of housing unit in Roosevelt is single-family homes with over 70 percent of units falling in that category. At the projected rate of growth if 1.88 percent, the City can expect the addition of 1,477 more households by 2045 at the average rate of 52.1 households per year.

Overall, homes are generally very affordable – over half of the units in the City are affordable to moderate- and low-income households. However, there are limited housing units suitable for some of the residents in the higher income levels. A unique challenge for the City in predicting future housing demand is the effect oil prices can have on the demand for housing. Past trends have shown that when oil prices increase so do application for building permits, and when prices fall so do the application numbers. This trend will likely continue in the future.

5.3 Current Housing Supply

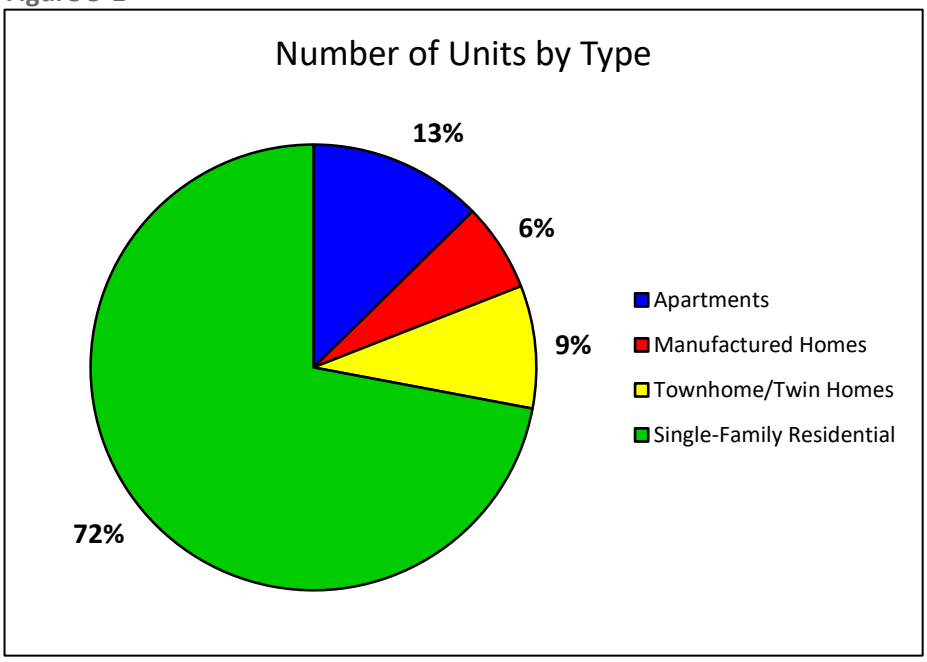
The majority of housing units in Roosevelt are owner-occupied, single-family homes. The City currently has 1,920 residential parcels listed with the Duchesne Assessor's Office, with about 2,214 total housing units, the difference being in the City's apartment complexes and managed apartment properties. About 72 percent of units are categorized as single-family residences (SFRs). The median value for SFRs is $161,356 according to the County's assessed market values.

Table 5-1: Number of Parcels and Units by Housing Type

Summary	Number of Parcels	Number of Units
Apartments	25	280
Manufactured Homes	142	142
Single-Family Residential	1,595	1,595
Townhomes/Twin Homes	158	197
TOTAL	1,920	2,214

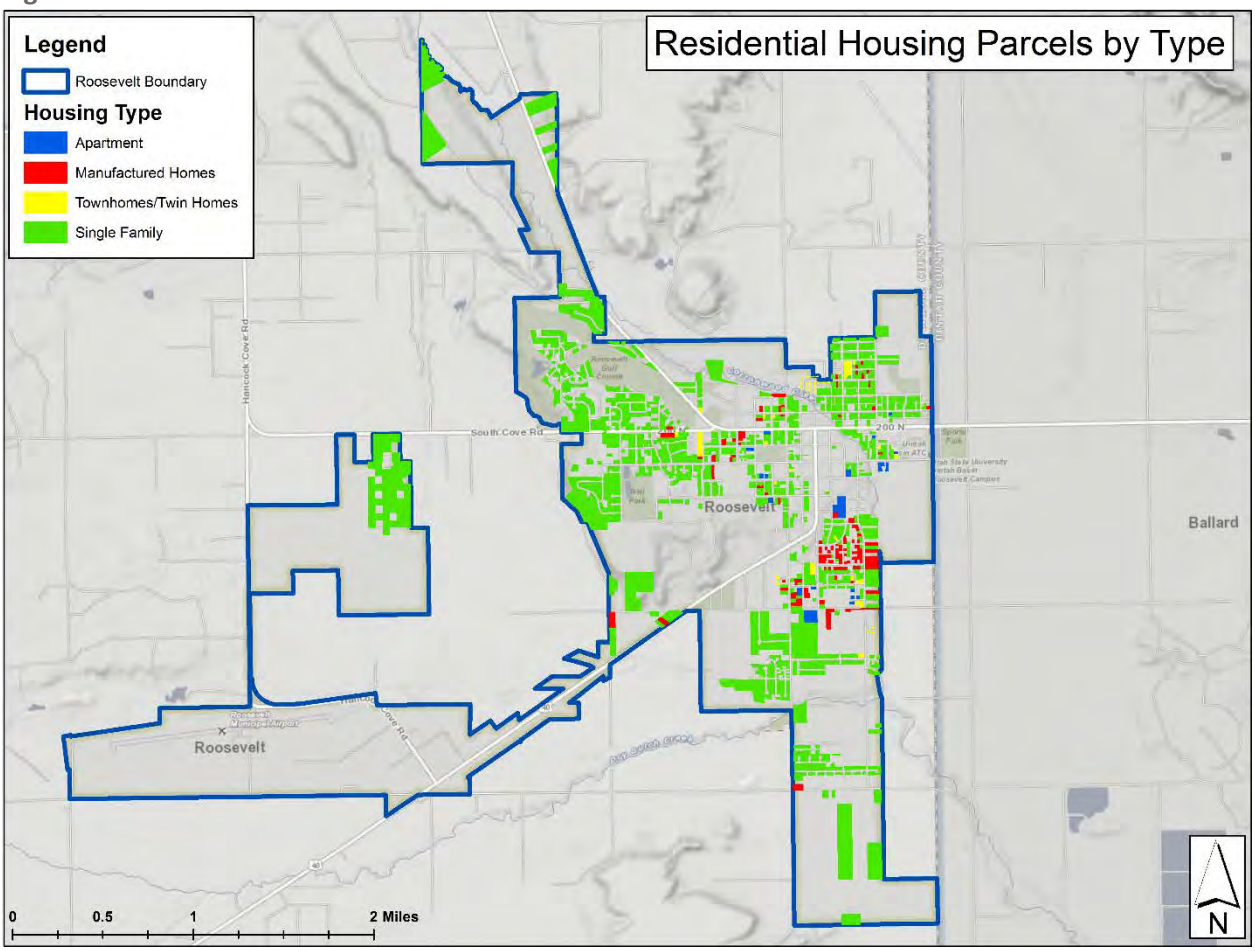
Source: Duchesne County Parcel Database

Figure 5-1



Source: Duchesne County Assessor's Database

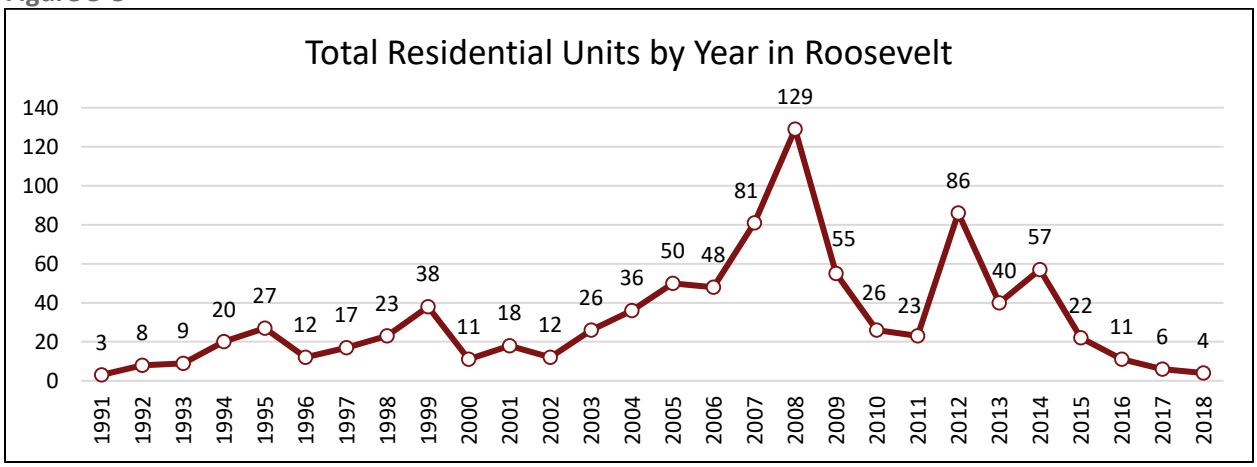
Figure 5-2



Source: Duchesne County Assessor's Database

The construction of new residential units, according to the Duchesne County Assessor's Database, has seen peaks and valleys in the past twenty years. The City followed the national trend through the 2008 financial crisis with housing falling off greatly in 2009. New housing numbers saw an increase in 2012 which fell in 2013 and rebounded in 2014. Since then, the City has seen four consecutive years of decreasing new residential units. Figure 5-3 shows the database's records of reported building permits since 1991.

Figure 5-3



Source: Duchesne County Assessor's Database

The 2017 American Community Survey (ACS) 5- Year Estimates produced by the U.S. Census Bureau estimates a 65.7 percent ownership rate for the City. While Roosevelt is higher than some, and lower than other surrounding cities, the City rate is lower than the rest of the County, which has 74.3 percent ownership of housing units.

Table 5-2: Proportion of Homes that are Owner-Occupied

	Altamont	Ballard	Duchesne	Myton	Naples	Vernal	Roosevelt	Duchesne County
% of units owner-occupied	79.2	85.5	60.4	59.2	84.6	59.3	65.7	74.3

Source: Source: ACS 2017 5-Year Estimate

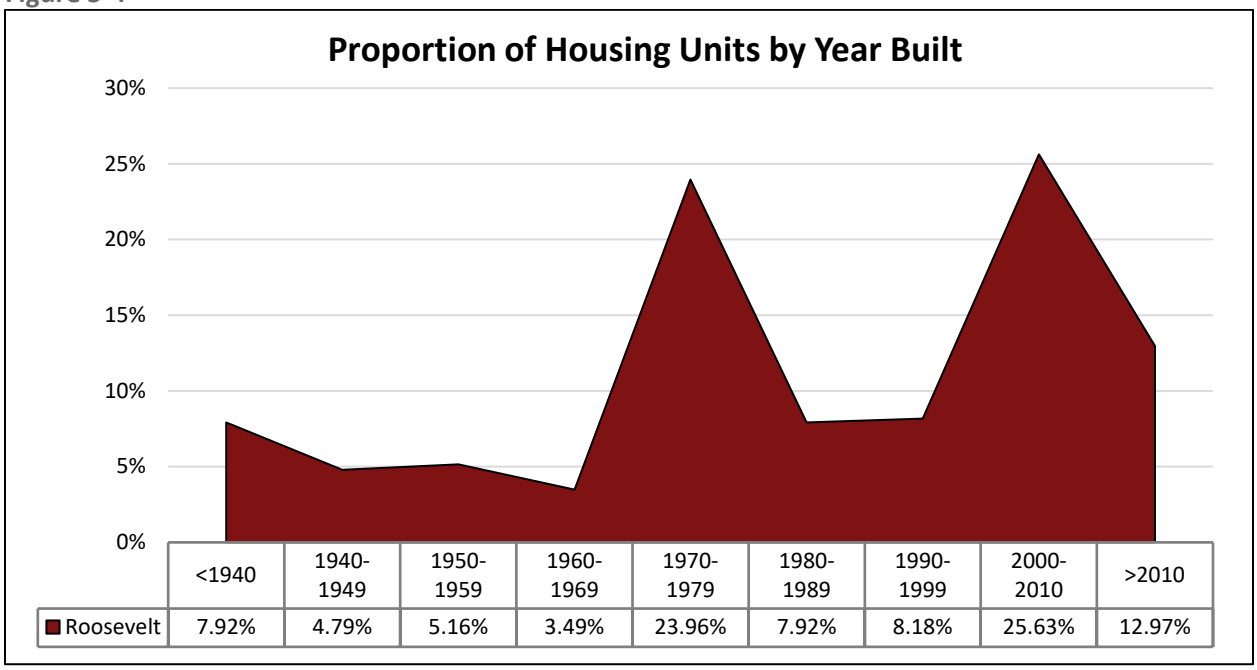
Roosevelt has three apartment complexes within the City – Cottonwood Apartments with 54 units, Stoneridge Apartments with 48 units, and the 600 E Lagoon Street complex with 24 units. Rents at these complexes range from $550 to $800 and are discussed in detail in the Housing Affordability section. There are also rental units available through private renters and property management companies who own housing units and rent them individually. The 2017 ACS estimates that all rental rates, including apartment complexes and all other rental dwellings in the City, are in the $500 to $999 range with a median rate of $837 a month.

5.3.1 Housing Conditions

The economic environment of Roosevelt is greatly influenced by the energy industry. This trend is evident in the number of homes in Roosevelt and the year they were built. The Duchesne County Assessor's data shows that nearly half of the homes in Roosevelt were built during the 1970s or the 2000s, both decades when oil prices were increasing at an unusually high rate. The data also shows that

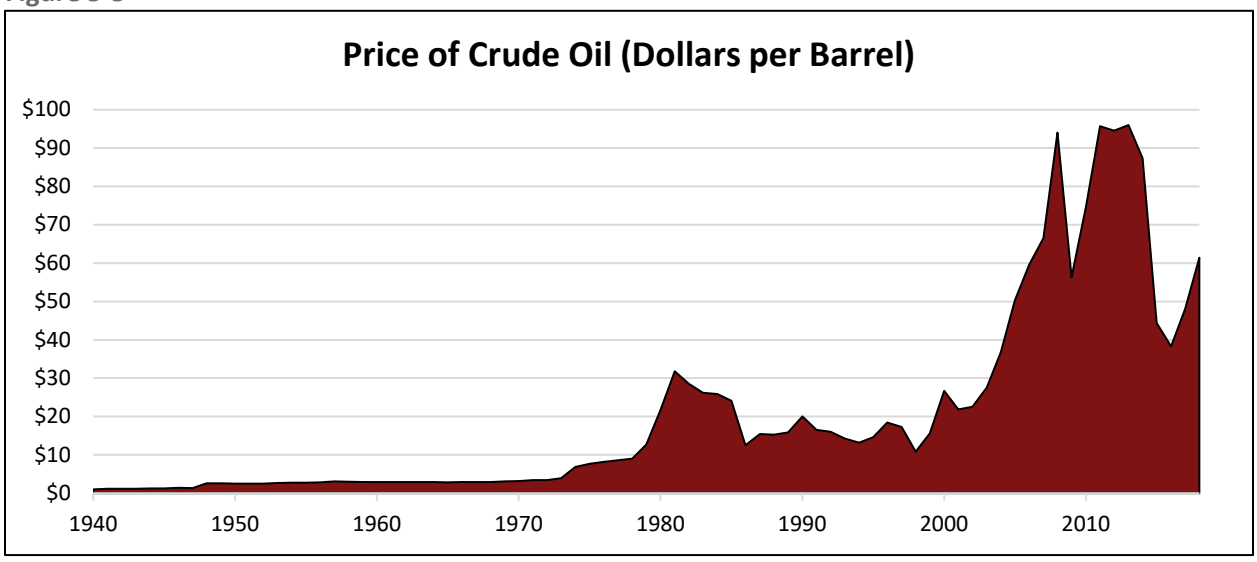
78.66 percent of housing in Roosevelt has been built since 1970 and 38.6 percent of homes have been constructed since 2000.

Figure 5-4



Source: Duchesne County Assessor's Database

Figure 5-5



Source: U.S. Energy Information Administration (Not adjusted for inflation)

5.4 Housing Affordability

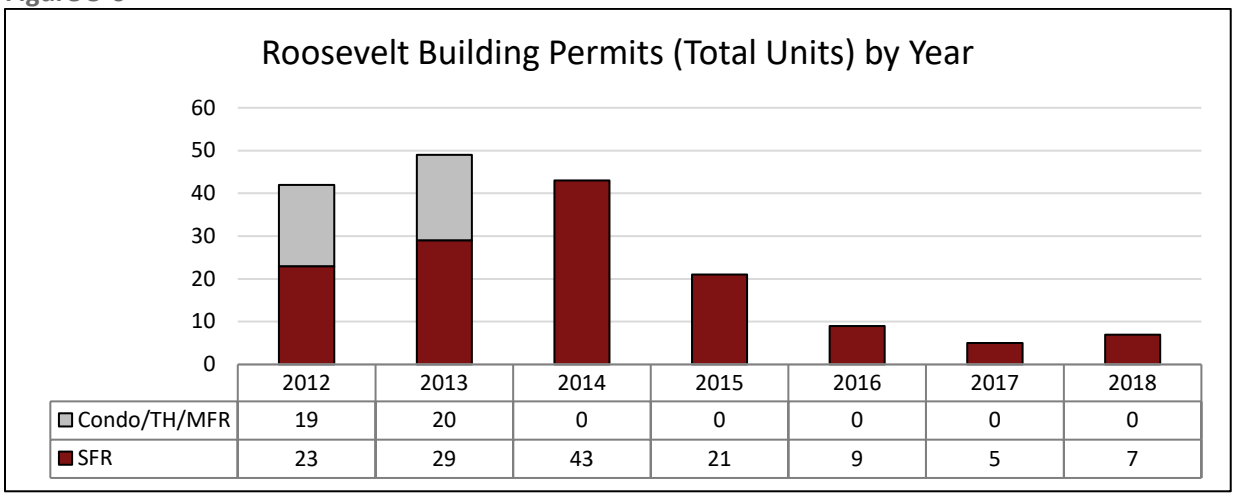
5.4.1 Projections

Population projections expect the City's population to be 11,339 by 2045. Dividing that population by the current household size of 3.08, about 3,681 households are projected to be in the City by 2045. This is a growth of 1,477 households from the 2,204 households listed in 2018.

5.4.2 Housing Permits

The graph below shows that the building of residential homes has been trending downward since 2013. This is a trend shared throughout the region as other energy-industry dependent cities and counties experience an economic slowdown that comes with lower oil prices. The figure below shows that applications for building permits have decreased substantially since 2013. The City has received about the same number of applications for new residences in the last 4 years as it received in 2014 alone.

Figure 5-6



	2012	2013	2014	2015	2016	2017	2018
Condo/TH/MFR	19	20	0	0	0	0	0
SFR	23	29	43	21	9	5	7

Source: Roosevelt City, Building and Zoning

Interviews with the City indicate the slowdown in issued building permits may continue into the future as oil companies have moved towards increasing overtime hours for current employees instead of hiring new employees as demand increases. This is one indicator that may point to a prolonged decrease in new construction of housing units and is consistent with the projections provided by the Governor's Office of Management and Budget

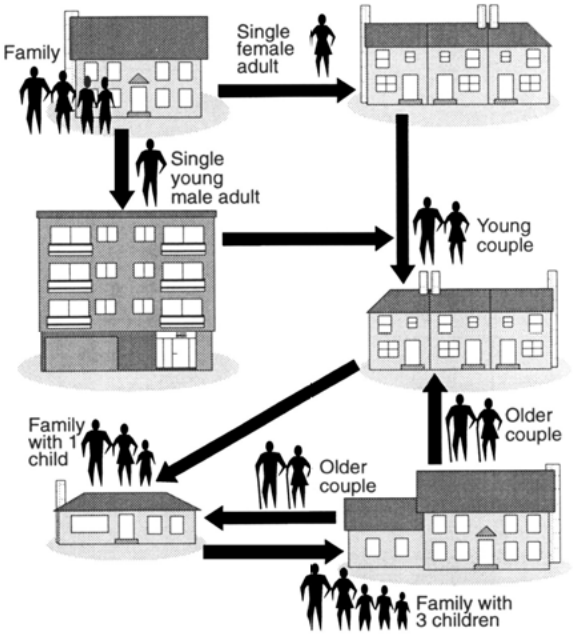
5.4.3 Lifecycle Housing

There are significant age gaps in the City, with less people in their early twenties and very few above 65 years old, suggesting that the current housing supply may not be adequately meeting full life-cycle housing demands. It is important to ensure housing suitable for different stages of life, such as units for singles, townhomes for retirees, as well as opportunities for senior citizen housing and long-term

care/assisted living facilities. Such an approach creates opportunities for people to live and grow in the same community. It also enables young couples, families and the elderly to live near relatives.

2017 ACS data shows that 7.7 percent of all households are age 65 and older. This is significantly lower than the state average of 10.3 percent. There are currently two Senior Living facilities within the City with a total of 79 beds. These facilities report that 11 beds are vacant, and applicants have applied to fill the vacancies. A recent survey showed that 66 percent of respondents felt that there is not enough senior housing and 61 percent felt there was not enough assisted living in the Roosevelt area. A deficit of townhomes, senior housing, and assisted living may encourage residents to leave the community as they age.

Figure 5-7: Life-Cycle Housing



Source: Salt Lake County Cooperative Plan

The ACS data indicates that a large portion of the City's population consists of young families. The largest age group in Roosevelt is adults aged 25 to 34 years old, who make up 18.8 percent of the City's population and are generally well educated, along with being entrepreneurial and active in the community. Not surprisingly then, 23 percent of the the City's population is composed of children aged 9 and younger. The abundance of low-cost housing within the City is important in providing starter homes for these young families.

The City's 20 to 35 year-old population is a very large generation that will be important for the City to keep in mind for future planning, even if college-aged adults are currently a small segment of the population. This group sees socially-conscious shopping and living as highly desirable. Since this demographic is generally thrifty, development with modern aesthetics at a discounted price will be a draw.

5.4.4 Housing Affordability Background

Utah State Code (Section 10-9a-403) requires municipalities to include a plan for moderate-income housing as part of a general plan. It outlines a responsibility of a City to facilitate a "reasonable opportunity" for those households with moderate-income to live within the City. Moderate-income housing is defined by the U.S. Department of Housing and Urban Development (HUD) as "housing occupied or reserved for occupancy by households with a gross household income equal to or less than 80 percent of the median gross income for households of the same size in the county in which the City is located." This study uses the Area Median Income (AMI) in Duchesne County as determined by HUD and average household size to determine moderate income thresholds for an average household.

5.4.5 Area Median Income Levels

According to HUD, the AMI for 2018 in Duchesne County is $64,125 based on a three-person household. Duchesne County has an average household size of 2.99; therefore, a household of 3 persons is used as the average size. This puts the moderate-income threshold at $51,300, which is 80 percent of Duchesne County 2018 AMI.

Table 5-3: Area Median Income Thresholds by Household Size

Household Size	30% AMI	50% AMI	80% AMI
1 person	$14,950	$24,950	$39,900
2 persons	$17,100	$28,500	$45,600
3 persons	$20,780	$32,050	**$51,300**
4 persons	$25,100	$35,600	$56,950
5 persons	$29,420	$38,450	$61,550
6 persons	$33,740	$41,300	$66,100
7 persons	$38,060	$44,150	$70,650
8 persons	$42,380	$47,000	$75,200

Source: HUD

HUD considers an affordable monthly housing payment for either a mortgage or rent to be no greater than 30 percent of gross monthly income. This 30 percent should include utilities and other housing costs such as mortgage and hazard insurance.

Table 5-4 below shows affordable monthly allowances at different levels of income given in Table 5-3 above. These amounts represent total housing costs affordable at 30 percent of gross income. Utah Code does not stipulate whether those of moderate income must be able to purchase a home, so the allowance considers affordability for either a mortgage or rental rate. A family choosing housing would need to factor utilities and other fees for a given housing unit within this affordable range. For example, a household of 3 at the 80 percent AMI threshold has a monthly housing allowance of $1,283. If utilities are $250,[1] the family can afford a rent or mortgage payment of $1,033 per month, including taxes and interest if applicable.

Table 5-4: Monthly Housing Allowance by Household Size and AMI Thresholds

Household Size	30% AMI	50% AMI	80% AMI
1 person	$374	$624	$998
2 persons	$428	$713	$1,140
3 persons	$520	$801	**$1,283**
4 persons	$628	$890	$1,424
5 persons	$736	$961	$1,539
6 persons	$844	$1,033	$1,653
7 persons	$952	$1,104	$1,766
8 persons	$1,060	$1,175	$1,880

Source: HUD, ZPFI

[1] Utilities include water, sewer, storm drain, gas, electric, and garbage. This is an estimated amount for a typical residence.

Translating this moderate-income affordability level to home values, a family of 3 at 80 percent of AMI can afford a home in Roosevelt at a cost up to $178,439. This assumes utility payments at $250 per month, current City property tax rates, insurance, a 5 percent interest rate, 30-year mortgage term and a 10 percent down payment. Table 5-5 shows the home price ranges affordable to household income categories at various interest rates.

Table 5-5: Affordable Home Price Ranges by Income Category and Mortgage Interest Rate

Household Income Range	Home Price Range					
	4% Mortgage		5% Mortgage		6% Mortgage	
	Low	High	Low	High	Low	High
$10,000 to $14,999	$0	$23,705	$0	$21,598	$0	$19,728
$15,000 to $24,999	$23,705	$71,125	$21,598	$64,804	$19,728	$59,193
$25,000 to $34,999	$71,125	$118,546	$64,804	$108,010	$59,193	$98,658
$35,000 to $49,999	$118,546	$189,676	$108,010	$172,818	$98,658	$157,855
$50,000 to $74,999	$189,676	$308,226	$172,818	$280,832	$157,855	$256,518
$75,000 to $99,999	$308,226	$426,776	$280,832	$388,846	$256,518	$355,180
$100,000 to $149,999	$426,776	$663,877	$388,846	$604,873	$355,180	$552,504
$150,000 to $199,999	$663,877	$900,978	$604,873	$820,901	$552,504	$749,828
$200,000 or more	$900,978		$820,901		$749,828	

Source: ZPFI

Table 5-6 shows the ranges specific to targeted low- and moderate-income households. Note the significant difference the interest rate can make. While current rates are currently under five percent, making housing much more affordable, affordability in the City will be more difficult to maintain if interest rates continue to rise in the future.

Table 5-6: Affordable Price Ranges by Targeted Group and Interest Rate

Household Income Range			Home Price Range					
			4% Mortgage		5% Mortgage		6% Mortgage	
	Income Range - Low	Income Range - High	Low	High	Low	High	Low	High
< 30% of AMI	$0	$20,780	$0	$51,119	$0	$46,576	$0	$42,543
30% to 50% of AMI	$20,780	$32,050	$51,119	$104,561	$46,576	$95,268	$42,543	$87,020
50% to 80% of AMI	$32,050	$51,300	$104,561	$195,845	$95,268	$178,439	$87,020	$162,990

Source: ZPFI

5.4.6 Pricing and Affordability

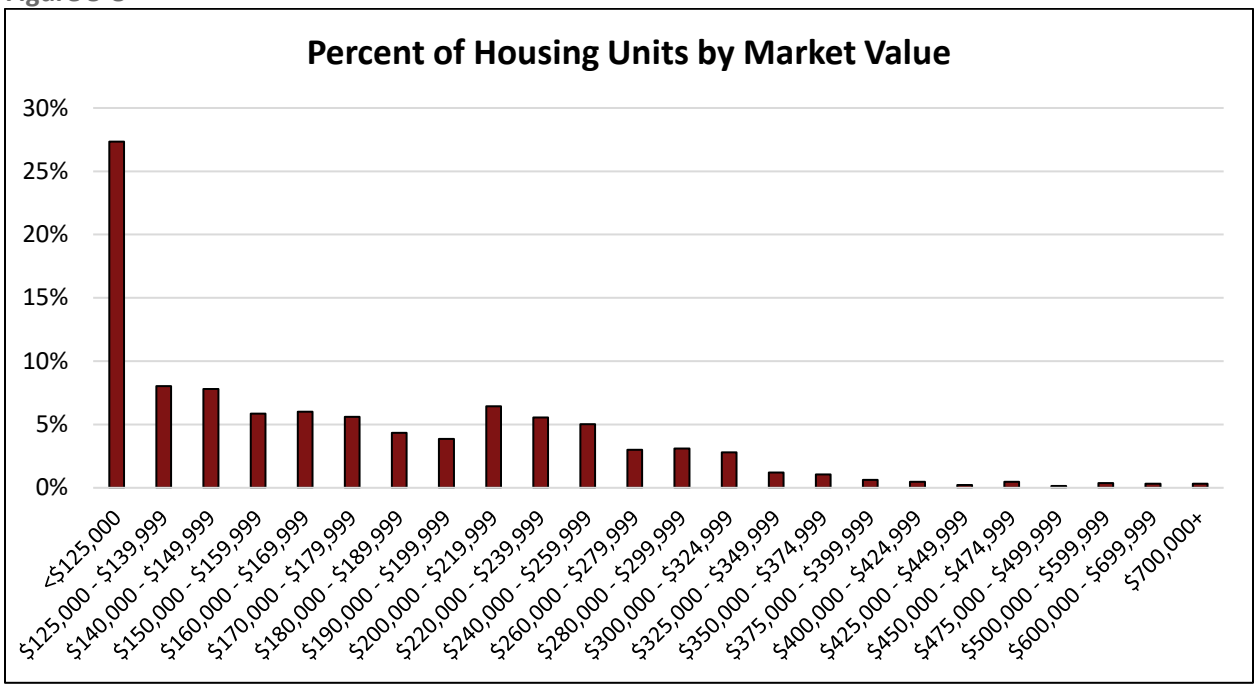
Table 5-7 below shows the distribution of non-rental units by home value, as assessed and maintained by the Duchesne County Assessor's Office. The median value of these assessed values is $161,356, which is below the affordable threshold of $178,439, assuming a 5 percent mortgage rate. Approximately 59.9 percent (1,134 units) are within the affordability target or below.

Table 5-7: Non-Rental Residential Unit Values

Home Value	# of Units	% of Total	Cumulative % Total
<$125,000	518	27.35%	27.35%
$125,000 - $139,999	152	8.03%	35.37%
$140,000 - $149,999	148	7.81%	43.19%
$150,000 - $159,999	111	5.86%	49.05%
$160,000 - $169,999	114	6.02%	55.07%
$170,000 - $179,999	106	5.60%	60.67%
$180,000 - $189,999	82	4.33%	64.99%
$190,000 - $199,999	73	3.85%	68.85%
$200,000 - $219,999	122	6.44%	75.29%
$220,000 - $239,999	105	5.54%	80.83%
$240,000 - $259,999	95	5.02%	85.85%
$260,000 - $279,999	57	3.01%	88.86%
$280,000 - $299,999	59	3.12%	91.97%
$300,000 - $324,999	53	2.80%	94.77%
$325,000 - $349,999	23	1.21%	95.99%
$350,000 - $374,999	20	1.06%	97.04%
$375,000 - $399,999	12	0.63%	97.68%
$400,000 - $424,999	9	0.48%	98.15%
$425,000 - $449,999	4	0.21%	98.36%
$450,000 - $474,999	9	0.48%	98.84%
$475,000 - $499,999	3	0.16%	99.00%
$500,000 - $599,999	7	0.37%	99.37%
$600,000 - $699,999	6	0.32%	99.68%
$700,000+	6	0.32%	100.00%

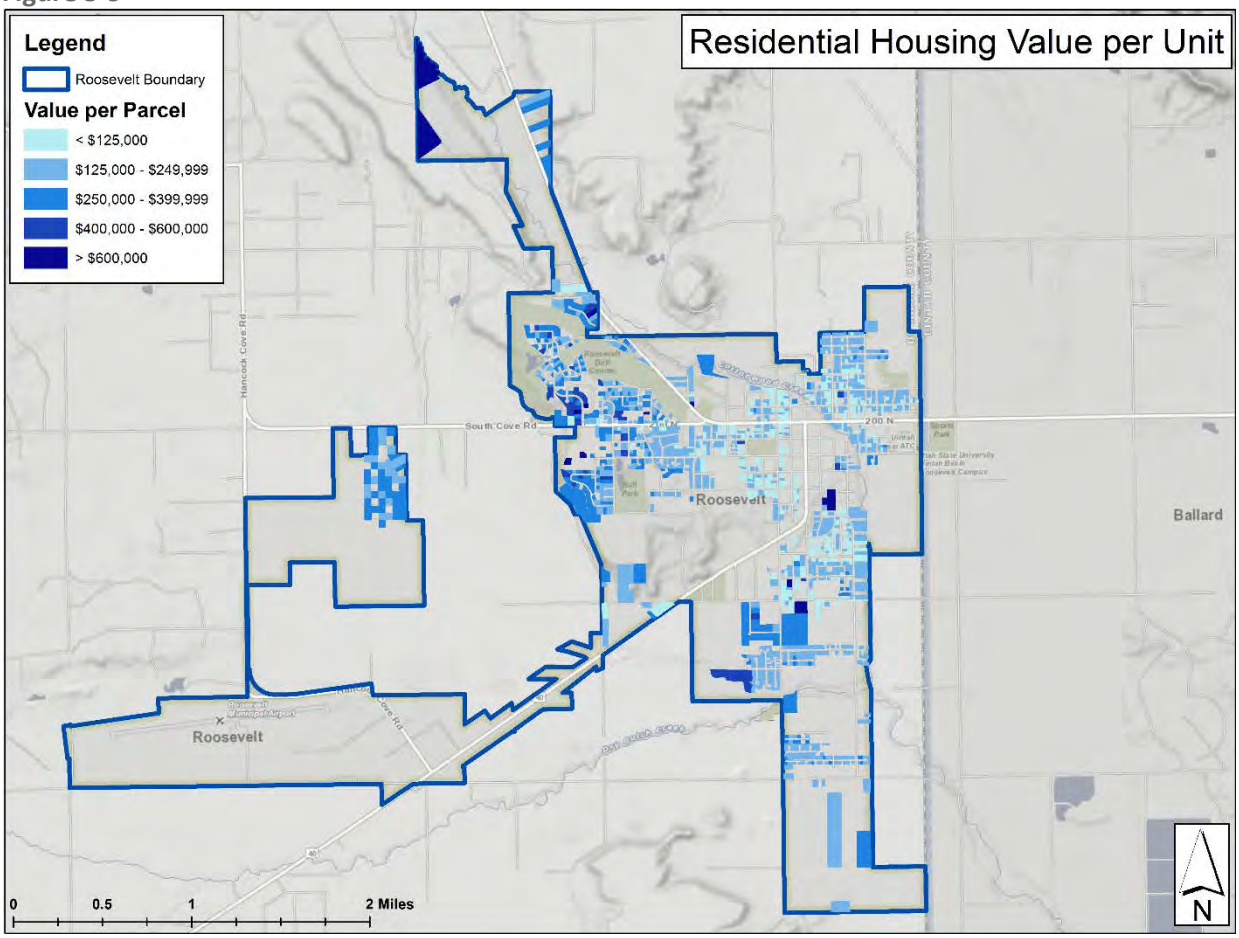
Source: Duchesne County Parcel Database

Figure 5-8



Source: Duchesne County Parcel Database

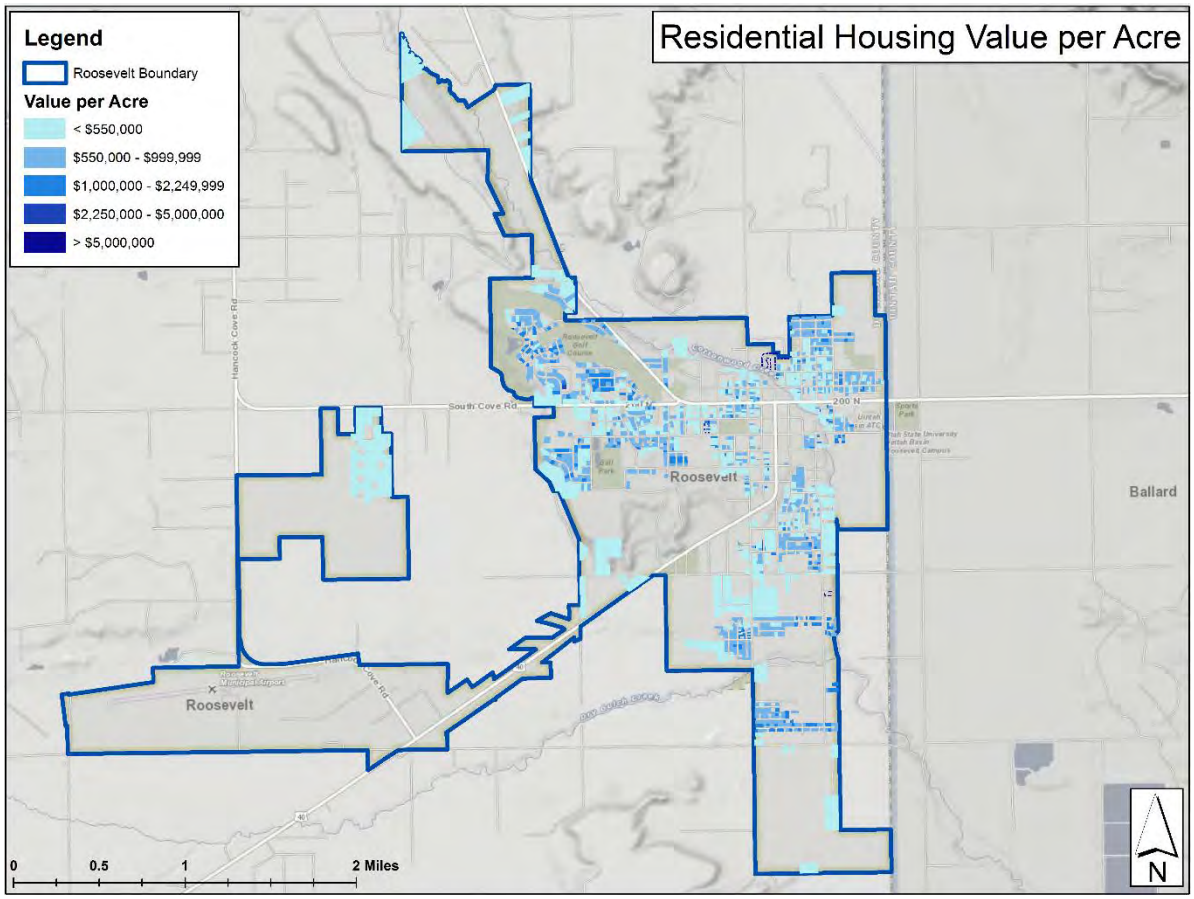
Figure 5-9



Source: Duchesne County Parcel Database

Generally larger parcels are more expensive housing units, partially due to increased land cost, but also often due to the type of larger homes generally associated with a larger lot.

Figure 5-10



Source: Duchesne County Parcel Database

While these properties are valuable and provide high property tax revenue per parcel, value is more densely concentrated on smaller lots. Higher property tax revenues per acre are generally seen in denser housing.

Assuming about $250 per month in utility and other housing costs, rent rates should be $1,033 or lower to be affordable. The City has three apartment complexes: Cottonwood Apartments, Stoneridge Apartments, and the 600 E. Lagoon St. Apartment Complex.

The Cottonwood Apartments offers rental rates ranging from $550 to $600. Management indicated that this complex is enrolled in a tax credit program which imposes a cap on rent. Even if the rent was taken to the maximum amount of $1,000, all units would still fall under the affordability threshold.

Table 5-8: Cottonwood Apartments and Rental Rates

Unit Type	Number of Units	Rental Rate
2 bed/1.5 baths	27	$550
3 bed/ 1.5 baths	27	$600

Unit Type	Number of Units	Rental Rate
Total Complex	54	$550 - $600

The Stoneridge Apartments offers 48 units with rental rates that are calculated based on the renter's income. The apartment's rental rate is calculated on a per-tenant basis and determines rent to be at 30 percent of the renter's current income. This process makes calculating specific rents by unit type impossible as rents can vary widely based on each individual renter's income. However, it can be assumed that all units would be considered affordable with this type of rent calculation.

Table 5-9: Stoneridge Apartments and Rental Rates

Unit Type	Number of Units	Rental Rate*
1 bed/ 1 bath	8	NA
2 bed/1 bath	32	NA
3 bed/ 1 bath	8	NA
Total Complex	48	NA

*Rental rates are calculated as being 30% of renter's income and are calculated on a per-renter basis

The apartment complex located near 600 E and Lagoon Street offers both low-income and market units. There is a total of 24 units with rental rates which range from $600 to $800, all of which are considered affordable.

Table 5-10: 600 E Lagoon Street Apartments and Rental Rates

Unit Type	Low-Income Units		Market Units	
	Number of Units	Rental Rate	Number of Units	Rental Rates
2 bed/1 baths	4	$600	16	$700
3 bed/ 1 baths	0	NA	4	$800
Total Complex	4	$600	20	$700 - $800

Many of the City's apartments are managed by property management companies and are not included in a large apartment complex. The table below groups these apartments together based on their rental rates to provide insight on the cost of rental units in Roosevelt. Of these apartments, 128 units fall under the affordability threshold for rent.

Table 5-11: Other Roosevelt Apartments

Rental Rate	Number of Units
$500 - $599	14
$600 - $699	25
$700 - $799	33
$800 - $899	34
$900 - $999	12
$1,000 - $1,099*	18
$1,100 - $1,199	3
$1,200 - $1,299	7

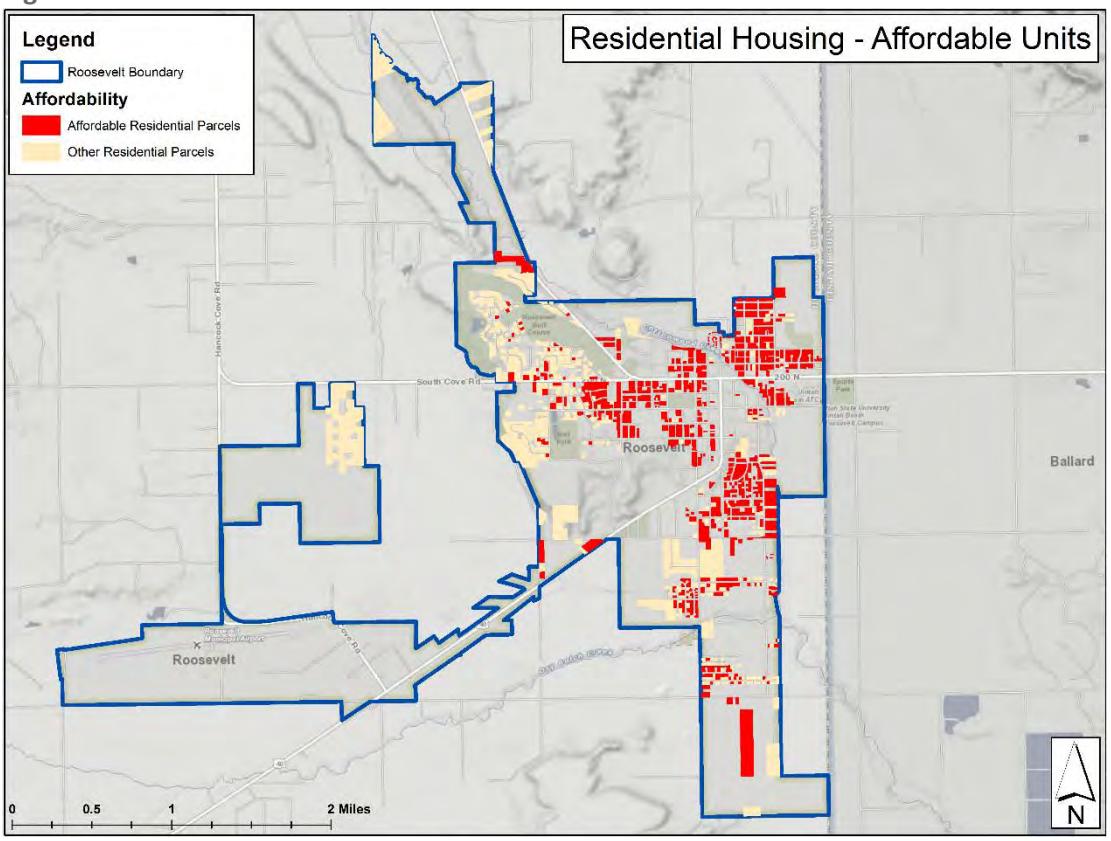
Rental Rate	Number of Units
$1,600 - $1,699	8
Total Units	154

*10 units in this range are under the $1,033 affordability threshold

There are rental units available through private renters who own housing units individually. The 2017 ACS estimates the bulk of all rental rates in the City are in the $500 to $999 range with a median dollar amount of $837. This means the majority of rental units are within affordable ranges. Affordable rental units are important options for households that do not have down payment savings, would have trouble with loan approval, or simply for those not wishing to make a large commitment on purchasing a home. These households are often those with the highest need for affordable housing.

Overall, there is a very reasonable opportunity for moderate-income households to live in the City. Combining affordable apartment and single-family units brings the total estimated number of units that can be classified as affordable at 1,388. This shows that 62.7 percent of housing units are affordable.

Figure 5-11



Source: Duchesne County Parcel Database

5.4.7 Matching Market with Demographics

Outside of moderate-income affordability, it is notable how current housing availability matches income levels of Roosevelt residents. This analysis again assumes a 5 percent mortgage rate, 10 percent down payment, 30 percent of gross income, $250 in utilities per month and other factors like taxes and insurance. Table 5-12 shows by home price ranges the income level that matches a given price range, the percentage of single-family homes in that price range, and the percentage of residents that fall into that income category. The table further suggests that there may be demand for more expensive housing, given current income levels in the City and the relative lack of supply for households making more than $75,000 per year.

Table 5-12: Household Income and Home Price Distribution

Household Income Range	% of HH in Income Range	Affordable Home Price Range*	Affordable SFR
$10,000 to $14,999	4.20%	$0 to $21,598	0.00%
$15,000 to $24,999	8.20%	$21,598 to $64,804	5.33%
$25,000 to $34,999	9.00%	$64,804 to $108,010	11.99%
$35,000 to $49,999	12.50%	$108,010 to $172,818	39.49%
$50,000 to $74,999	24.80%	$172,818 to $280,832	32.15%
$75,000 to $99,999	13.70%	$280,832 to $388,846	8.45%
$100,000 to $149,999	15.80%	$388,846 to $604,873	2.01%
$150,000 to $199,999	3.80%	$604,873 to $820,901	0.32%
$200,000 or more	2.40%	> $820,901	0.26%

*Assumes 5 percent mortgage rate.
Source: ACS 2017 5-Year Estimate, ZPFI, Duchesne County Parcel Database

Resident income levels indicate some room for growth in housing priced above $300,000; however, the economic cycles related to the energy industry in Duchesne County may cause some hesitation with this type of investment.

5.5 Conclusion

While the current housing supply has a large amount of affordable housing, there may be a disproportionate supply of low-cost housing. Careful planning will be needed to ensure that there is a supply of homes more fitting of individuals and families with higher incomes. The availability of quality housing is an important factor in bringing new businesses and employers to the City and in aiding economic development and growth.

Single-family home production has almost ceased in recent years, with fewer homes being built in the last 4 years than were built in 2014 alone. New housing may remain stagnant until there is more diversification in the workforce demand and a deviation from dependence on the energy industry.

5.6 Goals and Strategies

Overall, housing in Roosevelt is affordable and accessible. At the present time, there is not significant demand for additional housing. Therefore, the City may do well to primarily concentrate on improving existing housing stock. In this regard, the City can take many steps to promote safe, healthy, and attractive housing in a range of types, styles, and price levels.

5.6.1 Life-Cycle Housing

Goal: Ensure housing is meeting life-cycle housing needs for all age groups including senior and starter housing.

Strategy: Encourage development of townhomes/assisted living facilities/retirement communities for residents over 65-years-old. This will allow residents to stay in Roosevelt through all stages of life.

5.6.2 Housing Product Diversity

Goal: Promote the development of diverse housing types, as needed, so that new businesses and employers will be attracted to the City. This may include higher-end homes as well as starter homes.

Strategy: Work closely with developers to streamline permitting processes and ensure that the City is charging reasonable fees which would not deter future development.

Strategy: Strive to maintain the integrity of neighborhoods in traffic planning, zoning, open space, recreational areas and infrastructure design.

5.6.3 Neighborhoods

Goal: Maintain and develop appealing neighborhoods and prepare for future residential growth

Strategy: Schools, churches, libraries, fire stations, and other public buildings and structures, located in residential areas, should provide attractive and well- maintained landscaping.

Strategy: Industrial and other non-compatible activities should not be permitted or allowed to expand or encroach upon residential neighborhoods.

Strategy: Ensure proper zoning is in place to allow for growth

Strategy: New residential areas should be grouped into neighborhoods and planned in relation to schools, playgrounds, parks, and other facilities.





Recreation Master Plan
Chapter 6

HORROCKS ENGINEERS



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Chapter 6

Executive Summary

This Recreation Master Plan addresses deficiencies in the existing parks, trails and recreation system and proposes additional improvements to meet future growth, demands, and trends. Improvements to the existing system include but are not limited to improving irrigation systems, providing shade over playgrounds and at the pool, and providing pavilions and other site furnishings.

Proposed improvements and additions to the system to meet future growth and trends include but are not limited to a splash pad, new sports fields, additional trails, lighting, new parks, pickleball courts, a dog park (*see Figure 6-9 – Parks and Recreation Master Plan map*).

Listed in Section 6.4 are the capital improvements needed to address the identified deficiencies and futures needs. These costs are separated out between park and recreation projects and trail projects. Funding for all of these projects has not been established. Below is a summary of expected costs and associated improvement periods.

Parks and Recreation

1-5 year improvements	High	$8,292,500
6-10 year improvements	Medium	$9,622,500
10+ year improvements	Low	$14,080,000
Total Identified Improvements =		**$31,995,000**

Trails

1-5 year improvements	High	$2,170,000
6-10 year improvements	Medium	$1,948,560
10+ year improvements	Low	$9,477,936
Total Identified Improvements =		**$13,596,496**

6.1 Introduction

Parks, open spaces and trails are at the heart of a community. They are where people gather, recreate, and socialize. Roosevelt City recognizes the importance of their parks and recreation system, is invested in maintaining the amenities they have, and is dedicated in planning for future success. This Recreation Master Plan analyzes Roosevelt's current parks and recreation system, considers requested improvements and additions, and makes final recommendations for improvements to the existing system and for proposed projects to accommodate the future growth and development of the City.

6.2 Existing Conditions, Needs Assessment, & Level of Service Analysis

There are currently four developed parks within the Roosevelt City park system. These parks include a diversity of facilities and amenities ranging from the Aquatics Center at Central Park to the stage at Old Mill Park. In total, the City has approximately 217.27 acres of developed parks including the cemetery and the golf course and 53.27 acres of developed parks not including the cemetery and the golf course (see Table 6-1 – Existing Parks Inventory, and Figure 6-3 – Existing Parks and Trails System).

Table 6-1: Existing Parks Inventory

Name	Type	Size (developed)
Centennial Park	Neighborhood Park	3.85 ac
Central Park	Community Park	7.83 ac
Constitution Park	Community Park	41 ac
Old Mill Park	Pocket Park	0.59 ac
	Total Developed Acreage =	53.27 ac
Other Facilities:		
Roosevelt Memorial Park	Cemetery	14 ac
Roosevelt Municipal Golf Course	Golf Course	150 ac

6.2.1 Definitions

Community Park

Community Parks are generally ten (1) acres in size and larger and may include ball fields, sports courts, pavilions, formal and semi-formal landscaping, lighting for sports fields and along pedestrian paths, and other community-wide recreational amenities. These parks are developed based on the overall community recreation needs and funding opportunities. These parks often become central gathering spaces for the community where festivals, markets, outdoor entertainment, and sport tournaments are conducted. Community Parks are defined to have a 1 mile service radius of influence due to the more community-wide and regional amenities contained within them.

Level of Service

The level of service of a parks system generally presented as a ratio representing the amount of park acreage provided per 1,000 residents.

Neighborhood Park

Neighborhood Parks are generally a minimum of 2 acres and less than 10 acres in size and located to provide easy and convenient access from surrounding development. Typical amenities may include playground equipment, sports courts, site furnishings, pavilion(s), walking paths, and landscaping. Neighborhood Parks are defined to have a 1/2 mile service radius of influence.

Pocket Park

Pocket Parks are generally less than one (1) acre in size, often located between buildings or homes in areas with few other places for people to gather, relax, or to enjoy the outdoors. They are small-scale open spaces that provide a safe and inviting environment for surrounding community members. In some cases they may have specific historic significance or specialty use. Due to size, amenities may be limited and are generally passive in use. Pocket Parks are defined to have a 1/4 mile service radius of influence unless specialty features exist in the park that would result in a greater influence.

Service Radius

A park service radius is the identified and measured zone of influence of a specific type of park. The radius is generally associated with the willingness of a user to travel that distance to reach the facility. Although expressed in terms of a radius, features such as arterial roads, rivers, or other disruptions to connectivity to the park may influence the true extent of the influenced area.

6.2.2 Existing Conditions

Existing conditions of Roosevelt's park were evaluated to understand deficiencies of these parks and specific items that need to be addressed. These evaluations focused on:

- Current programming of parks and facilities. Do they meet the current community needs?
- Maintenance. Are there specific elements or features that are in need of repair?
- Size and distribution.

Summaries of the existing parks and recreation facilities in Roosevelt City, organized by size, are included below. Recommendations are separated by needed improvements and possible improvements. Needed improvements are those items that are either a clear safety or maintenance issue; or a clear deficiency in providing a base level of programming and functionality. Possible improvements are ideas that may be implemented in the future based on City or community identified need.

Old Mill Park



Location: 278 East 100 North

Park Type: Pocket Park

Size: 0.59 Acres

Amenities: Covered Stage, Two Small Pavilions, Clock, Picnic Tables, Benches, Lighting, Parking (approx. 22 spaces), Pathways, Landscaping, And irrigation.

Uses: Leisure, Parties, Receptions, Community Gatherings, and Concerts.

Needed Improvements: Restroom, Improved Parking in Alley Way, Dog Waste Bag Dispenser, and Drinking Fountain

Possible Improvements: Small splash pad (flow through system)

Centennial Park



Location: 940 South 500 East

Park Type: Neighborhood Park

Size: 3.85 Acres (City Owned), Approximately 3 Additional Acres of Field Owned by School District

Amenities: Open Play Field, Parking (approx. 50 spaces)

Uses: Youth Football, Some Soccer

Needed Improvements: Park Signage, Pavilion

Possible Improvements: Baseball Diamond west of Football Uprights

Recommendation: This park facility is currently shared with the school district but the City is solely responsible for maintenance of the park

space. Due to the complications of shared ownership, the burden of sole maintenance responsibilities, and the lack of benefit to City residents, it is recommended that the City sell the City-owned park space to the school district and turn over maintenance responsibilities to them. Include in the sale agreement that public use of the park space should be maintained.

Central Park

Location: 91 West 100 North



Park Type: Community Park

Size: 7.83 Acres

Amenities: Aquatic Center, Library, Restroom, Reservable Pavilion, Softball Fields, Lighted Basketball Court, Sand Volleyball Court, Playground, Picnic Tables, Benches, Parking (approx. 45 spaces), Pathways, Landscaping, and Irrigation.

Uses: Aquatic Center, Library, Softball, Tee-ball, Leisure, Community Gathering, Basketball, Volleyball

Needed Improvements: Shade Over Playground, Shade at Pool

Possible Improvements: New Library to be Built on West Side of Park, Two Western Fields to be Removed (see Constitution Park), Northeast Field to be Kept for Informal Use, Repurpose Old Library Building when New Library is Constructed

Constitution Park

Location: 792 West 300 South



Park Type: Community Park

Size: 58 Acres, Approximately 17 Acres Undeveloped

Amenities: Covered Stage, Restrooms (2), Pavilions (2), Lighted Baseball/Softball Fields (5), Lighted Soccer Fields, Volleyball, Playground, Skate Park, Bike Park, Parks Maintenance Building, Parking, Pathways, Trails, Landscaping, and Irrigation.

Uses: Leisure, Baseball/Softball, Soccer, Volleyball, Community Gathering, and Mud Run.

Needed Improvements: Shade over Playground

Possible Improvements: Pickleball, Dog Park, Additional Baseball/Softball Fields, Soccer Fields, Disc Golf, Additional Trail around Park, Lighting for New Trail

Figure 6-1: Constitution Park – Mud Run Route



Other City Facilities:

Roosevelt Memorial Park

Location: 240 West Highway 40

Facility Type: Cemetery

Size: 14 Acres

Amenities: Total Plots = 7,497, Plots Available = Approximately 700

Needed Improvements: It is projected that the Cemetery will be at capacity near the year 2030. Additional acreage needs to be planned for or a new Cemetery site needs to be identified (see Cemetery Master Plan – Appendix A).



Roosevelt Municipal Golf Course

Location: 1155 West Clubhouse Drive

Facility Type: Golf Course

Size: 150 Acres

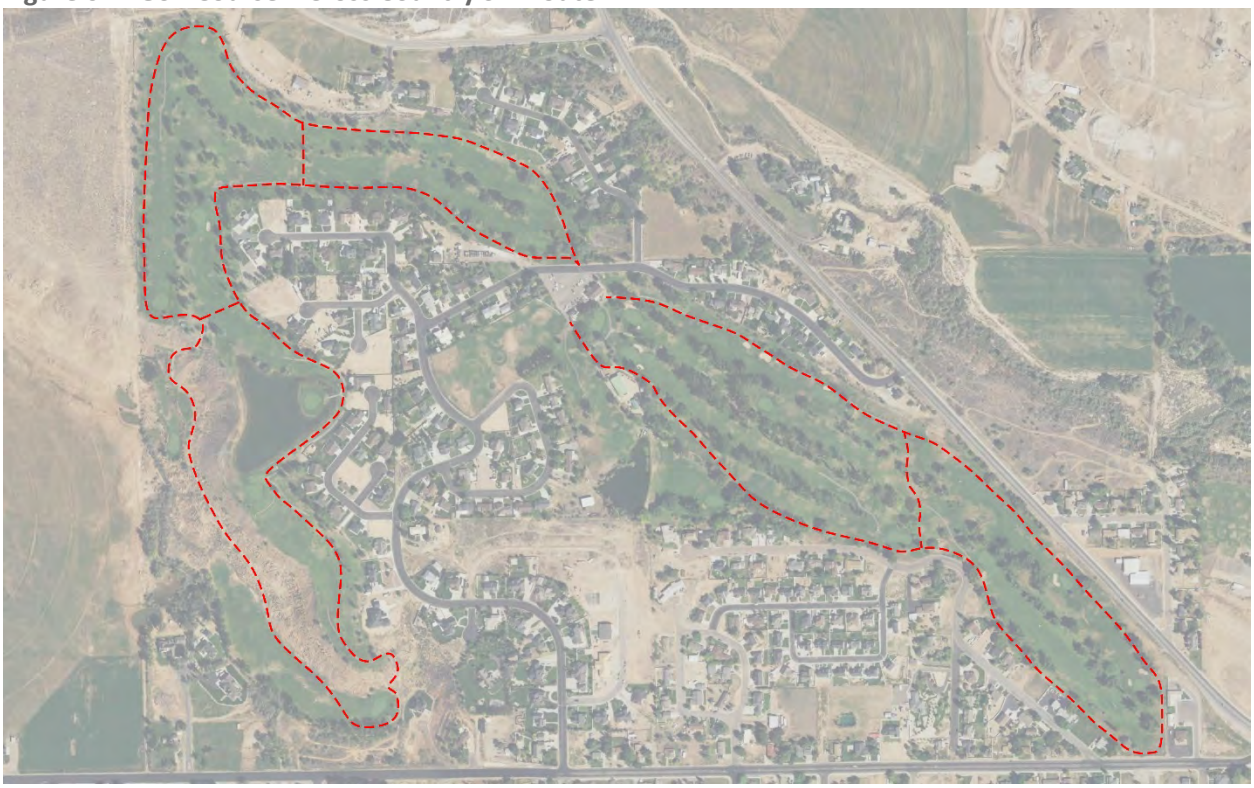
Amenities: 18 Hole Golf Course, Cross Country Skiing

Needed Improvements: Tie Irrigation System into Secondary Water System, Upgrade Irrigation System to be more Efficient, Remove Dead/Large Trees for Safety

Possible Improvements: Replace Clubhouse Flooring, Remodel Course Bathrooms, Replace Driving Range Netting (every 7-10 years), Replace Maintenance Equipment (Mowers), Plant New Trees to Replace Removed Trees



Figure 6.2: Golf Course – Cross Country Ski Route



Non-City Facilities:

Centennial Elementary School

Location: 940 South 500 East

Park Type: Elementary School

Size: 10.75 Acres (District Owned), Another 3.85 Acres of Field Owned by City

Amenities: Playgrounds, Open Play Fields

East Elementary School

Location: 700 East 400 North

Park Type: Elementary School

Size: 12.20 Acres

Amenities: Black Top, Basketball Courts, Playgrounds, Open Play Fields

Gorky Park

Location: 1126 North Cove Road

Park Type: Private Pocket Park

Size: 2.25 Acres

Amenities: Tot Lot, Landscaping, Ponds

Kings Peak Elementary School

Location: 437 North 300 West

Park Type: Elementary School

Size: 11.50 Acres

Amenities: Black Top, Playgrounds, Open Fields

Roosevelt Junior High School

Location: 350 West 200 South

Park Type: Junior High School

Size: 14.0 Acres

Amenities: Black Top, Playgrounds, Open Fields, Gymnasium (2 Full Court Basketball)

Union High School

Location: 850 East Lagoon Street

Park Type: High School

Size: 22.70 Acres

Amenities: Tennis Courts (6), Baseball Field, Softball Field, Football Field, Track, Gymnasium (2 Full Court Basketball)

Utah State University Campus

Location: 987 East Lagoon Street

Park Type: University Campus

Size: +/- 9 Acres

Amenities: Open Lawn (+/- 3.5 Acres)

6.2.3 Needs Assessment

A multi-faceted approach was taken to identify the future needs of the City's parks and recreation facilities. These included identifying deficiencies in the City's current distribution of parks and recreation facilities through a Service Radius Study, through consideration of non-City facilities, through public input via a community survey, and through a level of service comparison with similar Utah communities. Concurrently with this plan, a county-wide trail study was also conducted. In addition to looking at trail connectivity within Roosevelt, this county-wide study looked at connections and access to public lands and amenities outside of the City boundary.

6.2.3.1 Existing Parks Distribution

As shown on the Existing Park Service Radius Analysis map (Figure 6-4) there are some geographic deficiencies in the coverage of the existing parks system. These gaps in coverage primarily exist in the northeast corner, the northern finger, the western island, and the southern finger. Many of these areas are lightly developed and may not currently need parks facilities. Other areas that do not currently have nearby parks facilities may never require them due to their current or planned zoning.

In looking at the possible annexation boundary, as new areas are annexed and developed, parks will certainly need to be considered for these areas. These future park facilities should be consistent and complimentary with the future land use plan and actual development. Drainage basins required for new subdivisions, if developed and treated properly, should be considered to help satisfy this need.

6.2.3.2 Existing Trails

Existing trails are listed in Table 6-2 – Existing Trails Inventory and shown on Figure 6-3 – Existing Parks & Trails System. These trails consist of numerous urban trails (sidewalks) and an asphalt path around the southern perimeter of Constitution Park. Appendix F contains recommendations for sidewalk connectivity to satisfy the safety of pedestrians.

Table 6-2: Existing Trails Inventory

Name	Type	Length
800 South Both Sides (State Street to 500 E)	Urban	1.0 miles
State Street West Side (800 South to Dry Gulch)	Urban	0.53 miles
200 N/200 E Both Sides (High School to 300 S)	Urban	2.27 miles
Hwy 40 South Side – Phase 1 (300 S to State Street)	Urban	0.22 miles
Lagoon Street North Side – Phase 1 (200 W to 500 W)	Urban	0.28 miles
Central Park	Urban	0.47 miles
Constitution Park South	Urban	0.89 miles
200 South/Lagoon (High School to Constitution Park)	Urban	1.98 miles
Centennial/ 500 E West Side (800 S to Dry Gulch)	Urban	0.45 miles
	Total Length =	8.09 miles

6.2.3.3 Community Survey

As part of a greater survey performed in conjunction with the City Master Plan update, numerous Parks and Recreation questions were asked (Questions 31-38) to provide feedback and input as to the current state of the parks and recreations system and the desired future. Summaries to these parks and recreation questions are included below. Detailed survey results are included in Appendix G. In total, 220 survey responses were collected.

Top 10 Most Desired Park Improvements:

1. Splash Pad
2. Trails/Walking Paths
3. Restroom Facilities
4. Natural Areas/Trees
5. Drinking Fountains
5. Site Furnishings
7. Picnic Shelters
8. Gardens and Flowers
8. Playground Equipment
10. Lighting

General Survey Observations

Overall the opinion of Roosevelt's park system is good or very good (70.97% combined) with the most desired park improvement being a splash pad (58.02%) or trails/walking paths (57.55%). Over 65% of respondents confirm that they use the City's parks and trails system with the two highest uses being swimming (76.44%) and walking paths (73.08%). Multi-use trails are the most desired type of trail (77.45%). Generally, respondents support maintaining spending on existing recreational programs and facilities with the exception of the Golf Course where respondents support decreasing spending. Overwhelmingly, the most desired facility or program that respondents would be willing to pay more for is a recreation center (see Table 6-3 – Top Facilities and Programs Respondents are Willing to Pay More For). Though there was a lot of support for not paying any more for additional facilities or programs, over 67% of respondents would support an

increase in taxes to expand arts and recreation programs/facilities. Overall it seems that survey respondents have a desire to have more opportunity for recreating indoors and outdoors in multiple different ways through all seasons of the year.

Table 6-3: Top Facilities and Programs Respondents are Willing to Pay More For

Rank	Facility/Program	Number of Responses For
1	Recreation Center	41
2	Nothing/Fine As-Is	19
3	Biking Trail/Trails/Paths	14
4	Splash Pad	11
5	Arts	8
6	Dog Park	7
6	New Library	7
6	Youth Sports	7
9	Amphitheater	4
10	Archery Range	3
10	Bowling Alley	3
10	Pickleball Courts	3
10	Rock Climbing	3
10	Tennis Courts/Program	3
10	Youth Center	3

6.2.3.4 Level of Service Analysis

The information provided below is an evaluation of existing park acreage based on City population in comparison to other municipalities throughout Utah (see Table 6-4 – Level of Service Comparison Analysis). It is important to note that this is not an official level of service analysis associated with an impact fee analysis. Currently, Roosevelt's provided park acreage level of service provided, excluding the Cemetery and the Golf Course, is 7.78 acres of developed parks per 1,000 residents. Adding the non-developed existing park acreage at Constitution Park, this number increases to 10.27 acres of parks per 1,000 residents. This level of service is generally equal to or greater than the other Utah municipalities compared to.

Table 6-4: Level of Service Comparison Analysis

City	Population	Acres/1000	Notes
Bluffdale	9,887	6	From 2014 Bluffdale General plan
Centerville	16,819	15.26/3.24 developed	From Centerville General Plan
Clinton	21,104	6.5	From 2013 Clinton General Plan
Farmington	24,514	10	From Farmington General Plan
Highland	17,456	4.87	From 2009 Highland General Plan
Hurricane	15,205	6	From 2009 State of City Address
Lindon	10,723	4	From 2008 Lindon Parks, Trails & Recreation Master Plan
Mapleton	9,071	8.4	From 2012 Mapleton Impact Fee Report
Nibley	6,168	5.4	From 2017 Nibley City Parks, Trails, Recreation and Open Space Master Plan
North Logan	9,874	7.9	From North Logan Parks and Recreation Master Plan
North Ogden	18,172	8.9	From 2015 North Ogden General Plan
North Salt Lake	19,193	6.74	From 2005 North Salt Lake Parks, Trails & Recreation Master Plan
Payson	19,331	7.09	
Richfield	7,908	3.97	
Riverdale	8,592	6-8	From Riverdale City General Plan
Roosevelt	6,843	7.78	Excludes Cemetery and Golf Course
Santaquin	10,106	7.5	From 2014 Santaquin City General Plan
Saratoga Springs	24,356	5.93	From 2011 Saratoga Springs Parks, Recreation, Trails, and Open Space Master Plan
Smithfield	11,014	8.8	
South Ogden	16,852	8	
South Salt Lake	24,748	1.3	From 2015 South Salt Lake Park and Recreation Master Plan
Vernal	10,844	10.3	From 2010 Vernal General Plan
Woods Cross	11,082	5.8	From 2014 Woods Cross Parks and Trails Master Plan
	Average =	7.1	

6.2.4 Existing Analysis Summary

Overall, Roosevelt's provided park acreage is at or above where it should be based on its population. The National Recreation and Parks Association (NRPA) has historically recommended at least 5 to 8 acres of developed park per 1,000 residents. Roosevelt easily falls within the higher end of that range. Geographically, based on current residential development, the northeast and northwest corners of the City are farther from a park than is desirable. Results from the Community Survey identify some specific needs that should be addressed including amenities such as a recreation center, a splash pad, and trails/walking paths among others. It is important to note, however, that such improvements will require funding, and there was recognized sentiment through the Community Survey that supports not increasing spending on new improvements stating that the existing park and recreation facilities are fine as they are now.

EXISTING PARK INVENTORY			
	NAME	TYPE	SIZE
1	Old Mill Park	Pocket	0.59 Ac
2	Centennial Park	Neighborhood	3.85 Ac
3	Central Park	Community	7.83 Ac
4	Constitution Park	Community	41 Ac
5	Roosevelt Memorial Park	Cemetery	14 Ac
6	Roosevelt Municipal Golf Course	Golf Course	150 Ac
		TOTAL =	53.27 Ac*

*Existing park total acreage does not include cemetery or golf course acreages.

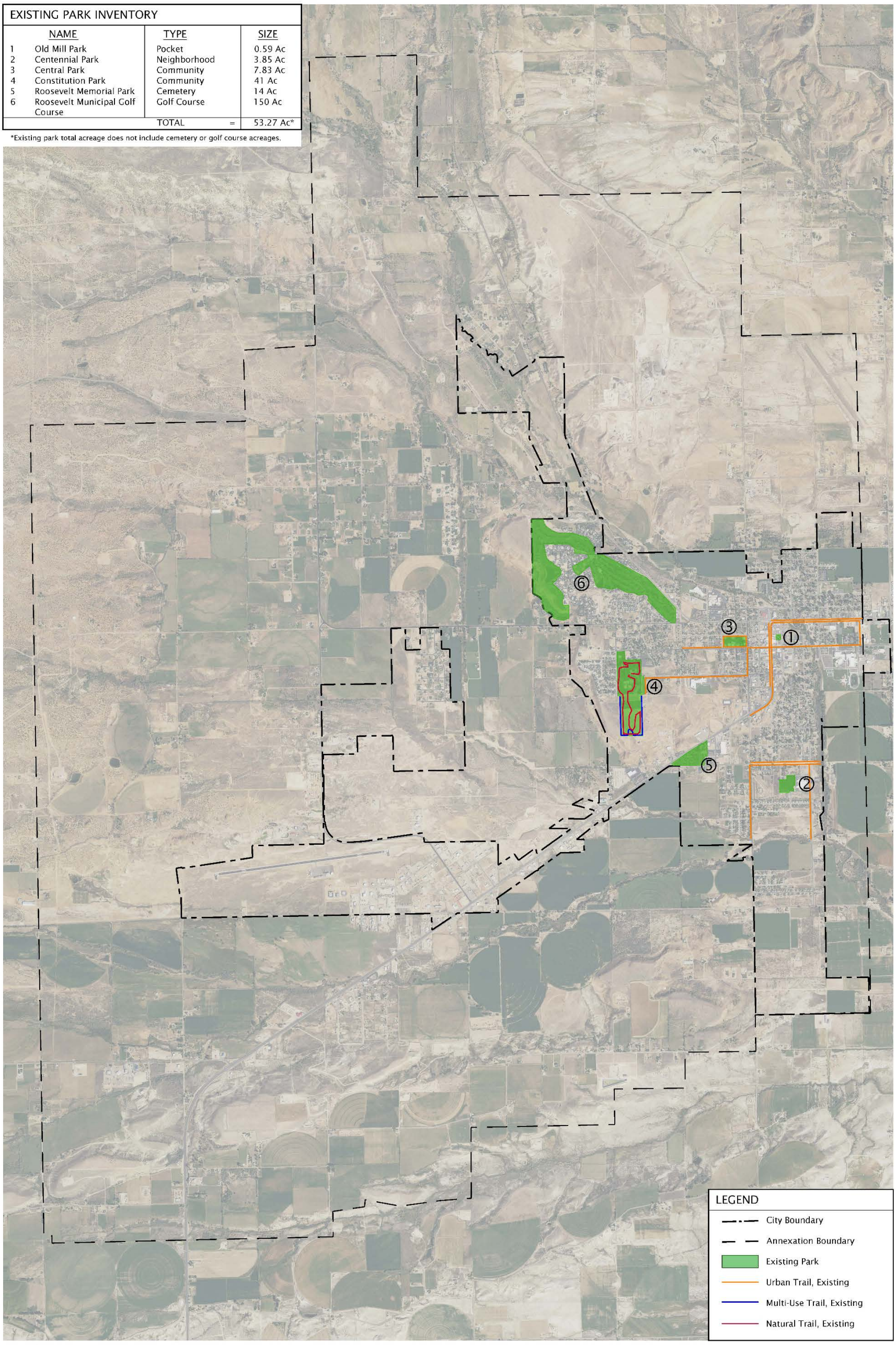


FIGURE 6-3: EXISTING PARKS AND TRAILS SYSTEM

EXISTING PARK INVENTORY			
	NAME	TYPE	SIZE
1	Old Mill Park	Pocket	0.59 Ac
2	Centennial Park	Neighborhood	3.85 Ac
3	Central Park	Community	7.83 Ac
4	Constitution Park	Community	41 Ac
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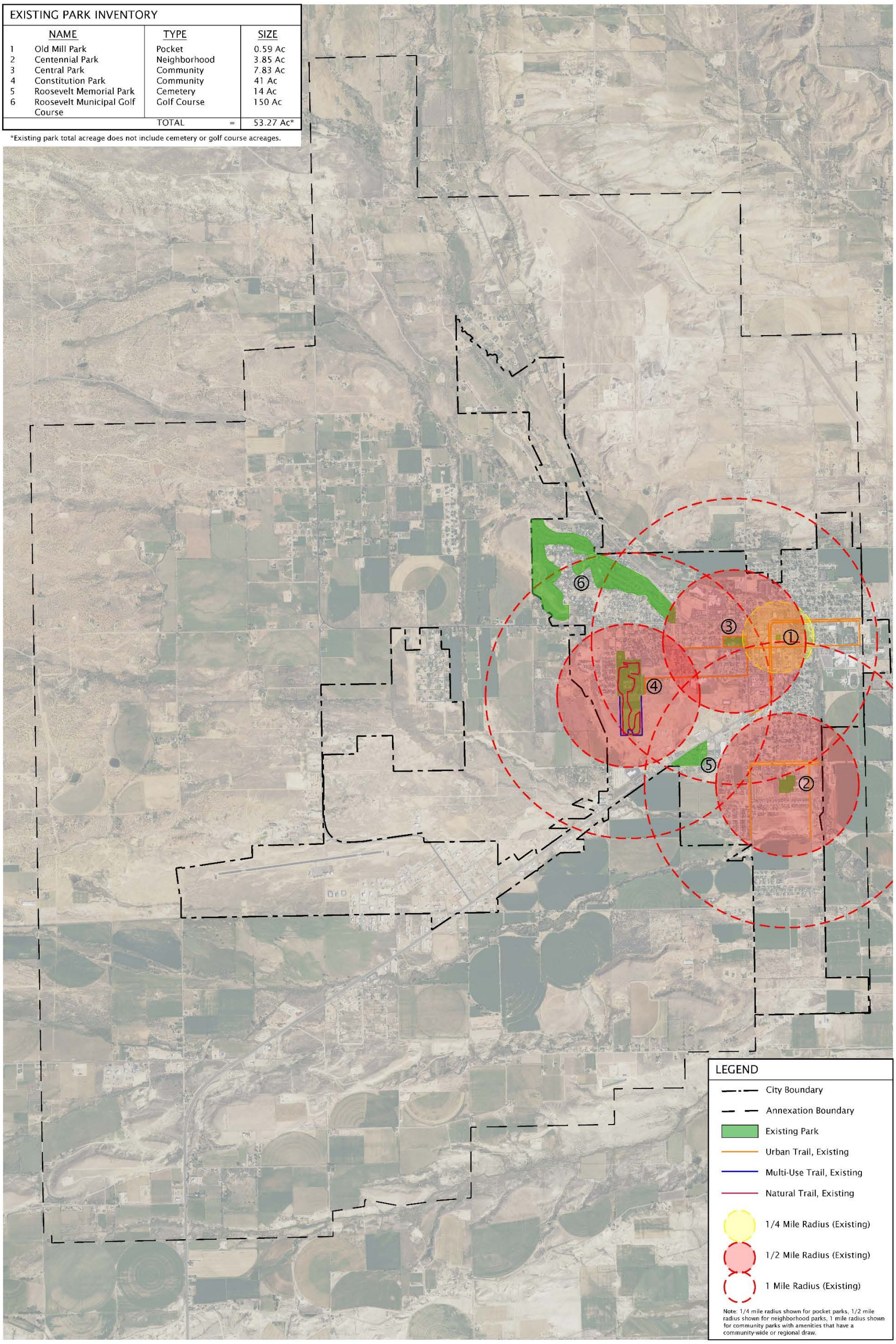


FIGURE 6-4: EXISTING PARK SERVICE RADIUS ANALYSIS

6.3 Proposed Improvements

This proposed master plan (see Figure 6-9 – Parks and Recreation Master Plan) attempts to address the deficiencies and needs identified in the existing conditions analysis and needs assessment and to provide for developing areas of the City. Included in these proposed improvements are upgrades and improvements to existing parks, development of new parks, and the development of new trails. Specifically, two new parks are proposed – Cove Park and Cowboy Park. Additionally, six other possible park locations are identified in areas that may likely experience future growth. These park improvements and additions will better meet the City's desire to have a developed park facility within close proximity to most residences (see Figure 6-10 – Proposed Park Service Radius Analysis). These improvements and proposed park facilities are described below.

6.3.1 Park Improvements

Centennial Park:

If the City maintains ownership and maintenance of this park, a park sign (specifically for the park, not the school) and a pavilion for shade are recommended to provide additional use and value to the park. Adding a baseball diamond west of the football uprights may be considered as demand requires.

Central Park:

Install a shade structure over the playground and provide shade structure(s) at the pool. A new library is proposed on the west side of the park. Part of this library construction should include maintaining or improving pedestrian connectivity around the park block. Widen 200 West between 100 North and Lagoon to provide additional parking. Repurpose old library building after the new library is constructed. Based on community survey responses, the library could be used as a multi-use building for community gathering, arts programs, a youth center, and/or exercise classes. This may meet some of the purposes of a larger community/recreation center that is unaffordable for Roosevelt City.

Constitution Park:

With approximately 17 acres of the park undeveloped, there are many possible improvements and additions that are planned to meet the needs identified in the community survey. These include shade over the playground, pickleball courts, a dog park, a disc golf course, additional trail along west side of park to connect to Lagoon street, lighting for trails, and additional baseball/softball fields to mitigate for the impact to the ballfields at Central Park when the Aquatic Center was built and for eliminated fields when the new library is constructed (see Figure 6-5 – Constitution Park South Expansion Concept).

Old Mill Park:

Though a small park, Old Mill Park is home to many gatherings and community events. To accommodate and further promote such events and gatherings, proposed improvements include a restroom, improved parking on the west side of the park, dog waste bag dispensers, a drinking fountain, and a small flow-through splash pad – the number one most desired park improvement from the Community Survey.

Roosevelt Memorial Park (Cemetery):

The Cemetery will soon be at capacity with a need to expand. It is proposed that the cemetery expand to the south adding approximately another 9 acres to the existing 14 acres. In addition to adding more burial space a new maintenance facility is proposed (see Appendix A - Cemetery Master Plan).

Roosevelt Municipal Golf Course:

Tie the irrigation system into the secondary water system (existing turnout off of MLWUA 32" Steel line) and renovate the irrigation system to be more efficient. Prune and/or remove dead/dying large trees for safety and replace them with new trees. Replace the Clubhouse flooring. Remodel the course bathrooms. Replace the driving range netting and replace the maintenance equipment (mowers).

Other Considerations:

Playground replacement – It is industry standard to replace playground equipment every 12-15 years. The reasons for this include wear and tear, availability of replacement parts, and keeping up with current trends and improvements in equipment. It is recommended that the City allocate funding in the budget for implementing a replacement program for their playground equipment.

Figure 6-5: Constitution Park South Expansion Concept



6.3.2 New Parks

Cove Park (16.08 Acres):

This park will include typical neighborhood park amenities possibly including multi-use sports fields, walking paths, picnicking, site furnishings, landscaping, and a connection to the future Cottonwood Creek loop trail.

Cowboy Park (0.70 Acres):

Very small in size and also serving as a detention facility, this park will serve as a small pocket park providing open lawn area and limited landscaping for rest and relaxation.

Other Future Parks:

Six other park sites are identified (see Figure 6-10 – Proposed Park Service Radius Analysis). These parks will include typical neighborhood park improvements while also catering to the specific needs of the neighborhoods they are constructed in.

6.3.3 Trails

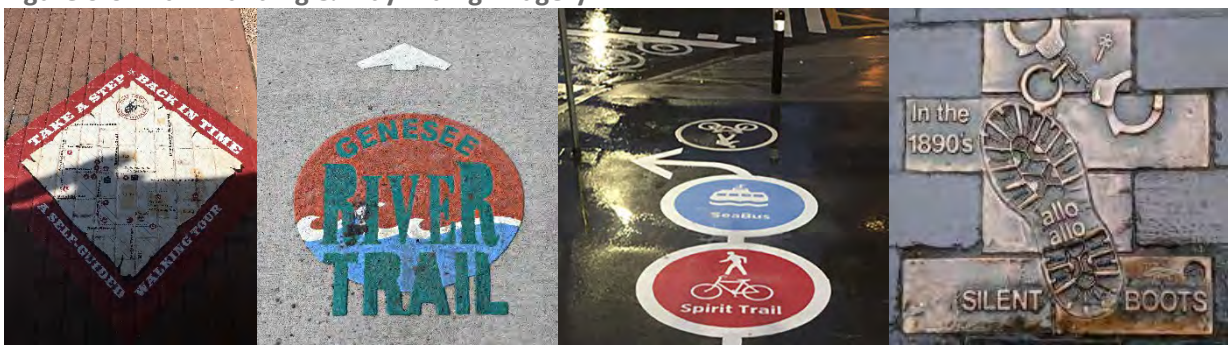
Trails and multi-use paths are an essential recreational amenity as they provide connectivity to parks and open spaces, access to natural features, connectivity between neighborhoods, and access to regional facilities. Trails and pathways were identified in the community survey as one of the most desired features within the parks system. The Parks and Recreation Master Plan map (Figure 6-9) identifies proposed trails to be built as part of this plan. These include urban trail improvements and multi-use trails.

6.3.3.1 Urban Trails

Roosevelt City has made a concerted effort to improve pedestrian connectivity within the City through sidewalk and urban trail improvements. The City continues to focus on adding to the system as it is clearly a priority for Roosevelt citizens. Future urban trail development could also include branding and wayfinding installations that would provide directional and interpretive information to trails users (see Figure 6-6 – Trail Branding Imagery). Proposed urban trails projects that the City has planned include:

- Highway 40 Sidewalk Extensions – Phases 2, 3 and 4 | 2.79 miles
- 200 N/Cove Road Sidewalk/Bike Lane (State Street to 3000 W) | 3.22 miles
- 3000 W Sidewalk/Bike Lane (200 N to Annex. Boundary) | 3.85 miles
- North Cove Road Sidewalk/Bike Lane (Cottonwood Creek Trail to 3000 W) | 0.99 miles
- Blue Bell Sidewalk/Bike Lane (3000 W to Annex. Boundary) | 0.50 miles
- 500 E Sidewalk (Lagoon Street to 800 S) | 0.81 miles
- State Street Sidewalk – West Side (200 S to 800 S) | 0.63 miles
- State Street Sidewalk – East Side (100 N to Cottonwood Creek) | 0.27 miles
- State Street Sidewalk/Bike Lane (Cottonwood Creek to Annex. Boundary) | 2.81 miles
- State Street Sidewalk/Bike Lane (Dry Gulch to Annex. Boundary) | 1.67 miles
- Hillcrest Drive Sidewalk (Neola Hwy to Cottonwood Creek) | 0.19 miles
- Lagoon Street Sidewalk (500 W to 1000 W) | 0.45 miles
- Neola Highway (121) Sidewalk/Bike Lane (200 N to Annex. Boundary) | 3.44 miles
- Constitution Park West Trail | 0.30 miles
- 800 South Sidewalk (State Street to Hwy 40) | 0.63 miles

Figure 6-6: Trail Branding & Wayfinding Imagery

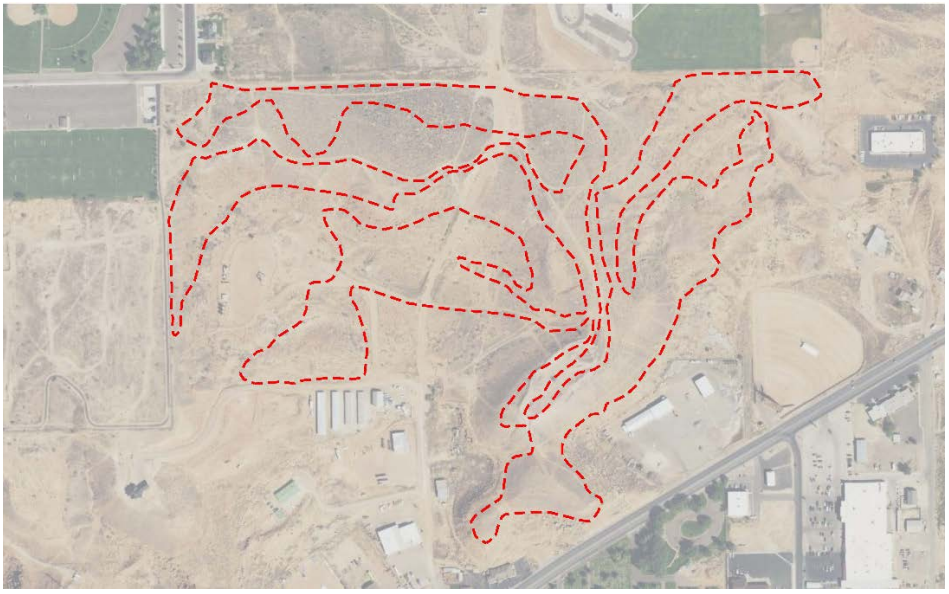


6.3.3.2 Multi-Use Trails

The Community Survey specifically illustrated a preference for multi-use trails and pathways. Multi-use trails allow for a diversity of users to enjoy the trail (walkers, runners, bikes, etc.) and will commonly be constructed of asphalt or granular material. Due to the diversity of usage, it is recommended that multi-use trails/paths are a minimum of eight (8) feet wide with a ten (10) to twelve (12) foot width preferable. Roosevelt's vision is to have a multi-use trail system that creates a loop around the City and connects at key locations to the City's urban trail network. Proposed multi-use path projects include:

- Cottonwood Creek Trail | 5.5 miles
- Cove Park Trail | 1.1 miles
- Dry Gulch Trail | 3.6 miles
- Lagoon to State Trail | 0.53 miles
- Natural Bike Trail (south of Roosevelt Junior High School) | 4.8 miles
- North Cove Mountain Bike Trail (North Cove Rd to Annex. Boundary) | 2.06 miles
- Bluebell Mountain Bike Trail (3000 W to Annex. Boundary) | 0.53 miles
- Harmston Bench Mountain Bike Trail | 6.99 miles
- Harmston Bench ATV Trail | 2.59 miles

Figure 6-7: Natural Bike Trail



6.3.4 Results/Recommendations

Recommendations of this plan include over 5 miles of urban trails and an additional 15.5 miles of multi-use trails; and over 50 acres of additional park land. As these parks and recreational amenities are developed these improvements will begin to satisfy identified deficiencies and meet the desires and future needs of the community and the City as it continues to grow. This Recreation Master Plan proposes improvements and new development that specifically address the top priorities from the Community Survey. Some of these proposed projects are already being planned and designed, including the Cottonwood Creek Trail from 1000 South to the Hospital. Developed in conjunction with the National Park Service, this project may include amenities such as an amphitheater and a fishing pond in additional to the multi-use trail itself.

It is noted that one of the most desired improvements from the Community Survey that citizens are willing to pay for is a Recreation Center. This Recreation Master Plan does not propose that Roosevelt City construct a recreation center due to the overly burdensome cost associated with a facility like this. This plan does recommend, however, that the City begin to plan for and provide for some of the desired activities that would occur at a recreation center, such as youth and arts programs; and indoor activities that can take place during the winter months. Furthermore, Duchesne County does not currently have a community recreation center. The development of one may be pursued as a County-wide amenity.

Figure 6-8: Cottonwood Creek Trail Plan – Central Section



EXISTING PARK INVENTORY			
	NAME	TYPE	SIZE
1	Old Mill Park	Pocket	0.59 Ac
2	Centennial Park	Neighborhood	3.85 Ac
3	Central Park	Community	7.83 Ac
4	Constitution Park	Community	41 Ac
5	Roosevelt Memorial Park	Cemetery	14 Ac
6	Roosevelt Municipal Golf Course	Golf Course	150 Ac
		TOTAL =	53.27 Ac*

PROPOSED PARK INVENTORY			
	NAME	TYPE	SIZE
7	Cove Park	Neighborhood	16.08 Ac
8	Cowboy Park	Pocket	0.70 Ac
9	Constitution Park Exp.	Community	17 Ac
10	Cemetery Expansion	--	9 Ac
11	New Park	Neighborhood	5 Ac
12	New Park	Neighborhood	5 Ac
13	New Park	Community	25 Ac
14	New Park	Neighborhood	5 Ac
15	New Park	Neighborhood	5 Ac
16	New Park	Neighborhood	5 Ac
		TOTAL =	83.78 Ac*

*Park total acreage does not include cemetery or golf course acreages.

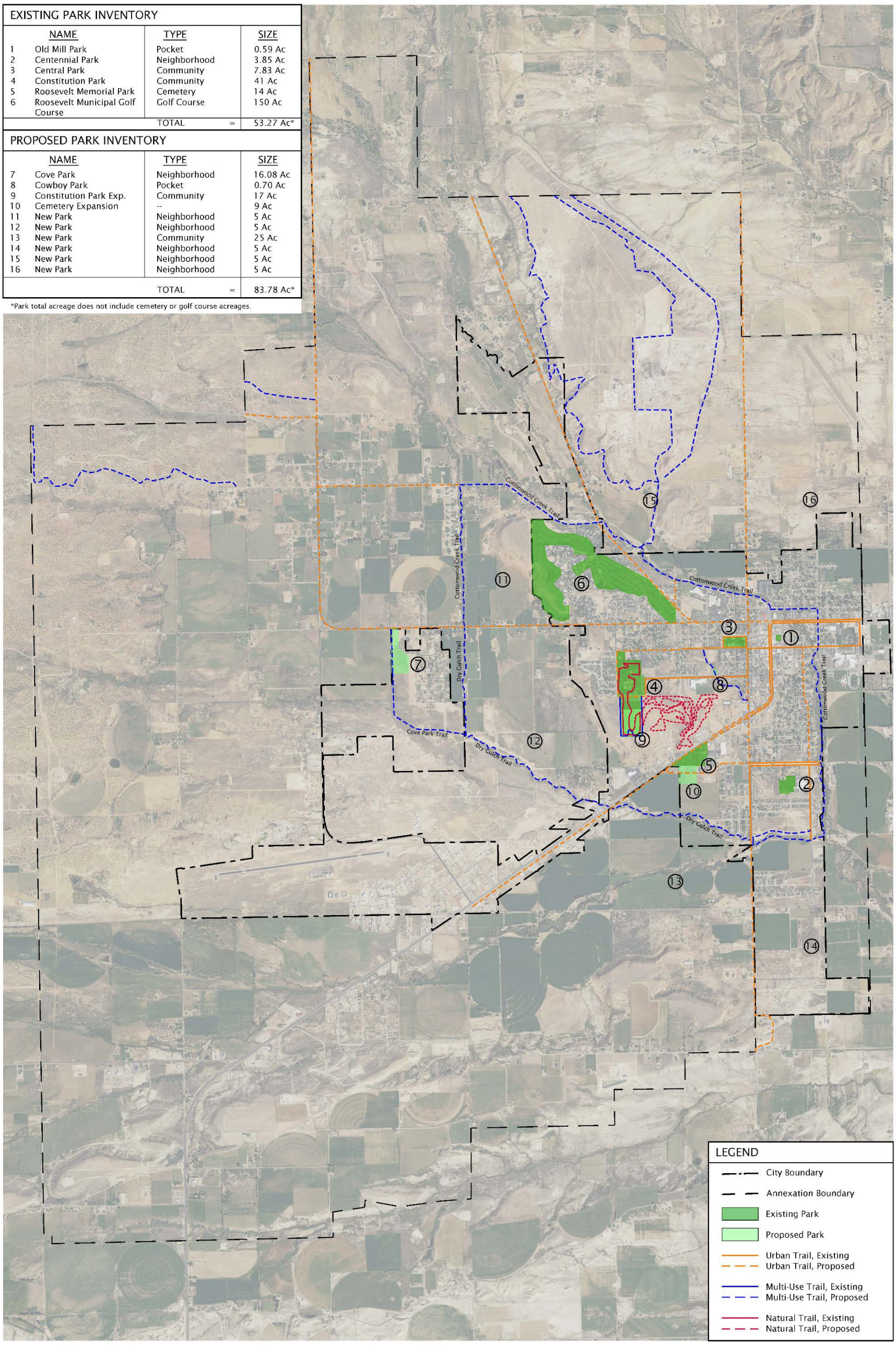


FIGURE 6-9: PARKS AND RECREATION MASTER PLAN

EXISTING PARK INVENTORY			
	NAME	TYPE	SIZE
1	Old Mill Park	Pocket	0.59 Ac
2	Centennial Park	Neighborhood	3.85 Ac
3	Central Park	Community	7.83 Ac
4	Constitution Park	Community	41 Ac
5	Roosevelt Memorial Park	Cemetery	14 Ac
6	Roosevelt Municipal Golf Course	Golf Course	150 Ac
		TOTAL =	53.27 Ac*

PROPOSED PARK INVENTORY			
	NAME	TYPE	SIZE
7	Cove Park	Neighborhood	16.08 Ac
8	Cowboy Park	Pocket	0.70 Ac
9	Constitution Park Exp.	Community	17 Ac
10	Cemetery Expansion	--	9 Ac
11	New Park	Neighborhood	5 Ac
12	New Park	Neighborhood	5 Ac
13	New Park	Community	25 Ac
14	New Park	Neighborhood	5 Ac
15	New Park	Neighborhood	5 Ac
16	New Park	Neighborhood	5 Ac
		TOTAL =	83.78 Ac*

*Park total acreage does not include cemetery or golf course acreages.

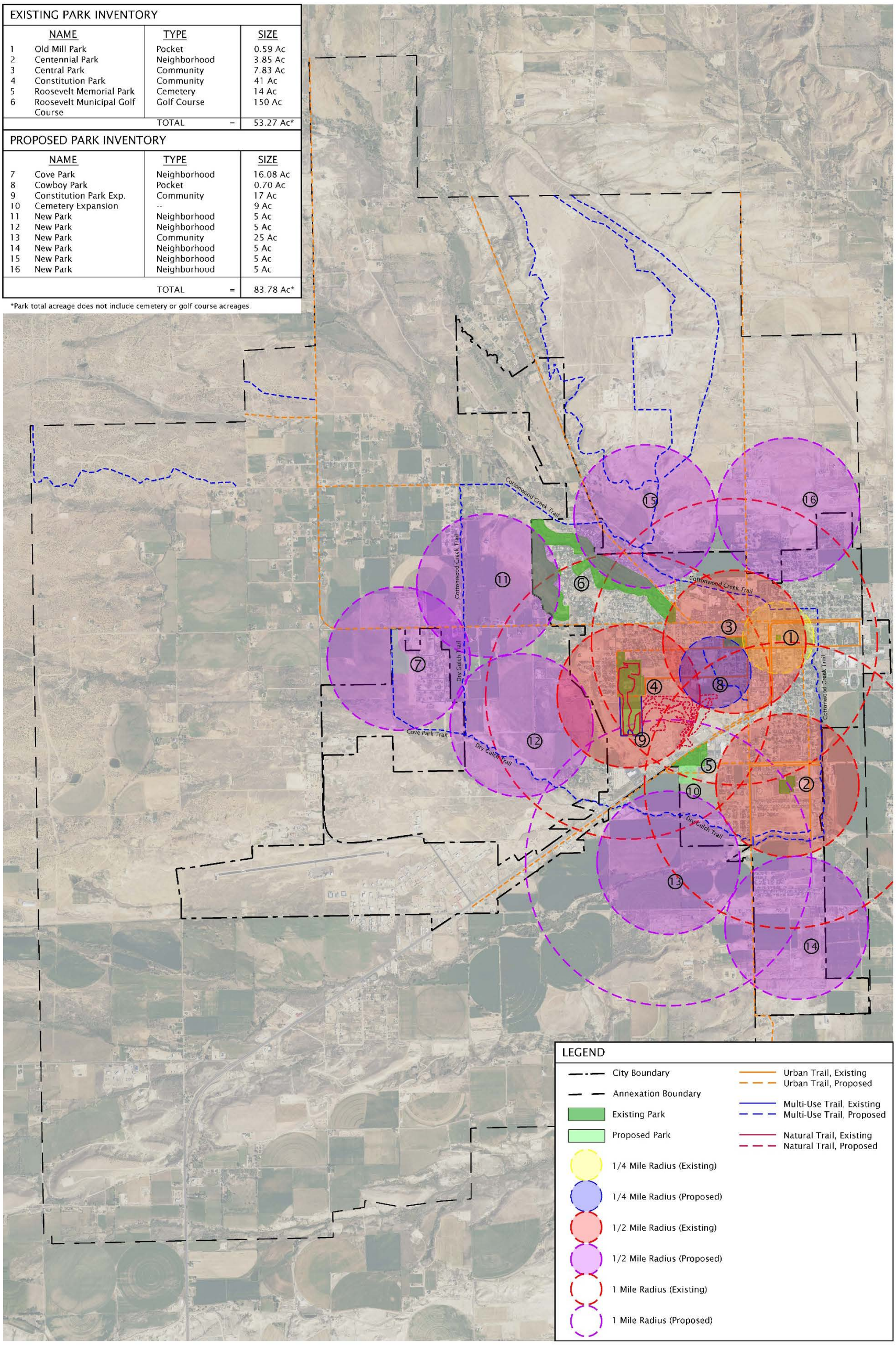


FIGURE 6-10: PROPOSED PARK SERVICE RADIUS ANALYSIS

6.4 Capital Facilities Plan

The CFP correlates with the proposed improvements identified above and provides a planning level cost estimate for each improvement.

Tie the irrigation system into the secondary water system and upgrade the irrigation system to be more efficient. Prune and/or remove dead/dying large trees for safety and replace them with new trees. Replace the Clubhouse flooring. Remodel the course bathrooms. Replace the driving range netting and replace the maintenance equipment (mowers).

Table 6-5: Budgetary Cost Estimates – Parks

Segment	Estimate
1-5 Year Improvements	
1) Centennial Park – Signage and Pavilion	$75,000
2) Central Park – Shade over Playground	$50,000
3) Central Park – Shade at Pool	$75,000
4) Constitution Park – Shade over Playground	$50,000
5) Constitution Park – Misc. Improvements (Pickleball, Dog Park, Disc Golf)	$200,000
6) Constitution Park – South Ballfields Expansion	$6,000,000
7) Old Mill Park – Misc. Improvements (Restroom, Drinking Fountain, Parking, Dog Waste Bag Dispensers)	$125,000
8) Old Mill Park – Splash Pad	$100,000
9) Playground Equipment Replacement	$200,000
10) Golf Course – Tie into secondary irrigation	$50,000
11) Golf Course – Renovate irrigation system	$900,000
12) Golf Course – Prune/Remove Dead Trees	$12,500
13) Golf Course – Replace maintenance equipment	$180,000
14) Golf Course – Remodel bathrooms	$25,000
15) Cowboy Park Development (#8)	$250,000
Subtotal	**$8,292,500**

Segment	Estimate
6-10 Year Improvements	
16) Cove Park Development (#7)	$4,800,000
17) Central Park – renovate/repurpose old library	$750,000
18) Golf Course – Clubhouse flooring	$7,500
19) Golf Course – Replace driving range netting	$65,000
20) New Park Development (#14) – Southeast	$2,000,000
21) New Park Development (#16) – Northeast	$2,000,000
Subtotal	**$9,622,500**
10+ Year Improvements	
22) New Park Development (#11) – Northwest	$2,000,000
23) New Park Development (#12) – West	$2,000,000
24) New Park Development (#13) – South	$7,500,000
25) New Park Development (#15) – North	$2,000,000
26) Playground Equipment Replacement	$400,000
27) Golf Course – Replace maintenance equipment	$180,000
Subtotal	**$14,080,000**
Total	**$31,995,000**

Table 6-6: Budgetary Cost Estimates - Trails

Segment	Estimate
1-5 Year Improvements	
1) Highway 40 Sidewalk Extensions – Phase 2, 3, and 4	$1,200,000
2) 500 E Sidewalk (Lagoon Street to 800 S)	$350,000
3) State Street Sidewalk – West Side (200 S to 800 S)	$270,000
4) State Street Sidewalk – East Side (100 N to Cottonwood Creek)	$150,000
5) Lagoon Street Sidewalk (500 W to 1000 W)	$200,000
Subtotal	**$2,170,000**
6-10 Year Improvements	
6) Constitution Park West Trail (including lighting)	$210,000
7) Cottonwood Creek Trail – Phase 1	$950,000
8) Natural Bike Trail (south of Junior High School)	$300,000
9) Lagoon to State Trail	$140,000
10) 800 South Sidewalk (State to Hwy 40)	$270,000
11) Hillcrest Drive Sidewalk (Neola Hwy to Cottonwood Creek)	$78,560
Subtotal	**$1,948,560**
10+ Year Improvements	
12) Cottonwood Creek Trail – Phase 2	$1,100,000
13) Dry Gulch Trail	$950,000
14) Cove Park Trail	$300,000
15) 200 N/Cove Road Sidewalk/Bike Lane (State Street to 3000 W)	$1,360,640
16) 3000 W Sidewalk/Bike Lane (200 N to Annex. Boundary)	$1,627,520
17) North Cove Road Sidewalk/Bike Lane (Cottonwood Creek to 3000 W)	$418,000
18) Blue Bell Sidewalk/Bike Lane (3000 W to Annex. Boundary)	$210,240
19) State Street Sidewalk/Bike Lane (Cottonwood Creek to Annex. Bndry.)	$1,187,520
20) State Street Sidewalk/Bike Lane (Dry Gulch to Annex. Boundary)	$706,320
21) Neola Highway (121) Sidewalk/Bike Lane (200 N to Annex. Boundary)	$1,453,920
22) North Cove Mountain Bike Trail (North Cove Rd to Annex. Boundary)	$130,416

Segment	Estimate
23) Blue Bell Mountain Bike Trail (3000 W to Annex. Boundary)	$33,360
Subtotal	**$9,477,936**
Total	**$13,596,496**

6.4.1 Funding Opportunities

Impact Fees

Impact fees can be collected with new development projects to help pay for the costs of providing public services to new development. The collection and use of impact fees are governed by Utah Law – UC11-36-202(1)(a)(ii). It is recommended that Roosevelt perform a park impact fee analysis and institute a park impact fee as part of new development.

Bonds

General Obligation Bonds (G.O. Bonds) are a low interest financing option for local government projects. Though low interest, this option is sometimes unpopular because it represents an additional tax burden on City residents. These bonds would need to be approved by the public through a bond election and are therefore subject to success or failure based on the popularity of the proposed project.

Special Taxes

Special taxes such as the Zoo, Arts & Parks (ZAP) tax or the Recreation, Arts & Parks (RAP) tax have been initiated and voted on by multiple Utah communities. These have successfully provided millions of dollars of improvements across the state. However, this funding option is again voted on and approved by the public with an increased tax burden. Other special taxes may be utilized for parks and recreation development but would need to be approved by citizens.

User Fees

The City may elect, particularly in the case of a large facility with significant operational costs, such as a recreation center or gymnasium, to collect a fee from users of such facilities. These funds may be used to either retire obligations resulting from the construction of the facility or on-going operations and maintenance. This funding alternative relies on the success of the specific facility and its popularity. Without significant use, the facility would not be able to pay back its initial capital costs and would need to be continually subsidized by other City funds in order to stay open.

Federal & State Funding/Grants

There are many types of federal and state grants that may be utilized for parks and recreation facilities but are often minimal in nature and difficult to acquire. Some of these include:

- Community Development Block Grants (CDBG): funding provided and used in low and moderate income areas. Certain restrictions and guidelines apply to how these funds are utilized.
- Utah Outdoor Recreation Grants
- Land and Water Conservation Fund
- Utah Trails and Pathways/ Non-motorized Trails Program
- Federal Recreation Trails Program
- UDOT Transportation Alternatives Program (MAP-21)
- Historic Preservation Funds

Service Districts

The City or collection of municipalities within a common region may create a Special Recreation District that provides recreational services to residents of the coverage area (such s Uintah Recreation District). The established district levies a property tax assessment on citizens of the coverage area to pay for both improvements and on-going maintenance and operations. Such a district may be organized and created by Roosevelt and surrounding municipalities to construct significant facilities such as a recreation center or gymnasium.

Public/Private Partnerships

Roosevelt may partner with other public entities or private groups/developers on facilities that service the public but are also attractive and beneficial to the private partner. This will result in a shared cost, thus reducing the up-front burden carried by the City, but may result in a pay-to-use facility that is not free for public use.

Development Agreements

Establishing development agreements with new developments within Roosevelt is a way to receive dedication of park land and in some cases developed park land and trails for public use. The City may elect to exchange the donation of park land and/or recreation facilities for developer concessions or negotiated considerations.

Private Donations/Fundraising

The potential for local investments and interest in parks and recreation projects that are important to special interest groups, neighborhoods, businesses, or even individuals and/or families should not be overlooked. This interest may result in focused fundraising efforts or at least in the donation of time and services. However, this type of funding usually requires a significant amount of time and focused effort by municipal staff.





Cemetery Master Plan
Appendix A



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Appendix A

Executive Summary

This Cemetery Master Plan addresses deficiencies in the existing cemetery and proposes additional improvements and expansion to meet future demands and trends. The existing cemetery is well maintained and used but needs additional facilities, improved infrastructure, improved circulation, better controlled access from Highway 40, and a better buffer from Highway 40.

The proposed expansion is adjacent to and south of the existing cemetery and is proposed to include a new maintenance building and yard, additional plots, a veteran's monument, and a columbarium (*see Figure A-2 – Cemetery Master Plan*).

Listed in **Section A.4** of this Appendix are the capital improvements needed to address the identified deficiencies and future needs and expansion. Funding for these projects has not been established. Below is a summary of expected costs and associated improvement periods. See **Figure A-3** for Cemetery Improvements Phasing Plan.

1-5 year improvements	High	$2,075,000
6-10 year improvements	Medium	$400,000
10+ year improvements	Low	$1,100,000
Total Identified Improvements =		**$3,575,000**

A.1 Introduction

The Roosevelt Memorial Park, located at 240 South Highway 40, is quickly nearing its capacity and is in the need of either expansion or the development of another cemetery facility elsewhere within the City. The existing cemetery has approximately 700 plots available. It is projected that the cemetery will be at or exceed capacity by the year 2030. By the year 2050, an additional 1600 plots will be needed. It is critical to identify a clear direction to address the upcoming deficiencies of the cemetery facility. This Cemetery Master Plan proposes development within the current cemetery acreage and multiple phases of expansion to address future needs.

Figure A-1: Existing Roosevelt Memorial Park Aerial



A.2 Existing Conditions and Analysis

The current cemetery is approximately 14 acres in size and currently has a capacity of 7,500 plots. Primary accesses to the site include Highway 40 and the existing 800 South alignment. The cemetery has an existing office and restroom (private) building; and a maintenance shed and yard. The northeast corner of the property is currently used as a road side park – a rest area off of Highway 40. Generally the cemetery is well maintained and in good condition. Listed below are existing considerations that should be addressed as part of this master plan:

- Controlled Access and Circulation – Access from Highway 40 is not well signed or controlled. There are no lockable gates. The north south circulation roads in the cemetery are narrow and not wide enough to accommodate two-way traffic and pull off parking. Preferred circulation patterns are not signed.

- The existing office/restroom building is old and in need of replacement. This building is currently serviced by a culinary water line coming from the maintenance shed area.
- The eastern most north-south road connecting the maintenance shed area to 800 South is not paved.
- There is no fencing or buffer from Highway 40.
- A portion of the cemetery is still irrigated from the culinary water system. Furthermore, there are properties that are serviced down stream of the culinary water line that services that portion of the cemetery.
- Cemetery is nearing capacity. Approximately 700 plots available.

The cemetery's existing fee schedule was also evaluated and compared to similar Utah municipal cemeteries (see *Table A-1 – Cemetery Fee Schedule Comparison*).

Table A-1: Cemetery Fee Schedule Comparison

	CITY (by population)															
	Logan	Kaysville	Clearfield	Brigham City	Hyrum	Ivins	Richfield	Salem	Providence	Ephraim	Santa Clara	Roosevelt	Enoch	Harrisville (Ben Lomond)	Vernal/Uintah	Average
	49,957	30,328	30,683	18,736	7,926	7,908	7,589	7,504	7,173	6,858	6,835	6,771	6,331	6,182		
Fee Type																
Burial Plot (resident)	$ 606.00	$ 500.00	$ 450.00	$ 600.00	$ 300.00	$ 300.00	$ 350.00	$ 600.00	$ 300.00	$ 100.00	$ 300.00	$ 300.00	$ 250.00	$ 500.00	$ 300.00	$ 383.73
Burial Plot (non-resident)			$ 950.00	$ 1,200.00	$ 700.00	$ 600.00	$ 600.00	$ 1,000.00	$ 800.00	$ 500.00	$ 850.00	$ 450.00	$ 600.00	$ 825.00		$ 756.25
Burial Plot (infant resident)	$ 302.00	$ 300.00	$ 150.00	$ 150.00		$ 150.00					$ 150.00					$ 200.33
Burial Plot (infant non-resident)			$ 400.00	$ 300.00		$ 300.00					$ 395.00					$ 348.75
Niche (resident)			$ 250.00	$ 300.00											$ 1,000.00	$ 516.67
Niche (non-resident)			$ 500.00	$ 600.00												$ 550.00
Openings & Closings (resident weekday)	$ 501.00	$ 500.00	$ 300.00	$ 500.00	$ 350.00	$ 250.00	$ 250.00	$ 350.00	$ 450.00	$ 325.00	$ 300.00	$ 300.00	$ 150.00	$ 350.00	$ 350.00	$ 348.40
Openings & Closings (non-resident weekday)		$ 650.00	$ 600.00	$ 1,000.00	$ 550.00		$ 250.00	$ 700.00		$ 550.00	$ 550.00	$ 450.00	$ 200.00	$ 700.00		$ 563.64
Openings & Closings (infant resident)	$ 222.00	$ 250.00	$ 200.00			$ 125.00	$ 150.00	$ 300.00	$ 75.00		$ 300.00	$ 100.00	$ 100.00	$ 150.00		$ 179.27
Openings & Closings (infant non-resident)			$ 300.00				$ 150.00	$ 325.00				$ 150.00	$ 125.00	$ 250.00		$ 216.67
Openings & Closings (resident Saturday)	$ 1,014.00		$ 500.00	$ 750.00		$ 550.00	$ 300.00	$ 550.00	$ 600.00	$ 450.00	$ 400.00	$ 550.00	$ 225.00	$ 750.00	$ 400.00	$ 541.46
Openings & Closings (non-resident Saturday)			$ 800.00	$ 1,500.00			$ 300.00	$ 900.00		$ 650.00	$ 750.00	$ 700.00	$ 300.00	$ 1,100.00		$ 777.78
Openings & Closings (infant Saturday)	$ 342.00					$ 150.00	$ 200.00		$ 100.00		$ 350.00	$ 250.00				$ 232.00
Cremains (resident weekday)	$ 222.00		$ 200.00	$ 250.00	$ 200.00		$ 150.00	$ 175.00			$ 300.00	$ 200.00	$ 100.00	$ 150.00	$ 450.00	$ 217.91
Cremains (non-resident weekday)			$ 300.00	$ 500.00	$ 400.00			$ 350.00				$ 300.00	$ 125.00	$ 250.00		$ 317.86
Cremains (resident Saturday)	$ 342.00		$ 400.00	$ 375.00			$ 250.00	$ 275.00			$ 350.00	$ 350.00	$ 150.00			$ 311.50
Cremains (non-resident Saturday)			$ 550.00	$ 750.00				$ 450.00				$ 450.00	$ 187.50			$ 477.50
Perpetual Care (resident)						$ 250.00				$ 200.00	$ 300.00			included		$ 250.00
Perpetual Care (non-resident)						$ 250.00					$ 400.00			$ 75.00		$ 241.67

A.3 Proposed Improvements

This proposed master plan attempts to address the concerns and deficiencies identified in the evaluation of existing conditions (see *Figure A-2 – Cemetery Master Plan*). The master plan addresses the issues of capacity, circulation, and access while also proposing a new maintenance building and yard; a veteran's monument; and a columbarium. Due to the extensive nature of the master plan, phasing has been proposed (see *Figure A-3 – Cemetery Improvements Phasing Plan*).

Phase 1A:

Phase 1A generally consists of capturing under-utilized or uncaptured property within the current cemetery property and converting that land into additional cemetery plots. This phase will add approximately 100 additional plots. This phase will also include a veteran's monument in the roadside park area.

Phase 1B:

Phase 1B consists of adding an additional 4 acres of property by expanding the cemetery property south of the existing 800 South alignment. This expansion would add approximately 1,800 additional plots,

interior roads, a new office, a new maintenance yard, additional parking, benches, and a proposed columbarium. This expansion assumes the re-alignment of 800 South to facilitate the cemetery expansion and to provide a 90 degree intersection at Highway 40. It is proposed that though the interior roads will be one way traffic, they would be wide enough to allow for vehicles to park along the road.

Phase 2:

Phase 2 is a long term expansion adding an additional 4.5 acres to the cemetery property and an additional 2,000 plots. This expansion would occur south of the proposed 1B expansion on the south side of the re-aligned 800 South. This expansion is not anticipated to be necessary until the year 2050. It is proposed that though the interior roads will be one way traffic, they would be wide enough to allow for vehicles to park along the road.

Proposed improvements to the cemetery are listed below by priority and phase.

- Item 1) Capture under-utilized or unused cemetery property and utilize for cemetery plots including signing and wayfinding to better control traffic patterns (Phase 1A).
- Item 2) Design and build new maintenance building (Phase 1B).
- Item 3) Install angled parking along existing 800 South (Phase 1A/1B).
- Item 4) Install Phase 1B roads, cemetery plot areas, fencing, landscaping, and irrigation (Phase 1B).
- Item 5) Install fencing and buffer landscaping along Highway 40 (Phase 1A).
- Item 6) Install gates at entrances (Phase 1A/1B).
- Item 7) Install culinary water line on eastern edge of cemetery property to allow for entire cemetery to be irrigated from secondary water system (Phase 1A).
- Item 8) Install interior road along eastern edge of cemetery property connecting 800 South to existing maintenance shed (Phase 1A).
- Item 9) Install Veteran's Monument (Phase 1A).
- Item 10) Install columbarium (Phase 1B).
- Item 11) Install lighting (Phase 1A/1B)
- Item 12) Install Phase 2 including interior roads, cemetery plot areas, fencing, landscaping, and irrigation.

As the cemetery continues to develop and expand updates to the fee schedule will need to occur. Based on the fee schedule comparison a proposed updated fee schedule is included below (see *Table A-2 – Proposed Cemetery Fee Schedule*).

Table A-2: Proposed Cemetery Fee Schedule

	Existing Fee	Proposed Fee
Fee Type		
Burial Plot (resident)	$ 300.00	$ 350.00
Burial Plot (non-resident)	$ 450.00	$ 600.00
Niche (resident)		$ 250.00
Niche (non-resident)		$ 400.00
Openings & Closings (resident weekday)	$ 300.00	$ 300.00
Openings & Closings (non-resident weekday)	$ 450.00	$ 450.00
Openings & Closings (infant resident)	$ 100.00	$ 150.00
Openings & Closings (infant non-resident)	$ 150.00	$ 225.00
Openings & Closings (resident Saturday)	$ 550.00	$ 550.00
Openings & Closings (non-resident Saturday)	$ 700.00	$ 700.00
Openings & Closings (infant Saturday)	$ 250.00	$ 250.00
Cremains (resident weekday)	$ 200.00	$ 200.00
Cremains (non-resident weekday)	$ 300.00	$ 300.00
Cremains (resident Saturday)	$ 350.00	$ 350.00
Cremains (non-resident Saturday)	$ 450.00	$ 450.00

A.4 Capital Facilities Plan

The CFP correlates with the proposed improvements identified above and provides a planning level cost estimate for each improvement. Phase 1A and 1B improvements are anticipated in the short range (1-5 years) and medium range (6-10 years) with Phase 2 improvements being long range (20+ years).

Table A-3: Budgetary Cost Estimates

Segment	Estimate
1-5 Year Improvements	
1) Existing cemetery property improvements including signage and wayfinding	$25,000
2) Design and build new maintenance building	$225,000
3) Install angled parking along existing 800 South	$180,000
4) Install Phase 1B (roads, cemetery plot areas, fencing, landscaping, and irrigation)	$1,200,000
5) Install fencing and landscaping buffer along Highway 40	$150,000
6) Install gates at entrances	$30,000
7) Install culinary water line on eastern edge of existing cemetery property	$15,000
8) Install interior road along eastern edge of existing cemetery property	$250,000
Subtotal	**$2,075,000**
6-10 Year Improvements	
9) Install veteran's monument	$175,000
10) Install columbarium	$75,000
11) Install lighting (Phase 1A and Phase 1B)	$150,000
Subtotal	**$400,000**
10+ Year Improvements	
12) Install Phase 2 (roads, cemetery plot areas, fencing, landscaping, and irrigation)	$1,100,000
Subtotal	**$1,100,000**
Total	**$3,575,000**



FIGURE A-2 – CEMETERY MASTER PLAN



FIGURE A-3 – CEMETERY IMPROVEMENTS PHASING PLAN





Culinary Water Plan

Appendix B



HORROCKS ENGINEERS

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Appendix B

Executive Summary

The Roosevelt City Culinary Water Master Plan Update contains analysis of the existing culinary water system and recommendations to accommodate future growth through the year 2045. Based on deficiencies found improvements were recommended for the existing system and future system growth.

Listed in **Section B.16** of this Appendix are the capital improvements needed to meet the 25-year population demands. Below is a summary of expected costs, associated improvement period, and priority.

1-5 year improvements	Highest	$6,347,245
6-10 year improvements	High	$5,940,675
11-15 year improvements	Medium	$13,623,064
16-25 year improvements	Low	$19,474,098

It is estimated that of the 11-15 year improvements $4,444,219 would be developer driven, therefore should be paid for by developers. The estimated developer contributions for the 16-25 year improvements is estimated at $14,250,187. These development type of improvements should only be explored if annexation and development does indeed become a reality during the planning period.

B.1 Introduction

This Appendix identifies the existing condition of the culinary water system as well as recommended improvements to meet the projected 25-year population demands.

Future conditions in Roosevelt City (City) were analyzed by projecting the population through the year 2045 and calculating the number of connections or equivalent residential connections (ERC's). Bentley WaterGems CONNECT Edition computer program was used to model Roosevelt City's water system. Based upon the historical actual culinary water use and the projected average yearly, peak daily, and peak instantaneous demand categories, the culinary flow are projected through the planning period. These flows are used to determine the required capacities of the culinary water source, storage, and distribution systems. Recommendations are made to maintain the current Level of Service (LOS) and provide the needed capacity for the projected population in the three categories mentioned.

Roosevelt City's water system provides water for both City and some County connections, as well as Neola Water Improvement District (NWID), and Cedarview Montwell Special Service District (CMSSD). For this study, all connections will be treated as City connections.

The State of Utah is currently in the process of implementing new drinking water sizing requirements. Community Water Systems (CWSs) serving over 3,300 people, by March 1, 2019 had to submit at least the most recent 3 years of water use data to Division of Drinking Water (DDW). In turn, source capacity and storage capacity sizing requirements shall be based on Peak Day Demand per ERC, Average Annual Demand per ERC, and Equalization Storage per ERC from the new reporting requirements. Site specific requirements of Peak Day Demand, Average Annual Demand, and Equalization Storage will be determined based on 3 years data, and updated as determined by DDW. Officials with DDW have indicated that the current state wide standards currently still apply and can be used in this masterplan until the new rule is fully enforced. DDW also indicated that the new rule based on 3 years of data can be used to determine Peak Day Demand, Average Yearly Demand, and Equalization Storage. The new standards are being used as the design criteria for this report.

To determine future impacts to the water system, it is estimated that of the population increase of 4,228, between 2019 and 2045, as described in Chapter 1, the majority of the existing vacant parcels near the central part of town will be filled. Refer to Chapter 2, Land Use Table 2-1 for a detailed description of anticipated development, and where it is predicted to occur. The remaining population will be distributed to the following locations with their respective percentages: Hancock Cove, Southtown, and N. Crescent at 45%, 35%, and 20%. Figure B-2 Proposed Service Parcels indicates where new development is expected to take place.

B.2 Existing System Evaluation

Roosevelt City's public water system is No. 07004, as identified by the State of Utah. The existing system is illustrated in Figures B-3a and B-3b, with the locations of pipes, pressure reducing valves (PRVs), storage tanks, wells, City boundary, and pressure zones. Existing sources include Hayden Wellfield, Durigan Springs Well, Hancock Cove Well, and Victory Pipeline. Hancock Cove Well is currently not supplying water to Roosevelt City. Existing storage facilities include: 2 million gallon (MG) SR 121 tank, the Page Bench 1 MG tank, the Cove 2 MG tank, and the Hayden 300,000 gallon tank. There is also a 0.5 MG tank located on "R Hill" which is abandoned, but shown on the exhibits as reference. The Cove Tank is owned and operated by Duchesne County Water Conservancy District (DCWCD), and has a 2 MG capacity, 1 MG of which is Roosevelt City's

The current system provides culinary water for residents of the City of Roosevelt and surrounding non-incorporated areas in Duchesne County including Hancock Cove and North Crescent. The City's system also supplies water to NWID and CMSSD.

B.3 Design Criteria

Table B-1: Roosevelt Culinary Water Master Plan Design Criteria

The Roosevelt City Design Criteria used in this study are summarized below:			
Demand	Average Yearly	236,215	gpy/ERC
	Peak Day	1,276	gpd/ERC
	Peak Instantaneous	(See Section B.6)	
	Fire	1,000 gpm @ 2 hours	
Storage	Equalization	647	gal/ERC
	Fire	120,000	gallons
Pressure	Minimum Static (recommended)	60	psi
	Maximum Static (recommended)	130	psi
	Minimum Peak Day	40	psi
	Minimum Peak Instantaneous	30	psi
	Minimum Peak Day Plus Fire	20	psi
Pipe Sizes	Minimum	8*	inches
Velocities	Maximum Peak Day	5	fps
	Maximum Peak Day Plus Fire	10	fps

*Standard design criteria suggests that water lines should be 8-inches minimum in diameter. There are several water lines within the City that are less than 8-inch diameter, but unless upsizing these water lines is a pre-requisite for future expansion, meaning that the City cannot go forward with expansion unless they are upsized, they are not included in this masterplan. Smaller pipes not identified in this Appendix to be upgraded, are capable of serving areas of the City where they are located, so they are not considered bottlenecks. This was discussed with City officials, and after careful consideration, upsizing these water lines to meet the minimum diameter of 8-inches was not considered a priority. Going forward it is recommended that in a street slated for reconstruction, all water lines in need of replacement be upsized or replaced to 8-inches, or greater if specified.

B.4 Sizing Requirements

The design criteria Table (B-1) and sizing requirements (Table B-2), are based on the recent legislative revisions to Sections 104 and 114 of Utah Code 19-4 (Utah Safe Drinking Water Act) that are being implemented in 2019 by the Utah State Division of Drinking Water (DDW). The new sizing requirements are a modification to Utah Public Water system (PWS) Design and Construction Minimum Sizing Standards (Utah Administrative Coad R309-510). Water use information in Table B-2 was obtained by Roosevelt City. The actual City metering and billing data from 2016 to 2018 as well as metered data at

the source was used. Metered data at the source was used to calculate Average Annual Demand and is not based on service meters of retail connections; sizing calculations are based on that data.

Table B-2: Sizing Requirement Calculations

Year	Days in the Year	Residential Usage (MG/year)	Non-Residential Usage (MG/year)	Res. ERCs	Non-Res. ERCs**	Total ERC	Peak Day* (AC-FT)	Peak Day (MG)	Peak Day Demand per ERC (gpd/ERC)	Source Metered Data (AC-FT/year)	Source Metered Data (MG/year)	Average Annual Demand per ERC (gpy/ERC)	Equalization Storage per ERC (gal/ERC)
2018	365	295	554	2,079	1,786	3,865	12.37	4.03	**1,043**	2,242	730	**188,972**	**518**
2017	365	271	187	2,066	1,244	3,310	10.58	3.45	1,042	1,759	573	173,180	474
2016	365	258	172	2,032	1,165	3,197	8.36	2.72	852	1,389	453	141,577	388

*Information obtained from Roosevelt City officials.

** Wholesale water not included in non-residential ERCs calculation.

Adjustments are required to be made based on a system-specific variability factor as required by the State of Utah's new policy for Sizing requirements. This factor is determined by obtaining the highest value of peak day demand and lowest value of peak day demand during the 3 year period, subtracting them, and then dividing that number by the lowest value of peak day demand. The calculation is similar for Average Annual Demand and Equalization Storage, and for the purposes of this report shall not to exceed 25%. The sizing adjustment requirements can be found in Table B-3.

Table B-3: Sizing Requirement Adjustments

Year	Operational Days in the Year	Total Number of ERCs	**"Peak Day Demand per ERC"** Data (gallons/day)	**"Average Annual Demand per ERC"** Data (gallons/year)	**"Equalization Storage per ERC"** Data (gallons)
2018	365	3865	**1043**	**188,972**	**518**
2017	365	3310	1042	173,180	474
2016	365	3197	852	141,577	388
***System-Specific Variability Factor:			22.4%	25.0%	25.0%
Per ERC Minimum Sizing Requirements:			**1,276**	**236,215**	**647**

Peak Day Demand per ERC min. sizing requirement = 1,043 x (1 + 22.4%) =1,276

Average Annual Demand per ERC min. sizing requirement = 188,972 x (1 + 25%)=236,215

Equalization Storage per ERC min. sizing requirement = 518 x (1 + 25%) =647

*** **Not to exceed 25%.**

B.5 ERC Evaluation

Water usage from typical residential connections differs from the usage of commercial, church, government and other non-residential connections. To evaluate residential and non-residential connections on an equal basis, Equivalent Residential Connections (ERC's) are used to equate the

different types of connections. To determine residential and non-residential ERCs, ¾-inch residential connections in Roosevelt City were analyzed. All ¾-Inch connections were assumed to be residential. The total number of ¾-Inch connections was obtained from City records and are represented as residential ERC's. Non-Residential connections are all meters larger than ¾ inch. Annual usage for a single-family residential connection was calculated by taking the annual water use and dividing it by the number of residential connections. To convert non-residential connections to ERCs, the total water use by non-residential connections minus wholesale water was divided by the single-family residential connection use.

For Example:

Total 2018 residential connections water use:	295 MG/yr
Total 2018 residential connections:	2,079
Single-family residential connection use:	0.14 MG/yr (295 ÷ 2,079)
Total 2018 non-residential connections water use (less wholesale)	253 MG/yr
Total 2018 non-residential connections:	1,786 (253 ÷ 0.14)

The monthly peak water use for a ¾-inch residential connection in Roosevelt City in 2018 was approximately 0.47 gpm. The monthly peak non-residential connection in Roosevelt City used approximately 1.23 gpm in 2018. Equating one typical non-residential connection to a residential connection results in an average ERC of 2.7 (1.23/0.47=2.7 ERCs) for each non-residential connection.

Residential ERC: 1.0 ERCs
Non-residential ERC: 2.7 ERCs

Table B-4: Existing and Projected Roosevelt City Projected Water System ERCs

Description	2016	2017	2018	2045
Residential ERCs	2,032	2,066	2,079	3,434
Non-residential ERCs	1,165	1,244	1,786	2,260
Cedarview Montwell Special Service District (CMSSD)-wholesale water ERCs	83	83	83	83
Neola Water Improvement District (NWID)-wholesale water ERCs	233	233	233	233
Total ERCs	3,513	3,626	4,181	**6,010**

CMSSD and NWID ERC's don't change through the planning period, because the growth is minimal. CMSSD has the ability to tap the Victory Pipeline source from DCWCD in the future. NWID has expanded

the water system and are currently using its own source of water, but indicate that the connection to the Roosevelt system is still needed as a secondary source of culinary water in the future.

B.6 Projected Culinary Water Use

Utah State regulations require sources to be capable of meeting peak daily flows, storage to meet average daily flows, and the distribution system to meet peak instantaneous or peak day plus fire flows, whichever is greater.

A definition of the flows required by the City's culinary water system will be given in the following paragraphs. These flows will be used to determine culinary water improvements needed to meet the projected demands of population.

B.6.1 Average Yearly Flow:

The total quantity (in gallons) of drinking water produced for a public water system in a year based on data metered at sources, not at service meters of retail connections.

B.6.2 Peak Daily Flow:

Peak daily flow is the total source flow into the water system to meet the demand on the day of the highest consumption in a year.

B.6.3 Peak Instantaneous Flow:

Peak instantaneous flow is the maximum flow for any given hour during the year.

Peak instantaneous flow is the maximum flow for any given hour during the year. The Department of Drinking Water recommends using Equation (1) below from State Rule R309-510-9 to determine the peak instantaneous indoor flow within a system. The variable N in the equation is the total number of ERC's in the system; Q is in gallons per minute (gpm).

Equation (1) $Q=10.8N^{.64}$

From the projected population, Using 6,010 projected ERC's in 2045, it is estimated that approximately 5,326 gallons per minute (gpm) (6,010 x 1,276gpd/ERC) will be required to meet Peak Day flows. Peak Day Demand is larger than the peak instantaneous demand based on Equation (1), therefore it will be the governing condition. It is also projected that an average yearly demand of 3.89 million gallons per day (mgd) (236,215gpy/ERC x 6,010 ÷ 365) will be used for City culinary water usage in the year 2045. This would be much higher if pressurized irrigation systems were not installed, and residents did not have a separate means for outdoor watering.

From the projected population, the additional future number of culinary connections is determined along with the number of future ERC's. Using State design regulations and historical culinary demands, the future water demands, including average yearly, peak daily, and peak instantaneous demands, are projected through the planning period.

B.7 Recommended Culinary Water System Improvements

As a result of this study, recommendations were made for development of a Capital Improvement Plan (CIP). These projects are given as guidance for planning and budgeting to maintain a culinary water system that meets minimum levels of service and complies with DDW requirements. The recommendations are contained in Section B.16 of this Appendix.

B.8 Drinking Water Source Contingency Plan

Roosevelt City's Drinking Water Source Contingency Plan outlines actions to be considered if remedial action is required for Roosevelt City's culinary water supplies. It contains emergency response, rationing, water supply, decontamination, and source development plans. This plan is located in Appendix I.

B.9 Source Protection

Currently Roosevelt City gets its water from three (3) sources: 1) Hayden Wells, 2) Durigan Springs Well, and 3) purchased water from the Victory Pipeline, owned and operated by Duchesne County Water Conservancy District (DCWCD). Roosevelt City has submitted the Drinking Water Source Protection plans for its Hayden Wells as required by sections R309-600 and R309-605 of the Utah Administrative Code.

The Roosevelt City Water System receives its water from two major well fields approximately 10 miles north of the City, namely the Hayden and Durigan Springs well fields. Water is delivered through a steel 24-inch to 20-inch transmission line from the Hayden and Durigan Spring wells, following SR-121 through Neola to Roosevelt. Other sources include Campbell Well field and Hancock Cove Wells. Currently, only the Hayden Wells and Durigan Springs Well are active in the system.

B.10 Projected Number of Water Connections

The projected number of new residential water connections is determined using the growth projection numbers as described in Chapter 1. The residential connections are assumed to increase at the same rate as population growth.

B.11 Projected Areas of Development

To relate the projected population to the improvements needed to serve them, the areas expected to be developed also need to be determined. The areas projected to be developed by the increased population are determined based upon the existing zoning regulations, available land within City limits, and land slated for annexation.

City officials have discussed and described where development will take place, and how it will take place. It is largely based on the land use; refer to Future Land Use Map (see Figure 2-1 in Chapter 2).

As discussed in the introduction of this Appendix, to determine future impacts to the water system, it is estimated that of the population increase from 2019 to 2045, the majority of the existing vacant parcels near the central part of town will be filled. The remaining population will be distributed to the following locations with their respective percentages: The Cove, Southtown, and N. Crescent at 45%, 35%, and 20%.

B.12 System Losses

Distribution systems have inherent losses that are functions of the size of pipe, joint construction, temperature, and age of the system. Typical municipal systems lose as much as 10 to 25 percent of the water flowing through the system. This is based on the total yearly flow metered at the sources compared to the total yearly amount of water billed to Roosevelt City residents. It is recommended that the City perform leak tests on major water lines in an effort to find and correct losses through pipes. It is also recommended that the SCADA system, control valves, and metering for the water system continue to be checked and monitored for accuracy and proper functioning to further minimize system losses.

B.13 Fire Flow

Roosevelt City has adopted the Uniform Fire Code to determine the fire flows required for buildings within the City. The fire code determines the size and duration of flow that will be required. The amount of fire flow required for a building is based on the type of construction, square footage, and distance from other buildings.

For the purpose of this study fire flows will be calculated using a minimum of 1,000 gpm for 2 hours.

B.14 Summary of Projected Water Flows

Total projected water use through the year 2045 includes calculations based on actual culinary water usage, and on fire flow requirements. Average Yearly usage per ERC is based on the highest actual quantity (in gallons) of water produced for Roosevelt City's water system over the last 3 years (2016-2018), divided by the current existing ERC's; a variability factor shall be applied to this value. The usage is based on data metered at sources, not at service meters of retail connections. Peak Day usage per ERC is calculated by taking the highest system consumption day of the year over the last 3 years divided by the current existing ERC's, with a variability factor applied to the value.

B.14.1 Bulk Water

The City provides bulk water for purchase by Contractors, oil and energy companies and residents to fill water trucks and tanks. The City provides a ¾ inch connection in the industrial area near 2000 West Hwy 40, for this purpose. The connections were included in the demands, and were assigned an ERC value to equate the average demands into the model based on the evaluation as described in Section B.5.

B.14.2 Water Purchased by Energy Industry

The City does occasionally allow oil and energy companies to purchase water from its system by means other than purchase at the fill station. This is accomplished by pulling water from the City's water lines at a specifically requested location. Hydraulic analysis was performed to see the impacts that this would have on the City's system. It is recommended that customer's LOS remain as defined in Section B.3. To maintain this level of service it was determined that no more than 800 gpm should be drawn from the City's culinary water system during peak day demand. At 2.7 non-residential ERC's per 1 residential ERC, this equates to 333 ERCs. This has been applied to the demands and included in the hydraulic model.

As an example, Axia Energy (Axia) recently contacted the City and requested the ability to draw water from the end of the 8-inch line on 1000 North near 3500 West. The resulting flow at a 20 psi residual limitation is well over 1,000 gpm, however Axia should not be allowed to draw water from the culinary system at this flowrate with a residual pressure constraint of 20 psi because this is for emergency fire conditions only. Minimum static pressure level of service (LOS) is 60 psi, so this should be the minimum pressure that the system should be held at under normal conditions, and the minimum pressure that residences and businesses should expect. The model was executed setting the residual pressure at 60 psi at service locations, and the resulting allowable flowrate that could be delivered to Axia at 1000 North 3500 West was approximately 800 gpm. This is similar at other locations. This could be accomplished with a flow control valve set at an upper limit of 800 gpm. A pressure sustaining valve could also be installed, which would likely allow more flow during non-peak times, however there would be the risk of limited flow to Energy Companies during times of high demand.

It is recommended that as the City allow heavy demand from its system from oil and energy companies, that a flow control valve be installed to guarantee no more than 800 gpm. It is also recommended that no water be made available for oil and energy companies during emergency fire conditions if system hydrants had to be activated.

The static pressure at 1000 North near 3500 West is 76 psi, and the calculated residual pressure, at a demand of 800 gpm, at that location is 60 psi.

B.14.3 Neola Water Improvement District

NWID has the ability to purchase water from Roosevelt City, taking water from Roosevelt City's 24-inch transmission line where it passes through the Town of Neola. NWID recently constructed improvements that has allowed them the ability to develop some springs they have rights to, and supply their customers with their own water supply, however, as is evident from City meter records, they still do occasionally use water from Roosevelt City's system. Representatives from NWID have been contacted regarding future use of Roosevelt's system, and they have indicated that they would like, as a backup and secondary source to continue to have the ability to take water from Roosevelt's 24-inch transmission line. For this reason, NWID demands were included in this study assigned to an ERC value that equates to 233. Little growth is expected in this area, therefore the same amount of ERC's are used now and for the future.

B.14.4 Cedarview Montwell Special Service District

CMSSD purchases water from Roosevelt City for its customers. They take water at two locations: 1) at the City's 24-inch transmission line to fill a tank at SR 121 and approximately 5000 North, and 2) at 4000 North and 3000 West. DCWCD has provided a turnout off of Victory Pipeline (Victory) for CMSSD, but CMSSD has not yet made a connection. DCWCD does however provide water to CMSSD, from Victory, through a Wheeling agreement via Roosevelt City. This agreement basically means that Roosevelt City on behalf of DCWCD supplies a portion of CMSSD's water system with water from Victory that the City takes from DCWCD at their active turnout off of Victory. CMSSD demands were included in this study and assigned to an ERC value that equates to 83 which is based on the existing number of CMSSD customers connected to its culinary water system. Little growth is expected in the area, therefore the same amount of ERC's are used now and for the future.

B.15 Culinary Water System and Level of Service

Roosevelt City's present culinary water system's capacity and LOS was checked by analyzing the source, storage, and distribution systems. Roosevelt City has used the State's minimum sizing requirements for water facility design and operation per Rule R309-510 to determine their minimum LOS; but with this masterplan will use the actual historical water use data which the State of Utah is presently trying to implement for site specific water systems. Future improvements need to maintain an acceptable LOS determined and recommended to maintain the capacity to meet the projected population's demands. This section describes the present system, design parameters, and recommendations for needed improvements.

B.15.1 Sources

Roosevelt City's culinary water system is presently served by five wells at the Hayden well site, from Durigan Springs Well, and from the Duchesne Valley Water Treatment Plant (DVWTP). DVWTP delivers treated water via the Victory Pipeline that is owned and operated by DCWCD.

The status of these source capacities were evaluated by analyzing water rights, amount of water physically provided, and peak daily flow requirements (Section B.15.1.3).

B.15.1.1 Water Rights

Some of the water used by Roosevelt City is obtained from Hayden wells that have municipal water rights. Water rights state the legal amount of water the City has the right to access. State regulations require that the City's water sources be legally and physically capable of meeting peak daily flows. Roosevelt City presently has 31 approved water rights. Twelve (12) of those rights are tied to the Hayden Wellfield and are highlighted in Table B-5; Four (4) of those rights are tied to the Durigan Springs Well and are highlighted in blue.

Table B-5: Roosevelt City's Water Rights

Water Right	Application/ Claim Number	Type/Status	Priority Date	Flow (cfs)	Quantity (acft)	Source
43-10495	A68337	Approved	11/3/1994		3.73	Underground Water Well
43-10496	A68338	Approved	11/3/1994		3.73	Underground Water Well
43-3035	A546	Certificated	9/27/1905	1.7	833.26	Uinta River
43-3160	A7409	Certificated	2/20/1928	0.029	21.00	Blackhawk Spring
43-3280	A15347	Certificated	7/9/1943	0.5	361.98	Underground Water Well
43-3607	A32695	Certificated	2/8/1961	2	1,447.93	Underground Water Well
43-7237	A39934	Certificated	4/28/1970	3	728.40	Underground Water Well
43-7253	A41738	Certificated	8/30/1972	4	809.00	Underground Water Well
43-7300	A42010	Water User's Claim	12/11/1972	3	1,273.39	Underground Water Well
43-8369	A30461b	Certificated	12/3/1958	1.59	480.00	Underground Water Well
43-8370	A32113b	Certificated	7/7/1960	3	803.64	Underground Water Well
43-1111	A31879	Certificated	4/21/1961	0.156	112.92	Underground Water Well
43-3396	A20609	Certificated	10/17/1951	0.022	15.90	Underground Water Well
43-3409	A21747	Certificated	5/29/1951	0.849	614.65	Underground Water Well
43-3512	A26133	Certificated	12/10/1954	3	2,171.90	Underground Water Well
43-3581	A30216	Certificated	9/10/1958	1.923	480.00	Underground Water Well
43-3880	U1657	Certificated	1/6/1936	0.033	23.89	Underground Water Well
43-3881	U1658	Underground Water Claim	7/10/1929	0.067	48.42	Underground Water Well
43-3882	U1659	Underground Water Claim	4/15/1934	0.076	54.92	Underground Water Well
43-3883	U1660	Underground Water Claim	7/26/1914	0.036	26.03	Underground Water Well
43-3884	U1661	Underground Water Claim	6/16/1934	0.223	161.16	Underground Water Well
43-3889	U1874	Underground Water Claim	8/10/1929	0.045	32.58	Underground Water Well
43-3890	U1875	Underground Water Claim	6/12/1926	0.06	43.36	Underground Water Well
43-3891	U1876	Underground Water Claim	4/20/1927	0.134	96.84	Underground Water Well
43-3892	U1877	Underground Water Claim	8/30/1930	0.011	7.95	Underground Water Well
43-3893	U1878	Underground Water Claim	6/8/1929	0.056	40.47	Underground Water Well
43-493	A28684	Certificated	11/10/1956	0.274	198.37	Underground Water Well
43-495	A30994	Certificated	5/11/1959	0.602	435.00	Underground Water Well
43-496	A30994	Water User's Claim	5/11/1959	0.602	435.00	Underground Water Well
43-7655	A30461a	Certificated	12/3/1958	1.77	720.00	Underground Water Well
43-8799	A358	Certificated	1861	0.244	89.10	Underground Water Well

Roosevelt City water rights are a combination of flow and volume rights. Flow rights for municipal use allow the City to use that amount of flow year round, as long as the maximum volume right is not exceeded. Volume rights may or may not have a maximum flow rate associated with them but the total volume the City can utilize is set by the maximum acre-feet (ac-ft) value of the water right over the usage period.

B.15.1.2 Source Capacity Requirements

Utah State Public Drinking Water rules (R309-510) require that a source provide sufficient supply of culinary water to meet Peak Day Demands and Average Yearly Demands.

B.15.1.3 Source Capacity

Roosevelt City currently has three sources of water to meet its culinary water demands; Hayden Wellfield, Durigan Well, and Victory Pipeline. Table B-6 lists the current pump capacity, source capacity, and water right quantity associated with each source. These sources are required to be capable of meeting the Peak Day and Average Yearly demand conditions. Roosevelt City's maximum actual Peak Day demand in the last 3 years occurred in 2018 at a rate of 2,800 gpm (12.37 AC-FT/day). The maximum annual use in the last 3 years also occurred in 2018 at 2,242 AC-FT. The values for 2,800 gpm and 2,242 AC-FT do not include delivery to NWID and CMSSD, or system-specific variability factor.

Hayden Well Field is capable of delivering 6,250 gpm or 10,081 ac-ft, but the City water rights only include up to 7,773 ac-ft or 4,819 gpm. According to DCWCD officials, Victory Pipeline is capable of delivering, for Roosevelt City, up to 744 gpm or 1,200 ac-ft. Durigan Springs Well is capable of producing over 2,000 gpm, but the City water rights only include up to 2,114 ac-ft or 1,311 gpm. The total current capacity is 6,874 gpm or 11,087 ac-ft according to water rights or DCWCD allocation. While the current capacity is more than adequate to satisfy the projected Average Yearly demand, additional capacity may be needed by the year 2045 to meet future Peak Day Demands, and the sources should be analyzed.

Table B-6: Individual Source Capacity Data

Description	Source Capacity		Existing Water Right/Allocation
	gpm	ac-ft	ac-ft
Hayden Well #1	1,220	1,968	7,773
Hayden Well #2	1,185	1,911	
Hayden Well #3	1,860	3,000	
Hayden Well #4	865	1,395	
Hayden Well #5	1,120	1,807	
Durigan Springs Well	2,110	3,403	2,114
Victory	744	1,200	1,200
Totals	**9,104**	**14,685**	**11,087 (6,874 gpm)**

Table B-7 shows a summary of the additional capacity that will be required from City sources in the future. As mentioned above, the peak day demand value of 2,800 gpm (12.37 AC-FT/day) does not include delivery to NWID and CMSSD, because the peak day demand calculation does not include wholesale water; in addition, the system-specific variability factor isn't applied. The calculations in Table B-7 do, however, include projected delivery to NWID and CMSSD, and the system-specific

variability factor. As can be seen from the table the City has enough source capacity to provide water to its system.

Table B-7: Source Capacity Needs Summary

Year	Total ERCs	Peak Day Demand (gpd/ERC)	Peak Day (gpm)	Current Capacity (gpm)	Remaining Capacity (gpm)	Average Yearly Demand (gpy/ERC)	Average Yearly (ac-ft)	Current Capacity (ac-ft)	Remaining Capacity (ac-ft)
2016	3,513	1,276	3,113	6,874	3,761	236,215	2,546	11,087	8,541
2017	3,626	1,276	3,213	6,874	3,660	236,215	2,628	11,087	8,459
2018	4,181	1,276	3,705	6,874	3,168	236,215	3,031	11,087	8,056
2045	**6,010**	**1,276**	**5,326**	**6,874**	**1,548**	**236,215**	**4,357**	**11,087**	**6,731**

B.15.1.4 Drinking Water Source Protection Program

The State Division of Drinking water requires all culinary water sources to have Drinking Water Source Protection Plans in place. The City has source protection plans in place for its existing sources that it has rights to. Horrocks Engineers updated the plan in 2018 and they were approved by the State of Utah.

B.15.2 Storage

B.15.2.1 Storage Requirements

State Drinking Water Rules recommend providing storage consisting of three components: 1) operational or equalization storage, 2) fire suppression storage, and 3) emergency storage.

Operational storage is sized for the Average Yearly demand and is sized based on the actual highest source demand over the last 3 years with the addition of the variability factor. The result of this is 647 gallons per ERC.

Fire suppression storage is based on the flow rate and duration required by the local fire department. Currently the fire department has indicated, that for planning purposes, 120,000 gallons (1,000 gpm for 2 hours) is acceptable.

Local fire Authority:	Roosevelt Fire Department
Fire Chief:	Lee Rockwood
Location:	255 South State Street, Roosevelt
Phone:	435-722-2754

B.15.2.2 Available Storage

Roosevelt City presently has 4 active storage reservoirs in the culinary system with a total capacity of 5.3 MG (Table B-8).

Table B-8: Roosevelt City Reservoirs

Name	Capacity (MG)	Type
Hayden	0.3	Concrete Circular
Page Bench	1	Concrete Circular
*Cove	1	Concrete Circular
SR 121	2	Concrete Circular
TOTAL	4.3	

*The Cove Tank is a 2 MG tank owned and operated by DCWCD, with 1 MG of storage capacity provided for Roosevelt City's system.

Each tank requires 120,000 gallons of fire storage, therefore since there are 4 tanks, the total required fire storage is 480,000 gallons.

Table B-9 summarizes existing and future storage requirements, and reveals that the amount of storage required will have surpassed the amount of storage available by 2045. For this reason, it is recommended that the Hayden Tank storage be increased from 0.3 MG to 2 MG to account for the lack of storage in 2045. It is important to point out that the recommendation to replace the existing 0.30 MG Hayden Tank with a 2 MG Tank is not just an available storage issue; the existing Hayden Tank is also old and in need of replacement.

Table B-9: Storage Capacity Projections

Storage Capacity							
Year	**ERC**	**Operational Storage (gal/ERC)**	**Operational Storage (MG)**	**Fire Storage (MG)**	**Required Storage (MG)**	**Available Storage (MG)**	**Remaining Storage (MG)**
2016	3,513	647	2.27	0.48	2.75	4.30	1.55
2017	3,626	647	2.35	0.48	2.83	4.30	1.47
2018	4,181	647	2.71	0.48	3.19	4.30	1.11
2045	6,010	647	3.89	0.48	4.37	4.30	(0.07)

B.15.3 Distribution System

The capacity of Roosevelt City's existing distribution system will be discussed in this section. Improvements will then be recommended to meet the projected water demand in areas of future development. Figure B-3a and B-3b shows the existing distribution system.

B.15.3.1 Distribution System Requirements

State of Utah Drinking Water rules require the distribution system be able to meet the peak instantaneous demand or Peak Day demands plus fire flow, and still maintain a minimum of 20 psi at all connections within the system. For Roosevelt City, it turns out that Peak Day plus fire is the governing condition.

B.15.3.2 Computer Model of Culinary Water System

The Bentley WaterGems CONNECT Edition computer program was used to model Roosevelt City's water system. The program requires that all pipes, elevations at intersections, wells, tanks, sources, well pumps, booster pumps, and pressure reducing valves (PRV) be entered into the model as they are constructed. System demands are then entered in. The program calculates static pressure throughout the system based on the given elevations. Available fire flows can also be determined. The program determines the available fire flows at various locations based on the user defined parameters, such as required flow and residual pressure. An extended period simulation was also run to monitor the entire system through a given time period. Tanks, pumps, pipes, demand nodes, and other system elements are modeled and can be graphed through the time period.

After the model is run and problem areas are defined, improvements can be modeled to bring the system up to the minimum LOS. Determining which improvements in the system will bring the system up to the minimum LOS in the most economical manner is an iterative process.

The following scenarios were modeled for Roosevelt City's culinary water system:

1. *Fire flow and 24 hour extended period simulation for existing conditions*
2. *Fire flow and 24 hour extended period simulation for ultimate build-out conditions*

The existing water system was modeled. Refer to Figure B-1 which illustrates existing service areas. The areas that are nearing minimum LOS were identified. Improvements were determined that would allow minimum fire flows and pressures to be preserved throughout the existing system. These improvements are recommended and listed in Section B.16. The improvements and their corresponding location are also shown in Figures B-4, B-5, B-6a, and B-6b.

Roosevelt City's General Plan Land Use map along with the Zoning Ordinance, Title 17 of the Roosevelt City Municipal Code, were used to aid in the determination of future development densities. The projected number of ERC's in undeveloped areas were in turn identified. Refer to Figure B-2 which illustrates future service areas. The additional demand projected for undeveloped areas was added to the present demand. From this information, the planning period water system was modeled, and the future improvements were identified to provide the fire flows and pressures to maintain the culinary water LOS in Roosevelt City.

It is recommended that the City perform updates to its water model as new developments and new construction produce new water lines, so that the water model stays current during the planning period.

B.16 Distribution System Recommendations

The entire culinary water system was modeled for both present and projected populations for instantaneous conditions with fire flow demand, and a 24-hour extended period simulation. Roosevelt City's existing storage capacity is presently adequate for average daily flows and fire flows.

Recommended improvements and estimated costs are listed in Table B-10. The costs of the improvements include construction costs, engineering costs, legal and administrative fees and contingencies. The total estimated cost for recommended improvements is **$45,385,081.** Table B-10 lists each project by priority and contains an associated estimated cost.

Table B-10: Estimated Cost of Roosevelt City's Capital Improvement Projects – Culinary Water

Proj. No.	Project Description	Total Estimated Cost	Priority	Improvement Period
1	Radio Read Tower	$45,610	Medium	11-15 year
2	Reconstruct Page Bench Tank	$596,632	Medium	11-15 year
3	Cedarview Tank Bypass	$191,263	Low	16-25 year
4	2 MG Tank Repair	$278,272	Medium	11-15 year
6	400 North (400 East to 600 East) 8-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$195,000	Highest	1-5 year
7	500 North (400 East to 600 East) 8-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$195,000	Highest	1-5 year
8	500 North (State Street to 100 East) 8-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$107,250	Highest	1-5 year
9	Lagoon St (300 East to 500 East) 8-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$195,000	Highest	1-5 year
10	100 South (300 East to 500 East) 8-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$195,000	Highest	1-5 year
11	300 North (300 West to 200 West) 8-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$107,250	High	6-10 year
12	Lagoon St (State Street to 200 East) 10-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$195,000	High	6-10 year
13	Lagoon St (Skyline Drive to 400 West) 10-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$341,250	High	6-10 year
14	Lagoon St (1000 West to Skyline Drive) 8-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$234,000	High	6-10 year
15	Bonnie Drive 200 North 1000 West 8-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$353,925	High	6-10 year
16	Skyline Drive (200 North to 200 South) 8-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$409,500	High	6-10 year
17	300 West (300 North to 200 North) 8-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$107,250	High	6-10 year
18	200 West (400 North to 200 South) 8-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$575,250	High	6-10 year
19	100 West (300 North to 100 North) 8-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$195,000	High	6-10 year

Proj. No.	Project Description	Total Estimated Cost	Priority	Improvement Period
20	100 East (400 North to 100 North) 8-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$258,375	Highest	1-5 year
21	State Street (Lagoons St. to 300 South) 8-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$302,250	High	6-10 year
22	300 East (200 North to 100 South) 8-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$302,250	Highest	1-5 year
23	400 East (100 North to 125 South) 8-Inch Transite Line Replacement with C-900 DR-18 PVC Pipe	$214,500	Highest	1-5 year
24	1500 North (Page Bench Tank to SR 121) Replace Existing 18" Brittle with C-905 DR-18 PVC Pipe	$487,500	High	6-10 year
25	1700 South Industrial Park; Upgrade 2-Inch to 8" C-900 DR-18 PVC Pipe	$199,875	Medium	11-15 year
26	1760 South Industrial Park; Upgrade 4-Inch to 8" C-900 DR-18 PVC Pipe	$195,000	Medium	11-15 year
27	SR 121 Replacing aging 20-Inch Pipe with C-905 DR-18 PVC Pipe-Phase 1	$2,632,500	Highest	1-5 year
27	SR 121 Replacing aging 20-Inch Pipe with C-905 DR-18 PVC Pipe-Phase 2	$2,632,500	High	6-10 year
27	SR 121 Replacing aging 20-Inch Pipe with C-905 DR-18 PVC Pipe-Phase 3	$2,632,500	Medium	11-15 year
28	Summerall Lane (200 North to Highway 40); Upgrade 4-Inch to 8" C-900 DR-18 PVC Pipe	$877,500	Medium[2]	11-15 year
29	1000 North (North Crescent Road to 1500 East); Upgrade 4-Inch to 8" C-900 DR-18 PVC Pipe	$1,033,500	Medium[2]	11-15 year
30	2000 North (1500 East to 2000 East); Upgrade 6-Inch to 8" C-900 DR-18 PVC Pipe	$536,250	Medium[2]	11-15 year
31	1500 East (2250 North to 3000 North); Upgrade 4-Inch to 8" C-900 DR-18 PVC Pipe	$1,228,500	Medium[2]	11-15 year
32	3000 North (North Crescent Road to 1450 East); Upgrade 6-Inch to 8" C-900 DR-18 PVC Pipe	$823,875	Medium[2]	11-15 year
33	Bryon Drive (North Crescent Road to 1450 East); Upgrade 6-Inch to 8" C-900 DR-18 PVC Pipe	$823,875	Medium[2]	11-15 year
34	4000 North (1000 West to North Crescent Road) 8-Inch C-900 DR-18 PVC Pipe	$2,113,476	Low	16-25 year
35	Page Bench from 3000 West to Page Bench Tank; 8-Inch C-900 DR-18 PVC Pipe	$2,203,500	Low[2]	16-25 year
36	2500 West (North Cove Road to 600 South); 8-Inch C-900 DR-18 PVC Pipe	$2,086,500	Medium[2]	11-15 year
37	400 South (3000 West to 2500 West); 8-Inch C-900 DR-18 PVC Pipe	$507,000	Low[1]	16-25 year
38	Stone Gate to Summerall Lane; 8-Inch C-900 DR-18 PVC Pipe	$1,560,000	Low[1]	16-25 year
39	1000 South to 2000 West; 8-Inch C-900 DR-18 PVC Pipe	$780,000	Low[1]	16-25 year
40	3000 West (1700 South to 1200 South); 8-Inch C-900 DR-18 PVC Pipe	$297,375	Low	16-25 year
41	Pole Line Road (1000 West to State Street); 8-Inch C-900 DR-18 PVC Pipe	$1,033,500	Low[2]	16-25 year

Proj. No.	Project Description	Total Estimated Cost	Priority	Improvement Period
42	1200 South (1000 West to State Street); 8-Inch C-900 DR-18 PVC Pipe	$1,033,500	Low[1]	16-25 year
43	Pole Line Road (State Street to 525 East); 12-Inch C-900 DR-18 PVC Pipe	$526,500	Low[2]	16-25 year
44	1200 South (100 East to 500 East); 8-Inch C-900 DR-18 PVC Pipe	$316,875	Low[1]	16-25 year
45	425 South (200 West to Rodeo Drive); 8-Inch C-900 DR-18 PVC Pipe	$132,600	Low[2]	16-25 year
46	200 South (100 East to 500 East); 8-Inch C-900 DR-18 PVC Pipe	$156,975	Low	16-25 year
47	600 North (750 East to Union Street); 8-Inch C-900 DR-18 PVC Pipe	$229,125	Low[1]	16-25 year
48	SR 121 (Hillcrest Drive to 790 North); 8-Inch C-900 CR-18 PVC Pipe	$789,750	Low[1]	16-25 year
49	Smith Lane (500 West to SR 121); 8-Inch C-900 CR-18 PVC Pipe	$511,500	Low[2]	16-25 year
50	1500 East (1000 North to 1800 North); 8-Inch C-900 CR-18 PVC Pipe	$1,053,000	Medium[2]	11-15 year
51	2500 South (State Street to 525 East); 8-Inch C-900 CR-18 PVC Pipe	$518,700	Low[1]	16-25 year
52	1000 West (1200 South to Pole Line Road); 8-Inch C-900 CR-18 PVC Pipe	$653,250	Low[1]	16-25 year
53	500 West (1200 South to Pole Line Road); 8-Inch C-900 CR-18 PVC Pipe	$653,250	Low[1]	16-25 year
54	300 East (Pole Line Road to 2500 South); 8-Inch C-900 CR-18 PVC Pipe	$515,580	Low[1]	16-25 year
55	525 East (Pole Line Road to 2500 South); 8-Inch C-900 CR-18 PVC Pipe	$515,580	Low[1]	16-25 year
56	500 West (815 South to 1200 South); 8-Inch C-900 CR-18 PVC Pipe	$326,625	Low[1]	16-25 year
57	Rodeo Drive (815 South to 1200 South); 8-Inch C-900 CR-18 PVC Pipe	$326,625	Low[1]	16-25 year
58	815 South (500 West to Rodeo Drive); 8-Inch C-900 CR-18 PVC Pipe	$268,125	Low[1]	16-25 year
59	500 West (200 South to 700 South); 8-Inch C-900 CR-18 PVC Pipe	$550,875	Medium[2]	11-15 year
60	Rodeo Drive (200 South to 675 South); 8-Inch C-900 DR-18 PVC Pipe	$1,070,985	Low[2]	16-25 year
61	600 East (350 South to 800 South); 8-Inch C-900 CR-18 PVC Pipe	$625,230	Low[1]	16-25 year
62	300 West (Smith Lane to 575 North); 8-Inch C-900 CR-18 PVC Pipe	$361,934	Low[2]	16-25 year
63	Union Street (700 North to 400 North)	$263,250	Low[1]	16-25 year
64	700 North (600 East to Union Street)	$326,625	Low[1]	16-25 year
65	Gales Acres PRV	$150,000	Low	16-25 year
66	Summerall Lane PRV	$150,000	Medium[2]	11-15 year

Proj. No.	Project Description	Total Estimated Cost	Priority	Improvement Period
67	Stone Gate PRV	$150,000	Low[1]	16-25 year
68	North Crescent PRV	$150,000	Medium	11-15 year
69	Page Bench PRV	$150,000	Low[2]	16-25 year
70	150 North PRV	$150,000	Medium	11-15 year
71	Gates Drive PRV	$150,000	Medium	11-15 year
72	2 MG Hayden Tank Upsize	$2,052,370	Highest	1-5 year
73	Maintenance Free Load Shack	$125,000	Low	16-25 year
74	Upgrade Burdick PRV Station	$90,400	Low	16-25 year
75	Replace Hayden Well Backflows	$61,300	Medium	11-15 year
	Total CIP Projects Estimated Construction Costs	**$45,385,081**		
	Approximate CIP Costs Per Year (to 2045)	**$1,745,580**		

[1] Denotes 100% developer driven.

[2] Denotes partial developer driven (ie improvement provides for development, but also provides service to existing residences).

B.17 Funding Sources

Funding Options include but are not limited to NRCS funding. NRCS are currently being explored as potential source of funding for the transite line replacement. Permanent Community Impact Board (PCIB) and State of Utah Division of Drinking Water (DDW) State Revolving Fund are also possible funding sources. Federal and State agencies are often charged with administering funds to assist in planning, design, and construction of many projects and typically notify City officials when these funds become available. The City should consider applying for funds to address the recommendations outlined in this masterplan as the funds become available.

B.18 Developer Contribution

The City should have a policy that developers are responsible for 100 percent of the cost of on-site improvements needed to serve their development. Developers are also responsible for extending any off site services needed to serve their development. However, developer reimbursement for a portion of these costs may be available through reimbursement agreements if the facilities have previously been identified in this Master Plan.

The City's policy for culinary water lines is to reimburse the incremental over-sizing cost for lines if they are larger than 8-inches, unless the oversized line is needed specifically to meet the demands of the development. It is recommended that the City periodically perform an analysis to see if the future outlook shows the likelihood of developments that require developer reimbursements to account for oversized lines. If so, this reimbursement fund should be included in the culinary water budget. The requirement to over-size the line was likely to meet the demands of other developments as well. The

City can recover the cost through development agreements, requiring that other developments, who will benefit by connecting to the oversized line, pay a portion of the incremental over-sizing cost.

If multiple developments, that are slated to be built around the same time period, require the same line installation to service their development, all should be required to participate in the cost of the installation. The latter developments can reimburse the development that installed the line, implemented through development agreements.

As stated in the executive summary, it is estimated that of the 11-15 year improvements $4,444,219 would be developer driven, therefore should be paid for by developers. The estimated developer contributions for the 16-25 year improvements is estimated at $14,250,187.

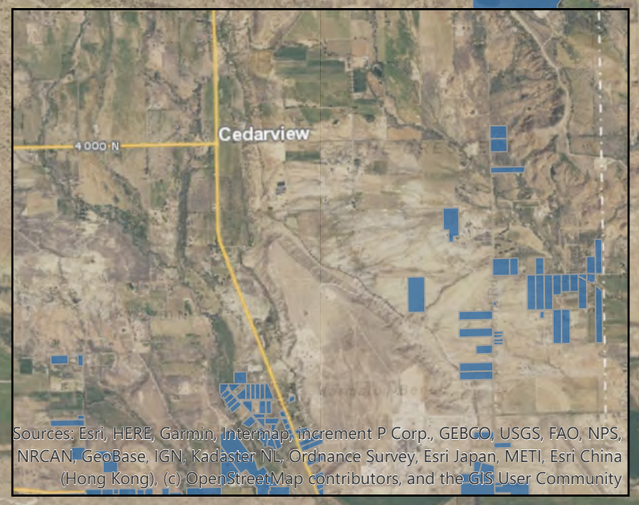
Impact fees can be collected with new development projects to help pay for the costs of providing public services to new development. The collection and use of impact fees are governed by Utah Law – UC11-36-202(1)(a)(ii). It is recommended that Roosevelt perform a culinary water impact fee analysis and institute a culinary water impact fee as part of new development.

B.19 Project Maps

Figure B-1 **Existing Service Parcels – Culinary Water**
Figure B-2 **Proposed Service Parcels – Culinary Water**
Figure B-3a **Existing Culinary Water**
Figure B-3b **Existing Culinary Water**
Figure B-4 **Existing and Replaced Culinary Water**
Figure B-5 **Existing and Upgraded Culinary Water**
Figure B-6a **Existing and Proposed Culinary Water**
Figure B-6b **Existing and Proposed Culinary Water**

EXISTING WATER SERVICE PARCELS

- EXISTING COMMERCIAL SERVICE PARCEL
- EXISTING INDUSTRIAL SERVICE PARCEL
- EXISTING INSTITUTIONAL CHURCH SERVICE PARCEL
- EXISTING INSTITUTIONAL SCHOOL SERVICE PARCEL
- EXISTING PARK SERVICE PARCEL
- EXISTING RESEARCH AND TECHNOLOGY SERVICE PARCEL
- EXISTING SERVICE PARCEL



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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Figure B-1 Existing Service Parcels - Culinary Water

Roosevelt City

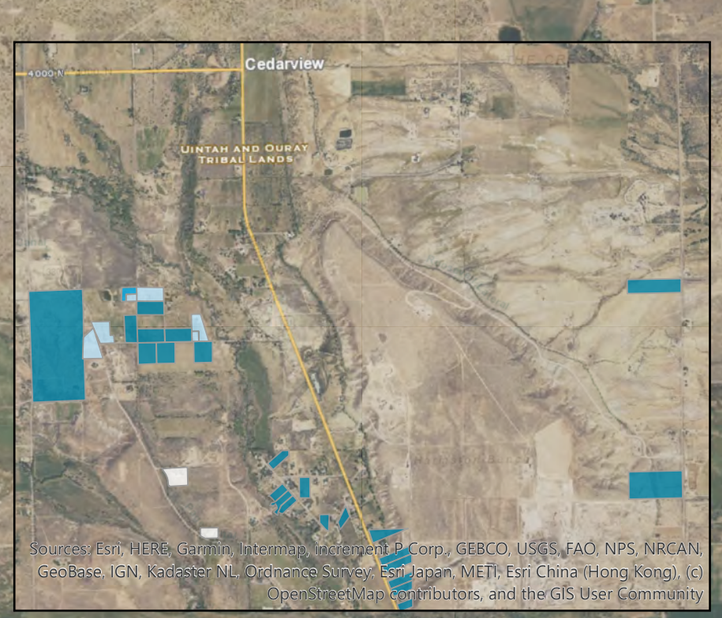
0 0.25 0.5 1 Miles

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PROPOSED WATER SERVICE PARCELS

- NONVACANT RESIDENTIAL PARCEL TO ADD COUNTY WATER
- NONVACANT RESIDENTIAL PARCEL
- VACANT COMMERCIAL PARCEL
- VACANT MANUFACTURING PARCEL
- VACANT RESIDENTIAL PARCEL
- VACANT RESIDENTIAL PARCEL TO ADD COUNTY WATER



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Figure B-2 Proposed Service Parcels - Culinary Water

Roosevelt City

0 0.25 0.5 1 Miles

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Hayden Wells and
Hayden Tank
(0.3 MG)

Durigan Wells

SR-121 Tank
(2 MG)

Page Bench
Tank (1 MG)

Abandoned
Tank

Cove Tank
(2 MG)

Bulk Water
Fill Station

Existing Culinary Water

- 2"
- 4"
- 6"
- 8"
- 10"
- 12"
- 16"
- 18"
- 20"
- 24"
- 36"

JWID Water Lines

Existing System Features

- PRV / Station
- Bulk Water Fill Station
- Tank

Pressure Zones

- Transmission Zone
- HGL - 5278
- HGL - 5307
- HGL - 5380
- HGL - 5396

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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Figure B-3a Existing Culinary Water

Roosevelt City

0 1.5 3 Miles

N

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SR-121 Tank
(2 MG)

Page Bench
Tank (1 MG)

Abandoned
Tank

Cove Tank
(2 MG)

Bulk Water
Fill Station

Cedarview

Roosevelt

Ballard

Loka

UINTAH AND OURAY TRIBAL LANDS

Roosevelt Municipal Airport

Roosevelt Golf Course

Bal Park

Montes Creek Reservoir

Butcher Knife
4268 Feet

Bluebell Rd

4250 N

Dry Gulch Creek

Dip Gulch Creek

Lateral

DITCHES NOT COUNTED IN MAP COUNT

EXISTING CULINARY WATER

- 2"
- 4"
- 6"
- 8"
- 10"
- 12"
- 16"
- 18"
- 20"
- 24"
- 36"
- – – JWID WATER LINES

EXISTING SYSTEM FEATURES

- PRV / STATION
- BULK WATER FILL STATION
- TANK

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), © OpenStreetMap contributors, and the GIS User Community

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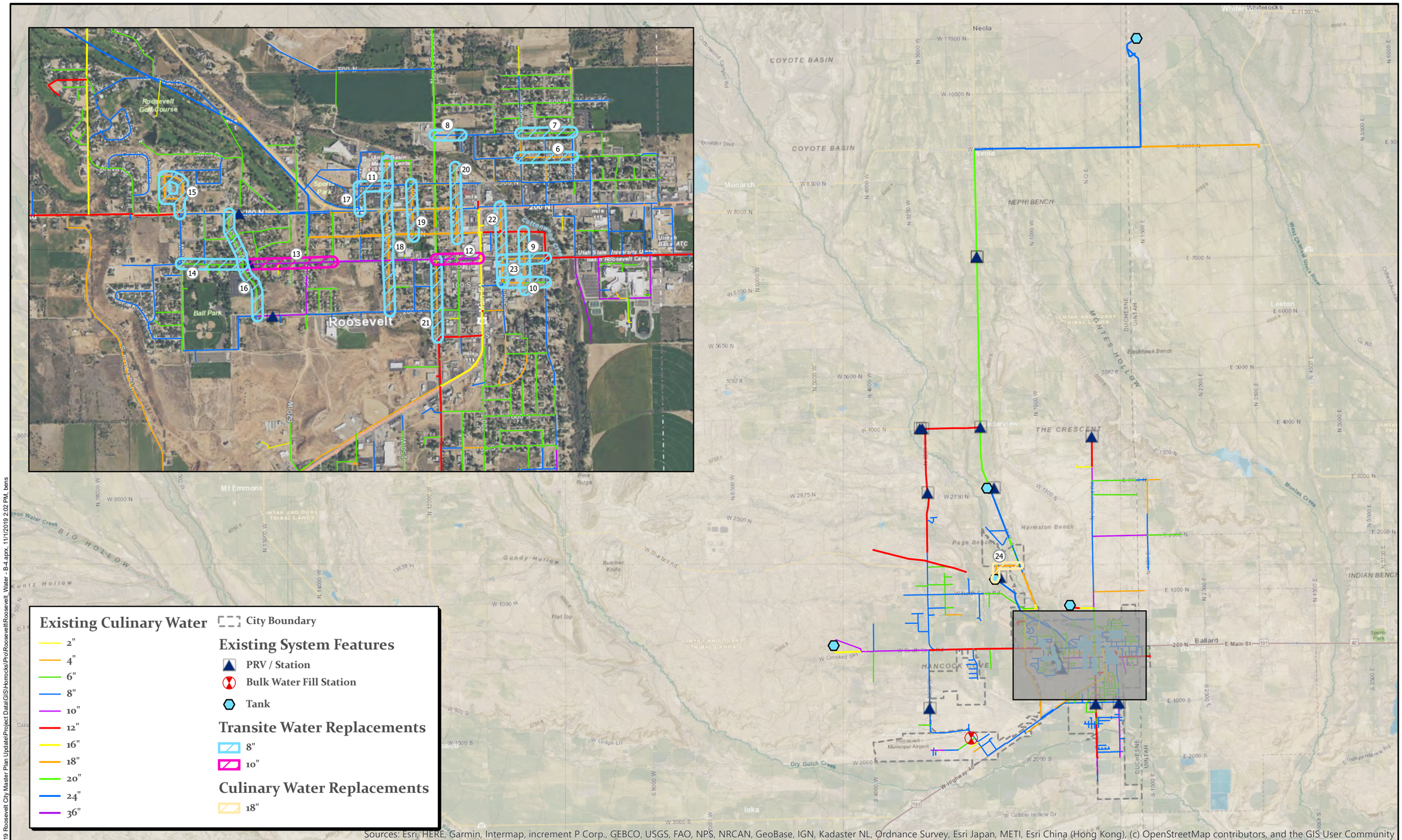
Fig B-3b Existing Culinary Water

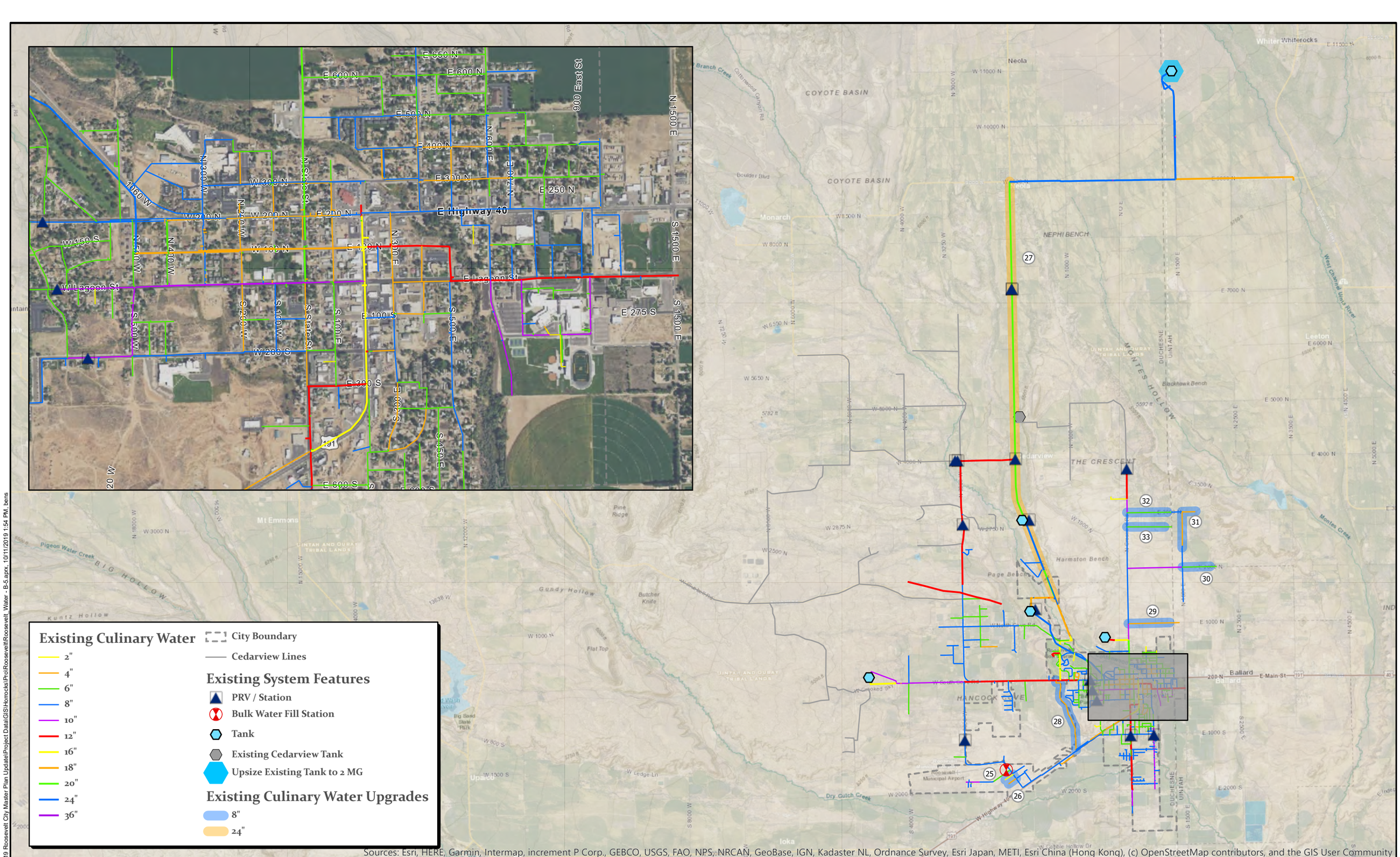
Roosevelt City

0 0.75 1.5 Miles

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Roosevelt
Neola
Monarch
Ballard
Whiterocks
Leeton
Ioka
Mt Emmons
Roosevelt Golf Course
Ball Park
Sports Park
Uintah Basin Medical Center
Utah State University Uintah Basin Roosevelt Campus
Uintah Basin ATC
Roosevelt Municipal Airport
COYOTE BASIN
NEPHI BENCH
THE CRESCENT
HANCOCK DRIVE
Harmston Bench
Blackhawk Bench
Gundy Hollow
Butcher Knife
Flat Top
Dry Gulch Creek
Cottonwood Canyon Rd
Boulder Blvd
W Blue Bird Rd
W Ledge Ln
W Crooked Sky
W Cobble Hollow Dr
E Main St
200 N
500 N
100 S
W 11000 N
W 10000 N
W 8300 N
W 8000 N
W 5650 N
W 5000 N
W 4000 N
W 3000 N
W 2750 N
W 2500 N
W 2875 N
W 2000 S
W 1000 N
W 800 S
W 1500 S
W 3000 S
E 7000 N
E 6000 N
E 5000 N
E 4000 N
E 3000 N
E 2000 N
E 1000 N
E 1000 S
E 2000 S
5782 ft
5592 ft
5568 ft
5598 ft
5758 ft
5768 ft
5758 ft
5758 ft
5758



Existing Culinary Water

- 2"
- 4"
- 6"
- 8"
- 10"
- 12"
- 16"
- 18"
- 20"
- 24"
- 36"

City Boundary

Cedarview Lines

Existing System Features

- PRV / Station
- Bulk Water Fill Station
- Tank
- Existing Cedarview Tank
- Upsize Existing Tank to 2 MG

Existing Culinary Water Upgrades

- 8"
- 24"

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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Figure B-5 Existing and Upgraded Culinary Water

Roosevelt City

0 0.75 1.5 3 Miles

N

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Existing Culinary Water

- 2"
- 4"
- 6"
- 8"
- 10"
- 12"
- 16"
- 18"
- 20"
- 24"
- 36"

City Boundary

Cedarview Lines

Existing System Features

PRV / Station

Bulk Water Fill Station

Tank

Proposed Water

Proposed PRV

Proposed Culinary Water

- 8"
- 12

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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Figure B-6a Existing and Proposed Culinary Water

Roosevelt City

0 1.5 3 Miles

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Existing Culinary Water

- 2"
- 4"
- 6"
- 8"
- 10"
- 12"
- 16"
- 18"
- 20"
- 24"
- 36"

Cedarview Lines

Proposed Culinary Water

- 8"
- 12

Existing System Features

- PRV / Station
- Bulk Water Fill Station
- Tank

Proposed System Features

- Proposed PRV

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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Fig B-6b Existing and Proposed Culinary Water

Roosevelt City

0 0.5 1 Miles

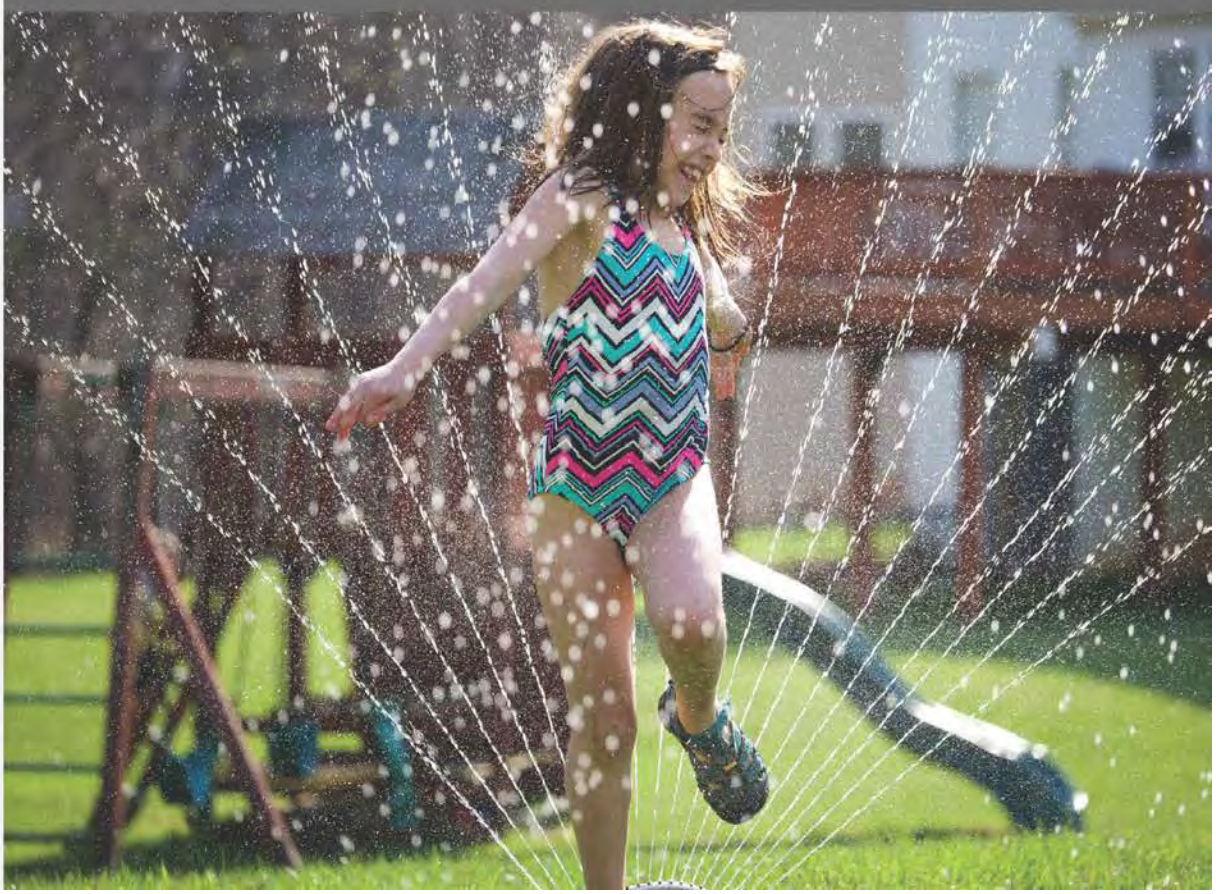
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Secondary Water Plan

Appendix C



HORROCKS ENGINEERS

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APPENDIX C

Executive Summary

The Roosevelt City Secondary Water Master Plan Update contains analysis of the existing secondary water system and recommendations to accommodate future growth through the year 2045. Based on deficiencies found improvements were recommended for the existing system and future system growth.

Listed in **Section C3.5** of this Appendix are the capital improvements needed to meet the 25-year population demands. Below is a summary of expected costs, associated improvement period, and priority.

1-5 year improvements	Highest	$3,677,100
6-10 year improvements	High	$7,098,678
11-15 year improvements	Medium	$436,875
16-25 year improvements	Low	$5,696,775

It is estimated that of the 6-10 year improvements $171,275 would be developer driven, therefore should be paid for by developers. The estimated developer contributions for 11-15 year improvements and 16-25 year improvements are estimated at $174,688 and $4,813,750 respectively. These development type of improvements should only be explored if annexation and development does indeed become a reality during the planning period.

C.1 Summary and Recommendations

C.1.1 Introduction

This chapter identifies the deficiencies of the pressurized irrigation system as well as recommended improvements to meet the projected 25 year population demands.

Future conditions in Roosevelt City are analyzed by projecting the population through the year 2040 and calculating the number of connection's or equivalent residential connections (ERC's). Based upon historical pressurized irrigation demand and the projected average yearly, peak daily, and peak instantaneous demands, the pressurized irrigation flows are projected through the planning period. These flows are used to determine the required capacities of the pressurized irrigation system within Roosevelt City. Moon Lake Water Users Association (MLWUA) supplies Roosevelt City with irrigation water and storage in Big Sand Wash Reservoir for peaking. Recommendations are made to maintain the current Level of Service (LOS) and provide the needed capacity for the projected population. Additional

infrastructure is also considered for areas which do not currently have pressurized irrigation available. It is estimated that only 35 percent of Roosevelt City residents have secondary irrigation.

MLWUA owns and operates the Roosevelt Pipeline from Big Sand Wash Reservoir that goes to the golf course, the cemetery, and other locations in the western part of the City. Roosevelt's secondary system has connections to the MLWUA line at the following locations:

1. 200 North 1000 West
2. Lagoon 1000 West
3. SE corner of Constitution Park at 300 South and 800 West
4. 300 South 500 West
5. Roosevelt City Cemetery
6. Areva Drive and Riviera Drive near the golf course
7. Drain line near filter station at 200 North and 1500 West (connected to 24" MLWUA steel line, with a closed valve that drains the system via a 10-inch line to the west, at the end of the irrigation season.)

A 3,000 acre-feet (ac-ft) secondary water source was made available to Roosevelt City in 2008 with completion of big Sand Wash – Roosevelt Pipeline, 1,500 ac-ft of which delivered water to the Golf Course, Constitution Park, and some of the Roosevelt City cemetery. A secondary irrigation system that uses this source has been installed in portions of Roosevelt City since that time. The remaining 1,500 ac-ft is for the Division of Wildlife Resources delivery to Cottonwood Creek.

The existing Roosevelt City Secondary Water System is shown in Figures C-3a and C-3b. Shown are the pressure zones as denoted by the Hydraulic Grade Line (HGL). The HGL line represents the total head available to the fluid minus the velocity head.

C.1.2 Major Users

The existing major outdoor water users tying into the secondary system include: the golf course, Constitution Park, Union High School, USU Uintah Basin Campus, Roosevelt Middle School, U.B. Medical Center, Duchesne County East Elementary School, LDS East Stake Center, Cemetery, and Old Mill Park. The existing combined annual usage for these major users is estimated at 850 acre-feet. Residential users were not considered major users.

C.1.3 Design Criteria

The Roosevelt City Design Criteria used in this study are summarized below:

• Demand:	-Average Yearly Outdoor	437 gpd/ERC (3.0 af/ac)
	-Peak Day	Average Yearly Demand x 3.4
	-Peak Instantaneous	Peak Day x 2.0

• Storage	-MLWUA for Roosevelt	437 gal/ERC
• Pressure	-Minimum Static	50 psi
	-Maximum Static	120 psi
	-Minimum Peak Day	40 psi
	-Minimum Peak Instant	30 psi
• Pipe Sizes	-Minimum	4-inches
• Velocities:	-Maximum Peak Day	5 fps
	-Maximum Peak Instant	8 fps

C.1.4 Projected Population

As detailed in Chapter 1, Roosevelt City's population is expected to increase by approximately 59 percent from 7,112 to 11,339 people by the year 2045. Approximately 2,388 additional PI equivalent residential units will be added. Growth beyond 2045 to ultimate build out will be addressed in future masterplan updates.

C.1.5 Future Use

Using 5,120 projected ERCs in 2045, it is estimated that 5,282 gpm will be required to meet Peak Day flows. It is also projected that an average demand of 2.2 million gallons per day (MGD) will be used. The usage per ERC is estimated to be 437 gpd/ERC spread over 12 months or 874 gpd/ERC over 6 month irrigation season.

C.1.6 Recommended Irrigation System Improvements

Capital improvements recommended to meet the projected population demands are shown in Figures C-4a and C-4b. These recommendations were determined by the use of a computer model of Roosevelt City's PI system, projected demands, input from the city and water use data. A list of the recommended improvements is given below.

1) Crossover Remaining Cemetery from Culinary to PI
2) 700 North (350 East to 600 East) 4-Inch C-900 DR-18 PVC Purple Pipe
3) 650 North (350 East to 600 East) 4-Inch C-900 DR-18 PVC Purple Pipe
4) 600 North (State St. to 300 East) 4-Inch C-900 DR-18 PVC Purple Pipe
5) 600 North (350 East to 800 East) 6-Inch C-900 DR-18 PVC Purple Pipe
6) 550 North (350 East to 400 East) 4-Inch C-900 DR-18 PVC Purple Pipe
7) 550 North (460 East to 600 East) 4-Inch C-900 DR-18 PVC Purple Pipe
8) 500 North (125 East to 325 East) 4-Inch C-900 DR-18 PVC Purple Pipe
9) 500 North (400 East to 600 East) 4-Inch C-900 DR-18 PVC Purple Pipe
10) 400 North (200 West to 100 West) 4-Inch C-900 DR-18 PVC Purple Pipe
11) 400 North (200 East to Union Street) 4-Inch C-900 DR-18 PVC Purple Pipe
12) 300 North (300 West to State Street) 4-Inch C-900 DR-18 PVC Purple Pipe
13) 300 North (Carma Ave to Union Street) 4-Inch C-900 DR-18 PVC Purple Pipe
14) 100 North (500 West to State Street) 4-Inch C-900 DR-18 PVC Purple Pipe

15) 100 North (600 East to 775 East) 4-Inch C-900 DR-18 PVC Purple Pipe
16) 100 South (200 West to 100 East) 4-Inch C-900 DR-18 PVC Purple Pipe
17) 200 South (State Street to 100 East) 4-Inch C-900 DR-18 PVC Purple Pipe
18) 300 South (State Street to 100 East) 4-Inch C-900 DR-18 PVC Purple Pipe
19) 400 South (State Street to 100 East) 4-Inch C-900 DR-18 PVC Purple Pipe
20) Roosevelt Cir. (200 East to 400 South) 4-Inch C-900 DR-18 PVC Purple Pipe
21) 500 South (450 East to 500 East) 4-Inch C-900 DR-18 PVC Purple Pipe
22) 550 South (200 East to 300 East) 4-Inch C-900 DR-18 PVC Purple Pipe
23) 600 South (100 East to 200 East) 4-Inch C-900 DR-18 PVC Purple Pipe
24) 600 South (200 East to 500 East) 4-Inch C-900 DR-18 PVC Purple Pipe
25) 675 South (75 West to State St.) 4-Inch C-900 DR-18 PVC Purple Pipe
26) N. Poco Dr. (S. Poco Dr. to Harrison Ave.) 4-Inch C-900 DR-18 PVC Purple Pipe
27) 700 South (State St. to 500 East) 4-Inch C-900 DR-18 PVC Purple Pipe
28) 975 South (200 West to State St.) 4-Inch C-900 DR-18 PVC Purple Pipe
29) 1080 South (State St. to 325 East) 6-Inch C-900 DR-18 PVC Purple Pipe
30) 1150 South (50 East to 200 East) 6-Inch C-900 DR-18 PVC Purple Pipe
31) 1200 South (375 West to Rodeo Drive) 6-Inch C-900 DR-18 PVC Purple Pipe
32) 1250 South (50 East to 500 East) 6-Inch C-900 DR-18 PVC Purple Pipe
33) 1700 South (State St. to 200 East) 6-Inch C-900 DR-18 PVC Purple Pipe
34) 1800 South (State St. to 250 East) 6-Inch C-900 DR-18 PVC Purple Pipe
35) 1875 South (State St. to 575 East) 6-Inch C-900 DR-18 PVC Purple Pipe
36) 400 West (180 North to Lagoons St.) 4-Inch C-900 DR-18 PVC Purple Pipe
37) 375 West (775 South to 1200 South) 6-Inch C-900 DR-18 PVC Purple Pipe
38) Rodeo Drive (800 South to 1200 South) 6-Inch C-900 DR-18 PVC Purple Pipe
39) 200 West (300 North to 200 South) 4-Inch C-900 DR-18 PVC Purple Pipe
40) 200 West (800 South to 975 South) 4-Inch C-900 DR-18 PVC Purple Pipe
41) 100 West (400 North to 100 North) 4-Inch C-900 DR-18 PVC Purple Pipe
42) State St. (300 North to 600 North) 6-Inch C-900 DR-18 PVC Purple Pipe
43) State St. (450 South to 200 South) 4-Inch C-900 DR-18 PVC Purple Pipe
44) State St. (800 South to 675 South) 6-Inch C-900 DR-18 PVC Purple Pipe
45) State St. (1875 South to 1300 South) 10-Inch C-900 DR-18 PVC Purple Pipe
46) 50 East (1250 South to 1080 South) 6-Inch C-900 DR-18 PVC Purple Pipe
47) 100 East (375 North to 200 North) 4-Inch C-900 DR-18 PVC Purple Pipe
48) 100 East (100 South to 300 South) 4-Inch C-900 DR-18 PVC Purple Pipe
49) 100 East (600 South to 800 South) 4-Inch C-900 DR-18 PVC Purple Pipe
50) 125 East (500 North to 425 North) 4-Inch C-900 DR-18 PVC Purple Pipe
51) 200 East (500 North to 400 North) 4-Inch C-900 DR-18 PVC Purple Pipe
52) 200 East (500 South to 800 South) 4-Inch C-900 DR-18 PVC Purple Pipe
53) 300 East (600 North 500 North) 4-Inch C-900 DR-18 PVC Purple Pipe
54) 300 East (400 North 300 North) 4-Inch C-900 DR-18 PVC Purple Pipe
55) 300 East (200 South to Roosevelt Circle) 4-Inch C-900 DR-18 PVC Purple Pipe
56) 300 East (600 South Roosevelt Circle) 4-Inch C-900 DR-18 PVC Purple Pipe
57) 400 East (700 North to 550 North) 4-Inch C-900 DR-18 PVC Purple Pipe
58) 400 East (300 North to 200 North) 4-Inch C-900 DR-18 PVC Purple Pipe
59) 400 East (700 South to 725 South) 4-Inch C-900 DR-18 PVC Purple Pipe
60) 460 East (600 North to 500 North) 4-Inch C-900 DR-18 PVC Purple Pipe
61) 450 East (400 South to 600 South) 4-Inch C-900 DR-18 PVC Purple Pipe

62) 500 East (700 North to 600 North) 4-Inch C-900 DR-18 PVC Purple Pipe
63) 500 East (500 North to 200 North) 4-Inch C-900 DR-18 PVC Purple Pipe
64) 600 East (700 North to 550 North) 6-Inch C-900 DR-18 PVC Purple Pipe
65) 600 East (300 North to 200 North) 8-Inch C-900 DR-18 PVC Purple Pipe
66) 600 East (350 South to 600 South) 8-Inch C-900 DR-18 PVC Purple Pipe
67) 700 East (400 North to 200 North) 4-Inch C-900 DR-18 PVC Purple Pipe
68) 800 East (400 North to 300 North) 4-Inch C-900 DR-18 PVC Purple Pipe
69) Union Street (400 North to 300 North) 4-Inch C-900 DR-18 PVC Purple Pipe
70) S.R. 121 (Clubhouse Dr. to 450 North) 6-Inch C-900 DR-18 PVC Purple Pipe
71) 450 North (S.R. 121 to N. Hillcrest Dr.) 6-Inch C-900 DR-18 PVC Purple Pipe
72) N. Hillcrest Dr. (500 North to S.R. 121) 6-Inch C-900 DR-18 PVC Purple Pipe
73) Nelson Ave. (Bonnie Dr. to 200 North) 4-Inch C-900 DR-18 PVC Purple Pipe
74) 350 North (1000 West to 850 W) 4-Inch C-900 DR-18 PVC Purple Pipe
75) 1000 West (Bonnie Drive to 200 North) 4-Inch C-900 DR-18 PVC Purple Pipe
76) 300 North (925 West to 850 West) 4-Inch C-900 DR-18 PVC Purple Pipe
77) Bonnie Drive (350 North to 1000 West) 4-Inch C-900 DR-18 PVC Purple Pipe
78) North Gates Dr. (N. Nelson Ave. to 200 North) 4-Inch C-900 DR-18 PVC Purple Pipe
79) 150 North (Wendall Ln. to 600 West) 4-Inch C-900 DR-18 PVC Purple Pipe
80) 75 North (Wendall Ln. to 600 West) 4-Inch C-900 DR-18 PVC Purple Pipe
81) King Aurthur Dr.; 4-Inch C-900 DR-18 PVC Purple Pipe
82) Guinevere Cir.; 4-Inch C-900 DR-18 PVC Purple Pipe
83) Wendall Ln. (150 North to Lagoons St.) 4-Inch C-900 DR-18 PVC Purple Pipe
84) Ivie Manor; 4-Inch C-900 DR-18 PVC Purple Pipe
85) S. Georgia Cir.; 4-Inch C-900 DR-18 PVC Purple Pipe
86) 550 W (200 North to 75 North) 4-Inch C-900 DR-18 PVC Purple Pipe
87) 550 W (Lagoon St. to 100 South) 4-Inch C-900 DR-18 PVC Purple Pipe
88) South Cove Road (1050 West to 3000 West) 12-Inch C-900 DR-18 PVC Purple Pipe
89) 2500 West (700 North to 500 South) 8-Inch C-900 DR-18 PVC Purple Pipe
90) 3000 West (South Cove Road to 350 South) 8-Inch C-900 DR-18 PVC Purple Pipe
91) 350 South (3000 West to 2500 West) 4-Inch C-900 DR-18 PVC Purple Pipe
92) 500 South (2500 West to 2200 West) 4-Inch C-900 DR-18 PVC Purple Pipe
93) 200 North 525 West PRV
94) 200 South 525 West PRV
95) 600 East 250 North PRV
96) 200 North Areva Road PRV
97) Upgrade and Reactivate 500 West 300 South PRV

C.1.7 Operation

MLWUA supplies secondary water to Roosevelt City through metered connections on their system.

C.2 Pressurized Irrigation Use

From the projected population described in Chapter 1, the additional future number of secondary connections is determined along with the number of future ERCs. Using State design criteria and historical demands, the future water demands, including the average yearly, peak daily and peak instantaneous demands, are projected through the planning period.

C.2.1 Projected Population

The projected population for Roosevelt City is discussed in Chapter 1, and as previously mentioned in this report. The 2045 population is projected to be 11,339. The population increase will be 4,228, but it is not anticipated that all new residences will have a pressurized irrigation connection made available during this planning period. The main reason for this, is that in some predicted annexation locations, the amount of infrastructure that would be required in conjunction with the proximity to an available connection location isn't feasible, and would be very costly.

C.2.2 Equivalent Residential Connections

Pressurized irrigation usage from typical residential connections differs from commercial, church, government, institutional, parks, research and technology, and other non-residential connections. To evaluate residential and non-residential connections on an equal basis, Equivalent Residential Connections (ERC's) are used to compare non-residential connections.

To calculate non-residential ERCs, existing metered secondary water use data was used. For this study, ERC's were approximated by dividing non-residential metered water usage by residential metered water usage. 5 years of data was used in this analysis.

For example, the average yearly water use for a residential connection in Roosevelt City, based on City records, was determined to be about 0.16 MG or 0.30 gpm. A non-residential connection, excluding the Golf Course and Constitution Park, used approximately 1.39 MG or 2.60 gpm. The resulting non-residential equivalent ERC is 8.70 (2.60 gpm ÷ 0.30 gpm).

Residential secondary water ERC = 1 ERCs
Non-residential secondary water ERC=8.7 ERCs

The total number of residential parcels currently being serviced by secondary water was determined to by roughly 998. The total number of non-residential parcels that use secondary water was determined to be roughly 32.

Therefore:

Existing residential ERC's was determined to be 998 (998 X 1).
Existing non-residential ERC's was determined to be 284 (32 X 8.7).

2045 projections have an additional 1,885 residences having a secondary connection resulting in 1,885 additional residential ERC's. This includes many existing residences that do not presently have the service, as well as future development. It is also anticipated that by 2045 there will be an additional 500 non-residential ERC's.

Constitution Park and the Golf Course were excluded from this calculation because they are by far the largest of the major users. For this purpose, ERC's for Constitution Park and the Golf Course were

calculated individually based on historic water use compared to the projected average yearly usage of 437gpd/ERC.

For Example:

Constitution Park average yearly water use between 2014 and 2018 was 205,827 gpd. The resulting ERC's for Constitution Park are 471 ERCs.

$$\frac{205{,}827\ gpd}{437\ gpd/ERC} = 471\ ERC$$

The Golf Course average yearly water use between 2014 and 2018 was 429,134 gpd. The resulting ERC's for the Golf Course are 982 ERCs.

$$\frac{429{,}134\ gpd}{437\ gpd/ERC} = 982\ ERC$$

The total number of projected ERCs are listed in Table C-1 and are based on additional projected residential connections multiplied by 1, and additional projected non-residential connections multiplied by 8.7, with the addition of Constitution Park and Golf Course with their own individual ERC Calculations. Future parks have also been included in the Future ERC calculations.

Table C-1: Existing and Projected ERCs

Description	Existing	Future (2045)
Residential ERCs	998	2,883
Non-residential ERCs	284	784
Constitution Park	471	471
Golf Course	982	982
Total ERCs	2,734	**5,120**

C.2.3 Historical Pressurized Irrigation Use

Table C-2 is a description of how much water Roosevelt City customers used annually between 2013 and 2018. The information was obtained from MLWUA.

Table C-2: Annual Use Data from MLWUA

Year	Annual Use (ac-ft)
2013	879
2014	1,151

Year	Annual Use (ac-ft)
2015	1,222
2016	1,024
2017	1,172
2018	1,500
Average	1,158

C.2.4 Projected Use

The Division of Drinking Water estimates outdoor use in Section R309-510 of the Utah Administrative Code. Roosevelt City is in map zone 3 based on the Division of Drinking Water's water use map. State Drinking water Rules require that water providers deliver sufficient supply to meet Peak Day and Average Yearly outdoor water demands. The State Engineer's procedure for estimating outdoor water use is as follows:

1) Determine consumptive water use zone in which Roosevelt City resides (Zone 3).
2) Determine the Peak Day and Average Yearly demands using Table 510-3 found in the State Rule R309-510.

The following are outdoor water use estimates for Roosevelt City which are based on this code.

1) Average Yearly Demand: 1,482 gpd, 1.66 acre-feet/irrigated acre
2) Peak Day Demand: 4,882 gpd, 3.39 gpm/irrigated acre
3) Peak Instantaneous Demand: 6.78 gpm/irrigated acre

Roosevelt City's water system is located in map Zone 3 according to the map available from the Utah State Division of Drinking Water entitled "Irrigated Crop Consumptive Use Zones and Normal Effective Precipitation, Utah". The map was prepared by Soil Conservation Service. This is an estimation of the quantity of culinary water residents without secondary water use for irrigation. Peak Day Demand (gpm/irrigated acre) is 3.39 gpm per irrigated for Map zone 3. The Average Yearly Demand for Map Zone 3 is 1.66 AF/irrigated acre. This can be found in Table 510-3 found in State Rule R309-510.

To convert outdoor usage from a per acre basis to a per connection basis several existing subdivisions were looked at. The observations indicated that on 0.25 to 0.5 acre lots, 70 percent of the lot is available to be irrigated, and of that available amount, 70 percent on average is irrigated. This study will therefore assume that, on average, 49 percent of a typical lot is irrigated. The assumption was made that there are approximately three connections per acre for residential land use. These assumptions and the State Drinking Water criteria result in a Peak Day demand of 797 gpd per ERC (4,882 x .49 ÷ 3), and an Average Yearly demand of 242 gpd per ERC (1,482 x .49 ÷ 3).

To compare another method for calculating outdoor use, the Utah Division of Water rights duty value was evaluated. This is also used to estimate irrigation use in their water use information for water right

applications. The irrigation season is described as April 1, 2019 to October 31, 2019. The duty value used in this method to calculate the diversion amount allowed for outside watering is an Average Yearly demand of 3.0 ac-ft per acre which results in an average yearly demand of 437 gpd/ERC. This calculation is based on the following:

a. 1 ac-ft = 325,851 gallons
b. 49 percent of each lot is irrigated
c. 3 connections per acre

$$\frac{3\ ac-ft}{acre/year}\ x\ 0.49\ x\ \frac{1\ acre}{3\ ERC}\ x\ \frac{325{,}851\ gallons}{1\ ac-ft}\ x\ \frac{1\ year}{365\ day} = \frac{437\ gpd}{ERC}$$

The average City outdoor demand will be **437 gpd per ERC** which is larger than the State requirement of 242 gpd/ERC of culinary outdoor use. The Peak Day demand using a peaking factor of 2.0 will be **874 pgd/ERC** which is greater than the State Requirement of 797 gpd per ERC. The Utah Division of Water Rights method of estimating outdoor water use was used in this study because it appears to be the most accurate method of predicting outdoor water use over time.

The Peak Day demand for a secondary system is based on a 6 month use period with peak months being July and August. This equates to a peaking factor of 2 for the 6 month period. This is because 437 gpd/ERC is based on a 12 month period and the irrigation season only consists of 6 months. A peaking factor of 1.7 also is applied for the hottest days. Analysis of City metered water use records from 2014 to 2018 show that in July and August average water use for those two months is approximately 1.7 times more than the resulting average of the remaining irrigated months. This results in a peaking factor of 3.4 (2 x 1.7). The resulting peak day demand is 1,486 gpd/ERC (437 gpd x 3.4).

The peak instantaneous demand is determined by multiplying the peak day demand by the peaking factor of 2.0. This results in peak instantaneous demand of 2,970 gpd/ERC.

C.2.5 Projected Areas of Development

To determine future impacts to the secondary system, it is estimated that of the population increase from 2019 to 2045 of 4,228, the majority of the existing vacant parcels near the central part of town will be filled. Refer to Chapter 2, Land Use Table 2-1 for a detailed description of anticipated development. The remaining population will be distributed to the following locations with their respective percentages: The Cove, Southtown, and N. Crescent at 45%, 35%, and 20%. **Figure C-2** illustrates where new development is estimated to take place.

C.2.6 System Losses

Distribution systems have inherent losses that are functions of the size of pipe, joint construction, temperature, and age of the system. Typical municipal systems lose as much as 15-25 percent of the water flowing through the system. City meter reading records compared to metered water at the source indicate that over the last 5 years, Roosevelt City has seen an average of approximately 23

percent water loss annually. It is recommended that the City monitor potential losses in the pressurized irrigation system.

C.2.7 Summary of Projected Water Flows

Average Yearly outdoor water usage is 437 gpd per ERC. Not all residences and businesses in Roosevelt City have pressurized irrigation available for outdoor use. The current pressurized irrigation water usage is approximated by using the number of pressurized irrigation connections. It is anticipated that new development will have pressurized irrigation available in the future. Table C-3 shows the projected demands throughout the planning period.

Table C-3: Existing and Projected Demands

		Average Yearly Demand		Peak Day Demand		Peak Instantaneous	
Year	**ERC**	**(MGD)**	**(ac-ft)**	**(MGD)**	**(gpm)**	**(MGD**	**(gpm)**
2018	2,734	1.19	1,339[1]	4.06	2,821	8.13	5,643
2045	5,120	2.24	2,506	7.61	5,282	15.21	10,565

[1] Compared to the actual MLWUA metered usage of 1,500 ac-ft from Big Sand Wash Reservoir (Table C-2), the current estimated average yearly demand is much less. In 2018, according to Roosevelt City officials, irrigation water was sold to companies in the oil industry. As previously mentioned, Roosevelt City is contractually allocated 1,500 ac-ft of water from Big Sand Wash Reservoir which is lost if the City doesn't use it, therefore the remaining was sold to the oil industry.

2045 projections of average yearly demand result in 2,506 ac-ft. This is less than the 3,000 ac-ft that MLWUA will soon be able to deliver to Roosevelt City, solely for irrigation, via the Roosevelt Pipeline from Big Sand Wash Reservoir.

Please note that the proposed recommended improvements listed in Sections C.1.6 and C.3.5 cannot be implemented until the entire 3,000 acre-feet is secured, via contract, with MLWUA for City secondary irrigation purposes only.

C.2.8 Water Conservation

Utah is the 2nd driest state in the nation, and the Uintah Basin is one of the driest regions in the State. It is very important that water conservation efforts continue to be studied and explored. It is recommended that Roosevelt City continue to monitor outdoor watering and offer continued education and be informative about water conservation efforts. Through social media, newspapers, radio, and other means information should be provided to continue to educate the public about the importance of water conservation. The City should prohibit watering between the hours of 10 a.m. and 6 p.m. It is recommended that violators be cited to ensure water is not being wasted.

C.3 Pressurized Irrigation System and Level of Service

Roosevelt City's present pressurized irrigation system's capacity and Level of Service (LOS) were checked by analyzing the distribution systems. The City uses the State's minimum sizing requirements for water facility design and operation per Rule R309-510 to determine their minimum LOS for the distribution system. Future improvements needed to serve projected population demands are sized to maintain the existing capacities and LOS. This section describes the present system, design parameters, and recommendations for needed improvements.

C.3.1 Sources

Construction of a 32" diameter pipeline from Big Sand Wash Reservoir to Roosevelt was completed in 2000; for the purposes of this report, it will be known as the Roosevelt Pipeline. The pipeline has the capability to provide Roosevelt City with the current 3,000 acre-feet of secondary water annually. Currently, Roosevelt City has a contracted amount of 3,000 acre-feet and is leasing 1,500 acre-feet of this amount to the Division of Wildlife Resources. According to Roosevelt City officials, the lease is scheduled to expire during the early stages of the planning period, and it is not scheduled for renewal, therefore the City will be able to provide the entire 3,000 acre-feet for secondary irrigation. Please note that the proposed recommended improvements listed in C.1.6 and C.3.5 cannot be implemented until the entire 3,000 acre-feet is secured via contract with MLWUA.

C.3.2 Storage

Roosevelt City's secondary system is presently supplied by MLWUA and their Big Sand Wash Reservoir Storage facility.

C.3.3 Distribution System Requirements

The distribution system needs to be able to meet the Peak Day demand and maintain 40 psi at all connections. It must also meet the peak instantaneous while maintaining a minimum of 30 psi at all connections with in the system.

C.3.4 Computer Model of Pressurized Irrigation System

A computer program called *WaterGEMs Connect Edition* was used to model the City's secondary water system. The program requires that all pipes, elevations at intersections, sources, reservoirs, canals, pumps, and pressure reducing valves (PRV) be entered into the model as they are constructed. System demands are then entered in. The program calculates static pressure throughout the system based on the given elevations. Sources, pumps, pipes, demand nodes, and other system elements are modeled and can be graphed throughout the time period.

After the model is run and problem areas are defined, improvements can be modeled to bring the system up to the minimum level of service (LOS). Determining which improvements in the system will bring the system up to the minimum LOS in the most economical manner is a trial and error process.

The existing pressurized irrigation system was modeled and calibrated. The areas that are nearing minimum LOS were identified. Improvements were determined that would allow minimum flows and pressures to be preserved throughout the existing system. These improvements are recommended in this section and were listed previously in Section C.1.6, and are shown in Figures C-4a and C-4b.

Roosevelt City's General Plan map was used to determine future development densities, and the projected number of ERC's in undeveloped areas, that are expected to develop were determined. The additional demand projected for undeveloped areas was added to the present demand. From this information, the secondary water system was modeled, and the future improvements were identified to provide the necessary flows and pressures to maintain the pressurized irrigation LOS in Roosevelt City.

C.3.5 Distribution System Recommendations

The entire Roosevelt City portion of the pressurized irrigation system and key elements of the MLWUA pressurized irrigation system was modeled for both present and projected populations for instantaneous conditions and a 24-hour extended period simulation. Water system information and recommendations were obtained from the City and incorporated into the recommended future water system and water model. Deficiencies for the future system were identified which helped expose the ideal locations for the future waterline projects.

Recommended improvements and estimated costs are shown in Table C-4. The costs of the improvements include construction costs, engineering costs, legal and administrative fees and contingencies. The total estimated cost for the recommended improvements is $16,909,428.

Table C-4: Estimated Cost of Roosevelt City's Capital Improvement Projects – Secondary Water

Proj. No.	Project Description	Quantity	Units	Unit Price	Estimated Cost	Priority	Period
1	Crossover Remaining Cemetery from Culinary to PI	1	LS	$51,388	$51,388	High	6-10 yr
2	700 North (350 East to 600 East) 4-Inch C-900 DR-18 PVC Purple Pipe	1,325	LF	$140	$185,500	High	6-10 yr
3	650 North (350 East to 600 East) 4-Inch C-900 DR-18 PVC Purple Pipe	1,325	LF	$140	$185,500	High	6-10 yr
4	600 North (State St. to 300 East) 4-Inch C-900 DR-18 PVC Purple Pipe	1,200	LF	$140	$168,000	High	6-10 yr
5	600 North (350 East to 800 East) 6-Inch C-900 DR-18 PVC Purple Pipe	2,000	LF	$140	$280,000	High	6-10 yr
6	550 North (350 East to 400 East) 4-Inch C-900 DR-18 PVC Purple Pipe	360	LF	$140	$50,400	High	6-10 yr
7	550 North (460 East to 600 East) 4-Inch C-900 DR-18 PVC Purple Pipe	750	LF	$140	$105,000	High	6-10 yr
8	500 North (125 East to 325 East) 4-Inch C-900 DR-18 PVC Purple Pipe	870	LF	$140	$121,800	High	6-10 yr
9	500 North (400 East to 600 East) 4-Inch C-900 DR-18 PVC Purple Pipe	990	LF	$140	$138,600	High	6-10 yr
10	400 North (200 West to 100 West) 4-Inch C-900 DR-18 PVC Purple Pipe	575	LF	$140	$80,500	High	6-10 yr

Proj. No.	Project Description	Quantity	Units	Unit Price	Estimated Cost	Priority	Period
11	400 North (200 East to Union Street) 4-Inch C-900 DR-18 PVC Purple Pipe	3,475	LF	$140	$486,500	High	6-10 yr
12	300 North (300 West to State Street) 4-Inch C-900 DR-18 PVC Purple Pipe	1,475	LF	$140	$206,500	High	6-10 yr
13	300 North (Carma Ave to Union Street) 4-Inch C-900 DR-18 PVC Purple Pipe	1,050	LF	$140	$147,000	High	6-10 yr
14	100 North (500 West to State Street) 4-Inch C-900 DR-18 PVC Purple Pipe	2,500	LF	$140	$350,000	High	6-10 yr
15	100 North (600 East to 775 East) 4-Inch C-900 DR-18 PVC Purple Pipe	650	LF	$140	$91,000	High	6-10 yr
16	100 South (200 West to 100 East) 4-Inch C-900 DR-18 PVC Purple Pipe	1,375	LF	$140	$192,500	High	6-10 yr
17	200 South (State Street to 100 East) 4-Inch C-900 DR-18 PVC Purple Pipe	450	LF	$140	$63,000	High	6-10 yr
18	300 South (State Street to 100 East) 4-Inch C-900 DR-18 PVC Purple Pipe	450	LF	$140	$63,000	High	6-10 yr
19	400 South (State Street to 100 East) 4-Inch C-900 DR-18 PVC Purple Pipe	850	LF	$140	$119,000	Highest	1-5 yr
20	Roosevelt Cir. (200 East to 400 South) 4-Inch C-900 DR-18 PVC Purple Pipe	1,225	LF	$140	$171,500	Highest	1-5 yr
21	500 South (450 East to 500 East) 4-Inch C-900 DR-18 PVC Purple Pipe	425	LF	$140	$59,500	Highest	1-5 yr
22	550 South (200 East to 300 East) 4-Inch C-900 DR-18 PVC Purple Pipe	525	LF	$140	$73,500	Highest	1-5 yr
23	600 South (100 East to 200 East) 4-Inch C-900 DR-18 PVC Purple Pipe	475	LF	$140	$66,500	Highest	1-5 yr
24	600 South (200 East to 500 East) 4-Inch C-900 DR-18 PVC Purple Pipe	1,400	LF	$140	$196,000	Highest	1-5 yr
25	675 South (75 West to State St.) 4-Inch C-900 DR-18 PVC Purple Pipe	350	LF	$140	$49,000	Highest	1-5 yr
26	N. Poco Dr. (S. Poco Dr. to Harrison Ave.) 4-Inch C-900 DR-18 PVC Purple Pipe	850	LF	$140	$119,000	Highest	1-5 yr
27	700 South (State St. to 500 East) 4-Inch C-900 DR-18 PVC Purple Pipe	2,250	LF	$140	$315,000	Highest	1-5 yr
28	975 South (200 West to State St.) 4-Inch C-900 DR-18 PVC Purple Pipe	900	LF	$140	$126,000	High	6-10 yr
29	1080 South (State St. to 325 East) 6-Inch C-900 DR-18 PVC Purple Pipe	1,400	LF	$140	$196,000	High	6-10 yr
30	1150 South (50 East to 200 East) 6-Inch C-900 DR-18 PVC Purple Pipe	800	LF	$140	$112,000	High	6-10 yr
31	1200 South (375 West to Rodeo Drive) 6-Inch C-900 DR-18 PVC Purple Pipe	725	LF	$130	$94,250	Low[1]	16-25 yr
32	1250 South (50 East to 500 East) 6-Inch C-900 DR-18 PVC Purple Pipe	1,950	LF	$130	$253,500	Low[1]	16-25 yr
33	1700 South (State St. to 200 East) 6-Inch C-900 DR-18 PVC Purple Pipe	825	LF	$140	$115,500	High	6-10 yr
34	1800 South (State St. to 250 East) 6-Inch C-900 DR-18 PVC Purple Pipe	1,600	LF	$140	$224,000	High	6-10 yr
35	1875 South (State St. to 575 East) 6-Inch C-900 DR-18 PVC Purple Pipe	2,550	LF	$140	$357,000	High	6-10 yr
36	400 West (180 North to Lagoons St.) 4-Inch C-900 DR-18 PVC Purple Pipe	900	LF	$140	$126,000	High	6-10 yr

Proj. No.	Project Description	Quantity	Units	Unit Price	Estimated Cost	Priority	Period
37	375 West (775 South to 1200 South) 6-Inch C-900 DR-18 PVC Purple Pipe	1,650	LF	$130	$214,500	Low[1]	16-25 yr
38	Rodeo Drive (800 South to 1200 South) 6-Inch C-900 DR-18 PVC Purple Pipe	2,050	LF	$130	$266,500	Low[1]	16-25 yr
39	200 West (300 North to 200 South) 4-Inch C-900 DR-18 PVC Purple Pipe	2,425	LF	$140	$339,500	High	6-10 yr
40	200 West (800 South to 975 South) 4-Inch C-900 DR-18 PVC Purple Pipe	946	LF	$140	$132,440	High	6-10 yr
41	100 West (400 North to 100 North) 4-Inch C-900 DR-18 PVC Purple Pipe	1,450	LF	$140	$203,000	High	6-10 yr
42	State St. (300 North to 600 North) 6-Inch C-900 DR-18 PVC Purple Pipe	1,500	LF	$140	$210,000	High	6-10 yr
43	State St. (450 South to 200 South) 4-Inch C-900 DR-18 PVC Purple Pipe	1,086	LF	$140	$152,040	High	6-10 yr
44	State St. (800 South to 675 South) 6-Inch C-900 DR-18 PVC Purple Pipe	940	LF	$140	$131,600	Highest	1-5 yr
45	State St. (1875 South to 1300 South) 10-Inch C-900 DR-18 PVC Purple Pipe	2,015	LF	$170	$342,550	High[2]	6-10 yr
46	50 East (1250 South to 1080 South) 6-Inch C-900 DR-18 PVC Purple Pipe	600	LF	$140	$84,000	High	6-10 yr
47	100 East (375 North to 200 North) 4-Inch C-900 DR-18 PVC Purple Pipe	850	LF	$140	$119,000	High	6-10 yr
48	100 East (100 South to 300 South) 4-Inch C-900 DR-18 PVC Purple Pipe	1,025	LF	$140	$143,500	High	6-10 yr
49	100 East (600 South to 800 South) 4-Inch C-900 DR-18 PVC Purple Pipe	1,400	LF	$140	$196,000	Highest	1-5 yr
50	125 East (500 North to 425 North) 4-Inch C-900 DR-18 PVC Purple Pipe	350	LF	$140	$49,000	High	6-10 yr
51	200 East (500 North to 400 North) 4-Inch C-900 DR-18 PVC Purple Pipe	532	LF	$140	$74,480	High	6-10 yr
52	200 East (500 South to 800 South) 4-Inch C-900 DR-18 PVC Purple Pipe	1,850	LF	$140	$259,000	Highest	1-5 yr
53	300 East (600 North 500 North) 4-Inch C-900 DR-18 PVC Purple Pipe	570	LF	$140	$79,800	High	6-10 yr
54	300 East (400 North 300 North) 4-Inch C-900 DR-18 PVC Purple Pipe	525	LF	$140	$73,500	High	6-10 yr
55	300 East (200 South to Roosevelt Circle) 4-Inch C-900 DR-18 PVC Purple Pipe	1,525	LF	$140	$213,500	Highest	1-5 yr
56	300 East (600 South Roosevelt Circle) 4-Inch C-900 DR-18 PVC Purple Pipe	625	LF	$140	$87,500	Highest	1-5 yr
57	400 East (700 North to 550 North) 4-Inch C-900 DR-18 PVC Purple Pipe	850	LF	$140	$119,000	High	6-10 yr
58	400 East (300 North to 200 North) 4-Inch C-900 DR-18 PVC Purple Pipe	500	LF	$140	$70,000	High	6-10 yr
59	400 East (700 South to 725 South) 4-Inch C-900 DR-18 PVC Purple Pipe	250	LF	$140	$35,000	Low[1]	16-25 yr
60	460 East (600 North to 500 North) 4-Inch C-900 DR-18 PVC Purple Pipe	600	LF	$140	$84,000	High	6-10 yr
61	450 East (400 South to 600 South) 4-Inch C-900 DR-18 PVC Purple Pipe	1,225	LF	$140	$171,500	Highest	1-5 yr
62	500 East (700 North to 600 North) 4-Inch C-900 DR-18 PVC Purple Pipe	550	LF	$140	$77,000	High	6-10 yr

Proj. No.	Project Description	Quantity	Units	Unit Price	Estimated Cost	Priority	Period
63	500 East (500 North to 200 North) 4-Inch C-900 DR-18 PVC Purple Pipe	1,450	LF	$140	$203,000	High	6-10 yr
64	600 East (700 North to 550 North) 6-Inch C-900 DR-18 PVC Purple Pipe	825	LF	$140	$115,500	High	6-10 yr
65	600 East (300 North to 200 North) 8-Inch C-900 DR-18 PVC Purple Pipe	525	LF	$145	$76,125	Low	16-25 yr
66	600 East (350 South to 600 South) 8-Inch C-900 DR-18 PVC Purple Pipe	1,350	LF	$145	$195,750	Low[1]	16-25 yr
67	700 East (400 North to 200 North) 4-Inch C-900 DR-18 PVC Purple Pipe	987	LF	$140	$138,180	High	6-10 yr
68	800 East (400 North to 300 North) 4-Inch C-900 DR-18 PVC Purple Pipe	475	LF	$140	$66,500	High	6-10 yr
69	Union Street (400 North to 300 North) 4-Inch C-900 DR-18 PVC Purple Pipe	475	LF	$140	$66,500	Low[1]	16-25 yr
70	S.R. 121 (Clubhouse Dr. to 450 North) 6-Inch C-900 DR-18 PVC Purple Pipe	1,150	LF	$145	$166,750	Medium[2]	11-15 yr
71	450 North (S.R. 121 to N. Hillcrest Dr.) 6-Inch C-900 DR-18 PVC Purple Pipe	605	LF	$145	$87,725	Medium[2]	11-15 yr
72	N. Hillcrest Dr. (500 North to S.R. 121) 6-Inch C-900 DR-18 PVC Purple Pipe	650	LF	$146	$94,900	Medium[2]	11-15 yr
73	Nelson Ave. (Bonnie Dr. to 200 North) 4-Inch C-900 DR-18 PVC Purple Pipe	2,500	LF	$140	$350,000	Highest	1-5 yr
74	350 North (1000 West to 850 W) 4-Inch C-900 DR-18 PVC Purple Pipe	975	LF	$140	$136,500	Highest	1-5 yr
75	1000 West (Bonnie Drive to 200 North) 4-Inch C-900 DR-18 PVC Purple Pipe	200	LF	$140	$28,000	Highest	1-5 yr
76	300 North (925 West to 850 West) 4-Inch C-900 DR-18 PVC Purple Pipe	1,000	LF	$140	$140,000	Highest	1-5 yr
77	Bonnie Drive (350 North to 1000 West) 4-Inch C-900 DR-18 PVC Purple Pipe	875	LF	$140	$122,500	Highest	1-5 yr
78	North Gates Dr. (N. Nelson Ave. to 200 North) 4-Inch C-900 DR-18 PVC Purple Pipe	1,025	LF	$140	$143,500	Highest	1-5 yr
79	150 North (Wendall Ln. to 600 West) 4-Inch C-900 DR-18 PVC Purple Pipe	875	LF	$140	$122,500	Highest	1-5 yr
80	75 North (Wendall Ln. to 600 West) 4-Inch C-900 DR-18 PVC Purple Pipe	625	LF	$140	$87,500	Highest	1-5 yr
81	King Aurthur Dr.; 4-Inch C-900 DR-18 PVC Purple Pipe	250	LF	$140	$35,000	Highest	1-5 yr
82	Guinevere Cir.; 4-Inch C-900 DR-18 PVC Purple Pipe	275	LF	$140	$38,500	Highest	1-5 yr
83	Wendall Ln. (150 North to Lagoons St.) 4-Inch C-900 DR-18 PVC Purple Pipe	700	LF	$140	$98,000	Highest	1-5 yr
84	Ivie Manor; 4-Inch C-900 DR-18 PVC Purple Pipe	275	LF	$140	$38,500	Highest	1-5 yr
85	S. Georgia Cir.; 4-Inch C-900 DR-18 PVC Purple Pipe	275	LF	$140	$38,500	Highest	1-5 yr
86	550 W (200 North to 75 North) 4-Inch C-900 DR-18 PVC Purple Pipe	625	LF	$140	$87,500	Medium[1]	11-15 yr
87	550 W (Lagoon St. to 100 South) 4-Inch C-900 DR-18 PVC Purple Pipe	500	LF	$140	$70,000	Highest	1-5 yr

Proj. No.	Project Description	Quantity	Units	Unit Price	Estimated Cost	Priority	Period
88	South Cove Road (1050 West to 3000 West) 12-Inch C-900 DR-18 PVC Purple Pipe	10,550	LF	$170	$1,793,500	Low[1]	16-25 yr
89	2500 West (700 North to 500 South) 8-Inch C-900 DR-18 PVC Purple Pipe	5,900	LF	$145	$855,500	Low[1]	16-25 yr
90	3000 West (South Cove Road to 350 South) 8-Inch C-900 DR-18 PVC Purple Pipe	2,700	LF	$145	$391,500	Low[1]	16-25 yr
91	350 South (3000 West to 2500 West) 4-Inch C-900 DR-18 PVC Purple Pipe	2,700	LF	$130	$351,000	Low[1]	16-25 yr
92	500 South (2500 West to 2200 West) 4-Inch C-900 DR-18 PVC Purple Pipe	3,175	LF	$130	$412,750	Low[1]	16-25 yr
93	200 North 525 West PRV	1	LS	$150,000	$150,000	Low	16-25 yr
94	200 South 525 West PRV	1	LS	$150,000	$150,000	Low	16-25 yr
95	600 East 250 North PRV	1	LS	$150,000	$150,000	Low	16-25 yr
96	200 North Summerall Ln PRV	1	LS	$150,000	$150,000	Low[1]	16-25 yr
97	Upgrade and Reactivate 500 West 300 South PRV	1	LS	$90,400	$90,400	Low	16-25 yr
				Total CIP Projects Estimated Construction Costs	$16,909,428		
				Approximate CIP Costs Per Year (to 2045)	$650,363		

[1] Denotes 100 % developer driven.

[2] Denotes partial developer driven (improvement provides for development, but also provides service to existing residences).

C.3.5.1 Existing City Residences Project Prioritization

There are existing residences within the City that currently do not have secondary water, but can easily connect to the existing secondary system. These are considered to be the "low hanging fruit" or the most feasible projects to implement, and therefore are considered to be of the highest priority, however, improvements to provide secondary services to these residences would cost over $10M. To better prioritize which of these projects should be implemented first, these areas, that have existing residences, were divided into 5 "Areas".

Area 1	200 North to 700 North; State Street to Union Street
Area 2	1100 West to 500 West; Gates Drive to 100 South
Area 3	500 West to Highway 40; 450 South to 300 North
Area 4	Highway 40 to 600 East; and 800 South to 100 South
Area 5	800 South to Pole Line; 600 East to 250 West

The zones were analyzed, and the estimated cost to provide secondary service to these areas, as well as the estimated total usage for the zone were determined. The zones were prioritized based on the

lowest cost and the highest usage. The results are shown in Table C-5, and are represented in the Capital Improvement Projects Table C-4.

Table C-5: Usage/Cost Analysis per Residential Area

Area	ERC	Estimated Cost	Average Yearly Demand (gpd/ERC)	Usage (ac-ft)	Cost Per Ac-Ft ($/ac-ft)	Rank	Period (years)
1	287	$2,790,760	437	140	$19,864.65	3	6-10
2	179	$1,449,000	437	88	$16,537.13	1	1-5
3	149	$2,567,040	437	73	$35,195.82	5	6-10
4	234	$2,228,100	437	115	$19,451.97	2	1-5
5	150	$1,689,490	437	73	$23,009.60	4	6-10

C.4 Culinary and Secondary Fee Comparison.

Roosevelt City's current monthly rate structure for secondary water is as follows:

$1.00/1,000 gallons up to 50,000 gallons
$1.25/1,000 gallons up to 75,000 gallons
$1.50/1,000 gallons over 75,000 gallons

The average yearly demand as previously determined is 437 gpd/ERC, therefore one residence of a typical lot in Roosevelt City uses, on average, 437 gpd. Using 30 days in a month, the total estimated gallons used per month for a typical lot is 13,110 gallons. Under the current secondary water monthly rate structure, this would cost the resident $13 per month for a secondary irrigation service.

Residents that do not have a secondary source for irrigation use culinary water for outdoor watering. To compare the costs for outdoor watering using culinary, the current monthly rate structure for culinary water was examined.

Roosevelt City's current monthly rate structure for culinary water is as follows:

Base rate: $30
$1.25/1,000 gallons up to 8,000 gallons
$1.50/1,000 gallons up to 20,000 gallons
$2.00/1,000 gallons up to 40,000 gallons
$2.25/1,000 gallons up to 60,000 gallons
$2.00/1,000 gallons over 60,000 gallons

If the same 13,110 gallons is used for outdoor watering, but is used from the culinary source, it would cost the resident $17.50 per month. The base rate would have no bearing, because a typical lot would have a culinary connection, so they would still pay the base rate of $30. The savings would be $4.50 per month if secondary water is used versus culinary water. As previously evaluated in this report, by 2045 future residential ERC's are estimated to be 2,883; the existing estimated residential ERC's is 998. This means that there is the potential to add 1,885 residential secondary connections to the City's secondary system. At a $4.50 per month savings by using secondary water in place of culinary water for outdoor watering, the City could potentially save its residents a total of $8,483 per month or $101,790 annually.

This analysis shows that it is cost effective for residents to move from culinary to pressurized irrigation under the current rate structure.

C.4.1 Comparable Rates

As a comparison Heber City collects secondary fees based on lot size and are as follows:

<6,000 square feet	$8.16/month
6,000 – 9,999 square feet	$13.60/month
10,000-14,999 square feet	$20.39/month
15,000-19,999 square feet	$27.19/month
>20,000 square feet	$33.99/month

The assumption that was made in this study is that typical lot sizes within the City are ¼ to ½ acre or 10,890 square feet to 21,780 square feet. This results in an average lot size of approximately $16,335 square feet, which would be $27.19 if in Heber City. Based on water use estimations, Roosevelt City would charge $13 per month.

Other comparable rates, based on volume are shown in Table C-6.

Table C-6: Other Market Rate Structure Comparisons

Cost per Thousand Gallons			
System	**Base Rate**	**Range**	**Cost**
Roosevelt City Culinary	$30.00	1K to 8K	$1.25
		9K to 20K	$1.50
		20K to 40K	$2.00
		40K to 60K	$2.25
		>60K	$2.00
Roosevelt City Secondary	$0.00	0K to 50K	$1.00
		50K to 75K	$1.25
		>75K	$1.50
Duchesne Culinary	$22.75	5K to 10K	$1.20
		10K to 20K	$1.40
		20K to 30K	$1.60
		30K to 40K	$1.80

Cost per Thousand Gallons			
System	**Base Rate**	**Range**	**Cost**
		>40K	$2.15
Heber City Culinary	$21.32	0K to 7K	$0.76
		7K to 12K	$0.94
		12K to 19K	$1.37
		19K to 35 K	$1.70
		35K to 70K	$1.97
		>70K	$2.30
Saratoga Springs Secondary[1]	$24.38	0K to 30K	$0.35
		30K to 40K	$1.00
		40K to 60K	$1.25
		60K to 80K	$2.00
		80K to 100K	$3.00
		>100K	$3.80
Kamas City Culinary	$28.00	15K to 40K	$0.75
		40K to 100K	$1.25
		100K to 300K	$2.00
		>300K	$2.75
Francis City Culinary	$30.00	15K to 20K	$1.00
		20K to 30K	$1.25
		30K to 50K	$2.50
		>50K	$4.00

[1]Saratoga Springs was calculated based on the following rate structure, using 16,335 SF, lot sizes which would be comparable to an average Roosevelt City lot size.

Saratoga Springs Rate Structure	
Single Family Residential Base Fee:	$65.00 per acre
Single Family Residential Monthly Allotment (thousand gallons)	Gross lot acreage multiplied by 108.793732
Secondary Water Usage Rates	0 to 75% of allotment, $0.35 per 1,000 gallons
	75 to 100% of allotment, $1.00 per 1,000 gallons
	100 to 150% of allotment, $1.25 per 1,000 gallons
	150 to 200% of allotment, $2.00 per 1,000 gallons
	200 to 250% of allotment, $3.00 per 1,000 gallons
	Above 250% of allotment, $3.80 per 1,000 gallons

C.5 Funding Sources

Funding Options include but are not limited to NRCS funding and Permanent Community Impact Board (PCIB). Federal and State agencies are often charged with administering funds to assist in planning, design, and construction of many projects and typically notify City officials when these funds become available. The City should consider applying for funds to address the recommendations outlined in this masterplan as the funds become available.

C.6 Developer Contribution

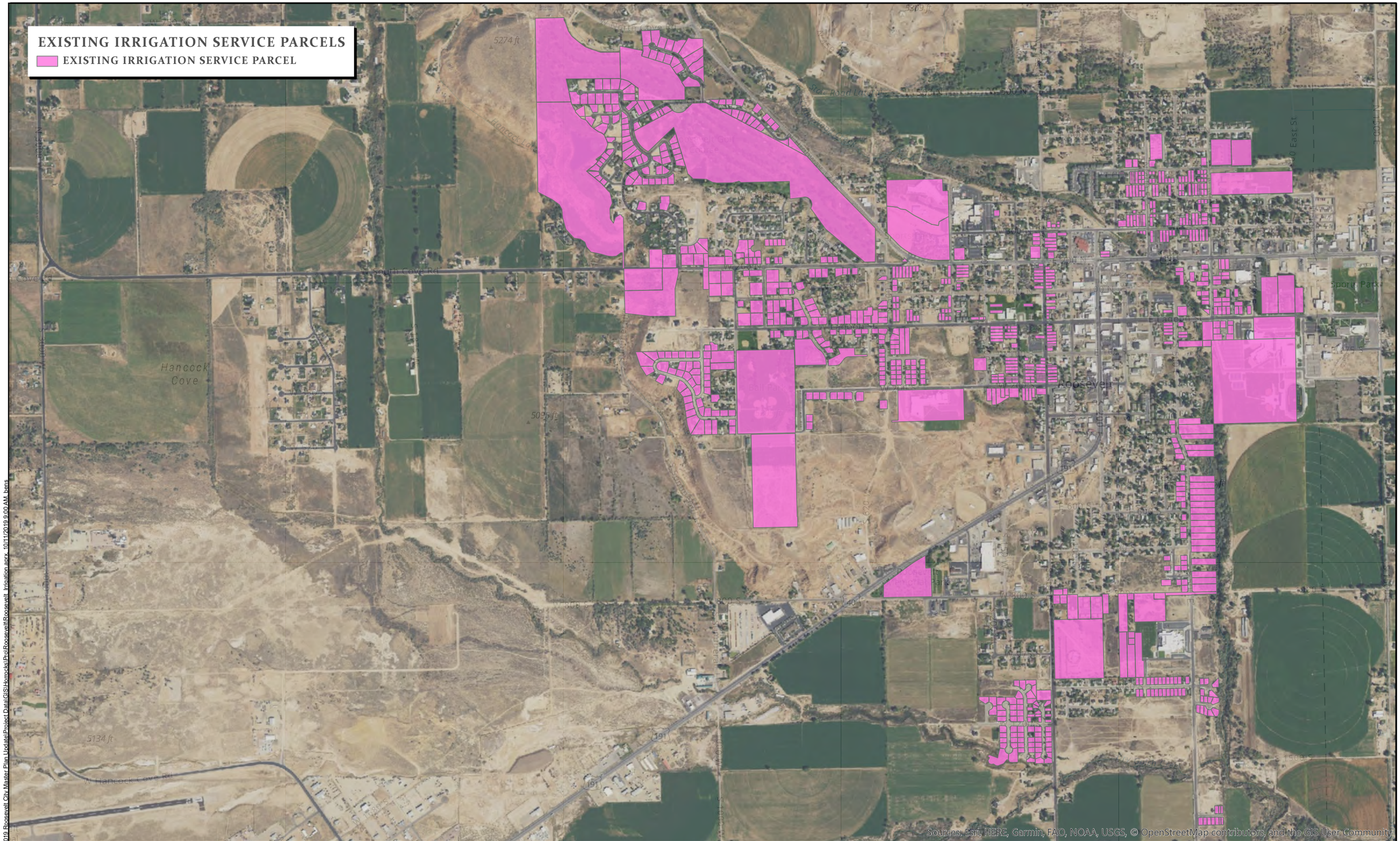
The City should have a policy that developers are responsible for 100 percent of the cost of on-site improvements needed to serve their development. Developers are also responsible for extending any off site services needed to serve their development. However, reimbursement for a portion of these costs may be available through reimbursement agreements if the facilities have previously been identified in this Master Plan.

As mentioned in the executive summary, it is estimated that of the 6-10 year improvements $171,275 would be developer driven, therefore should be paid for by developers. The estimated developer contributions for 11-15 year improvements and 16-25 year improvements are estimated at $174,688 and $4,813,750 respectively.

Impact fees can be collected with new development projects to help pay for the costs of providing public services to new development. The collection and use of impact fees are governed by Utah Law – UC11-36-202(1)(a)(ii). It is recommended that Roosevelt perform a secondary water impact fee analysis and institute a secondary water impact fee as part of new development.

C.7 Project Maps

Figure C-1 Existing Service Parcels – Secondary Water
Figure C-2 Proposed Service Parcels – Secondary Water
Figure C-3a Existing Secondary Water
Figure C-3b Existing Secondary Water
Figure C-4a Existing and Proposed Secondary Water
Figure C-4b Existing and Proposed Secondary Water



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2162 West Grove Parkway
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Figure C-1 Existing Service Parcels - Secondary Water

Roosevelt City

0 0.13 0.25 0.5 Miles

N

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Proposed Irrigation Service Parcels

- Nonvacant Cemetery Parcel
- Nonvacant Residential Parcel
- Vacant Cemetery Parcel
- Vacant Residential Parcel
- Nonvacant Institutional Parcel

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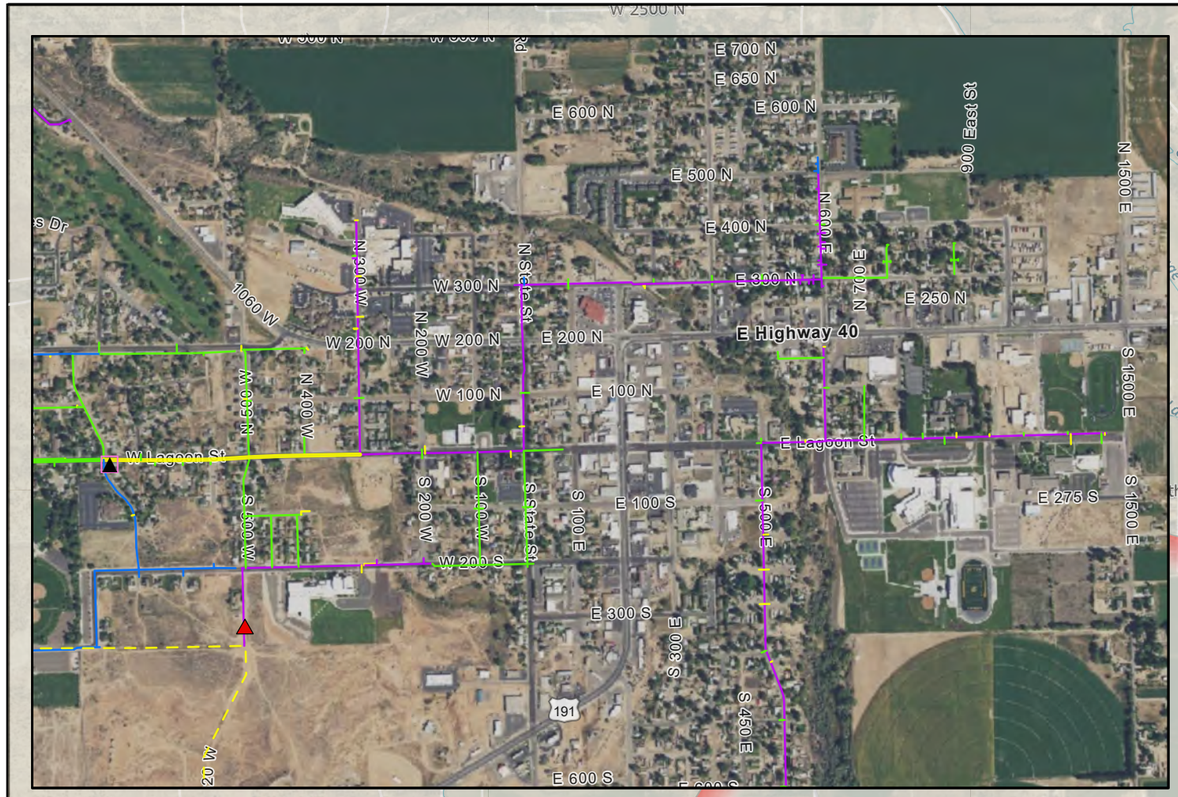
Figure C-2 Proposed Service Parcels - Secondary Water

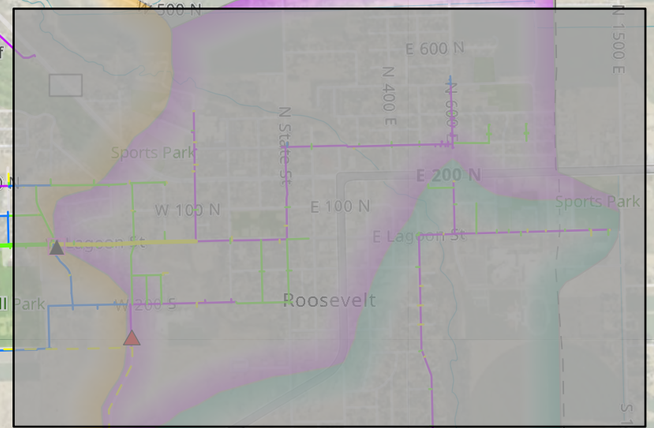
Roosevelt City

0 0.13 0.25 0.5 Miles

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EXISTING IRRIGATION

- 2"
- 4"
- 6"
- 8"
- 10"
- 12"
- 14"
- 16"
- 18"
- 20"
- 24"
- 32"
- 14" MLWUA
- 18" MLWUA
- 20" MLWUA
- 24" MLWUA
- 32" MLWUA

IRRIGATION SYSTEM FEATURES

- EXISTING PRV
- EXISTING PRV (CLOSED)
- EXISTING FILTER STATION
- EXISTING PI DRAIN

IRRIGATION PRESSURE ZONES

- HGL - 5270
- HGL - 5350
- HGL - 5372
- HGL - 5450

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Figure C-3a Existing Secondary Water

Roosevelt City

0 0.25 0.5 1 Miles

N

EXISTING IRRIGATION

- 2"
- 4"
- 6"
- 8"
- 10"
- 12"
- 14"
- 16"
- 18"
- 20"
- 24"
- 32"
- 14" MLWUA
- 18" MLWUA
- 20" MLWUA
- 24" MLWUA
- 32" MLWUA

IRRIGATION SYSTEM FEATURES

- EXISTING PRV
- EXISTING PRV (CLOSED)
- EXISTING FILTER STATION
- EXISTING PI DRAIN

IRRIGATION PRESSURE ZONES

- HGL - 5270
- HGL - 5350
- HGL - 5372
- HGL - 5450

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Figure C-3b Existing Secondary Water

Roosevelt City

0 0.3 0.6 Miles

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PRV on MLWUA 24" Steel Line

EXISTING IRRIGATION

- 2"
- 4"
- 6"
- 8"
- 10"
- 12"
- 14"
- 16"
- 18"
- 20"
- 24"
- 32"

PROPOSED SECONDARY WATER

- 4
- 6"
- 8"
- 10"
- 12"

IRRIGATION SYSTEM FEATURES

- EXISTING PRV
- EXISTING PRV (CLOSED)
- EXISTING FILTER STATION
- EXISTING PI DRAIN

PROPOSED SYSTEM FEATURES

- PROPOSED PRV
- REBUILD AND REACTIVATE EXISTING PRV

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Figure C-4a Existing and Proposed Secondary Water

Roosevelt City

0 0.25 0.5 1 Miles

N

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PRV on MLWUA 24" Steel Line

EXISTING IRRIGATION

- 2"
- 4"
- 6"
- 8"
- 10"
- 12"
- 14"
- 16"
- 18"
- 20"
- 24"
- 32"

PROPOSED SECONDARY WATER

- 4
- 6"
- 8"
- 10"
- 12"

IRRIGATION SYSTEM FEATURES

- EXISTING PRV
- EXISTING PRV (CLOSED)
- EXISTING FILTER STATION
- EXISTING PI DRAIN

PROPOSED SYSTEM FEATURES

- PROPOSED PRV
- REBUILD AND REACTIVATE EXISTING PRV

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Figure C-4b Existing and Proposed Secondary Water

Roosevelt City

0 0.13 0.25 0.5 Miles

N

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Sewer Master Plan

Appendix D

HORROCKS ENGINEERS



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Appendix D

Executive Summary

The Roosevelt City Sewer System Master Plan contains an analysis of the existing sewer system and recommendations to accommodate future growth through year 2045. Based on deficiencies identified during the analysis improvements were recommended for the existing system and future system growth.

Listed in **Section D.5** of this Appendix are the capital improvements needed to meet the 25-year population demands. Below is a summary of expected costs, associated improvement period, and priority.

1-5 year improvements	Highest	$841,705
6-10 year improvements	High	$1,259,890
11-15 year improvements	Medium	$13,361,619
16-25 year improvements	Low	$16,529,718

It is estimated that of the 6-10 year improvements $629,945 would be developer driven, therefore should be paid for by developers. The estimated developer contributions for 11-15 year improvements and 16-25 year improvements are estimated at $9,499,272 and $10,569,911 respectively. These development type of improvements should only be explored if annexation and development does indeed become a reality during the planning period.

D.1 Introduction

This chapter identifies the existing condition of the Roosevelt City (City) Sewer System as well as recommended improvements to meet the projected 25-year population demands.

Roosevelt City's sewer system was evaluated for the projected population, number of connections and measured sewer flows. Using State design requirements, population per household, historical sewer flows, and historic flow measurements, the flows were projected through the planning period.

The software SewerGEMS CONNECT was used to create a computerized model to analyze the existing sewer system and determine the respective capacities in collector and interceptor lines using the potential areas of development and the projected sewer flow. Based on deficiencies found in the model and from City input, improvements were recommended to meet future demands.

Roosevelt City sewer and Ballard City sewer is treated at the Wastewater Treatment Facilities located at 2500 East and 2700 South, then land applied at the Sewer Farm adjacent to the lagoon system to the east (Figure D-6). 2011 flow measurement records indicate that of the influent to the wastewater treatment facilities, 85% of that flow is a contribution from Roosevelt City and 15% is a contribution from the Ballard City.

D.1.1 Design Criteria

Flow	Average Yearly	335 gpd/ERC
	Peak Hour Collector Lines	Average Yearly x 4.0
	Peak Hour Interceptor Lines	Average Yearly x 2.5
Pipe Capacity	Maximum	75% of Full Capacity
Pipe Sizes	Minimum	8-inches*
Velocities	Minimum	2 fps
	Maximum	15 fps
	Existing Equivalent Residential Connections (ERC)	3,217
	2045 ERC	4,889

*Standard design criteria suggests that sewer lines should be 8-inches minimum in diameter. There are several sewer lines within the City that are less than 8-inch diameter, but unless upsizing these sewer lines is a pre-requisite for future expansion, meaning that the City cannot go forward with expansion unless they are upsized, they are not included in this masterplan. Smaller pipes not identified in this Appendix to be upgraded, are capable of serving areas of the City where they are located, so they are not considered bottlenecks. This was discussed with City officials, and after careful consideration, upsizing these sewer lines to meet the minimum diameter of 8-inches was not considered a priority. There are also many back lot sewer lines, meaning that they are in the back of lots or in alleys, and not in streets. After careful discussion and consideration, it was determined that since these lines do not restrict expansion they are not considered a priority, and therefore not included as part of this master plan. Going forward it is recommended that in a street slated for reconstruction, all sewer lines in need of replacement, or relocation from back of lots or in an alley, be upsized, replaced or relocated to 8-inches, or greater if specified.

D.1.2 Projected Sewer Flow

In 2045 there is expected to be an estimated 4,889 projected ERCs resulting in an average yearly flow increase of 205 million gallons (MG), from 393 MG to 598 MG. (3,217 ERC x 335 gpd/ERC x 365 ÷ 1,000,000) and (4,889 ERC x 335 gpd/ERC x 365 ÷ 1,000,000).

Records of measured influent at the City's wastewater treatment facilities show a flow increase of 49% during the summer months between the years of 2015 and 2018. The majority of this increase is likely due to infiltration and inflow.

D.1.3 Recommended Sewer System Improvements

Capital improvements recommended to meet the projected population's sewer flows are shown in Figures D-4, D-5a, and D-5b. These recommendations were determined by using a computer model of Roosevelt City's sewer system and input from City staff. A detailed listing of the recommended improvements with corresponding cost estimates is given in Section D.5 (Table D-8). A list of recommended improvements as needed are listed below.

1) Sewer Farm operations maintaining sufficient land application to ensure capacity for winter storage through the planning period.
2) Continue to take steps to further reduce infiltration and inflow via:
    a. replace existing brittle lines
    b. pipe slip-lining or other maintenance
    c. manhole lining
    d. manhole replacement
    d. construct new drain lines
3) Line manholes that are corroding with corrosive tolerant substance to stop corrosion.
4) Inspection and testing for all new sewer lines as defined in the City's specifications should be required.
5) The following is a list of capital improvement projects (CIP):
    1. Winter Storage Expansion (required by the end of the planning period)
    2. Annual Existing Pipe Maintenance (lining) 7,000 LF
    3. Annual Existing Manhole Maintenance (lining)
    4. Lagoon Street (400 West to 250 West) 12-Inch SDR-35 PVC Sewer Pipe
    5. 600 East (350 North to 300 North) 8-Inch SDR-35 PVC Sewer Pipe
    6. 600 East (Lagoon Street to 100 North) 10-Inch SDR-35 PVC Sewer Pipe
    7. Summerall Ln and 1200 South (800 South to 250 W) 15-Inch SDR-35 PVC Sewer Pipe
    8. Rodeo Drive (450 South to 700 South) 8-Inch SDR-35 PVC Sewer Pipe
    9. Rodeo Drive (815 South to 1200 South) 8-Inch SDR-35 PVC Sewer Pipe
    10. State Street (2250 South to Pole Line Road) 8-Inch SDR-35 PVC Sewer Pipe
    11. 2200 South (100 East to 300 East) 8-Inch SDR-35 PVC Sewer Pipe
    12. 300 East (2200 South to Pole Line Road) 8-Inch SDR-35 PVC Sewer Pipe
    13. 700 East (300 South to 800 South) 8-Inch SDR-35 PVC Sewer Pipe
    14. 800 South (700 East to 1500 East) 8-Inch SDR-35 PVC Sewer Pipe
    15. Cottonwood Creek (State Street to Lagoon Street) 12-Inch SDR-35 PVC Sewer Pipe
    16. Cottonwood Creek (State Street to SR 121) 8-Inch SDR-35 PVC Sewer Pipe
    17. S.R 121 (700 North to 2250 North) 8-Inch SDR-35 PVC Sewer Pipe
    18. State Street (Cottonwood Creek to 2700 North) 8-Inch SDR-35 PVC Sewer Pipe
    19. 2900 West (1200 South to 1800 South) 8-Inch SDR-35 PVC Sewer Pipe
    20. 1200 South (2900 West to 2250 West) 8-Inch SDR-35 PVC Sewer Pipe
    21. 2250 West (1200 South to 700 South) 8-Inch SDR-35 PVC Sewer Pipe
    22. Pole Line Road (3500 West to 2800 West) 8-Inch SDR-35 PVC Sewer Pipe
    23. 600 South (2200 West to 2400 West) 8-Inch SDR-35 PVC Sewer Pipe

24. 2400 West (600 South to 200 North) 8-Inch SDR-35 PVC Sewer Pipe
25. 350 South (2400 West to 3000 West) 8-Inch SDR-35 PVC Sewer Pipe
26. 200 North (4000 West to 2400 West) 8-Inch SDR-35 PVC Sewer Pipe
27. 200 North (1800 West to 2400 West) 12-Inch SDR-35 PVC Sewer Pipe
28. 200 North (1800 West to Summerall Lane) 8-Inch SDR-35 PVC Sewer Pipe
29. 2400 West (200 North to North Cove Road) 12-Inch SDR-35 PVC Sewer Pipe
30. North Cove Road (3000 West to 2400 West) 8-Inch SDR-35 PVC Sewer Pipe
31. North Cove Road (2400 West to 1930 West) 12-Inch SDR-35 PVC Sewer Pipe
32. North Cove Road (1800 West to 1930 West) 12-Inch SDR-35 PVC Sewer Pipe
33. 2250 West (North Cove Road to 1500 North) 8-Inch SDR-35 PVC Sewer Pipe
34. Cottonwood Creek (2250 West to 3000 West) 8-Inch SDR-35 PVC Sewer Pipe
35. 3000 West (2250 North to 2800 North) 8-Inch SDR-35 PVC Sewer Pipe
36. 2755 North (2700 West to 1950 West) 8-Inch SDR-35 PVC Sewer Pipe
37. 1950 West (2755 North to Cottonwood Loop) 8-Inch SDR-35 PVC Sewer Pipe
38. Cottonwood Loop
39. West of SR 121 (Cottonwood Loop to SR 121) 8-Inch SDR-35 PVC Sewer Pipe
40. Page Bench Road (Upper Hancock Cove to 2755 North) 8-Inch SDR-35 PVC Sewer Pipe
41. 550 North (1450 East to 1500 East) 10-Inch SDR-35 PVC Sewer Pipe
42. 1500 East (550 North to 300 North) 10-Inch SDR-35 PVC Sewer Pipe

D.1.4 Infiltration and Inflow Explanation

Sewer flows increase during the summer months as compared to winter months. A majority of the summer increase is assumed to be from infiltration and inflow. High water table occurs during the summer months, typically due to irrigation. Water enters old sewer pipes at cracks and failing joints. As shown in Table D-1, City sewer records of measured influent flow at the City's wastewater treatment facilities indicate an average increase of 49% in flow during the summer months as compared to winter months between the years of 2015 and 2018. However, during 2018, the City began artificially putting some water from its secondary source into the sewer system, to sell water to oil companies from the winter storage pond, which is evident by the spike in the summer increase. If the 2018 records are removed from the calculation, the average increase in flow during the summer months is 43% which is more realistic, but still very high. The City should continue to take steps to further reduce this infiltration and inflow.

Table D-1: 2015 – 2018 Sewer Records

Year	Winter Monthly Average (MG)	Summer Monthly Average (MG)	Yearly Flow (MG)	Roosevelt (85%) (MG)	Ballard (15%) (MG)	Percentage Summer Increase
2015	25	35	369	314	55	41.38%
2016	25	36	379	322	57	42.44%
2017	31	45	466	396	70	45.23%

Year	Winter Monthly Average (MG)	Summer Monthly Average (MG)	Yearly Flow (MG)	Roosevelt (85%) (MG)	Ballard (15%) (MG)	Percentage Summer Increase
2018	26	43	431	366	65	66.97%
Average	27	40	411	350	62	49.00%
Ave (less 2018)	27	39	405	344	61	43.02%

The expansion of the City's secondary water system with an efficient secondary system will lower the groundwater table reducing infiltration, which will in turn reduce infiltration. Ground water levels lower in some areas as pressurized pipe systems are developed, because there is a reduction in flood irrigation from canals and open ditches.

D.1.5 System Capacity Improvements

The existing sewer system will need various upgrades to have sufficient capacity to meet the needs of the projected growth and maintain the current Level of Service (LOS). Figures D-4, D-5a, and D-5b shows the additional lines or replacement lines needed to handle the flow generated from the growth projected through the planning period.

D.2 Sewer Flow Data

Future conditions in Roosevelt City will affect the sewer flow and the improvements needed to meet increased flow. Information used to determine the future conditions are:

- Present growth rates and future projected population growth rates
- Existing sewer flow
- Existing ERCs
- Projected residential and non-residential development areas

As this information changes, so will the timing of when recommended improvements are needed. This study will limit recommendations to all improvements needed by the end of the 25 year planning period. Interim phasing or timing of improvements will be determined and periodically adjusted by the City as information is accumulated.

Roosevelt City's population has been projected through the planning period. The projected number of sewer connections was determined based upon the projected population and the percent of the population connected to the system. To determine where the projected sewer flows will occur, the potential areas of development were analyzed (Figure D-2). Using historical sewer flows and State design requirements, the sewer flows have been projected through the planning period.

D.2.1 Projected Population

The projected population for Roosevelt City, during the planning period to 2045, is discussed in Chapter 1 of the General Plan. The current population is estimated to be 7,112 and the 2045 Roosevelt City population is projected to be 11,339, for a total 25-year population increase of 4,228.

D.2.2 Equivalent Residential Connections

Sewer flow from residential connections differs from commercial, church, government and other non-residential connections. To evaluate residential and non-residential connections on an equal basis, Equivalent Residential Connections (ERC's) are used to equate the different types of connections. For this study, it is assumed that most water used during the winter is discharged into the sewer system. ERC's for non-residential connections were approximated by using winter culinary water use data. The average monthly winter water usage of commercial, church, and government businesses, was divided by the average monthly winter water use per residential connection, to obtain non-residential number of ERC's per connection. Three years of data was used to calculate the average.

The average monthly winter usage from 2016 to 2018 was 0.13 gpm and 0.35 gpm for residential and non-residential respectively. The resulting average ERC's per non-residential connection was approximately 2.7 (0.35 gpm ÷ 0.13 gpm). Therefore, in terms of ERC's, 2018 had 2,169 residential connections and 1,048 non-residential ERC's (388 non-residential connections x 2.7 ERC's per connection), connected to the system, for a total existing ERC value of 3,217.

The total number of projected residential and non-residential ERC's are shown in Table D-2. The future ERC's is the summation of the estimated number of future residential connections multiplied by 1 and future non-residential connections multiplied by 2.7. There will be an estimated 3,696 residential connections in the future, and non-residential connections will increase by 54 from 388 to 442. The total resulting ERC's will be 4,889 (3,696 + 442 x 2.7).

The total number of existing residential and non-residential connections is a summation of existing residences or businesses tied to Roosevelt City's sewer system. The future residential and non-residential connections is a summation of residential and non-residential parcels that are projected to connect to the sewer system.

Table D-2: Existing and Projected ERC's for Sewer

Description	2018	2045
Residential ERCs	2,169	3,696
Non-residential ERCs	1,048	1,193
Total ERCs	3,217	**4,889**

D.2.3 Historical Sewer Flow

The historical sewer flow mentioned below using measuring devices is for discussion and comparison purposes only, and were not used to analyze existing and proposed sewer flows in this current plan.

In 2011 Marsh-McBirney FLO-DAR Sensor and Hach FL 900 Series Flow Logger were installed in 10 manholes throughout Roosevelt City and the Ballard City (Ballard) over a 30 day period. The average daily flow from the Roosevelt City sewer system for the 30 day period was found to be approximately 0.80 MG/d, resulting in an average yearly flow of 292 MG. The resulting average yearly flow from the Ballard's system was measured at 52 MG. In 2011, there were approximately 2,400 estimated ERCs. The resulting average yearly flow per ERC using actual metered data was, at the time, determined to be 333 gpd/ERC ($\left(\frac{292\ MG}{365\ day}\right) x \left(\frac{1{,}000{,}000\ gal}{1\ MG}\right) \div 2{,}400\ ERC$). The average yearly flow between 2015 and 2018, excluding Ballard, based on measured values was determined to be 350 MG (Table D-1). This number with the current estimated ERCs of 3,217 yields an average yearly flow per ERC of 298 gpd/ERC ($\left(\frac{350\ MG}{365\ day}\right) x \left(\frac{1{,}000{,}000\ gal}{1\ MG}\right) \div 3{,}217\ ERC$). The actual measured average yearly flow in 2011 is greater than what is calculated for the present using the influent volume and total ERCs. The reduction could be the result of a number of contributing factors including fluctuations in infiltration between 2015 and 2018, or missing influent volume records. Also, the Ballard City versus Roosevelt City ratio probably varies from year to year.

D.2.4 Calculation of Sewer Flow

The State of Utah Administrative Rule R317-3-2 contains the requirements for sewer system design. New sewer systems are designed on the basis of an annual average rate of flow of 100 gallons per capita per day. This includes an allowance for infiltration, and the rate may be higher if there is a probability of large amounts of infiltration entering the system. Design flow is calculated from this base flow plus a peaking factor. A peaking factor of 2.5 for interceptor and outfall sewers is used, and 4.0 for laterals and collector sewers is used. Using an estimate of 3.35 people per household equates to an Average Yearly flow of approximately 335 gpd per residential connection (3.35 capita x 100 gal/capita-day). As a comparison, this is very near the average yearly flow of 333 gpd per ERC measured in 2011 which includes infiltration and inflow. 335 gpd per residential connection was used in this study, as the average yearly flow per ERC.

D.2.5 Projected Number of Sewer Connections

The projected number of new residential sewer connections is determined using the growth numbers in Chapter 1. The residential connections are assumed to increase at the same rate as population growth. In 2018, as previously discussed in D.2.2 there were approximately 2,169 residential sewer connections, and 388 non-residential sewer connections. It is expected that by the year 2045, there will be approximately 3,696 residential sewer connections and 442 non-residential sewer connections.

D.2.6 Infiltration and Inflow

Increased flow caused by infiltration and inflow in the sewer lines can cause higher sewer treatment costs. If these additional flows are large, they may cause the flow to exceed the capacity of the lines. Old sewer lines were constructed using caulked mortar joints, which developed leaks. These leaking

joints have acted as subsurface drains allowing groundwater to infiltrate into the sewer line during the summer months.

Reductions in infiltration have resulted from maintenance, repairs, and reconstruction of the City's sewer system. Additionally, reduction in the ground water infiltration results from the installment and use of a pressurized irrigation system. Reduction in irrigation via flood irrigation from canals and open ditch systems, by replacing the irrigation system with a pressurized pipe system, lowers the ground water table in certain areas, reducing infiltration.

While major strides have been made to reduce infiltration and inflow in Roosevelt City's sewer system, it should continue to be monitored for, and opportunities should be explored for further reductions. Observing high flow lines in late evening or early morning, when low flow should be present, could indicate excessive infiltration. Observing seasonal surcharging may indicate infiltration or other inflow problems. Based on the problems found, decisions can be made on the type of improvements needed. Improvement options may include the following:

- Fix existing leaking manholes
- Slip-line leaking pipes
- Replace leaking pipes
- Construct new drainage lines

These improvements can reduce sewer flow and lower treatment costs. As the population grows, Roosevelt City should explore additional opportunities to reduce infiltration and inflow.

Storm water entering sewer manholes during large storm events has been a problem in certain areas of the City, particularly in the area south of the 400 South to 1000 South, between approximately 500 West and 100 East. The City continues to make strides to improve its drainage system, but there are still issues as evident by the existing systems inability to handle large storm events. An updated Storm Drain Master Plan aimed at addressing and correcting existing drainage deficiencies by proposing the implementation of retention ponds and proposed storm drain facilities is located in Appendix E of the Roosevelt City Master Plan Update.

D.2.6.1 Infiltration, Secondary Injection, and Winter Storage Ponds Costs analysis

In 2018, Roosevelt City began selling water from their winter storage pond at the Wastewater Treatment Facilities to energy companies. With this knowledge, analysis of whether the importance of exploring measures to stop infiltration was re-examined. Because the water is going to be used anyway, and infiltration is already accounted for in per capita use, then the question was raised whether this should even be a concern.

As touched upon in Section D.1.4, in 2018, the City began artificially putting some water from its secondary source into the sewer system. The secondary water would end up in the sewer lagoons, and

after primary, secondary, and tertiary treatment, could be available to sell to oil companies from the winter storage pond.

To summarize Table D-1 in Section D.1.4:

Average infiltration=	43%
2018 metered influent=	366 MG
2018 increase from secondary injection=	67%

For this analysis, if the actual metered influent during 2018 generated by Roosevelt City of 366 MG is used, the resulting infiltration volume would be 94 MG, and the resulting injected water volume would be 53 MG, using the percentage increases calculated.

According to City officials, Roosevelt City has billed some energy companies $433,620 for water the companies have taken from the winter storage ponds between July 2018 and June 2019. The cost to purchase this water is $3.02/1,000 gallons. Between July 2018 and June 2019, operational costs for all activities at the wastewater treatment facilities and Sewer Farm, cost the City $863,862. If 366 MG was used to calculate an approximate cost to treat 1,000 gallons, the treatment cost would be $2.36/1,000 gallons.

The resulting infiltration cost would be $222,575, and the cost to treat the secondary water being introduced into the system would be $123,911 for a total treatment cost of $346,486. It this value is subtracted from the total that has been billed to the energy companies, the resulting balance is $87,134 annually. If it is assumed that the volume of water taken by the energy companies equal the volume of water being treated, then the resulting balance is $94,786, as the difference between what is being sold versus what is being treated is $0.66/1,000 gallons. Table D-3 shows these values of energy company revenue and treatment cost per 1,000 gallons.

Table D-3: Oil and Energy Costs versus Treatment Costs

Description	2018 cost per 1,000 gallons	Actual Metered Quantity (1,000 gal)	Total
Oil Industry	$3.02	143,583	$433,620
Treatment cost	$2.36	366,067	$863,862
Base flow treatment cost	$2.36	219,241	$517,376
Infiltration treatment cost	$2.36	94,317	$222,575
secondary water injection treatment cost	$2.36	52,508	$123,911

According to the calculated cost, infiltration costs the City less than what they are selling the water for, but it cannot be determined how often this practice can take place. Is this going to be an ongoing

practice for the next 25 years, or will this only happen once in a great while? There are too many unknowns in the energy industry when it comes to the economy, and it is hard to determine if this can be a consistent practice.

Additionally, without a set precedence on what can actually be injected into the sewer system, it is unknown if the system capacity will be exceeded under these methods. Also, if measures to reduce infiltration were stopped because there is the possibility that the winter storage can be sold to the energy industry, the City runs the risk of jeopardizing the available winter storage pond storage capacity. The reason for this is increased volume caused by infiltration when these practices are discontinued, due to increases in State scrutiny, rule changes, changes in the economy, or other possible reasons.

As will be determined later in this report, the future system will be designed to handle an average yearly projected flow of 335 gpd/ERC, which does not include infusing the sewer system with secondary water. This is not standard practice in determining the proper design criteria, and is difficult to design for, and over-sizing sewers to allow for the addition of water so oil companies can purchase it and haul it from the winter storage pond could get more expensive.

It is recommended that the City sell its secondary water to the oil industry somewhere in the secondary system. Furthermore, it is recommended that the City require companies that buy water from the winter storage pond for recycling, to perform a study that demonstrate that the water is clean enough for what it is being used for.

Based on the information provided in this section of this Appendix, and the uncertainties in the oil industry, and the quality of the water being recycled, it is recommended that efforts to reduce infiltration continue to be implemented to reduce treatment costs, and to assure that capacity is available for the future.

D.2.7 Summary of Projected Sewer Flow

To determine future impacts to the sewer system, it is estimated that of the population increase from 2019 to 2045 of 4,228, the majority of the existing vacant parcels near the central part of town will be filled. Refer to Chapter 2, Land Use Table 2-1 for a detailed description of anticipated development. The remaining population will be distributed to the following locations with their respective percentages: The Cove, Southtown, and N. Crescent at 45%, 35%, and 20%. Figure D-2 illustrates where new development is estimated to take place.

The projected population, historical sewer flow, and design criteria were used to project the sewer flow through the year 2045. As discussed in this report, the State design requirements for new sewer systems is 100 gallons per capita per day with includes an allotted portion of infiltration and inflow. Roosevelt City on average has approximately 3.35 persons per household. This equates to an Average Yearly flow of 335 gpd per ERC.

There are currently approximately 3,217 ERC's in the City's sewer system. City sewer records obtained at the City's wastewater treatment facility suggest that between 2015 and 2018 there was an average

yearly volume of 350 MG, which means average yearly flow per ERC would have to be 298 gpd/ERC at the current ERC value (3,217) to achieve 350 MG. State criteria of 100 gallons per capita per day and average house hold of 3.35 persons resulting in an average yearly flow of 335 gpd/ERC will govern. The projected average yearly flow volume in 2045 is estimated to be 598 MG gpd/ERC ($4{,}889\ ERC\ x\left(\frac{335\ gpd}{ERC}\right)x\left(\frac{365\ day}{1\ YR}\right)x\left(\frac{1\ MG}{1{,}000{,}000\ gal}\right)$). This is based on the average yearly flow per ERC and the 4,889 ERC estimate. Table D-4 shows the projected Average Yearly flow through the planning period, and show comparison to historic and current flow estimations.

Sewer lines are designed to provide capacity for the Peak Hourly flow with the lines at no more than 75 percent of full capacity. The ratio of the Peak Hourly flow to the Average Yearly flow is referred to as the peaking factor. Peaking factors are higher for collector lines than for outfall or interceptor lines because the peak is reduced as the distance from the source increases. Peaking factors for Roosevelt City are based on the State Department of Environmental Quality (DEQ) recommendations of 2.5 for interceptor and outfall sewers and 4.0 for laterals and collector sewers.

Table D-4: Projected Sewer Flow

Year	ERC	Average Yearly (gpd/ERC)	Average Yearly Flow	
			(MGD)	(MG)
2011	2,400	333	0.80	292
2018	3,217	335	1.08	393
2045	4,889	335	1.64	598

D.3 Sewer System Analysis and Level of Service

Roosevelt City's sewer system was analyzed to find the existing capacity and Level of Service (LOS). Future improvements needed to maintain the existing LOS were determined. This section describes the existing sewer system, along with a discussion of the concerns and improvements necessary to maintain the current LOS with future population growth. State and Roosevelt City standard requirements will be used as criteria to analyze the sewer system. Information obtained from a computer sewer model of Roosevelt's system will be presented with the recommended improvements needed to meet the projected population's sewer flow. Figures D-3a and D-3b show the existing sewer system.

D.3.1 Level of Service

The existing sewer system of Roosevelt City serves its residents with no interruption. Each pipe in the system is checked to ensure it is in good condition and large enough for its designated flow. Collection lines in the City carry approximately 393 MG per year.

The ERC capacity of incremental sewer line sizes is shown in Table D-5. The capacity is calculated at 75 percent of full capacity, using minimum slopes, a PVC roughness coefficient, and an appropriate peaking factor. As discussed in the previous section, outfall and interceptor lines experience smaller peaks than collector lines do, therefore a smaller peaking factor is used. Table D-5 also represents sewer line capacities and the current sewer LOS that existing residents in Roosevelt City should experience.

Table D-5: Sewer Line Capacity by Pipe Size

Size (in)	Percent of Full Capacity (%)	Manning's n	Min. Slope @ 2 fps (ft/ft)	Capacity @ Min. Slope (MGD)	Peaking Factor	Capacity @ 335 gpd * PF (ERC)
6	75	0.013	0.010000	0.34	4	254
8	75	0.013	0.003340	0.41	4	306
10	75	0.013	0.002480	0.65	4	485
12	75	0.013	0.001940	0.92	4	687
15	75	0.013	0.001440	1.45	4	1,082
18	75	0.013	0.001130	2.09	2.5	2,496
21	75	0.013	0.000920	2.83	2.5	3,379
24	75	0.013	0.000770	3.7	2.5	4,418
27	75	0.013	0.000630	4.6	2.5	5,493
30	75	0.013	0.000571	5.79	2.5	6,913
36	75	0.013	0.000449	8.33	2.5	9,946

D.3.2 Computer Model of Sewer System

A computer program called *SewerGEMS CONNECT* was used to model Roosevelt City's sewer system. The program uses the flows generated by each sewer connection to calculate the full flow, maximum flow, and flow velocity for each pipe. From the output of the model, the amount of sewer flowing in each line can be estimated. Information for the existing sewer system, including the pipe diameters, lengths, manhole locations, and invert elevations, were obtained from a survey, and from mapping produced by Horrocks Engineers and Roosevelt City in 2018 and 2019.

The assumption was made that most of the existing vacant lots within the City would be built out and portions of the Cove area, Southtown area, and North Crescent area would make up the remaining population increase at 45%, 35%, and 20% respectively. Using this proposed residential development information along with proposed non-residential connections, existing non-residential connections, and existing residential connections, the projected number of ERC's as discussed in earlier sections were generated. The additional flows generated by the future ERC's were entered into the sewer model, producing projected sewer flows into the existing and newly proposed interceptor lines. The model was run to determine upgrades needed for demands on the existing sewer system and the additional demands placed on the system in the future.

The existing sewer system was modeled using peaking factors to determine the peak hour flow. Any mains approaching a service level of 75 percent of full capacity were identified as in need of expansion.

The following lines are at 75 percent capacity and it is recommended that they be upsized to handle additional flow that is projected to be impact the sewer system during the planning period:

1) Lagoon Street (400 West to 250 West) upsize from 8-inch to 12-inch
2) 600 East (350 North to 300 North) upsize from 6-inch to 8-inch
3) 600 East (Lagoon Street to 100 North) upsize from 8-inch to 10-inch

A summary of the recommended future improvements and associated estimated costs are shown in Table D-8.

D.4 Sewer Farm

D.4.1 Background

The first wastewater treatment facilities were constructed in 1966 and upgraded in 1976. The present treatment facility is composed of 3 treatment lagoons, a winter storage lagoon, and 5 irrigation pivots for land application of treated effluent. In 2014 Lagoon Treatment Cell 1 was cleaned of sludge, and in 2012, the pump house was re-built and the pumps were upgraded. The land application acreage for the five pivots covers 268 acres, and the winter storage pond has a surface area of 56 acres.

D.4.2 Existing Conditions

For other winter storage pond recycling methods, refer to Section D.2.6.

Effluent is limited to land application of treated effluent via 5 irrigation pivots during non-winter months. The winter storage pond retains treated effluent for the winter months until land application can resume. The existing winter storage pond has capacity of 880 acre-feet. The measured average yearly flow between 2015 and 2018 is 411 MG (Table D-1). This equates to an average inflow of 1.13 million gallons per day. At this rate, the winter storage pond currently has the potential to store treated influent for 254 days ($880\ acft\ x \left(\frac{325{,}851\ gal}{acft}\right) \div \left(\frac{1.13\ MG}{day}\right) x \left(\frac{1{,}000{,}000\ gal}{1\ MG}\right)$. This is of course if all of the water in the winter storage pond is either lost to evaporation, and land applied by the pivots. Pivots 1 and 2 are the two furthest south east, pivots 3 and 4 are the two center pivots, and pivot 5 is located the furthest northwest (refer to Figure D-6).

The current maximum land application capability with the current pivot/sprinkler set up is 7.6 acre-ft per acre annually, but for an alfalfa crop, this is too much water. The Utah Division of Water Rights duty value for Roosevelt City according to duty maps provided by water rights is 3 ac-ft per acre, but the value is obtained from maps that are provided for general reference only and may not accurately represent the correct duty value in certain locations. Based on climate data for the State of Utah, for an

alfalfa crop in Roosevelt to overcome the net evapotranspiration (ET) or the transfer of water from land to the atmosphere, the irrigation land application rate should be 4 acre-ft per acre.

The pan evaporation depth over free-surface lagoons area is 51.7 inches annually, and the average annual precipitation for the area is 7.1 inches.

D.4.3 Future Conditions

In 2045, the population will be 11,339 and it is estimated that there will be 4,889 projected ERC's. The result is an average yearly flow of 598 MG (335 gpd/ERC x 4,889 x 365 ÷ 1,000,000), but this is for Roosevelt City's contribution only. It is estimated that Ballard contributes 15% of the influent into the City's wastewater treatment facilities resulting in an additional 105 MG for a total average yearly flow of 703 MG, or an average system inflow of 1.93 million gallons per day (703 MG/365 day). At this rate the existing winter storage pond can store treated influent for 149 days ($880\ acft\ x \left(\frac{325{,}851\ gal}{acft}\right) \div \left(\frac{1.93\ MG}{day}\right) x \left(\frac{1{,}000{,}000\ gal}{1\ MG}\right)$. The current number of winter storage days will decrease by 105 by the year 2045.

The water balance for the Winter Storage pond is defined as follows:

Storage (AF) = Inflows (AF) – Outflows (AF)

Inflows are waters that enter the pond, and in this case it is the sum of treated effluent (from treatment to winter storage) plus precipitation. The outflows from the system are seepage losses, evaporation, and pivot land application. For the purposes of this report, and since seepage losses are so small, they will be considered negligible. Table D-6 summarizes storage requirements currently and at the end of the planning period in 2045 if all 5 pivots are operating. The following are the parameters used in the calculation of required storage.

Existing treated effluent (TE):	411 MG/yr (Effluent from treatment cells to winter storage pond)
2045 treated effluent:	703 MG/yr
Pan evaporation:	51.7 inches/yr
Precipitation:	7.1 inches/yr
Land application:	4 ac-ft/acre-yr
Future Land application:	5.5 ac-ft/acre-yr
Pivot acreage:	268 acres Pivot 1 57 acres Pivot 2 44 acres Pivot 3 44 acres Pivot 4 57 acres Pivot 5 66 acres

Available Storage:	880 ac-ft
Future Storage:	1,270 ac-ft
Winter Storage Pond Acres:	56 acres
Future Winter Storage Pond Acres:	95 acres

Table D-6: Required Storage (all pivots)

Pivots available: 1, 2, 3, 4, 5													
Year	Treated Effluent (TE) (MG)	TE (MG/ mo.)	Sum. TE (ac-ft)	Wint. TE (ac-ft)	Evap. (ac-ft)	Sum. Precip. (ac-ft)	Wint. Precip. (ac-ft	Land Applied (ac-ft)	Winter Storage Generated (ac-ft)	Available Storage (ac-ft)	End Season Balance (ac-ft)	Result	100% Wasted (Y/N)
2018	411	34	736	526	(239)	16	16	(1,073)	542	880	-18	OK	Y
2045	703	59	1,258	899	(239)	16	16	(1,073	915	880	878	EXCEEDED	N

According to Table D-6, with all pivots operating, and the ability to waste winter storage on the fields, storage currently isn't an issue, however, in 2045, the amount of winter storage required will exceed the available storage.

The existing volume generated during the winter is 542 ac-ft. This initial volume along with irrigation season effluent (736 ac-ft), and irrigation season precipitation has to be wasted by evaporation and land application. Table D-6 illustrates that presently the total volume will be wasted by the end of the irrigation season (season) if all pivots are operating. This is at a land application rate of 4 ac-ft/acre, which supports alfalfa growth. In 2045, this isn't the case; at a 4-ac-ft/acre application, and in addition to inflows during the season, the system would not waste all of the winter storage by the end of the season. The volume that would be generated during the winter (915 ac-ft), in addition to the remaining volume at the end of the season (878 ac-ft) would exceed the available storage (880 ac-ft).

As part of this masterplan, it is proposed that the winter storage pond be expanded. Recommendations for winter storage expansion, and associated costs are included in Table D-8. The proposed winter storage expansion is located in a foot print that is approximately 39 acres (Figure D-6). The topography in the area, limits expansion to this area. A pond at a depth of 10-ft would yield 390 ac-ft. The addition to the current available storage would increase the future available storage to 1,270 ac-ft.

The future winter volume generated is estimated to be 927 ac-ft. This is less than the proposed available storage of 1,270 ac-ft, but at a land application rate of 4 ac-ft/acre, not enough volume will be wasted by the end of the season. Beginning the summer with a winter storage pond volume of 927 ac-ft, along with a season effluent of 1,258, and precipitation, the end of the season balance after evaporation and land application would be 733 ac-ft, if the application rate were 4 ac-ft/acre. This volume in addition to 927 ac-ft generated during the winter would exceed the available volume.

An increase in land application of 5.5 ac-ft/acre minimum would be required to reduce the end of the season winter storage volume to 331 ac-ft. This volume in addition to what would be generated during

the winter (927 ac-ft) would be close to the proposed winter storage volume (1,270 ac-ft). Table D-7 shows the required storage and available storage, with the proposed winter storage expansion, if the increased application rate of 5.5 ac-ft/acre is applied. 5.5 ac-ft/acre annually might be too much water to support alfalfa growth. There have also been indications that pivots 3 and 4 struggle to grow alfalfa and currently are not operating. It is recommended that crops that can support more water be explored.

Table D-7: Required Storage (pivots 1, 2, 3, 4, 5) – Added Winter Storage

Pivots available: 1, 2, 3, 4, 5													
Year	Treated Effluent (TE) (MG)	TE (MG/ mo.)	Sum. TE (ac-ft)	Wint. TE (ac-ft)	Evap. (ac-ft)	Sum. Precip. (ac-ft)	Wint. Precip. (ac-ft	Land Applied (ac-ft)	Winter Storage Generated (ac-ft)	Available Storage (ac-ft)	End Season Balance (ac-ft)	Result	100% Wasted (Y/N)
2018	411	34	736	526	(407)	28	28	(1,073)	554	1,270	-163	OK	Y
2045	703	59	1,258	899	(407)	28	28	(1,476)	927	1,270	331	OK	N

It should be mentioned in this report, that recent studies by Horrocks Engineers, in particular the Hancock Cove Feasibility Study back in 2014, stated that by the year 2060, even with all pivots operating, additional winter storage will be required. For this reason, the City should prohibit any development or utility infrastructure within a 1000' buffer from the east and south side of the winter storage pond, and the area should be preserved for expansion (Figure D-6).

Early in 2019 TransWest Express LLC (TransWest) approached the City proposing two pole and a pad location in the foot print of the future available space for future winter storage pond. After careful review, it was determined that the proposed plan should be revised, and that TransWest should present a new plan to install the pad and two poles in a location between the existing winter storage ponds and potential winter storage pond expansion area, or in an area where there proposed infrastructure wouldn't interfere with the future winter storage pond. The current agreement with TransWest includes an updated alignment, and assures that there will be no interference with the location of the future winter storage pond. Coordination with the City during the planning and construction of the TransWest line should be on-going, and it is recommended that the City stay involved so there is no deviation from the plan, to guarantee final pad/pole placement allows for winter storage pond expansion.

D.5 Recommendations

A summary of the recommended future improvements and estimated costs are shown in Table D-8. Improvements generated by future growth are shown. With contingencies, engineering, construction management and inspection, the total estimated cost is $32,230,931.

Table D-8: Estimated Cost of Roosevelt City's Capital Improvement Projects – Sanitary Sewer

Proj. No.	Project Description	Total Estimated Cost	Priority	Period
1	Winter Storage Expansion (required by the end of the planning period)	$3,471,193	Lowest	16-25 yr
2	Annual Existing Pipe Maintenance (lining) 7,000 LF	$300,000	High	1-5 yr
3	Annual Existing Manhole Maintenance (lining)	$299,680	High	1-5 yr
4	Lagoon Street (400 West to 250 West) 12-Inch SDR-35 PVC Sewer Pipe	$123,900	High	1-5 yr
5	600 East (350 North to 300 North) 8-Inch SDR-35 PVC Sewer Pipe	$42,000	High	1-5 yr
6	600 East (Lagoon Street to 100 North) 10-Inch SDR-35 PVC Sewer Pipe	$76,125	High	1-5 yr
7	Summerall Ln and 1200 South (800 South to 250 W) 15-Inch SDR-35 PVC Sewer Pipe	$933,875	Medium[2]	6-10 yr
8	Rodeo Drive (450 South to 700 South) 8-Inch SDR-35 PVC Sewer Pipe	$583,764	Low[1]	11-15 yr
9	Rodeo Drive (815 South to 1200 South) 8-Inch SDR-35 PVC Sewer Pipe	$238,000	Low[1]	11-15 yr
10	State Street (2250 South to Pole Line Road) 8-Inch SDR-35 PVC Sewer Pipe	$220,360	Low[1]	11-15 yr
11	2200 South (100 East to 300 East) 8-Inch SDR-35 PVC Sewer Pipe	$84,000	Low[1]	11-15 yr
12	300 East (2200 South to Pole Line Road) 8-Inch SDR-35 PVC Sewer Pipe	$140,000	Low[1]	11-15 yr
13	700 East (300 South to 800 South) 8-Inch SDR-35 PVC Sewer Pipe	$367,500	Low[1]	11-15 yr
14	800 South (700 East to 1500 East) 8-Inch SDR-35 PVC Sewer Pipe	$297,500	Low[1]	11-15 yr
15	Cottonwood Creek (State Street to Lagoon Street) 12-Inch SDR-35 PVC Sewer Pipe	$1,661,971	Low[2]	11-15 yr
16	Cottonwood Creek (State Street to SR 121) 8-Inch SDR-35 PVC Sewer Pipe	$2,516,266	Low[2]	11-15 yr
17	S.R 121 (700 North to 2250 North) 8-Inch SDR-35 PVC Sewer Pipe	$1,225,000	Low[2]	11-15 yr
18	State Street (Cottonwood Creek to 2700 North) 8-Inch SDR-35 PVC Sewer Pipe	$1,883,000	Lowest[2]	16-25 yr
19	2900 West (1200 South to 1800 South) 8-Inch SDR-35 PVC Sewer Pipe	$241,500	Low[1]	11-15 yr
20	1200 South (2900 West to 2250 West) 8-Inch SDR-35 PVC Sewer Pipe	$546,000	Low[1]	11-15 yr
21	2250 West (1200 South to 700 South) 8-Inch SDR-35 PVC Sewer Pipe	$424,200	Low[1]	11-15 yr
22	Pole Line Road (3500 West to 2800 West) 8-Inch SDR-35 PVC Sewer Pipe	$756,000	Low[1]	11-15 yr
23	600 South (2200 West to 2400 West) 8-Inch SDR-35 PVC Sewer Pipe	$273,000	Low[1]	11-15 yr
24	2400 West (600 South to 200 North) 8-Inch SDR-35 PVC Sewer Pipe	$448,000	Low[1]	11-15 yr
25	350 South (2400 West to 3000 West) 8-Inch SDR-35 PVC Sewer Pipe	$385,000	Low[1]	11-15 yr
26	200 North (4000 West to 2400 West) 8-Inch SDR-35 PVC Sewer Pipe	$1,113,000	Lowest[2]	16-25 yr
27	200 North (1800 West to 2400 West) 12-Inch SDR-35 PVC Sewer Pipe	$600,000	Lowest[2]	16-25 yr
28	200 North (1800 West to Summerall Lane) 8-Inch SDR-35 PVC Sewer Pipe	$301,000	Lowest[2]	16-25 yr
29	2400 West (200 North to North Cove Road) 12-Inch SDR-35 PVC Sewer Pipe	$795,000	Lowest[2]	16-25 yr
30	North Cover Road (3000 West to 2400 West) 8-Inch SDR-35 PVC Sewer Pipe	$364,000	Lowest[2]	16-25 yr
31	North Cove Road (2400 West to 1930 West) 12-Inch SDR-35 PVC Sewer Pipe	$495,000	Lowest[1]	16-25 yr
32	North Cove Road (1800 West to 1930 West) 12-Inch SDR-35 PVC Sewer Pipe	$119,000	Lowest[1]	16-25 yr
33	2250 West (North Cove Road to 1500 North) 8-Inch SDR-35 PVC Sewer Pipe	$569,336	Lowest[1]	16-25 yr
34	Cottonwood Creek (2250 West to 3000 West) 8-Inch SDR-35 PVC Sewer Pipe	$2,498,562	Lowest[1]	16-25 yr
35	3000 West (2250 North to 2800 North) 8-Inch SDR-35 PVC Sewer Pipe	$570,500	Lowest[1]	16-25 yr
36	2755 North (2700 West to 1950 West) 8-Inch SDR-35 PVC Sewer Pipe	$462,000	Lowest[2]	16-25 yr

Proj. No.	Project Description	Total Estimated Cost	Priority	Period
37	1950 West (2755 North to Cottonwood Loop) 8-Inch SDR-35 PVC Sewer Pipe	$1,160,127	Lowest[2]	16-25 yr
38	Cottonwood Loop	$632,100	Low	11-15 yr
39	West of SR 121 (Cottonwood Loop to SR 121) 8-Inch SDR-35 PVC Sewer Pipe	$2,321,458	Low[2]	11-15 yr
40	Page Bench Road (Upper Hancock Cove to 2755 North) 8-Inch SDR-35 PVC Sewer Pipe	$2,128,000	Lowest[1]	16-25 yr
41	550 North (1450 East to 1500 East) 10-Inch SDR-35 PVC Sewer Pipe	$144,765	Medium[2]	6-10 yr
42	1500 East (550 North to 300 North) 10-Inch SDR-35 PVC Sewer Pipe	$181,250	Medium[2]	6-10 yr
	Total CIP Projects Estimated Construction Costs	$31,992,931		
	Approximate CIP Costs Per Year (to 2045)	$1,230,497		

[1] Denotes 100 % developer driven.

[2] Denotes partial developer driven (ie pipe provides for development, but also provides service to existing residences).

D.6 Funding Sources

Permanent Community Impact Board (PCIB) and State of Utah Division of Water Quality (DWQ) State Revolving Fund are possible funding sources. Federal and State agencies are often charged with administering funds to assist in planning, design, and construction of many projects and typically notify City officials when these funds become available. The City should consider applying for funds to address the recommendations outlined in this masterplan as the funds become available.

D.7 Developer Contribution

The City has a policy that developers are responsible for 100 percent of the cost of on-site improvements needed to serve their development. Developers are also responsible for extending any off-site services needed to serve their development. Developer reimbursement for a portion of these costs may be available through reimbursement agreements for over-sizing of mains above 8-inches (or above the minimum size required for the development), if the facilities have previously been identified in this Master Plan.

It is recommended that the City periodically perform an analysis to see if the future outlook shows the likelihood of developments that require developer reimbursements to account for oversized lines. If so, this reimbursement fund should be included in the sewer budget. The requirement to over-size the line was likely to meet the demands of other developments as well. The City can recover the cost through development agreements, requiring that other developments, who will benefit by connecting to the oversized line, pay a portion of the incremental over-sizing cost.

If multiple developments, that are slated to be built around the same time period, require the same line installation to service their development, all should be required to participate in the cost of the

installation. The latter developments can reimburse the development that installed the line, implemented through development agreements.

As mentioned in the executive summary, it is estimated that of the 6-10 year improvements $629,945 would be developer driven, therefore should be paid for by developers. The estimated developer contributions for 11-15 year improvements and 16-25 year improvements are estimated at $9,499,272 and $10,569,911 respectively.

Impact fees can be collected with new development projects to help pay for the costs of providing public services to new development. The collection and use of impact fees are governed by Utah Law – UC11-36-202(1)(a)(ii). It is recommended that Roosevelt perform a sewer impact fee analysis and institute a sewer impact fee as part of new development.

D.8 Project Maps

Figure D-1 **Existing Service Parcels – Sewer**
Figure D-2 **Proposed Service Parcels – Sewer**
Figure D-3a **Existing Sanitary Sewer**
Figure D-3b **Existing Sanitary Sewer**
Figure D-4 **Existing and Upgraded Sanitary Sewer**
Figure D-5a **Existing and Proposed Sanitary Sewer**
Figure D-5b **Existing and Proposed Sanitary Sewer**
Figure D-6 **Wastewater Treatment Facilities and Sewer Farm**

EXISTING SEWER SERVICE PARCELS

- EXISTING COMMERCIAL SERVICE PARCEL
- EXISTING INDUSTRIAL SERVICE PARCEL
- EXISTING INSTITUTIONAL CHURCH SERVICE PARCEL
- EXISTING INSTITUTIONAL SCHOOL SERVICE PARCEL
- EXISTING PARK SERVICE PARCEL
- EXISTING RESEARCH AND TECHNOLOGY SERVICE PARCEL
- EXISTING SERVICE PARCEL

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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Figure D-1 Existing Service Parcels - Sewer

Roosevelt City

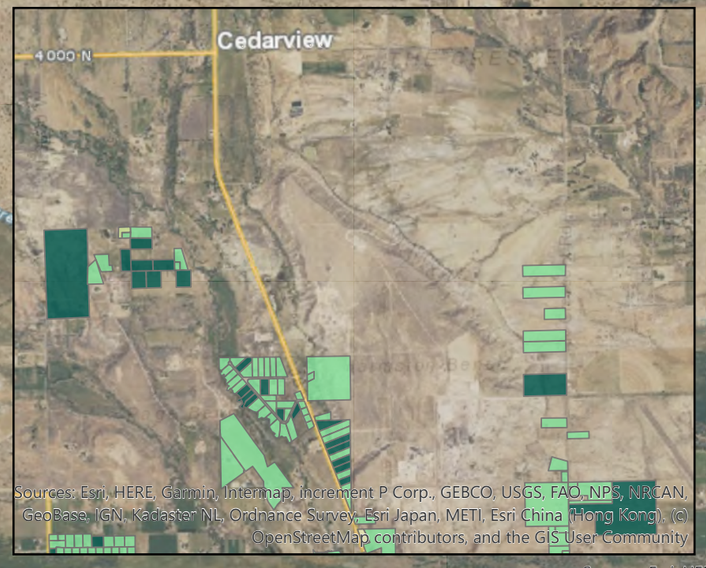
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PROPOSED SEWER SERVICE PARCELS

- NONVACANT COMMERCIAL PARCEL
- NONVACANT MANUFACTURING PARCEL
- NONVACANT RESIDENTIAL PARCEL
- VACANT COMMERCIAL PARCEL
- VACANT MANUFACTURING PARCEL
- VACANT RESIDENTIAL PARCEL



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Roosevelt Golf Course
200 N
Utah State University Uintah Basin Roosevelt Campus
Uintah Basin Atc
Ball Park
Roosevelt
DUCHESNE COUNTY
UINTAH COUNTY
Roosevelt Municipal Airport
Roosevelt
Hancock Cove Rd
Dry Gulch Creek
Sheridan Lateral
40

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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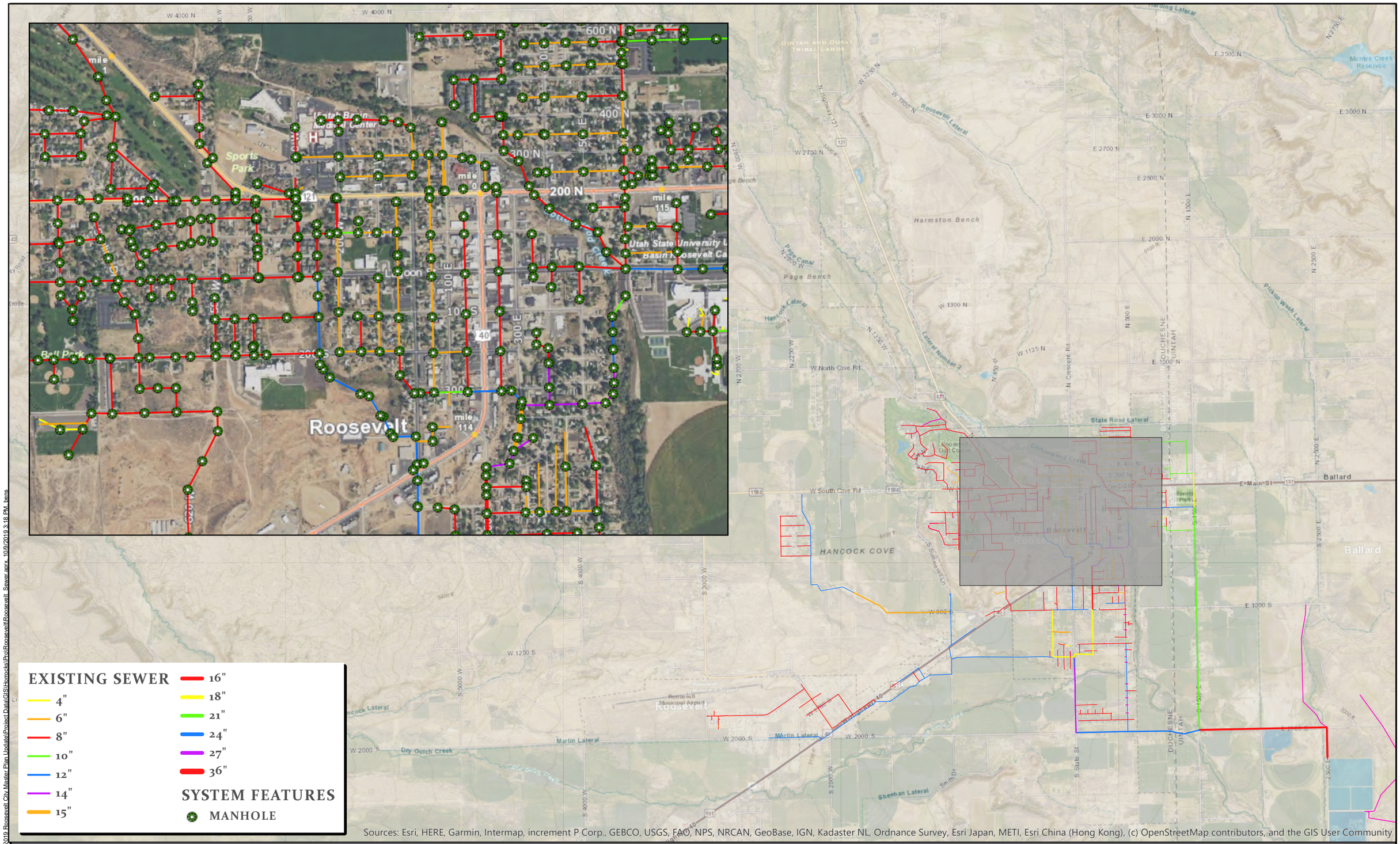
Figure D-2 Proposed Service Parcels - Sewer

Roosevelt City

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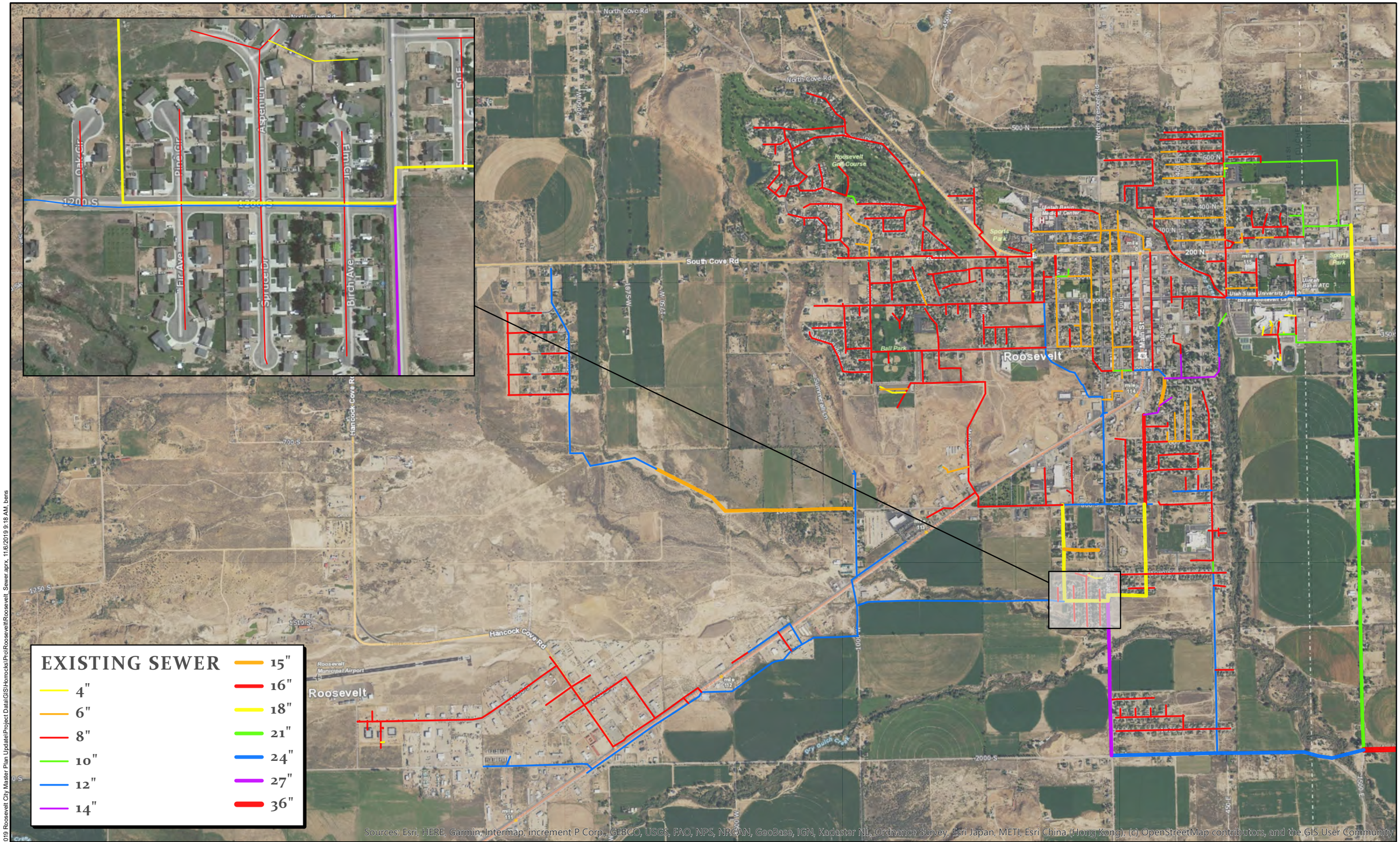
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Figure D-3a Existing Sanitary Sewer

Roosevelt City

0 0.5 1 Miles

N



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Figure D-3b Existing Sanitary Sewer

Roosevelt City

0 0.35 0.7 Miles

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Existing Sewer

- 4"
- 6"
- 8"
- 10"
- 12"
- 14"
- 15"
- 16"
- 18"
- 21"
- 24"
- 27"
- 36"

Proposed Sewer Upsize

- 8"
- 10"
- 12"
- 15"
- City Boundary

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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Figure D-4 Existing and Upgraded Sanitary Sewer

Roosevelt City

0 0.25 0.5 1 Miles

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EXISTING SEWER

- 4"
- 6"
- 8"
- 10"
- 12"
- 14"
- 15"
- 16"
- 18"
- 21"
- 24"
- 27"
- 36"
- CITY BOUNDARY

PROPOSED SEWER

- 8"
- 10"
- 12"

SYSTEM FEATURES

- MANHOLE
- PROPOSED SEWER MANHOLES

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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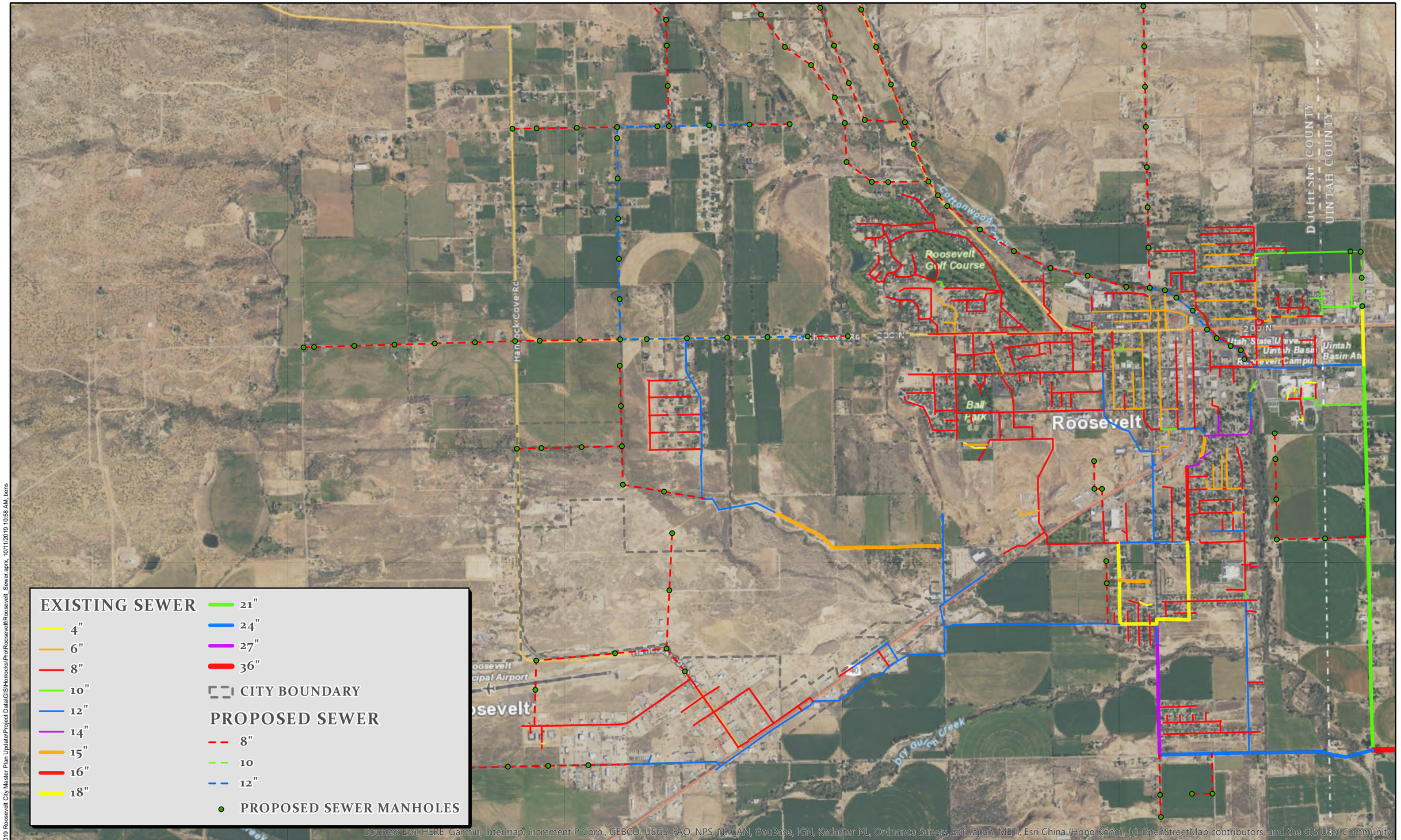
Figure D-5a Existing and Proposed Sanitary Sewer

Roosevelt City

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Figure D-5b Existing and Proposed Sanitary Sewer

Roosevelt City

0 0.25 0.5 1 Miles

N

Pivot 5

Pivot 4

Pivot 3

Pivot 2

Pivot 1

Treatment Cell 1

Treatment Cell 3

Treatment Cell 2

Pump House

Winter Storage Pond

Winter Storage Expansion (approx. 39 acres)

2500 E

2000 S

2000 E

2700 S

3750 E

Dry Gulch Creek

UINTAH AND OURAY TRIBAL LANDS

Existing Sewer

- 4"
- 6"
- 8"
- 10"
- 12"
- 14"
- 15"
- 16"
- 18"
- 21"
- 24"
- 27"
- 36"
- Secondary
- Ballard 12" Line
- Pump House
- City Boundary

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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Figure D-6 Wastewater Treatment Facilities and Sewer Farm

Roosevelt City

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Storm Drain Master Plan

Appendix E

HORROCKS ENGINEERS



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Appendix E

Executive Summary

This Storm Drain Master Plan addresses existing deficiencies as well as proposed storm drain facilities within Roosevelt City and annexation regions. The existing storm drain system is generally able to handle small storm events. However, during larger storms, the system is in many cases lacking adequate infrastructure and capacity, resulting in localized flooding. To prevent flooding of downstream drainage systems, future needs are based on developers supplying detention facilities for their own developments. Storm runoff from all future developments will be detained and released at a historic flow rate, as required by City code.

This master plan update includes areas that have recently been annexed, will be annexed, and are within Roosevelt City limits. The existing storm drain system does not extend outside Roosevelt City boundaries. However, there are elements of the proposed storm drain system which do go outside current City boundaries and are within proposed annexation areas. Commercial and Manufacturing zones in the annexed regions will require storm drain infrastructure. Much of the proposed zoning within the annexation boundary is Agricultural or Very Low Density, which does not necessitate the construction of storm drain facilities.

Capital Improvements

Listed in Section E.7, table E-2, are the capital improvements needed to address existing deficiencies and future needs. Funding sources for these projects have not been established, although potential funding sources include but are not limited to the Utah Permanent Community Impact Fund Board (CIB), and Natural Resources Conservation Service (NRCS) including PL-566.

The projects needed for future growth should be funded by impact fees as development occurs. Projects needed to correct existing deficiencies cannot be paid for using impact fees. There are several projects needed to correct existing deficiencies that also benefit future developments, and these projects may be funded in part by impact fees/developers.

Recommendations

- Storm drain improvements should be coordinated with roadway and other utility improvements to minimize construction disturbance and costs.
- Existing deficiencies should be addressed in conjunction with other improvements where feasible.
- Development should restrict runoff to historical flow rates.
- It is recommended that the City adopt the proposed storm water design standards for conveyance and detention which are identified in the Design Standards section of this report.

E.1 Introduction

A City's storm drain system plays an important role in protecting life and property. Planning for Roosevelt's storm drainage system must consider regional flooding of the various creeks and canals that pass through the City, as well as localized flooding that occurs from storm water runoff within the City and annexation zones. As Roosevelt City continues to grow, development will cause increases in localized runoff due to increased impervious area. To minimize the loss of property and to protect the health and safety of Roosevelt's residents, storm drain improvements will be required.

E.1.1 Definitions

Equivalent Residential Unit (ERU)

Development contributes to storm water runoff based on the amount of impervious area it contains regardless of actual lot size. For the purposes of this study, single family dwellings and multi-family residential units will each be considered one (1) ERU. ERU's for non-residential development including commercial, industrial, school and church buildings have been calculated based on their total impervious surface with one (1) ERU equalling 2,700 square feet of impervious surface area.

Single Family Units	*= 1 ERU/home unit*
Multi-Family Residential Units	*= 1 ERU/dwelling unit*
Non-Residential Units	*= 1 ERU/ 2,700 SF of impervious area*

cfs — *Cubic feet per second (449 gallons per minute)*

Ac-Ft — *Acre foot (volume of water required to cover an acre of land to a depth of one foot)*

Detention — *Short term storage of runoff provided by a pond or similar facility. During a storm runoff event water enters the detention pond at a relatively high flow rate and exits the pond at a controlled low flow rate. The volume of water stored in the pond increases while the inflow exceeds the controlled outflow, and decreases when the storm event ends and runoff inflow drops to below the controlled outflow.*

Retention — *Long term storage of storm water provided by a pond or similar facility that stores runoff water, but does not allow water to be discharged. Water will stay in a retention pond after a storm event until it either evaporates or soaks into the soil of the pond bottom.*

Primary Conveyance

Storm drain or open channel system which functions to carry storm water. Primary conveyance systems typically include drop inlets, pipes, gutters, swales and drainage ditches.

Secondary Conveyance

A conveyance system which conveys storm water after the capacity of the primary conveyance system has been exceeded. A street can function as a secondary conveyance system.

E.1.2 Design Standards

The design standards outlined in this report should be adhered to by Roosevelt City. These standards should be adopted by ordinance, thus requiring all future development to comply as well. The following criteria establishes standards for which storm drainage facilities should be designed.

- Design storm drain pipes to convey runoff from a 50-year storm event. In cases where the secondary conveyance (such as a roadway) drains to a pond, the pipes may be designed for the 10-year storm event.
- Design detention facilities to safely contain the 50-year, 24-hr storm event. Detention facilities should release runoff at a pre-developed release rate for the 2, 5, 10, and 50-year design storms. The pre-developed release rate will be based on the historic runoff rate for that location. Restricting detention pond release rates to the historical flow rates for smaller and larger storm events will prevent the downstream drainage facilities from being overwhelmed. Although some existing City-maintained detention facilities do not meet this criterion, all new development should include plans to detain runoff and release it at the pre-developed flow rate. If inadequate infrastructure is in place downstream of a development, the development will be required to restrict runoff release rates to fall within the available capacity of the downstream system.

The storm drain design criteria is summarized in Table E-1 below.

Table E-1: Design Standards

Design Standards		
Design Item	Design Event	Notes
Storm Drain Pipes	50-Year	Where secondary conveyance does not drain to pond or suitable outfall.
Storm Drain Pipes	10-Year	Where secondary conveyance drains to pond or suitable outfall.
Detention Ponds	50-Year, 24-hour	
Detention Pond Release Rate	2, 5, 10, 50-Year	Using historical runoff release rate

The recommended standard of releasing detained storm water is more representative of actual pre-developed flow rates because land cover types vary greatly across the City. Moreover, this method is less arbitrary and will protect the City by creating a more accurate representation of pre-developed flow conditions.

The existing design standard for determining pipe size is to use the 10-year storm. It is recommended that this standard be upheld provided that the secondary conveyance drains to a detention pond or other suitable outfall (such as a creek). However, it is recommended that the 50-year storm be used for determining pipe sizes where the secondary conveyance system does not drain to a detention pond or other suitable outfall. This recommendation will protect the City by providing conveyance for storms larger than a 10-year event and keeping storm water in the underground pipe system instead of ponding on the ground surface.

E.2 Existing System

The existing storm drain system is shown on Figure A-4 in Attachment A. It consists of several collection systems that were installed to correct specific flooding problems, or address the needs of individual developments.

In Figure A-1, the City has been divided into six major watersheds. The watersheds are divided into Northeast, Northwest, East, West, South, and Annexed areas. These areas reflect the sections of the City with the most development and existing drainage needs, as well as areas which are most likely to experience development in the foreseeable future. The annexation areas were divided into approximately 40-acre watersheds for analysis purposes.

E.3 Existing System Evaluation

In this section of the report, the major segments of the existing storm drain system will be described and evaluated.

E.3.1 West Area

A. The storm drain system on King Arthur Dr. consists of two inlets and two 15" pipes. It is currently connected to the sanitary sewer system.

B. At Constitution Dr. there is one existing inlet with a pipe system that discharges on the south end of the housing development. At the discharge location, flow is released down the hillside.

C. Southeast of the ball park fields on 290 S. there is an existing storm drain system that outfalls to the undeveloped property to the south.

D. There is an existing drop-inlet and pipe system located near 200 N. and 450 W. The pipe size ranges from 15" to 18" and discharges to an existing detention pond located at the intersection of 200 N. and S.R. 121. This pipe system was designed to primarily handle storm runoff from the road itself. It also has a storm drain connection from a neighborhood located just north of 200 N. The conveyance capacity of the pipe system is estimated to be 15 cfs.

E. The detention basin at 200 N. and S.R. 121 also receives storm runoff from a section of the highway east of the pond and from the care center located across the street to the north.

F. Downstream of the detention basin at 200 N. and S.R. 121 and heading south along 400 W. is a 36" storm drain pipe which turns east at Lagoon St. and then discharges into a drainage ditch on the south side of Lagoon St. near 320 W. This pipe functions as a major trunkline for this section of the City. It has an estimated normal flow conveyance capacity of 65 cfs.

G. The drainage ditch which runs from Lagoon St. and 320 W. to approximately 400 S. acts as a drainage conveyance and detention system for a major portion of the developed City. However, the downstream end of the ditch reaches a 12" pipe. This pipe is a critical choke point which causes flooding near local businesses.

H. The 200 S. and 200 W. detention pond located on the north side of 200 S. needs to be enlarged. It is currently a 2.3 ac-ft detention pond, but it is too small to hold the volume of water entering it. The basin helps reduce the peak flow which runs through this part of town. A park has been proposed in this location, making a combination park and detention pond.

I. From approximately 700 W. and 200 S. to near 350 W. and 200 S. a drop-inlet and pipe storm drain exists. The pipe sizes in this system vary from 15" to 18". This pipe system discharges to the aforementioned detention pond located north of 200 S and 200 W. This system conveys flows from the park located at the west end of the system as well as runoff from the road and surrounding neighborhoods. The estimated conveyance capacity of this pipe is 18 cfs.

J. From the intersection of 800 S. and Highway 40 to 800 S. and State St. there is a drop-inlet and pipe storm drain system with pipe sizes ranging from 24" to 30". There are also connecting pipes running from north to south through the cemetery and in Sunset Dr. which convey local runoff to the trunkline in 800 S. The slope of the 800 S. pipes is relatively mild. The estimated conveyance capacity of this pipe system is 20 cfs. 800 S. Street does not have curb and gutter at this time so the inlets cannot intercept storm runoff. This pipe system turns south at State St. and discharges to a 48" storm drain pipe.

K. Along State St. from 400 S. to 800 S. there is a drop inlet and pipe system which consists of 18", 36", and 48" pipes. The 18" pipe currently goes from 400 S. to the intersection of State. St. and Highway 40. The 36" pipe runs along State St. from Highway 40 to 800 S. The 48" pipe outfalls to Dry Gulch, with an overflow running eastward in 800 S. to Cottonwood. This pipe serves as a major trunkline for the City storm drain system. It has an estimated normal flow conveyance capacity of 75 cfs. Two culverts have been placed under State St. at Dry Gulch to perpetuate flows under the road.

L. The DMV has a detention basin behind the building that discharges to a 12" pipe. This is a natural drainage due to a berm that was constructed to make the area function as a detention basin.

M. An underground retention facility is located under the Burger King parking lot on State Street and Main Street to capture runoff from the parking lot.

E.3.2 East Area

A. N. Poco Dr. is a neighborhood with curb and gutter, but no storm drain infrastructure. This neighborhood slopes from north to south, and has experienced flooding in the past.

B. There is a drop-inlet and pipe system which runs from 300 E. and 100 S. south to 300 E. and 400 S. At 300 E. and 100 S. the inlets collect runoff from the lots south east of the intersection. At 400 S. the pipe goes east to Cottonwood Creek where runoff is discharged. The pipe sizes in this system range from 15" to 30". The estimated pipe conveyance capacity is 25 cfs.

C. Where Highway 40 crosses 100 S., Lagoon St. and 100 N. there are several drop inlets located at each intersection. Pipes extend eastward from these inlets but do not have a suitable outfall. The pipes are also undersized and may not have adequate slope.

E.3.3 Northeast Area

A. Near Union St. and Highway 40 there is a small drop-inlet and pipe system which extends south along Union St. and then connects to a 36" storm drain under Highway 40. This is the east City boundary, so it is important Roosevelt intercepts as much of its own runoff as possible to prevent it from causing a problem for Ballard City.

E.3.4 Northwest and South Areas

A. Brighton Estates currently has a retention pond at the east end of E. 1800 S., but there is not enough capacity to store runoff from housing developments in the surrounding South Town neighborhood.

B. There is an existing box culvert located on Dry Gulch under State Street, at about 1300 S.

E.3.5 Annexed Areas

A. 1080 E. has a storm drain system along the east side of the roadway, but not the west side of the roadway.

B. Union High School has a detention basin on the south west corner of the property. The detention basin holds storm runoff from the high school and discharges through an 18" pipe into Cottonwood Creek.

C. There is a subdivision located at approximately 2200 W. and 200 S. which has no curb, sidewalk, or storm drain infrastructure. This development relies on dissipation and infiltration of all storm water. However, during large storm events, runoff floods the homes in this development.

D. North of W. 1000 S. St. and west of Summerall Ln. there is a drainage channel that was dammed and now creates a detention basin. This detention basin can hold roughly 0.44 ac-ft of storm water runoff from the hills to the north.

E. Strata Retention Pond is located south of the airport to collect runoff from the parking lot, and the roofs of the warehouse, administration building, and the shop. This retention facility has a capacity of 1.8 ac-ft.

E.4 Existing Deficiencies

Although Roosevelt City has some outfalls in place and several streets with storm drain systems, there are numerous existing deficiencies. Existing deficiencies can include a lack of storm drain infrastructure, undersized pipes, lack of detention facilities, flooding areas, and choke points. Specific deficiencies for each watershed are listed below and illustrated in Figure A-2 in Attachment A.

E.4.1 West Area

1. There is insufficient detention in the swale area near 300 S. 100 W. Much of the City's runoff is conveyed to this area. However, there is inadequate conveyance capacity in the downstream system. The 200 S. and 200 W. detention pond does not have enough capacity.
2. There is insufficient detention and storm drain infrastructure in the hillside area in the vicinity of 550 W. and Highway 40. Runoff from the undeveloped rocky hillside causes flooding in this area. Excess runoff ponds on the north side of Highway 40 causing flooding problems for local businesses.
3. There is a choke point at the downstream end of the swale located behind businesses at 400 S. and State St. This is caused by an undersized pipe from the downstream end of the swale to the pipe system near Country Cabinets. The existing pipe system begins with a 12" pipe and then turns to an 18" pipe. The pipe cannot convey the headwater quickly enough and the water level rises causing problems for the nearby businesses.

4. There is a lack of infrastructure along State St. near 200 S and adjacent streets. Inlets are needed in this area to intercept runoff before it runs down the hill. Currently runoff from several neighborhoods and wide streets upstream of this point surface flows to this area and then flows down the hillside.
5. The 200 S. and 200 W. detention pond does not have enough capacity.
6. There is an insufficient number of drop inlets at the intersection of State St. and Highway 40.
7. The neighborhoods south of Rodeo Dr. and Highway 40 have experienced devastating flooding in the past due to storm runoff coming down the hills and surpassing the existing storm drain system.
8. King Arthur Dr. has a connected storm drain and sanitary sewer system.

E.4.2 East Area

1. There is insufficient infrastructure downtown between Highway 40 and Cottonwood Creek, particularly along 100 N., Lagoon St. and 100 S. There are several drop inlets near the intersection of these streets and Highway 40. However, the pipes coming from these inlets are either undersized, have reverse grade or have no outfall. Additional inlets as well as a pipe system should be constructed from Highway 40 to Cottonwood Creek or to the system in 300 E. to prevent continued flooding in this area.
2. There is a lack of storm drain inlets along 800 S. and west of 200 E. There are pipes running west to east under 800 S, but due to the flat topography and lack of curb and gutter to intercept runoff, surface runoff ponds along the road resulting in localized flooding.
3. The neighborhoods around N. Poco Dr. have experienced flooding during larger storm events.

E.4.3 Northeast Area

1. There is a lack of infrastructure in the developed area north of 200 N. between 400 E. and 800 E. Due the very flat topography, residential development and lack of a storm drain system, this area is prone to flooding.
2. Flooding has occurred on Lagoon St. between Union St. and 1500 E. Runoff from the High School as well as from Uintah Basin Applied Technology College drains to this area. There is not sufficient downstream conveyance or detention to prevent flooding in this area.

E.4.4 Northwest and South Areas

1. The Brighton Estates retention pond does not have enough capacity to store runoff from housing developments in the surrounding South Town neighborhood.
2. The neighborhood on 1200 S. experiences pooling in the center of the neighborhood. This neighborhood relies primarily on gutters and waterways. There are insufficient drainage elements to intercept runoff in this area.

E.4.5 Annexed Areas

No existing deficiencies have been identified in these areas. However, as new development occurs, the potential for significant problems needs to be evaluated with each project. Developments should

construct on-site detention or retention facilities to prevent drainage problems downstream of the project site.

E.5 Improvements to Correct Existing Deficiencies

Improvements required to eliminate existing deficiencies for all areas are shown below (items correspond to those shown on Figure A-3 in Attachment A). The order in which these projects are constructed is subject to funding and City prioritization in coordination with other utility and roadway improvements.

Item 1) 200 S. State St. Improvements – Inlets at intersection and 750' of 24" storm drain pipe extending from the intersection of 200 S. and State St. westward to 100 W. and then south to the existing swale area. This improvement addresses Deficiency 4 under the West Area.

Item 2) 200 S. Detention Ponds – There is currently 2.3 acre-ft of usable storage volume, but there needs to be 4.1 ac-ft of storage volume. The usable storage volume of this pond needs to be increased by 1.8 ac-ft. This detention basin is located at approximately 200 W. and 200 S. A pond should be constructed within the swale area downstream of this detention pond. The pond in the swale area should have 2.52 ac-ft of usable storage volume. This item would correct an existing deficiency as well as provide for future needs. The upsizing of this pond should coincide with the establishment of the park. This improvement addresses Deficiency 1 under the West Area.

Item 3) 400 S. Storm Drain Improvements – 710' of 36" storm drain pipe extending from the downstream end of the large drainage swale to the intersection of Highway 40 and State St. This pipe will replace the 12” and 18” pipes currently in this location. This improvement addresses Deficiency 4 under the West Area.

Item 4) 600 E. Storm Drain Improvements – 260' of 18" storm drain pipe extending from 650 N. to 600 N., 1040' of 24" storm drain pipe extending from 600 N. to 400 N., and 930’ of 30" storm drain pipe extending from 400 N. to 200 N. This improvement addresses Deficiency 1 under the Northeast Area.

Item 5) 800 E. Storm Drain Improvements – 940' of 24" storm drain pipe extending from 400 N. to Highway 40, 590' of 30" storm drain pipe extending from Highway 40 to 100 N., 610' of 36" storm drain pipe extending westward to connect to the system in 600 E. This improvement also addresses Deficiency 1 under the Northeast Area.

Item 6) 550 W./ Highway 40 Detention Pond – Provide 5 acre-ft of usable storage volume. Depending on the pond location, up to 1000' of 24" storm drain pipe may be needed to drain the pond. This improvement addresses Deficiency 2 under the West Area.

Item 7) Rodeo Detention Facility – Provide 2 acre-ft of usable storage volume to detain the 50-yr storm event. 30 feet of 15” storm drain pipe will connect the outfall of this detention facility to the storm drain system on Rodeo Dr. This improvement addresses Deficiency 2 under the West Area.

Item 8) Lagoon St., 1500 E. Detention Pond– Provide 1.5 acre-ft of usable storage volume, 700' of 18" storm drain pipe. An orifice plate will be needed to not overwhelm the downstream system. This improvement addresses Deficiency 2 under the Northeast Area.

Item 9) 200 E. to Cottonwood Creek Improvements – 2440' of 18" storm drain pipe, and 1370' of 24" storm drain pipe with several inlets are needed to prevent continued flooding. This project would tie into the Lagoon St. Storm Drain Improvements (Item 13). This improvement addresses Deficiency 1 under the East Area.

Item 10) State St./ Highway 40 Storm Drain Improvements – addition of drop inlets to intercept runoff at this intersection. Coordination should take place with UDOT as this improvement is pursued. This improvement addresses Deficiency 6 under the West Area.

Item 11) 200 E. and 800 S. Storm Drain Improvements – Place inlets on the west side of 200 E along 800 S. in the ponding locations and connect them to the existing storm drain trunk line on the south side of the road. Use 50 ft of 15" RCP for each new lateral pipe. This improvement addresses Deficiency 2 under East Area.

Item 12) King Arthur Dr. Retention Pond – Place a retention pond to capture storm drain flows and disconnect the storm drain system from the sanitary sewer system. This improvement addresses Deficiency 8 under West Area.

Item 13) Lagoon St. Storm Drain Improvement – 825' of 30" storm drain pipe from 400 E. to 550 E. with inlets at the intersections. This improvement addresses Deficiency 1 under East Area.

Item 14) 1200 S. Storm Drain Improvements – add 1270' of 30" RCP and inlets to prevent pooling. This system will also capture flows coming from Rodeo Dr. when the road is extended to the south. This improvement addresses Deficiency 2 under Northwest and South Areas.

Item 15) N. Poco Dr. Storm Drain Improvements – 1800' of 18" storm drain and inlets will connect to the existing storm drain system at 500 E. and 700 S. This improvement addresses Deficiency 3 under East Area.

Item 16) Brighton Estates Detention Pond - A detention facility that can store 2 ac-ft of runoff with 2700 feet of 18" storm drain pipe out falling to Cottonwood Creek is recommended. The detention pond enlargement addresses an existing deficiency. The pipe outfall may be constructed later and will serve to drain future developments in this area. The upsizing of this pond should coincide with the establishment of a park. This improvement addresses Deficiency 1 under Northwest and South Areas.

Several of the existing deficiencies occur near or along a highway. Coordination should take place with UDOT to ensure that the full potential of the project may be achieved and investigate the feasibility of cost sharing.

E.6 Future Facilities

Future growth in Roosevelt will require storm drain system improvements to be made in addition to those listed above. Proposed improvements to the system due to future development are also shown on Figure A-3 and referenced by number below.

Improvements Needed for Future Growth (Item numbers correspond to Figure A-3 in Appendix A).

Item 17) Lagoon St. Storm Drain Improvements – storm drain pipe running in Lagoon St. extending from 1000 W. to 320 W. Storm drain pipe in Skyline Drive from 100 N. to Lagoon St. 1000' of 18" storm drain pipe, 1800' of 24"storm drain pipe, respectively. This will prevent flooding in the developed areas south of Lagoon St. and along Skyline Dr.

Item 18) 500 W. Detention Ponds – two ponds needed to reduce peak flows in downstream system as future development occurs. 1.5 acre-ft pond located at the bottom of the golf course just north of 200 N.; 0.4 acre-ft pond located near 100 N. and 550 W.

Item 19) Highway 121/ Golf Course Culvert – 360' of 18" storm drain pipe to intercept runoff from golf course and some residential areas surrounding the golf course to divert flows to Cottonwood Creek and reduce the peak flows to pipes downstream.

Item 20) West of Highway 40 Storm Drain Systems (Annexation Regions) – 15” to 42” pipes will need to be installed in the annexed regions to convey storm water runoff for the proposed commercial and industrial zoning regions. The storm drainage system should align with roads and buildings so as to not have storm drain pipe under structures. (See section 6.1 for further discussion)

Item 21) 500 W. and 300 W. Extensions – 5517’ of 18” storm drain pipe is proposed along the length of 500 W. and 300 W. when these roads are extended to the south.

Item 22) Rodeo Dr. Extension – Rodeo Dr. will have 2000’ of 30” storm drain pipe when the road is extended to the south. This system will connect to the proposed storm drain system in 1200 S.

E.6.1 Needs for Future Development of Annexation Areas

In the Roosevelt Annexation zones, most of the land use designations are Very Low Density. These locations will not need storm drain infrastructure since runoff will be able to infiltrate the soil. If poor soil conditions exist or if the area is steep, storm drain best management practices are recommended. These practices may include effective grading, swales, check dams, retention pockets, and strategic placement of basement and finished grade elevations. In the locations where commercial or manufacturing land use is designated, storm drain infrastructure is proposed to help runoff reach a suitable outfall instead of flooding buildings.

Runoff will generally flow from northwest to southeast, and the proposed storm drain infrastructure shown on the Proposed Storm Drain Map perpetuates this flow pattern. Various sizes of storm drain pipes are recommended to convey flows into the surrounding channels. These pipes can be tied into as

need when development occurs. Future development will drive the placement of these storm drain systems.

E.7 Capital Facilities Plan

The CFP indicates which improvements will be needed in the future and provides a planning level cost estimate for each improvement. Funding for projects required for future growth can be obtained through impact fees. Projects needed to address existing deficiencies cannot be funded by impact fees. Several methods of financing the proposed projects can be used by the City. Some of these methods include user fees, taxes levied through the formation of a special improvement district, issuing bonds, and use of general funds. Grants or loans through government agencies can also be applied for to assist in funding these projects. Recommended improvements to the storm drain system have been separated into the following categories: short range (0-5 years) and medium range (6-10 years). Table E-2 summarizes the recommended improvement projects and their anticipated costs.

Table E-2: Budgetary Cost Estimates

Segment	Estimate (Thousands)	Prioritization (1=Highest, 3=Lowest)
1-5 Year Improvements		
1) 200 S. State St. Improvements (Existing Deficiency)	$231	1
2) 200 S. Detention Ponds (Existing Deficiency)	$82	1
3) 400 S. Storm Drain Improvements (Existing Deficiency)	$262	1
4) 600 E. Storm Drain Improvements (Existing Deficiency)	$1,096	1
5) 800 E. Storm Drain Improvements (Existing Deficiency)	$685	1
6) 550 W./ Highways 40 Detention Pond (Existing Deficiency)	$530	1
7) Rodeo Detention Facility (Existing Deficiency)	$219	1
8) Lagoon St, 1500 E. Detention Pond (Existing Deficiency)	$392	1
9) 200 E. to Cottonwood Creek Improvements (Existing Deficiency)	$951	1
10) State St./ Highway 40 Storm Drain Improvements (Existing Deficiency)	$39	1
11) 200 E. and 800 S. Storm Drain Improvements (Existing Deficiency)	$39	1
12) King Arthur Dr. Retention Pond (Existing Deficiency)	$25	1

Segment	Estimate (Thousands)	Prioritization (1=Highest, 3=Lowest)
13) Lagoon St. Storm Drain Improvement (Existing Deficiency)	$273	1
14) 1200 S. Storm Drain Improvements (Existing Deficiency)	$438	1
15) N. Poco Dr. Storm Drain Improvements (Existing Deficiency)	$463	1
16) Brighton Estates Detention Pond (10% existing deficiency, 90% for future growth)	$391	1
Subtotal	**$6,115**	
6-10 Year Improvements		
17) Lagoon St. Storm Drain Improvements	$791	2
18) 500 W. Detention Ponds	$210	2
19) Highway 121/ Golf Couse Culvert	$393	2
21) 500 W. and 300 W. Extensions	$809	2
22) Rodeo Dr. Extension	$395	2
Subtotal	**$2,598**	
10+ Year Improvements		
20) West of Highway 40 Storm Drain Systems (Annexation Regions)	$8,228	3
Subtotal	**$8,228**	
Total	**$16,941**	

Data supporting budgetary cost estimates are included in Attachment C.

Attachment A

- Figure A-1 Regions Map
- Figure A-2 Existing Deficiencies Map
- Figure A-3 Future Project Improvements Map
- Figure A-4 Existing Storm Drain Map
- Figure A-5 Proposed Storm Drain Map

Channels
City Boundary
AnnexationBoundary

Regions
East
West
Northeast
Northwest
South

Annexed

Northwest

Northeast

West

Roosevelt

East

Annexed

Annexed

South

Dry Gulch Creek

Dry Gulch Creek

Stonewood Creek

Roosevelt Golf Course

Ball Park

Uintah Basin Medical Center

Sports Park

Utah State University Uintah Basin Roosevelt Campus

Uintah Basin ATC

1300 N
1125 N
500 E
500 N
400 N
300 N
200 N
100 N
100 S
200 S
300 S
600 S
800 S
1000 S
1080 S
2000 S
2500 S
South 500 E Rd
Crescent Rd
Areva Rd
Skyline Dr
Lagoon St
Park Ridge Dr
State St
Sunset Dr
Union St
1000 W
500 W
300 W
200 W
100 W
1500 W
100 E
200 E
300 E
400 E
500 E
600 E
800 E
1500 E
450 E
US 40
121

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Figure A-1 Regions Map

Roosevelt City

As described in Report

0.25 0 0.25 Miles

N

Roosevelt City - Storm Drain System

- Culvert
- Storm Drain Detention Ponds

Existing

- 10
- 12
- 15
- 16
- 18
- 24
- 30
- 36
- 42
- 48
- Ditch / Stream
- Dry Ditch
- Irrigation
- City Boundary
- AnnexationBoundary
- Sump

600 E. Area
Historic Runoff: 18 cfs
Existing Runoff: 30 cfs
Available Capacity: None
Insufficient Pipe System

800 E. Area
Historic Runoff: 5.7 cfs
Existing Runoff: 11 cfs
Available Capacity: None
Insufficient Pipe System

200 E. Area
Historic Runoff:12 cfs
Existing Runoff: 19 cfs
Available Capacity: None
Insufficient Pipe System
No Suitable Outfall

200 S. Pond Area
Available Vol: 2.3 ac-ft
Req'd Vol for Existing: 4.1 ac-ft
Insufficient Detention Volume

King Arthur Dr.
Sewer & Storm Drain systems are combined.

Lagoon St
Lack of Storm Drain infrastructure

Lagoon St.
Flooding on 1500 E. and Union St.

400 S. Area
12" Pipe Choke Point
Available Capacity: 6 cfs

400 S. Area
18" Pipe Choke Point

Rocky Hillside Area
Historic Runoff: 90 cfs
Existing Runoff: 90 cfs
Available Capacity: 5 cfs
Insufficient Interception and Detention

State St. 200 S.
Historic Runoff: 17 cfs
Existing Runoff: 27 cfs
Available Pipe Capacity: None
Lack of Inlets and Pipe

State St., Highway 40
Insufficient Inlets

North Poco Dr. Flooding

Rodeo Drive, Highway 40
Flooding in areas south of here

1200 South
Pooling in the roadway

Brighton Estates
Retention Pond is insufficient retention volume

Dry Gulch Creek

Roosevelt

Roosevelt Golf Course

Ball Park

Sports Park

Utah State University Uintah Basin Roosevelt Campus

Uintah Basin ATC

US 40

121

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Figure A-2 Existing Deficiencies Map

Roosevelt City

0.25 0 0.25 Miles

N

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Storm Drain Pipe Line

Existing
- 4
- 6
- 8
- 10
- 12
- 15
- 16
- 18
- 24
- 30
- 36
- 42
- 48
- Ditch / Stream
- Dry Ditch
- Irrigation

Proposed
- 10
- 12
- 15
- 16
- 18
- 24
- 30
- 36
- 42
- 48
- Proposed Detention Ponds
- Storm Drain Detention Ponds

Projects to correct Existing Deficiencies
- Projects to correct Existing Deficiencies
- Projects needed for Future Growth
- City Boundary

Item	Description
1	200 S. State St. Improvements
2	200 S. Detention Ponds
3	400 S. Storm Drain Improvements
4	600 E. Storm Drain Improvements
5	800 E. Storm Drain Improvements
6	550 W./ Highway 40 Detention Pond
7	Rodeo Detention Facility
8	Lagoon St., 1500 E. Detention Pond
9	200 E. to Cottonwood Creek Improvements
10	State St./ Highway 40 Storm Drain Improvements
11	200 E. and 800 S. Storm Drain Improvements
12	King Arthur Dr. Retention Pond
13	Lagoon St. Storm Drain Improvement
14	1200 S.
15	N. Poco Dr.
16	Brighton Estates Detention Pond
17	Lagoon St. Storm Drain Improvements
18	500 W. Detention Ponds
19	Highway 121/ Golf Couse Culvert
20	West of Highway 40 Storm Drain Systems (Annexation Regions)
21	500 W and 300 S Extensions
22	Rodeo Dr. Extension

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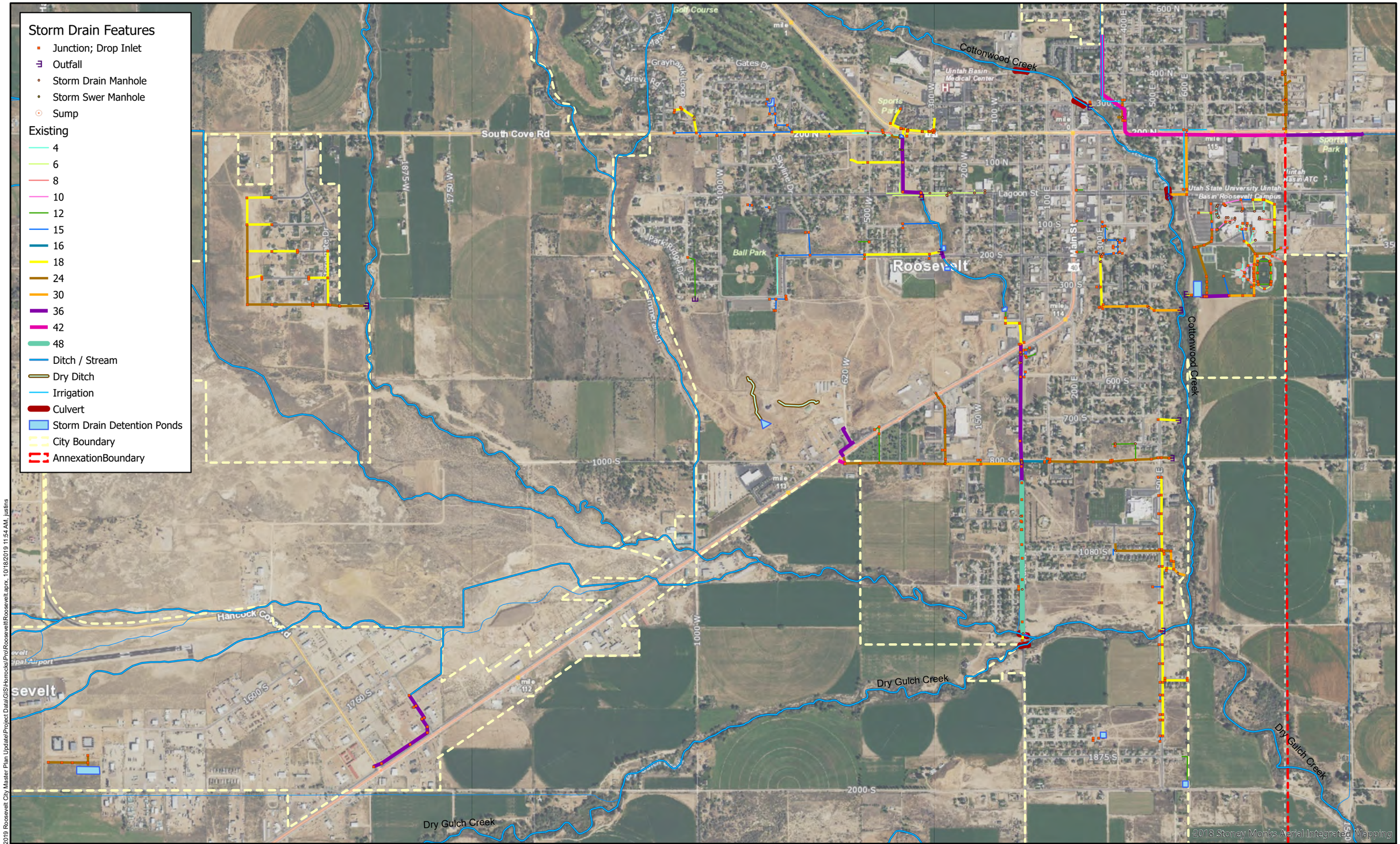
Figure A-3 Future Project Improvements Map

Roosevelt City

0.25 0 0.25 Miles

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Figure A-4 Existing Storm Drain Map

Roosevelt City

0.25 0 0.25 Miles

N

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Roosevelt City - Storm Drain System

- Culvert
- Storm Drain Detention Ponds

Existing
- 10
- 12
- 15
- 16
- 18
- 24
- 30
- 36
- 42
- 48

Proposed
- 10
- 12
- 15
- 16
- 18
- 24
- 30
- 36
- 42
- 48
- Ditch / Stream
- Dry Ditch
- Irrigation
- Channel Discharge Points
- City Boundary

Notes:
1. Volumes listed at Detention Facilities represent the required volume to address existing deficiencies and to address future growth needs.

2. Channel discharge points use the 50-year, 24-hour storm event. Assuming all development constructs its own detention basins.

Roosevelt Golf Course
Existing Dsicharge: 0 cfs
Proposed Discharge: 9.6 cfs

Cottonwood Creek

10-Yr Vol: 0.07 ac-ft
50-Yr Vol: 0.12 ac-ft

10-Yr Vol: 0.02 ac-ft
50-Yr Vol: 0.04 ac-ft

South Cove Rd

10-Yr Vol: 0.15 ac-ft
50-Yr Vol: 0.35 ac-ft

10-Yr Vol: 1.90 ac-ft
50-Yr Vol: 2.31 ac-ft

Existing Discharge: 0 cfs
Proposed Discharge: 40 cfs

Existing Discharge: 7 cfs
Proposed Discharge: 48 cfs

10-Yr Vol: 1.02 ac-ft
50-Yr Vol: 1.44 ac-ft

10-Yr Vol: 0.01 ac-ft
50-Yr Vol: 0.02 ac-ft

10-Yr Vol: 1.90 ac-ft
50-Yr Vol: 2.31 ac-ft

Roose

10-Yr Vol: 1.47 ac-ft
50-Yr Vol: 2.52 ac-ft

10-Yr Vol: 0.15 ac-ft
50-Yr Vol: 0.34 ac-ft

Existing Discharge: 33 cfs
Proposed Discharge: 46 cfs

10-Yr Vol: 1.81 ac-ft
50-Yr Vol: 3.30 ac-ft

Existing Discharge: 5 cfs
Proposed Discharge: 5 cfs

10-Yr Vol: 2.33 ac-ft
50-Yr Vol: 4.73 ac-ft

Existing Discharge: 0 cfs
Proposed Discharge: 28 cfs

Existing Discharge: 0.18 cfs
Proposed Discharge: 0.18 cfs

Existing Discharge: 16.55 cfs
Proposed Discharge: 16.55 cfs

Existing Discharge: 9.40 cfs
Proposed Discharge: 9.40 cfs

Existing Discharge: 0.08 cfs
Proposed Discharge: 0.08 cfs

Existing Discharge: 0.96 cfs
Proposed Discharge: 0.96 cfs

Roosevelt Municipal Airport

Harrocks Cove Rd

40

Existing Discharge: 70 cfs
Proposed Discharge: 110 cfs

Existing Discharge: 7 cfs
Proposed Discharge: 7 cfs

Dry Gulch Creek

Existing Discharge: 0.2 cfs
Proposed Discharge: 0.2 cfs

Roosevelt

Existing Discharge: 3.19 cfs
Proposed Discharge: 3.19 cfs

Existing Discharge: 0 cfs
Proposed Discharge: 1.46 cfs

Existing Discharge: 9.19 cfs
Proposed Discharge: 9.19 cfs

Dry Gulch Creek

Existing Discharge: 13.50 cfs
Proposed Discharge: 13.50 cfs

Dry Gulch Creek

Existing Discharge: 0.58 cfs
Proposed Discharge: 0.58 cfs

Existing Discharge: 0.90 cfs
Proposed Discharge: 0.90 cfs

Existing Discharge: 1.10 cfs
Proposed Discharge: 1.10 cfs

Existing Discharge: 1.80 cfs
Proposed Discharge: 1.80 cfs

Existing Discharge: 1.16 cfs
Proposed Discharge: 1.16 cfs

Existing Discharge: 28.79 cfs
Proposed Discharge: 28.79 cfs

Existing Discharge: 0.49 cfs
Proposed Discharge: 0.49 cfs

Existing Discharge: 1.03 cfs
Proposed Discharge: 1.03 cfs

Existing Discharge: 0.55 cfs
Proposed Discharge: 0.55 cfs

Existing Discharge: 9.14 cfs
Proposed Discharge: 9.14 cfs

Existing Discharge: 3.10 cfs
Proposed Discharge: 3.10 cfs

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HORROCKS ENGINEERS
2162 West Grove Parkway
Suite 400
Pleasant Grove, UT 84062
(801) 763-5100

Figure A-5 Proposed Storm Drain Map

Roosevelt City

0.25 0 0.25 Miles

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Attachment B

- Table B-1-1 Sub-basin Data
- Table B-1-2 Sub-basin Data (Annexation Regions)
- Figure B-1 Sub-basin Map
- CN Data

Table B-1-1 Sub-basin Data

ID	Historic CN	Historic Tc (hr)	Q10historic (cfs)	Q50historic (cfs)	Q10exist (cfs)	Q50exist (cfs)
CM-4	72.0	1.096	2.3	12.54	2.3	12.54
CM-5	83.0	1.360	11.02	24.4	13.12	27.54
CM-6	75.0	0.941	3.73	14.43	7.48	22.22
CM-7	74.0	0.667	2.89	13.39	3.81	15.56
CM-8	75.0	1.386	2.07	7.61	3.06	9.63
CM-10	74.0	0.150	0.41	1.85	0.41	1.85
CM-13	74.0	1.827	3.49	13.2	3.78	13.89
CM-14	89.0	0.444	45.28	80.44	48.78	84.61
CM-15	89.0	0.265	32.05	56.25	35.83	60.76
CM-16	80.0	0.697	1.21	3.23	2.8	5.59
CM-17	80.0	0.548	1.46	3.85	3.69	7.19
CM-18	80.0	0.572	1.43	3.81	0.72	2.5
CM-19	80.0	0.358	1.87	4.94	7.34	12.33
CM-20	80.0	0.266	2.61	6.65	2.97	7.29
CM-21	81.0	0.546	1.36	3.41	3.8	6.81
CM-22	79.0	1.039	1.73	4.84	2.89	6.85
CM-23	79.0	1.230	1.49	4.1	1.59	4.3
CM-24	78.0	1.292	0.78	2.27	2.03	4.4
CM-25	78.0	1.003	1.39	4.14	3.38	7.45
CM-26	78.0	0.851	1.01	3.05	2.36	5.29
CM-27	79.0	0.915	1.97	5.49	5.06	10.32
CM-28	81.0	0.190	4.1	9.71	14.78	23.37
CM-29	81.0	0.301	1.11	2.71	3.26	5.61
CM-30	81.0	0.315	1.98	4.87	5.93	10.17
CM-31	81.0	0.326	2.02	4.89	7.18	11.72
CM-32	82.0	0.406	1.97	4.55	6.17	10.15
CM-33	82.0	0.371	2.5	5.84	7.26	12.11
CM-34	82.0	0.386	1.27	2.94	3.59	5.92
CM-35	84.0	0.687	8.61	18.29	11.38	22.25
CM-36	80.0	0.654	5.21	13.75	9.77	20.82
CM-37	74.0	2.229	1.13	4.1	1.48	4.89
CM-38	74.0	1.640	0.91	3.59	1.53	4.89
CM-39	74.0	1.850	1.53	5.86	2.24	7.44
CM-40	80.0	0.407	4.55	12.13	15.61	27.27
CM-42	74.0	1.59	6.99	17.43	3.58	17.43
CM-43	74.0	1.23	2.50	6.99	2.57	9.33
CM-46	74.0	0.745	0.66	1.71	0.37	1.93

ID	Historic CN	Historic Tc (hr)	Q10historic (cfs)	Q50historic (cfs)	Q10exist (cfs)	Q50exist (cfs)
CM-47	74.0	0.703	0.59	1.56	1.19	3.7
CM-49	74.0	0.264	0.1	0.49	2.64	3.7
CM-50	74.0	1.078	0.22	0.91	1.66	3.39
CM-52	78.0	0.536	3.09	9.45	3.02	9.36
CM-53	79.0	0.491	3.87	10.94	12.6	23.75
CM-54	79.0	0.669	1.3	3.64	2.53	5.65
CM-55	78.0	0.537	3.78	11.59	4.85	13.59
CM-56	74.0	0.328	0.43	3.32	0.51	3.6
CM-57	80.0	0.266	4.16	10.61	4.83	11.68
CM-58	78.0	0.470	3.39	10.53	3.51	10.72
CM-59	80.0	0.334	3.39	8.95	4.95	11.29
CM-60	80.0	0.347	4.95	13.11	8.07	17.6
CM-61	79.0	0.330	1.64	4.58	2.93	6.62
CM-62	81.0	0.483	3.57	8.78	5.12	11.27
CM-63	79.0	0.554	1.05	3	1.43	3.65
CM-64	79.0	0.402	1.36	3.88	2.17	5.18
CM-65	81.0	0.318	2.86	6.95	5.29	10.44
CM-66	89.0	0.084	3.19	5.58	3.42	5.87
CM-67	75.0	0.478	1	4.2	1.5	5.26
CM-68	78.0	0.690	1.17	3.52	2.02	5.03
CM-69	78.0	0.911	2.07	6.21	4.42	10.16
CM-71	77.0	0.661	1.99	6.62	4.34	10.78
CM-72	77.0	0.235	3.08	10.03	6.26	14.96
CM-73	81.0	0.349	1.61	3.9	3.43	6.47
CM-74	77.0	0.413	0.44	1.49	0.67	1.88
CM-75	80.0	0.124	4.75	11.35	8.44	16.91
CM-76	78.5	0.496	2.23	6.64	2.39	6.87
CM-77	78.0	0.762	4.84	14.68	5.22	15.37
CM-78	78.0	0.508	5.37	16.47	8.48	21.77
CM-79	76.0	0.430	0.5	1.89	6.44	9.89
CM-80	76.0	0.550	0.56	2.06	2.11	4.69
CM-81	76.0	0.586	0.49	1.8	3.04	5.73
CM-82	76.0	0.306	0.54	2.04	6.5	9.99
CM-84	77.0	1.683	1.29	3.88	3.22	7.25
CM-85	75.0	1.084	1.16	4.39	1.15	4.37
CM-86	75.0	1.138	1.1	4.13	2.16	6.32
CM-87	74.0	0.447	0.65	3.19	4.35	9.56
CM-88	75.0	1.370	1.78	6.48	13.22	24.75

Table B-1-2 Sub-basin Data (Annexation Regions)

ID	Area (acres)	Historic CN	Tc (min)	Q10historic (ft^3/s)	Q50historic (ft^3/s)
0	125.892	70	28.581	1.07	11.37
1	79.855	70	114.15	0.52	3.1
1.1	78.417	70	93.402	0.53	3.42
1.2	48.164	70	10.437	0.46	8.1
1.3	36.557	70	114.15	0.24	1.42
1.4	54.761	70	25.934	0.47	5.24
2	49.765	63	77.746	0.05	0.49
2.1	39.89	63	91.165	0.04	0.38
2.1	40.842	63	100.919	0.04	0.38
2.11	40.181	63	100.919	0.04	0.37
2.12	46.393	63	132.51	0.04	0.4
2.13	38.303	63	57.962	0.04	0.4
2.14	37.132	63	57.962	0.03	0.39
2.15	43.292	63	118.573	0.04	0.38
2.2	40.065	63	91.165	0.04	0.38
2.3	54.779	63	91.165	0.05	0.52
2.4	41.907	63	70.474	0.04	0.42
2.5	43.747	63	70.474	0.04	0.44
2.6	44.287	63	70.474	0.04	0.44
2.7	45.844	63	139.587	0.04	0.39
2.8	48.765	63	132.51	0.04	0.42
2.9	42.298	63	100.919	0.04	0.39
3	401.487	60	118.418	0.04	1.67
3.1	301.356	60	132.098	0.02	1.24
4	418.924	(N/A)	(N/A)	(N/A)	(N/A)
5	385.469	60	119.015	0.03	1.6
6	949.413	(N/A)	(N/A)	(N/A)	(N/A)
7	740.203	(N/A)	(N/A)	(N/A)	(N/A)
8	237.029	(N/A)	(N/A)	(N/A)	(N/A)
9	490.853	60	161.052	0.04	1.97
10	433.741	(N/A)	(N/A)	(N/A)	(N/A)
11	198.56	(N/A)	(N/A)	(N/A)	(N/A)
12	244.207	(N/A)	(N/A)	(N/A)	(N/A)
13	356.401	70	230.227	1.91	9.23
14	225.271	(N/A)	(N/A)	(N/A)	(N/A)
15	39.913	60	40.244	0.01	0.17
15.1	40.854	60	19.391	0.01	0.18

ID	Area (acres)	Historic CN	Tc (min)	Q10historic (ft^3/s)	Q50historic (ft^3/s)
15.1	47.2	60	31.179	0.01	0.21
15.11	49.312	60	53.794	0.01	0.21
15.12	58.655	60	60.202	0.01	0.25
15.13	59.194	60	77.319	0.01	0.25
15.14	48.751	60	55.002	0.01	0.21
15.15	48.654	60	55.002	0.01	0.21
15.16	45.077	60	47.985	0.01	0.2
15.17	56.621	60	46.009	0.01	0.25
15.2	49.783	60	33.421	0.01	0.22
15.3	47.87	60	16.8	0.01	0.21
15.4	65.939	60	59.047	0.01	0.29
15.5	65.863	60	58.116	0.01	0.29
15.6	47.145	60	38.722	0.01	0.21
15.7	41.267	60	55.397	0.01	0.18
15.7	18.715	60	24.12	0	0.08
15.8	46.745	60	19.443	0.01	0.2
15.9	43.918	60	24.597	0.01	0.19
16	61.994	63	96.809	0.06	0.58
16.1	72.671	63	112.251	0.07	0.65
16.2	58.623	63	90.562	0.05	0.55
16.3	53.331	63	90.562	0.05	0.5
16.4	55.692	63	90.562	0.05	0.53
16.5	68.023	63	91.805	0.06	0.64
16.6	68.721	63	112.251	0.06	0.62
16.7	58.84	63	112.251	0.05	0.53
16.8	61.104	63	112.251	0.06	0.55
16.9	72.277	63	66.689	0.07	0.73
17	722.005	(N/A)	(N/A)	(N/A)	(N/A)
17.1	51.007	70	8.229	0.49	9.56
17.1	43.373	70	49.892	0.33	2.76
17.11	44.337	70	85.235	0.31	2.05
17.12	50.898	70	27.986	0.43	4.67
17.13	40.13	70	28.173	0.34	3.67
17.14	52.597	70	15.481	0.49	7.11
17.15	44.485	70	19.191	0.4	5.22
17.16	27.771	70	43.938	0.22	1.92
17.17	45.201	70	31.886	0.38	3.82
17.2	45.643	70	113.92	0.29	1.77
17.3	44.218	70	80.554	0.31	2.1

ID	Area (acres)	Historic CN	Tc (min)	Q10historic (ft^3/s)	Q50historic (ft^3/s)
17.4	53.76	70	31.021	0.45	4.59
17.5	44.354	70	16.232	0.41	5.8
17.6	44.621	70	13.578	0.42	6.5
17.7	50.953	70	19.402	0.46	5.93
17.8	47.981	70	42.617	0.38	3.39
17.9	50.747	70	46.508	0.4	3.38
18	956.943	(N/A)	(N/A)	(N/A)	(N/A)
19	42.323	70	77.56	0.3	2.07
19.1	52.421	70	9.503	0.51	9.21
19.1	43.214	70	42.396	0.34	3.04
19.11	42.46	70	54.843	0.32	2.57
19.12	46.667	70	50.309	0.36	2.97
19.13	48.191	70	59.957	0.36	2.73
19.14	44.022	70	95.217	0.3	1.9
19.2	49.037	70	59.957	0.36	2.78
19.3	41.444	70	64.707	0.3	2.27
19.4	41.45	70	64.707	0.3	2.27
19.5	45.464	70	75.857	0.32	2.25
19.6	47.844	70	69.14	0.35	2.5
19.7	41.408	70	69.14	0.3	2.16
19.8	46.744	70	59.957	0.35	2.65
19.9	46.495	70	40.13	0.37	3.39
20	177.458	(N/A)	(N/A)	(N/A)	(N/A)
21	253.534	(N/A)	(N/A)	(N/A)	(N/A)
22	220.641	(N/A)	(N/A)	(N/A)	(N/A)
23	307.662	(N/A)	(N/A)	(N/A)	(N/A)
24	61.93	(N/A)	(N/A)	(N/A)	(N/A)
25	475.214	(N/A)	(N/A)	(N/A)	(N/A)
26	113.721	(N/A)	(N/A)	(N/A)	(N/A)
27	219.796	(N/A)	(N/A)	(N/A)	(N/A)
28	522.182	(N/A)	(N/A)	(N/A)	(N/A)
29	711.637	(N/A)	(N/A)	(N/A)	(N/A)
30	43.973	70	95.217	0.3	1.9
30.1	46.406	70	67.515	0.34	2.44
30.2	34.212	70	58.63	0.26	1.97
30.3	40.161	70	138.793	0.25	1.37
31	104.81	(N/A)	(N/A)	(N/A)	(N/A)
32	383.987	(N/A)	(N/A)	(N/A)	(N/A)
33	187.239	(N/A)	(N/A)	(N/A)	(N/A)

ID	Area (acres)	Historic CN	Tc (min)	Q10historic (ft^3/s)	Q50historic (ft^3/s)
34	26.844	(N/A)	(N/A)	(N/A)	(N/A)
35	301.867	(N/A)	(N/A)	(N/A)	(N/A)
36	209.193	(N/A)	(N/A)	(N/A)	(N/A)
37	303.151	(N/A)	(N/A)	(N/A)	(N/A)
38	293.043	(N/A)	(N/A)	(N/A)	(N/A)
39	29.64	70	47.741	0.23	1.94
39.1	35.398	70	68.207	0.26	1.87
39.1	46.871	70	98.658	0.31	1.98
39.11	49.127	70	91.738	0.33	2.16
39.12	52.542	70	79.21	0.37	2.53
39.13	45.182	70	95.488	0.3	1.95
39.14	22.901	70	16.182	0.21	3
39.2	34.556	70	24.35	0.3	3.47
39.3	42.375	83	37.306	7.81	17.9
39.4	45.484	70	24.477	0.4	4.54
39.5	42.734	70	27.954	0.36	3.89
39.6	44.07	83	16.244	13.9	30.5
39.7	43.552	70	66.023	0.32	2.34
39.8	44.307	70	64.691	0.33	2.42
39.9	42.329	70	38.094	0.34	3.19
40	104.14	(N/A)	(N/A)	(N/A)	(N/A)
41	347.7	(N/A)	(N/A)	(N/A)	(N/A)
42	30.342	90	5	27.69	47.54
43	11.189	(N/A)	(N/A)	(N/A)	(N/A)
44	361.034	(N/A)	(N/A)	(N/A)	(N/A)
45	40.533	70	94.817	0.27	1.74
46	26.492	70	118.337	0.17	1.01
47	72.441	70	52.468	0.55	4.47
48	49.524	70	48.857	0.38	3.22
48.1	108.788	70	91.495	0.74	4.76
49	167.948	70	81.928	1.17	7.89
50	47.834	70	60.27	0.36	2.73
50.1	39.897	70	61.748	0.3	2.25
50.2	41.366	70	49.438	0.32	2.65
50.3	25.441	70	42.396	0.2	1.79
50.4	37.63	70	69.734	0.27	1.97
51	195.074	(N/A)	(N/A)	(N/A)	(N/A)
52	342.258	(N/A)	(N/A)	(N/A)	(N/A)
53	48.492	(N/A)	(N/A)	(N/A)	(N/A)

ID	Area (acres)	Historic CN	Tc (min)	Q10historic (ft^3/s)	Q50historic (ft^3/s)
54	132.464	(N/A)	(N/A)	(N/A)	(N/A)
55	13.112	(N/A)	(N/A)	(N/A)	(N/A)
56	143.835	(N/A)	(N/A)	(N/A)	(N/A)
57	42.281	70	26.936	0.36	3.97
57.1	38.56	70	16.545	0.36	4.97
57.1	46.504	70	31.721	0.39	3.94
57.11	50.359	70	39.234	0.4	3.73
57.12	56.48	70	41.077	0.45	4.05
57.13	47.643	70	38.094	0.38	3.59
57.14	41.428	70	38.094	0.33	3.13
57.15	41.928	70	38.094	0.34	3.16
57.16	48.894	70	45.785	0.38	3.29
57.17	47.92	70	45.785	0.37	3.22
57.18	42.606	70	33.79	0.35	3.44
57.2	35.972	70	118.756	0.23	1.37
57.3	56.578	94	24.087	44.53	69.38
57.4	42.712	94	25.828	32.37	50.49
57.5	63.269	70	34.205	0.52	5.08
57.5	53.49	70	120.5	0.34	2
57.6	65.185	70	17.819	0.6	7.98
57.7	50.625	70	30.182	0.42	4.4
57.8	47.816	70	45.785	0.37	3.21
57.9	41.252	70	38.094	0.33	3.11
58	49.329	78	65.998	2.75	8.24
For cells that contain "(N/A)", the land use suggests minimal development, so flow rates and time of concentration were not determined.					

City Boundary
Annexation Boundary

4000 N
Cedarview
UINTAH AND OURAY TRIBAL LANDS
Roosevelt Municipal Airport
Roosevelt Golf Course
Roosevelt Ball Park
Roosevelt Campground
DUCHESNE COUNTY
UINTAH COUNTY

26 113.721 Acres
25 475.214 Acres
53 13.112 Acres
8 237.029 Acres
44 361.034 Acres
56 143.835 Acres
27 219.796 Acres
28 522.182 Acres
29 711.637 Acres
54 132.464 Acres
CM-42 309.3 Acres
37 303.151 Acres
35 301.867 Acres
13 356.401 Acres
40 104.14 Acres
7 740.203 Acres
CM-4 169.8 Acres
CM-43 96.8 Acres
38 293.043 Acres
33 187.239 Acres
41 347.7 Acres
CM-10 5.5 Acres
34 26.844 Acres
6 949.413 Acres
10 433.741 Acres
36 209.193 Acres
23 307.662 Acres
CM-7 95.1 Acres
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CM-13 189.9 Acres
CM-23 24.1 Acres
CM-24 15.5 Acres
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CM-79 7.5 Acres
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1.3 36.557 Acres
1.2 48.164 Acres
1.4 54.761 Acres

HORROCKS ENGINEERS
2162 West Grove Parkway
Suite 400
Pleasant Grove, UT 84062
(801) 763-5100

Figure B-1 Sub-Basin Map

Roosevelt City

0.25 0 0.25 Miles

N

Area ID	Area1 (acres)	Area2 (acres)	Area3 (acres)	Area4 (acres)	Area5 (acres)	Total Area	Existing Land Use 1	CN Land Use 1	Existing Land Use 2	CN Land Use 2	Existing Land Use 3	CN Land Use 3	Existing Land Use 4	CN Land Use 4	Weighted C (Existing)
CM-10	5.5					5.5	Hillside, rural	74							74.00
CM-11	33.15	3	4.3	55	47.6	143.05	Park	74	Residential 1 acre lots	79	Church/School	94	Bare dry fields	78	79.57
CM-13	85	40	65			190	Green/farm field	72	Wooded/brushy areas	70	Dry fields	80			74.32
CM-14	83.6	12.8				96.4	Bare Rocky Hillsides	89	Commercial	94					89.66
CM-15	39.5	11.7				51.2	Bare Rocky Hillsides	89	Commercial	94					90.14
CM-17	1.42	8.78				10.2	Business	94	Residential 1/5 acre lots	85					86.25
CM-18	10.04	1.515				11.555	Park	74	Pool, tennis, buildings	94					76.62
CM-19	5.1	1.8	3.2			10.1	Church/School	94	Business	94	Residential 1/4 acre lots	83			90.51
CM-20	8.94	2.7				11.64	Residential 1/3 acre lots	81	Residential 1/2 acre lots	80					80.77
CM-22	4.5	5.3	15.2			25	Bare Dirt	87	Residential 1/3 acre lots	81	Herbacious-Fair	81			82.08
CM-23	3	8.5	13			24.5	Residential 1 acre lots	79	Row Crop/field	74	Residential 1/4 acre lots	83			79.39
CM-24	15.5					15.5	Residential 1/5 acre lots	84							84.00
CM-25	17.5	5.7				23.2	Residential 1/5 acre lots	84	Herbacious-Fair	81	Herbacious-Fair	81			83.26
CM-26	15.2					15.2	Residential 1/4 acre lots	83							83.00
CM-27	5	22				27	Business	94	Residential 1/4 acre lots	83					85.04
CM-28	0.65	0.5	13.47			14.62	Park	74	Residential 1/4 acre lots	83	Business	94			92.73
CM-29	5.5	2.47				7.97	Business	94	Dry fields	80					89.66
CM-3	97					97	Pasture	74							74.00
CM-30	3.9	5.23				9.13	Residential 1/5 acre lots	84	Commercial	94					89.73
CM-31	2.1	7.32				9.42	Residential 1/4 acre lots	83	Commercial	94					91.55
CM-32	2.09	7.01				9.1	Residential 1/4 acre lots	83	Commercial	94					91.47
CM-33	3.2	7.7				10.9	Residential 1/4 acre lots	83	Commercial	94					90.77
CM-34*	20.406	13.86	1	59.93		95.196	Residential 1 acre lots	79	Residential 1/4 acre lots	94	Business	94	Row Crop/field	74	78.19
CM-35	13.36	15.6	14.28			43.24	Business	94	Trailer Park	84	Herbacious-Fair	81			86.10
CM-36	0	12.5	31.4			43.9	Cemetery	74	Commercial	94	Dry fields	80			83.99
CM-37	14.7	0	1	51.17		66.87	Residential 1 acre lots	79	Residential 1/4 acre lots	94	Business	94	Row Crop/field	74	75.40
CM-39	9.3	22	38	21.33		90.63	Residential 1/5 acre lots	82	Row Crop/field	75	Pasture/grassy field	74	River/Vegetation surrounding	77	75.77
CM-4	169					169	Agricultural, Open land	72							72.00
CM-40	15.8	12.5				28.3	Business	94	Residential 1/4 acre lots	83					89.14
CM-42	309.3					309.3	Agricultural, Open land	72							72.00
CM-44	25	28.5				53.5	Residential 1/2 acre lots	80	Pasture/undeveloped brushy fields	70					74.67
CM-45	23.6	37				60.6	Residential 1/2 acre lots	80	Residential 1/4 acre lots	83					81.83
CM-46	18	1.6				19.6	Green/farm field	72	Residential 1/3 acre lots	81					72.73
CM-47	12	1.3	4			17.3	Green/farm field	72	Residential 1/3 acre lots	81	Church/School	94			77.76
CM-48	4.6		6.3			10.9	Green/farm field	72	Residential 1/4 acre lots	83	Church/School	94			84.72
CM-49	1.88					1.88	Highway	98							98.00
CM-5	16.8	88				104.8	Residential 1/3 acre lots	81	Bare dry fields	78					78.48
CM-50	6.75	1.5	0.95			9.2	1/5 acre lots	85	Residential 1/2 acre lots	80	Business	94			85.11
CM-52	22	9.7	2.3			34	Golf Course	74	Residential 1/4 acre lots	83	Business	94			77.92
CM-53	4.1	12	17.4			33.5	Residential 1/4 acre lots	83	Bare dry fields	78	Business	94			86.92
CM-54	13.08					13.08	Residential 1/4 acre lots	83							83.00
CM-55	27.8	14.11				41.91	Residential 1/2 acre lots	80	Bare dry fields	78					79.33
CM-56	3.65	16.52				20.17	Residential 1/4 acre lots	83	Wooded/brushy areas	70					72.35
CM-57	7.4	7.35	3	2.5		20.25	Residential 1/2 acre lots	80	Bare dry fields	78	Residential 1 acre lots	79	Business	94	80.85
CM-58	1	3	30.79			34.79	Residential 1/2 acre lots	80	Residential 1 acre lots	79	Bare dry fields	78			78.14
CM-59	6.75	1.8	2.63	7.9		19.08	Residential 3/4 acre lots	79.5	Bare dry fields	78	Twin/Condos	90	Residential 1/4 acre lots	83	82.25
CM-6	24	14.1	75.3			113.4	Golf Course	74	Residential 1/3 acre lots	81	Pasture/ grassy hillside	79			78.19
CM-60	21.91					21.91	Residential 1/4 acre lots	83	Bare dry fields	78					83.00
CM-61	6.63	2	1.5	0.7		10.83	Residential 1/4 acre lots	83	Residential 1/2 acre lots	80	Bare dry fields	78	Business	94	82.46
CM-62	6.45	4.75	10.45			21.65	Church/School	94	Turf/fields	74	Herbacious-Fair	81			83.34
CM-63	4.6	9.21				13.81	Residential 1/2 acre lots	80	Herbacious-Fair	81					80.67
CM-64	1.83	8.47				10.3	Road	94	Residential 1 acre lots	79					81.67
CM-65	6.05	7.07				13.12	Business	94	Bare dry fields	78					85.38
CM-67	15	2	3.5			20.5	Cemetery/Park	74	Commercial	94	Bare dry fields	78			76.63
CM-68	10.2	5.1				15.3	Residential 1/2 acre lots	80	Residential 1/4 acre lots	83					81.00
CM-69	28.8	3.9				32.7	Residential 1/4 acre lots	83	Bare dry fields	78					82.40
CM-7	79.73	15.35				95.08	Golf Course	74	Residential 1/2 acre lots	80					74.97
CM-71	19.26	12				31.26	Residential 1/4 acre lots	83	Bare dry fields	78					81.08
CM-72	2.15	5.4	6.6	1.1	9.55	24.8	Residential 1/4 acre lots	83	Trailer Park	84	Residential 1/2 acre lots	80	Appartments	90	80.80
CM-73	1.53	1.11	5.16			7.8	Residential 1/4 acre lots	83	Commercial	94	Bare dry fields, hillside	86			86.55
CM-75	7.03	10.14				17.17	Business	94	Bare dry fields	78					84.55
CM-76	3.3	18.2				21.5	Residential 1/4 acre lots	83	Bare dry fields	78					78.77
CM-77	4.6	40.62	10.97	2.8	9	67.99	Church/School	94	Park	76	Residential 1/3 acre lots	81	Residential 1 acre lots	79	78.41
CM-78	23	34.6				57.6	Residential 1/5 acre lots	84	Bare dry fields	78					80.40
CM-79	7.54					7.54	Church/School	94							94.00
CM-8	46	23.04	9.4			78.44	Golf Course	74	Residential 1/3 acre lots	81	Residential 1/2 acre lots	80			76.78
CM-80	9.77					9.77	Residential 1/4 acre lots	83							83.00
CM-81	5.8	3.1				8.9	Residential 1/4 acre lots	83	Commercial	94					86.83
CM-84	6.2	14.5		15.7		36.4	Residential 1 acre lots	79	Residential 1/4 acre lots	94	Business	94	Row Crop/field	74	82.82
CM-85	3.2	3	31.94			38.14	Residential 1 acre lots	79	Residential 1/3 acre lots	81	Row Crop/field	74			74.97
CM-86	3.9	4.06	5.23	23.28		36.47	Residential Apartments	90	Residential 1/3 acre lots	81	Residential, Undeveloped, Low veg	86	Row Crop/field	74	78.21
CM-9	21	72.6	67			160.6	Golf Course	74	Residential 1/2 acre lots	80	Undeveloped, low vegetation	86			81.72
CM-87	6.58	5	2	10.23		23.81	Park	72	Commercial	94	Trailer Park	88	Residential 1/4 acre lots	83	82.69

Attachment C

- Cost Data

#1

200 S. State St. Improvements

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$8,382.32
2	15 Inch Storm Drain	0	LF	$65.00	$0.00
3	18 Inch Storm Drain	0	LF	$80.00	$0.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	750	LF	$95.00	$71,250.00
6	30 Inch Storm Drain	0	LF	$110.00	$0.00
7	36 Inch Storm Drain	0	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Basin Grading	0	CY	$8.00	$0.00
11	Manholes/Inlets/Structures	8	EA	$3,800.00	$30,400.00
12	Class "A" Road Repair	7500	SF	$7.00	$52,500.00
13	Class "D" Field Repair	0	SF	$1.00	$0.00
14	Imported Backfill	156.05	TON	$18.00	$2,808.99
15	State Road Crossing	0	LS	$220,000.00	$0.00
16	Traffic Control	0	LS	$4,708.77	$0.00
17	Utility Relocation (15% of pipe cost)	1	LS	$10,687.50	$10,687.50
	Sub Total (Construction)				$176,028.81
	Contingencies	20%			$35,205.76
	Land	-	SF	$5.00	$0.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$211,234.58
	Design and Construction Engineering	10%			$17,602.88
	Administration, Legal, and Bond Counsel	1%			$1,760.29
	Total (Professional Services)				$19,363.17
	Grand Total				**$230,597.75**

#2

200 S. Detention Ponds

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$2,970.00
2	15 Inch Storm Drain	0	LF	$65.00	$0.00
3	18 Inch Storm Drain	0	LF	$80.00	$0.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	0	LF	$95.00	$0.00
6	30 Inch Storm Drain	0	LF	$110.00	$0.00
7	36 Inch Storm Drain	0	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Basin Grading	6950	CY	$8.00	$55,600.00
11	Manholes/Inlets/Structures	1	EA	$3,800.00	$3,800.00
12	Class "A" Road Repair	0	SF	$7.00	$0.00
13	Class "D" Field Repair	0	SF	$1.00	$0.00
14	Imported Backfill	0.00	TON	$18.00	$0.00
15	State Road Crossing	0	LS	$220,000.00	$0.00
16	Traffic Control	0	LS	$4,708.77	$0.00
17	Utility Relocation (15% of pipe cost)	0	LS	$0.00	$0.00
	Sub Total (Construction)			$0.00	$62,370.00
	Contingencies	20%		$0.00	$12,474.00
	Land	-	SF	$5.00	$0.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)			$0.00	$74,844.00
	Design and Construction Engineering	10%		$0.00	$6,237.00
	Administration, Legal, and Bond Counsel	1%		$0.00	$623.70
	Total (Professional Services)			$0.00	$6,860.70
	Grand Total			$0.00	**$81,704.70**

#3

400 S. Storm Drain Improvements

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$9,516.18
2	15 Inch Storm Drain	0	LF	$65.00	$0.00
3	18 Inch Storm Drain	0	LF	$80.00	$0.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	0	LF	$95.00	$0.00
6	30 Inch Storm Drain	0	LF	$110.00	$0.00
7	36 Inch Storm Drain	710	LF	$125.00	$88,750.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Basin Grading	0	CY	$8.00	$0.00
11	Manholes/Inlets/Structures	8	EA	$3,800.00	$30,400.00
12	Class "A" Road Repair	7810	SF	$7.00	$54,670.00
13	Class "D" Field Repair	0	SF	$1.00	$0.00
14	Imported Backfill	177.28	TON	$18.00	$3,191.01
15	State Road Crossing	0	LS	$220,000.00	$0.00
16	Traffic Control	0	LS	$5,310.33	$0.00
17	Utility Relocation (15% of pipe cost)	1	LS	$13,312.50	$13,312.50
	Sub Total (Construction)				$199,839.69
	Contingencies	20%			$39,967.94
	Land	-	SF	$5.00	$0.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$239,807.62
	Design and Construction Engineering	10%			$19,983.97
	Administration, Legal, and Bond Counsel	1%			$1,998.40
	Total (Professional Services)				$21,982.37
	Grand Total				**$261,789.99**

#4

600 E. Storm Drain Improvements

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$39,824.92
2	15 Inch Storm Drain	0	LF	$65.00	$0.00
3	18 Inch Storm Drain	260	LF	$80.00	$20,800.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	1040	LF	$95.00	$98,800.00
6	30 Inch Storm Drain	926	LF	$110.00	$101,860.00
7	36 Inch Storm Drain	450	LF	$125.00	$56,250.00
8	42 Inch Storm Drain	710	LF	$140.00	$99,400.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Basin Grading	0	CY	$8.00	$0.00
11	Manholes/Inlets/Structures	26	EA	$3,800.00	$98,800.00
12	Class "A" Road Repair	35708	SF	$7.00	$249,956.00
13	Class "D" Field Repair	0	SF	$1.00	$0.00
14	Imported Backfill	781.44	TON	$18.00	$14,065.92
15	State Road Crossing	0	LS	$220,000.00	$0.00
16	Traffic Control	0	LS	$22,197.96	$0.00
17	Utility Relocation (15% of pipe cost)	1	LS	$56,566.50	$56,566.50
	Sub Total (Construction)				$836,323.34
	Contingencies	20%			$167,264.67
	Land	-	SF	$5.00	$0.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$1,003,588.01
	Design and Construction Engineering	10%			$83,632.33
	Administration, Legal, and Bond Counsel	1%			$8,363.23
	Total (Professional Services)				$91,995.57
	Grand Total				**$1,095,583.57**

#5

800 E. Storm Drain Improvements

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$24,912.27
2	15 Inch Storm Drain	0	LF	$65.00	$0.00
3	18 Inch Storm Drain	0	LF	$80.00	$0.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	940	LF	$95.00	$89,300.00
6	30 Inch Storm Drain	590	LF	$110.00	$64,900.00
7	36 Inch Storm Drain	610	LF	$125.00	$76,250.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Basin Grading	0	CY	$8.00	$0.00
11	Manholes/Inlets/Structures	18	EA	$3,800.00	$68,400.00
12	Class "A" Road Repair	22305	SF	$7.00	$156,135.00
13	Class "D" Field Repair	0	SF	$1.00	$0.00
14	Imported Backfill	482.94	TON	$18.00	$8,692.88
15	State Road Crossing	0	LS	$220,000.00	$0.00
16	Traffic Control	0	LS	$13,910.34	$0.00
17	Utility Relocation (15% of pipe cost)	1	LS	$34,567.50	$34,567.50
	Sub Total (Construction)				$523,157.65
	Contingencies	20%			$104,631.53
	Land	-	SF	$5.00	$0.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$627,789.18
	Design and Construction Engineering	10%			$52,315.77
	Administration, Legal, and Bond Counsel	1%			$5,231.58
	Total (Professional Services)				$57,547.34
	Grand Total				**$685,336.53**

#6

550 W./ Highway 40 Detention Pond

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$3,416.40
2	15 Inch Storm Drain	0	LF	$65.00	$0.00
3	18 Inch Storm Drain	0	LF	$80.00	$0.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	0	LF	$95.00	$0.00
6	30 Inch Storm Drain	0	LF	$110.00	$0.00
7	36 Inch Storm Drain	0	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Basin Grading	8066	CY	$8.00	$64,528.00
11	Manholes/Inlets/Structures	1	EA	$3,800.00	$3,800.00
12	Class "A" Road Repair	0	SF	$7.00	$0.00
13	Class "D" Field Repair	0	SF	$1.00	$0.00
14	Imported Backfill	0.00	TON	$18.00	$0.00
15	State Road Crossing	0	LS	$220,000.00	$0.00
16	Traffic Control	0	LS	$2,049.84	$0.00
17	Utility Relocation (15% of pipe cost)	0	LS	$0.00	$0.00
	Sub Total (Construction)				$71,744.40
	Contingencies	20%			$86,948.88
	Land	72,600	SF	$5.00	$363,000.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$521,693.28
	Design and Construction Engineering	10%			$7,174.44
	Administration, Legal, and Bond Counsel	1%			$717.44
	Total (Professional Services)				$7,891.88
	Grand Total				**$529,585.16**

#7

Rodeo Detention Facility

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$1,609.44
2	15 Inch Storm Drain	30	LF	$65.00	$1,950.00
3	18 Inch Storm Drain	0	LF	$80.00	$0.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	0	LF	$95.00	$0.00
6	30 Inch Storm Drain	0	LF	$110.00	$0.00
7	36 Inch Storm Drain	0	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Basin Grading	3227	CY	$8.00	$25,816.00
11	Manholes/Inlets/Structures	1	EA	$3,800.00	$3,800.00
12	Class "A" Road Repair	41.625	SF	$7.00	$291.38
13	Class "D" Field Repair	235.875	SF	$1.00	$235.88
14	Imported Backfill	5.31	TON	$18.00	$95.51
15	State Road Crossing	0	LS	$220,000.00	$0.00
16	Traffic Control	0	LS	$965.66	$0.00
17	Utility Relocation (15% of pipe cost)	0	LS	$292.50	$0.00
	Sub Total (Construction)				$33,798.19
	Contingencies	20%			$35,799.64
	Land	29,040	SF	$5.00	$145,200.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$214,797.83
	Design and Construction Engineering	10%			$3,379.82
	Administration, Legal, and Bond Counsel	1%			$337.98
	Total (Professional Services)				$3,717.80
	Grand Total				**$218,515.63**

#8

Lagoon St., 1500 E. Detention Pond

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$9,363.98
2	15 Inch Storm Drain	0	LF	$65.00	$0.00
3	18 Inch Storm Drain	700	LF	$80.00	$56,000.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	0	LF	$95.00	$0.00
6	30 Inch Storm Drain	0	LF	$110.00	$0.00
7	36 Inch Storm Drain	0	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Basin Grading	2420	CY	$8.00	$19,360.00
11	Manholes/Inlets/Structures	13	EA	$3,800.00	$49,400.00
12	Class "A" Road Repair	6650	SF	$7.00	$46,550.00
13	Class "D" Field Repair	0	SF	$1.00	$0.00
14	Imported Backfill	131.09	TON	$18.00	$2,359.55
15	State Road Crossing	0	LS	$220,000.00	$0.00
16	Traffic Control	1	LS	$5,210.09	$5,210.09
17	Utility Relocation (15% of pipe cost)	1	LS	$8,400.00	$8,400.00
	Sub Total (Construction)				$196,643.62
	Contingencies	20%			$61,762.12
	Land	22,433	SF	$5.00	$112,167.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$370,572.74
	Design and Construction Engineering	10%			$19,664.36
	Administration, Legal, and Bond Counsel	1%			$1,966.44
	Total (Professional Services)				$21,630.80
	Grand Total				**$392,203.54**

#9

200 E. to Cottonwood Creek Improvements

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$34,563.42
2	15 Inch Storm Drain	0	LF	$65.00	$0.00
3	18 Inch Storm Drain	2440	LF	$80.00	$195,200.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	1370	LF	$95.00	$130,150.00
6	30 Inch Storm Drain		LF	$110.00	$0.00
7	36 Inch Storm Drain	0	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Basin Grading	0	CY	$8.00	$0.00
11	Manholes/Inlets/Structures	12	EA	$3,800.00	$45,600.00
12	Class "A" Road Repair	36880	SF	$7.00	$258,160.00
13	Class "D" Field Repair	0	SF	$1.00	$0.00
14	Imported Backfill	741.99	TON	$18.00	$13,355.81
15	State Road Crossing	0	LS	$220,000.00	$0.00
16	Traffic Control	0	LS	$19,273.97	$0.00
17	Utility Relocation (15% of pipe cost)	1	LS	$48,802.50	$48,802.50
	Sub Total (Construction)				$725,831.72
	Contingencies	20%			$145,166.34
	Land	-	SF	$5.00	$0.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$870,998.06
	Design and Construction Engineering	10%			$72,583.17
	Administration, Legal, and Bond Counsel	1%			$7,258.32
	Total (Professional Services)				$79,841.49
	Grand Total				**$950,839.55**

#10

State St./ Highway 40 Storm Drain Improvements

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$1,407.48
2	15 Inch Storm Drain	0	LF	$65.00	$0.00
3	18 Inch Storm Drain	80	LF	$80.00	$6,400.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	0	LF	$95.00	$0.00
6	30 Inch Storm Drain	0	LF	$110.00	$0.00
7	36 Inch Storm Drain	0	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Curb and Gutter	0	LF	$17.00	$0.00
11	Basin Grading	0	CY	$8.00	$0.00
12	Manholes/Inlets/Structures	4	EA	$3,800.00	$15,200.00
13	Class "A" Road Repair	760	SF	$7.00	$5,320.00
14	Class "D" Field Repair	0	SF	$1.00	$0.00
15	Imported Backfill	14.98	TON	$18.00	$269.66
16	State Road Crossing	0	LS	$220,000.00	$0.00
17	Traffic Control	0	LS	$815.69	$0.00
18	Utility Relocation (15% of pipe cost)	1	LS	$960.00	$960.00
	Sub Total (Construction)				$29,557.15
	Contingencies	20%			$5,911.43
	Land	-	SF	$5.00	$0.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$35,468.58
	Design and Construction Engineering	10%			$2,955.71
	Administration, Legal, and Bond Counsel	1%			$295.57
	Total (Professional Services)				$3,251.29
	Grand Total				**$38,719.86**

#11

200 E. and 800 S. Storm Drain Improvements

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$1,426.10
2	15 Inch Storm Drain	120	LF	$65.00	$7,800.00
3	18 Inch Storm Drain	0	LF	$80.00	$0.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	0	LF	$95.00	$0.00
6	30 Inch Storm Drain	0	LF	$110.00	$0.00
7	36 Inch Storm Drain	0	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Curb and Gutter	0	LF	$17.00	$0.00
11	Basin Grading	0	CY	$8.00	$0.00
12	Manholes/Inlets/Structures	3	EA	$3,800.00	$11,400.00
13	Class "A" Road Repair	1110	SF	$7.00	$7,770.00
14	Class "D" Field Repair	0	SF	$1.00	$0.00
15	Imported Backfill	21.22	TON	$18.00	$382.02
16	State Road Crossing	0	LS	$220,000.00	$0.00
17	Traffic Control	0	LS	$820.56	$0.00
18	Utility Relocation (15% of pipe cost)	1	LS	$1,170.00	$1,170.00
	Sub Total (Construction)				$29,948.12
	Contingencies	20%			$5,989.62
	Land	-	SF	$5.00	$0.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$35,937.75
	Design and Construction Engineering	10%			$2,994.81
	Administration, Legal, and Bond Counsel	1%			$299.48
	Total (Professional Services)				$3,294.29
	Grand Total				**$39,232.04**

#12

King Arthur Dr. Retention Pond

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$40.00
2	15 Inch Storm Drain	0	LF	$65.00	$0.00
3	18 Inch Storm Drain	0	LF	$80.00	$0.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	0	LF	$95.00	$0.00
6	30 Inch Storm Drain	0	LF	$110.00	$0.00
7	36 Inch Storm Drain	0	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Curb and Gutter	0	LF	$17.00	$0.00
11	Basin Grading	100	CY	$8.00	$800.00
12	Manholes/Inlets/Structures	0	EA	$3,800.00	$0.00
13	Class "A" Road Repair	0	SF	$7.00	$0.00
14	Class "D" Field Repair	0	SF	$1.00	$0.00
15	Imported Backfill	0.00	TON	$18.00	$0.00
16	State Road Crossing	0	LS	$220,000.00	$0.00
17	Traffic Control	0	LS	$24.00	$0.00
18	Utility Relocation (15% of pipe cost)	0	LS	$0.00	$0.00
	Sub Total (Construction)				$840.00
	Contingencies	20%			$4,168.00
	Land	4,000	SF	$5.00	$20,000.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$25,008.00
	Design and Construction Engineering	10%			$84.00
	Administration, Legal, and Bond Counsel	1%			$8.40
	Total (Professional Services)				$92.40
	Grand Total				**$25,100.40**

#13

Lagoon St. Storm Drain Improvement

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$9,939.94
2	15 Inch Storm Drain	0	LF	$65.00	$0.00
3	18 Inch Storm Drain	0	LF	$80.00	$0.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	0	LF	$95.00	$0.00
6	30 Inch Storm Drain	825	LF	$110.00	$90,750.00
7	36 Inch Storm Drain	0	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Basin Grading	0	CY	$8.00	$0.00
11	Manholes/Inlets/Structures	8	EA	$3,800.00	$30,400.00
12	Class "A" Road Repair	8662.5	SF	$7.00	$60,637.50
13	Class "D" Field Repair	0	SF	$1.00	$0.00
14	Imported Backfill	188.83	TON	$18.00	$3,398.88
15	State Road Crossing	0	LS	$220,000.00	$0.00
16	Traffic Control	0	LS	$5,555.59	$0.00
17	Utility Relocation (15% of pipe cost)	1	LS	$13,612.50	$13,612.50
	Sub Total (Construction)				$208,738.82
	Contingencies	20%			$41,747.76
	Land	-	SF	$5.00	$0.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$250,486.58
	Design and Construction Engineering	10%			$20,873.88
	Administration, Legal, and Bond Counsel	1%			$2,087.39
	Total (Professional Services)				$22,961.27
	Grand Total				**$273,447.85**

#14

1200 S. Storm Drain Improvements

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$15,908.45
2	15 Inch Storm Drain	200	LF	$65.00	$13,000.00
3	18 Inch Storm Drain	0	LF	$80.00	$0.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	0	LF	$95.00	$0.00
6	30 Inch Storm Drain	1270	LF	$110.00	$139,700.00
7	36 Inch Storm Drain	0	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Basin Grading	0	CY	$8.00	$0.00
11	Manholes/Inlets/Structures	8	EA	$3,800.00	$30,400.00
12	Class "A" Road Repair	15185	SF	$7.00	$106,295.00
13	Class "D" Field Repair	0	SF	$1.00	$0.00
14	Imported Backfill	326.05	TON	$18.00	$5,868.91
15	State Road Crossing	0	LS	$220,000.00	$0.00
16	Traffic Control	0	LS	$8,857.92	$0.00
17	Utility Relocation (15% of pipe cost)	1	LS	$22,905.00	$22,905.00
	Sub Total (Construction)				$334,077.36
	Contingencies	20%			$66,815.47
	Land	-	SF	$5.00	$0.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$400,892.83
	Design and Construction Engineering	10%			$33,407.74
	Administration, Legal, and Bond Counsel	1%			$3,340.77
	Total (Professional Services)				$36,748.51
	Grand Total				**$437,641.34**

#15

N. Poco Dr. Storm Drain Improvements

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$16,848.37
2	15 Inch Storm Drain	0	LF	$65.00	$0.00
3	18 Inch Storm Drain	1800	LF	$80.00	$144,000.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	0	LF	$95.00	$0.00
6	30 Inch Storm Drain	0	LF	$110.00	$0.00
7	36 Inch Storm Drain	0	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Basin Grading	0	CY	$8.00	$0.00
11	Manholes/Inlets/Structures	12	EA	$3,800.00	$45,600.00
12	Class "A" Road Repair	17100	SF	$7.00	$119,700.00
13	Class "D" Field Repair	0	SF	$1.00	$0.00
14	Imported Backfill	337.08	TON	$18.00	$6,067.42
15	State Road Crossing	0	LS	$220,000.00	$0.00
16	Traffic Control	0	LS	$9,461.02	$0.00
17	Utility Relocation (15% of pipe cost)	1	LS	$21,600.00	$21,600.00
	Sub Total (Construction)				$353,815.79
	Contingencies	20%			$70,763.16
	Land	-	SF	$5.00	$0.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$424,578.94
	Design and Construction Engineering	10%			$35,381.58
	Administration, Legal, and Bond Counsel	1%			$3,538.16
	Total (Professional Services)				$38,919.74
	Grand Total				**$463,498.68**

#16

Brighton Estates Detention Pond

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$14,208.36
2	15 Inch Storm Drain	0	LF	$65.00	$0.00
3	18 Inch Storm Drain	2700	LF	$80.00	$216,000.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	0	LF	$95.00	$0.00
6	30 Inch Storm Drain	0	LF	$110.00	$0.00
7	36 Inch Storm Drain	0	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Basin Grading	3227	CY	$8.00	$25,816.00
11	Manholes/Inlets/Structures	2	EA	$3,800.00	$7,600.00
12	Class "A" Road Repair	0	SF	$7.00	$0.00
13	Class "D" Field Repair	25650	SF	$1.00	$25,650.00
14	Imported Backfill	505.62	TON	$18.00	$9,101.12
15	State Road Crossing	0	LS	$220,000.00	$0.00
16	Traffic Control	0	LS	$8,525.01	$0.00
17	Utility Relocation (15% of pipe cost)	0	LS	$32,400.00	$0.00
	Sub Total (Construction)				$298,375.48
	Contingencies	20%			$59,675.10
	Land	-	SF	$5.00	$0.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$358,050.58
	Design and Construction Engineering	10%			$29,837.55
	Administration, Legal, and Bond	1%			$2,983.75
	Total (Professional Services)				$32,821.30
	Grand Total				**$390,871.88**

Note: Brighton Estates pond enlargement addresses an existing deficiency. Outfall pipe provides outlet for detention basin and for future development.

Proposed System	% of Total cost
Detention Pond	10%
Outfall Pipe	90%

#17

Lagoon St. Storm Drain Improvements

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$28,743.12
2	15 Inch Storm Drain	0	LF	$65.00	$0.00
3	18 Inch Storm Drain	1000	LF	$80.00	$80,000.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	1800	LF	$95.00	$171,000.00
6	30 Inch Storm Drain	0	LF	$110.00	$0.00
7	36 Inch Storm Drain	0	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Curb and Gutter	0	LF	$17.00	$0.00
11	Basin Grading	0	CY	$8.00	$0.00
12	Manholes/Inlets/Structures	22	EA	$3,800.00	$83,600.00
13	Class "A" Road Repair	27500	SF	$7.00	$192,500.00
14	Class "D" Field Repair	0	SF	$1.00	$0.00
15	Imported Backfill	561.80	TON	$18.00	$10,112.36
16	State Road Crossing	0	LS	$220,000.00	$0.00
17	Traffic Control	0	LS	$16,116.37	$0.00
18	Utility Relocation (15% of pipe cost)	1	LS	$37,650.00	$37,650.00
	Sub Total (Construction)				$603,605.48
	Contingencies	20%			$120,721.10
	Land	-	SF	$5.00	$0.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$724,326.57
	Design and Construction Engineering	10%			$60,360.55
	Administration, Legal, and Bond Counsel	1%			$6,036.05
	Total (Professional Services)				$66,396.60
	Grand Total				**$790,723.18**

#18

500 W. Detention Ponds

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$1,606.00
2	15 Inch Storm Drain	0	LF	$65.00	$0.00
3	18 Inch Storm Drain	0	LF	$80.00	$0.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	0	LF	$95.00	$0.00
6	30 Inch Storm Drain	0	LF	$110.00	$0.00
7	36 Inch Storm Drain	0	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Curb and Gutter	0	LF	$17.00	$0.00
11	Basin Grading	3065	CY	$8.00	$24,520.00
12	Manholes/Inlets/Structures	2	EA	$3,800.00	$7,600.00
13	Class "A" Road Repair	0	SF	$7.00	$0.00
14	Class "D" Field Repair	0	SF	$1.00	$0.00
15	Imported Backfill	0.00	TON	$18.00	$0.00
16	State Road Crossing	0	LS	$220,000.00	$0.00
17	Traffic Control	0	LS	$963.60	$0.00
18	Utility Relocation (15% of pipe cost)	0	LS	$0.00	$0.00
	Sub Total (Construction)				$33,726.00
	Contingencies	20%			$34,333.20
	Land	27,588	SF	$5.00	$137,940.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$205,999.20
	Design and Construction Engineering	10%			$3,372.60
	Administration, Legal, and Bond Counsel	1%			$337.26
	Total (Professional Services)				$3,709.86
	Grand Total				**$209,709.06**

#19

Highway 121/ Golf Couse Culvert

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$13,913.67
2	15 Inch Storm Drain	0	LF	$65.00	$0.00
3	18 Inch Storm Drain	360	LF	$80.00	$28,800.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	0	LF	$95.00	$0.00
6	30 Inch Storm Drain	0	LF	$110.00	$0.00
7	36 Inch Storm Drain	0	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Curb and Gutter	0	LF	$17.00	$0.00
11	Basin Grading	0	CY	$8.00	$0.00
12	Manholes/Inlets/Structures	0	EA	$3,800.00	$0.00
13	Class "A" Road Repair	3420	SF	$7.00	$23,940.00
14	Class "D" Field Repair	0	SF	$1.00	$0.00
15	Imported Backfill	67.42	TON	$18.00	$1,213.48
16	State Road Crossing	1	LS	$220,000.00	$220,000.00
17	Traffic Control	0	LS	$8,218.60	$0.00
18	Utility Relocation (15% of pipe cost)	1	LS	$4,320.00	$4,320.00
	Sub Total (Construction)				$292,187.16
	Contingencies	20%			$58,437.43
	Land	-	SF	$5.00	$0.00
	Right of Way	-	SF	$2.50	$0.00
	Easement	360	LF	$28.00	$10,080.00
	Total (Construction)				$360,704.59
	Design and Construction Engineering	10%			$29,218.72
	Administration, Legal, and Bond Counsel	1%			$2,921.87
	Total (Professional Services)				$32,140.59
	Grand Total				**$392,845.18**

Note: This storm drain system will cross Highway 121. It is recommended this project coincide with Highway 121 future projects.

#20

West of Highway 40 Storm Drain Systems (Annexation Regions)

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$299,096.97
2	15 Inch Storm Drain	32,567.60	LF	$65.00	$2,116,894.00
3	18 Inch Storm Drain	11100.77	LF	$80.00	$888,061.60
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	9,914.99	LF	$95.00	$941,924.05
6	30 Inch Storm Drain	2,692.23	LF	$110.00	$296,145.30
7	36 Inch Storm Drain	1,953.56	LF	$125.00	$244,195.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Curb and Gutter	0	LF	$17.00	$0.00
11	Basin Grading	0	CY	$8.00	$0.00
12	Manholes/Inlets/Structures	195	EA	$3,800.00	$741,000.00
13	Class "A" Road Repair	0	SF	$7.00	$0.00
14	Class "D" Field Repair	555615.09	SF	$1.00	$555,615.09
15	Imported Backfill	11005.80	TON	$18.00	$198,104.37
16	State Road Crossing	0	LS	$220,000.00	$0.00
17	Traffic Control	0	LS	$179,458.18	$0.00
18	Utility Relocation (15% of pipe cost)	0	LS	$673,082.99	$0.00
	Sub Total (Construction)				$6,281,036.39
	Contingencies	20%			$1,256,207.28
	Land	-	SF	$5.00	$0.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$7,537,243.66
	Design and Construction Engineering	10%			$628,103.64
	Administration, Legal, and Bond Counsel	1%			$62,810.36
	Total (Professional Services)				$690,914.00
	Grand Total				**$8,228,157.66**

#21

500 W. and 300 W. Extensions

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$29,418.41
2	15 Inch Storm Drain	0.00	LF	$65.00	$0.00
3	18 Inch Storm Drain	5517	LF	$80.00	$441,360.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	0.00	LF	$95.00	$0.00
6	30 Inch Storm Drain	0.00	LF	$110.00	$0.00
7	36 Inch Storm Drain	0.00	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Curb and Gutter	0	LF	$17.00	$0.00
11	Basin Grading	0	CY	$8.00	$0.00
12	Manholes/Inlets/Structures	20	EA	$3,800.00	$76,000.00
13	Class "A" Road Repair	0	SF	$7.00	$0.00
14	Class "D" Field Repair	52411.5	SF	$1.00	$52,411.50
15	Imported Backfill	1033.15	TON	$18.00	$18,596.63
16	State Road Crossing	0	LS	$220,000.00	$0.00
17	Traffic Control	0	LS	$17,651.04	$0.00
18	Utility Relocation (15% of pipe cost)	0	LS	$66,204.00	$0.00
	Sub Total (Construction)				$617,786.54
	Contingencies	20%			$123,557.31
	Land	-	SF	$5.00	$0.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$741,343.84
	Design and Construction Engineering	10%			$61,778.65
	Administration, Legal, and Bond Counsel	1%			$6,177.87
	Total (Professional Services)				$67,956.52
	Grand Total				**$809,300.36**

#22

Rodeo Dr. Extension

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$14,361.99
2	15 Inch Storm Drain	0.00	LF	$65.00	$0.00
3	18 Inch Storm Drain	0	LF	$80.00	$0.00
4	21 Inch Storm Drain	0	LF	$85.00	$0.00
5	24 Inch Storm Drain	0.00	LF	$95.00	$0.00
6	30 Inch Storm Drain	2,000.00	LF	$110.00	$220,000.00
7	36 Inch Storm Drain	0.00	LF	$125.00	$0.00
8	42 Inch Storm Drain	0	LF	$140.00	$0.00
9	48 Inch Storm Drain	0	LF	$160.00	$0.00
10	Curb and Gutter	0	LF	$17.00	$0.00
11	Basin Grading	0	CY	$8.00	$0.00
12	Manholes/Inlets/Structures	10	EA	$3,800.00	$38,000.00
13	Class "A" Road Repair	0	SF	$7.00	$0.00
14	Class "D" Field Repair	21000	SF	$1.00	$21,000.00
15	Imported Backfill	457.76	TON	$18.00	$8,239.70
16	State Road Crossing	0	LS	$220,000.00	$0.00
17	Traffic Control	0	LS	$8,617.19	$0.00
18	Utility Relocation (15% of pipe cost)	0	LS	$33,000.00	$0.00
	Sub Total (Construction)				$301,601.69
	Contingencies	20%			$60,320.34
	Land	-	SF	$5.00	$0.00
	Right of Way	-	SF	$2.50	$0.00
	Total (Construction)				$361,922.02
	Design and Construction Engineering	10%			$30,160.17
	Administration, Legal, and Bond Counsel	1%			$3,016.02
	Total (Professional Services)				$33,176.19
	Grand Total				**$395,098.21**





Detailed Traffic Studies

Appendix F



ROOSEVELT *Utah*

UNION HIGH SCHOOL TRAFFIC IMPACT ANALYSIS

HORROCKS ENGINEERS

2162 West Grove Parkway, Ste 400
Pleasant Grove, Utah 84062
801-763-5100
www.horrocks.com

Appendix F

To: **Ryan Snow, Roosevelt City Manager**

From: **Chuck Richins, PE**

Kevin Croshaw, PE

Date: July 12, 2019 **Memorandum**

Subject: **Union High School Traffic Impact Analysis**

The following includes the analysis of the roadway network surrounding the new Union High School in Roosevelt, Utah.

Data Used for Analysis

Existing Count Data

Counts were performed on the following intersections on January 23, 2019 to determine the existing traffic patterns and flows within the study area. A map showing the locations of these intersections is shown in **Figure F-1**.

1. 200 North & 600 East
2. 200 North & 800 East (Northbound Approach)
3. 200 North & 800 East (Southbound Approach)
4. 200 North & Old School Access
5. 200 North & 1500 East
6. Lagoon Street & 600 East
7. Lagoon Street & 800 East
8. Lagoon Street & East School Drop-Off
9. Lagoon Street & Union Street
10. Lagoon Street & Old School Access
11. Lagoon Street & 1500 East

With these counts, a general picture of traffic patterns was constructed showing existing traffic volumes, shown in **Figure F-2**, **Figure F-3**, and **Figure F-4**. Traffic specific to Union High School area was also identified and is shown separate from background traffic volumes, in **Figure F-5**, **Figure F-6**, and **Figure F-7**. These volumes are shown separately to show the increase in traffic volume when school is in session. Background traffic volume is the increase of existing traffic volumes over time by using a growth factor. The AM peak hour occurs from 7:45 AM to 8:45 AM, the PM peak hour occurs from 4:15 PM to 5:15 PM, and the peak time surrounding Union High School's release time occurs from 2:45 PM to 3:45 PM.



HORROCKS ENGINEERS

2162 WEST GROVE PARKWAY SUITE #400
PLEASANT GROVE, UT. 84062 (801) 763-5100

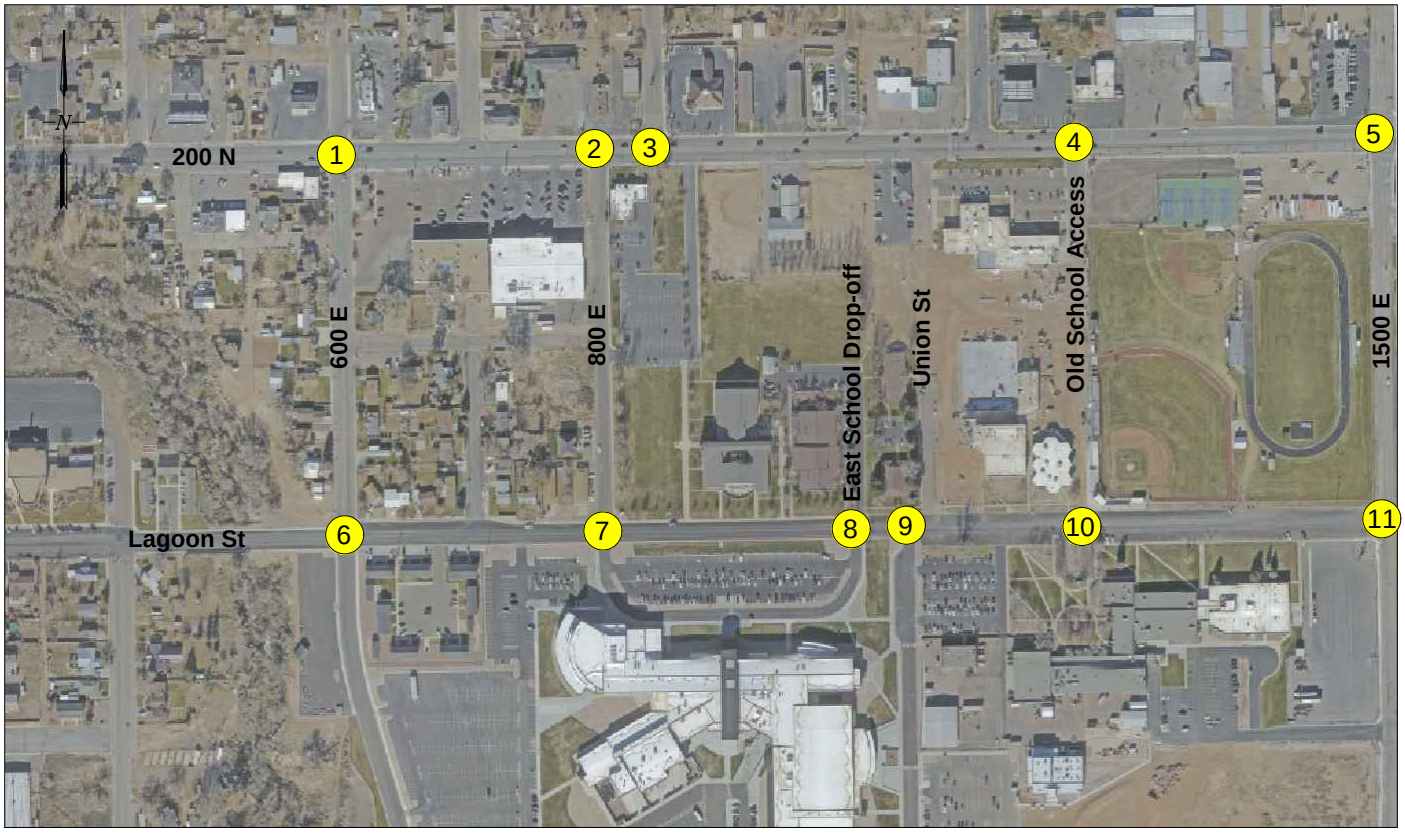
Roosevelt

Count Locations for the AM & PM Peak Hours

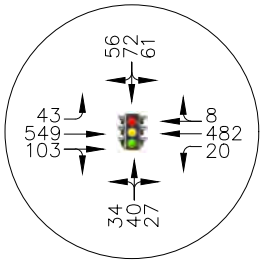
FIGURE F-1

SCALE: N/A

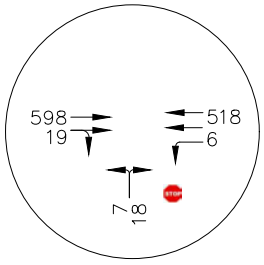
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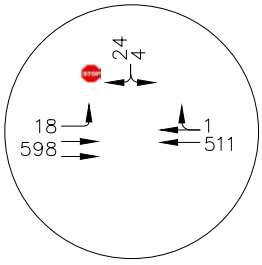
1 AM PEAK HOUR



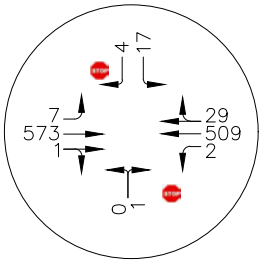
2 AM PEAK HOUR



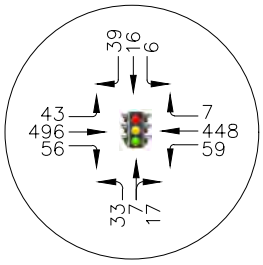
3 AM PEAK HOUR



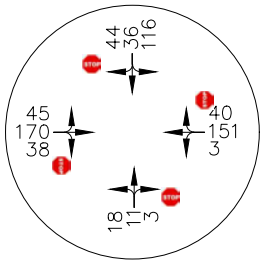
4 AM PEAK HOUR



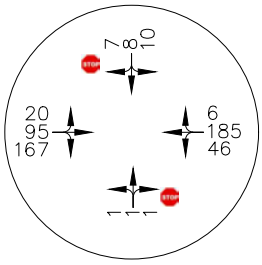
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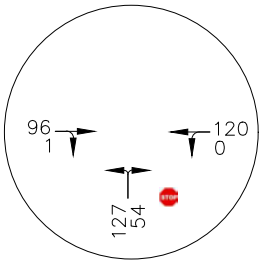
6 AM PEAK HOUR



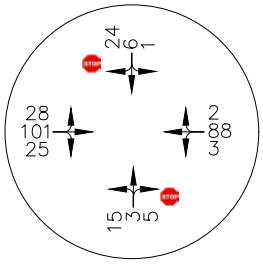
7 AM PEAK HOUR



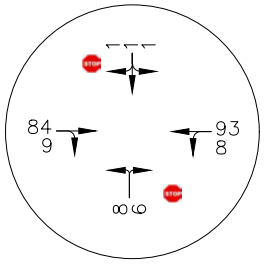
8 AM PEAK HOUR



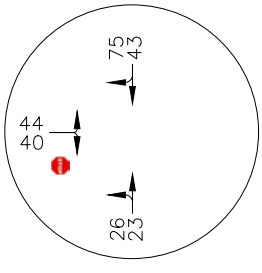
9 AM PEAK HOUR



10 AM PEAK HOUR



11 AM PEAK HOUR



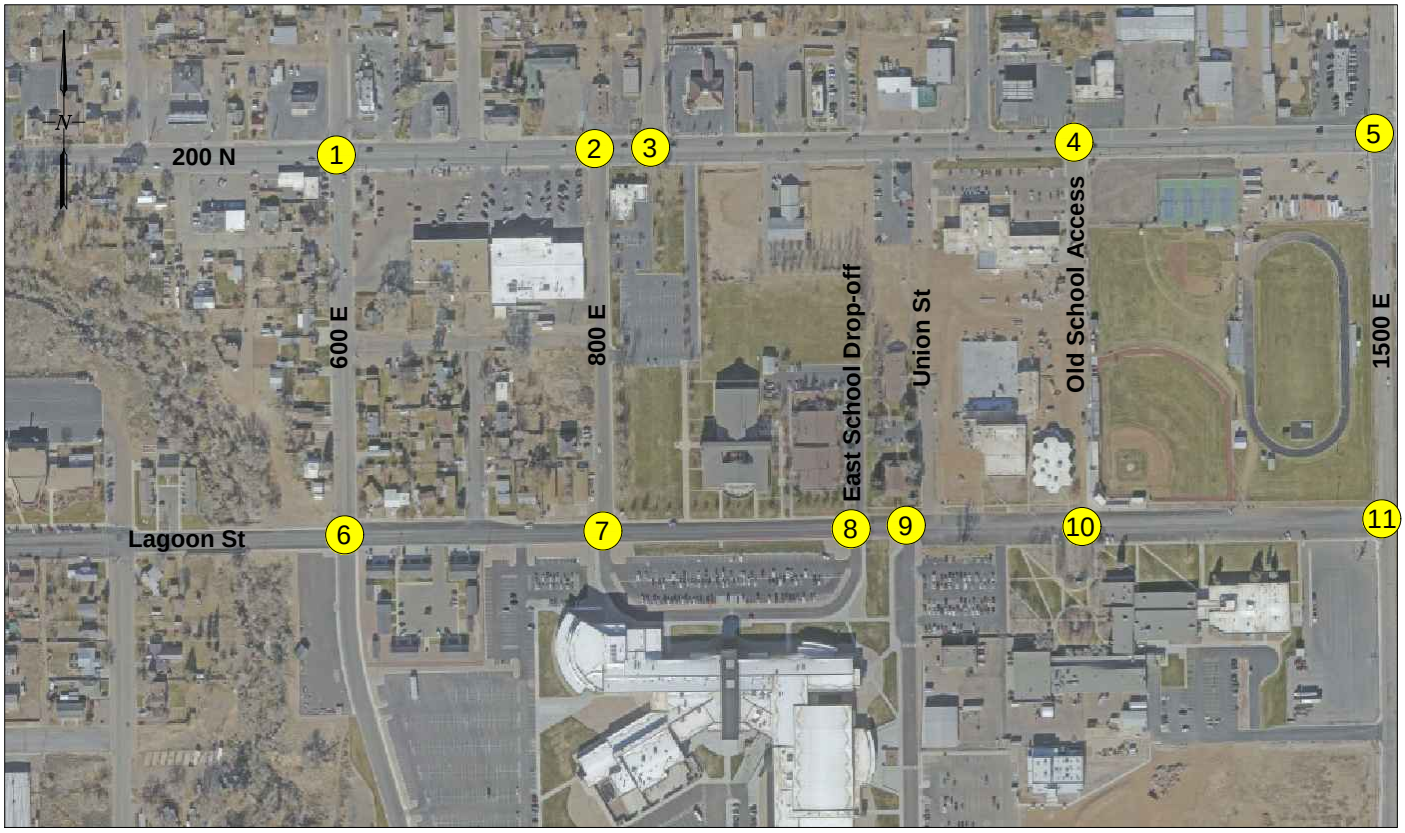
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Roosevelt
Existing Traffic
AM Peak Hour (7:30 AM - 8:30 AM)
Turn Movement Volumes

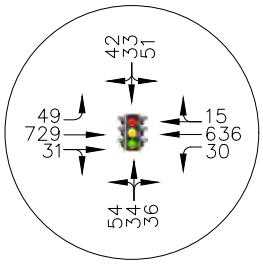
FIGURE F-2

SCALE: N/A

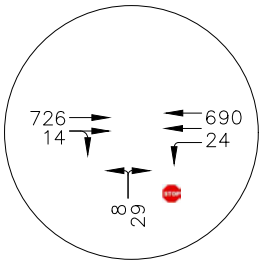
DATE: 09/2019



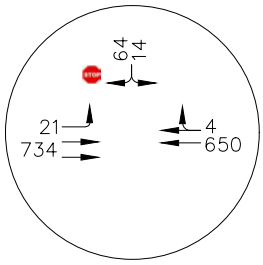
1 PM PEAK HOUR



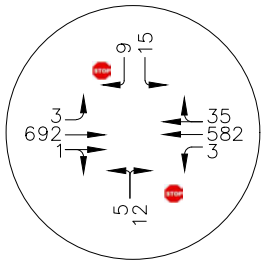
2 PM PEAK HOUR



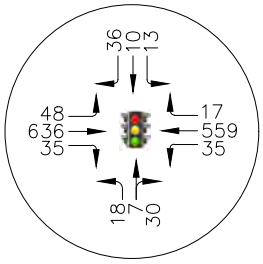
3 PM PEAK HOUR



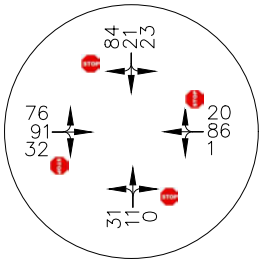
4 PM PEAK HOUR



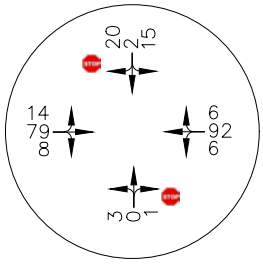
5 PM PEAK HOUR



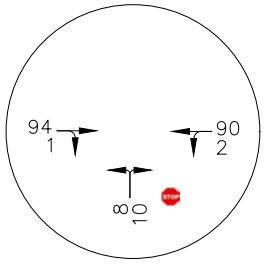
6 PM PEAK HOUR



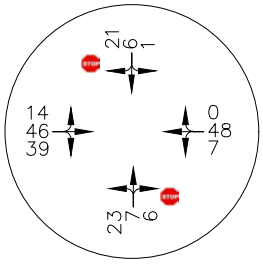
7 PM PEAK HOUR



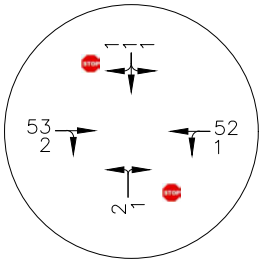
8 PM PEAK HOUR



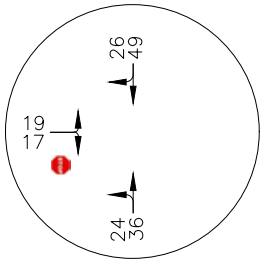
9 PM PEAK HOUR



10 PM PEAK HOUR



11 PM PEAK HOUR



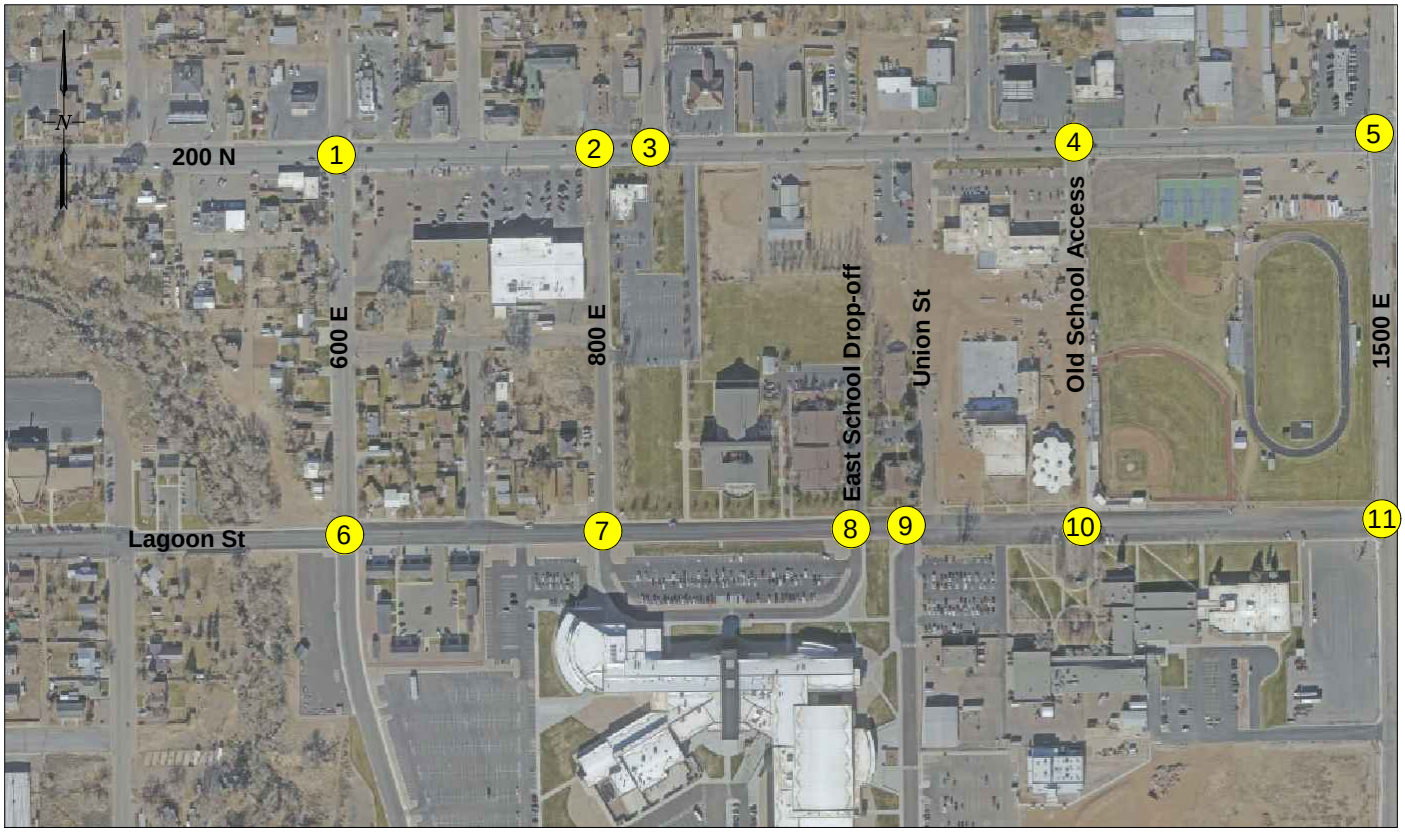
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Roosevelt
Existing Traffic
PM Peak Hour (4:45 PM - 5:45 PM)
Turn Movement Volumes

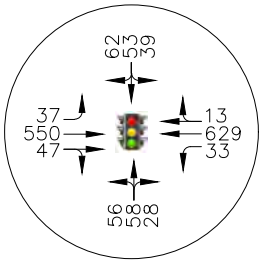
FIGURE F-3

SCALE: N/A

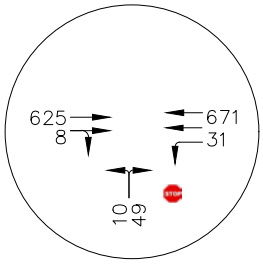
DATE: 09/2019



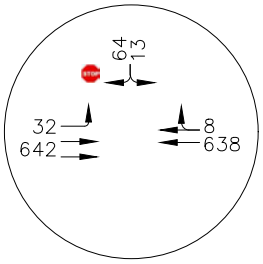
1 PM RELEASE TIME



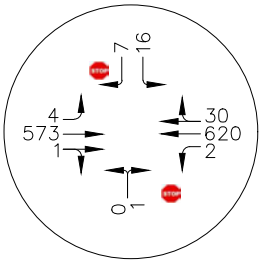
2 PM RELEASE TIME



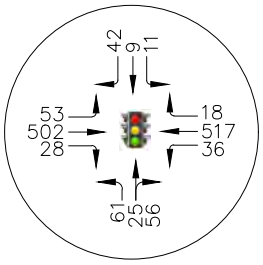
3 PM RELEASE TIME



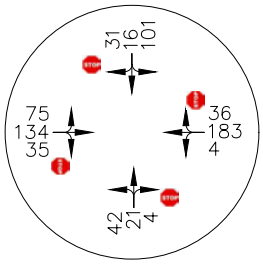
4 PM RELEASE TIME



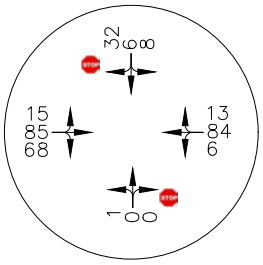
5 PM RELEASE TIME



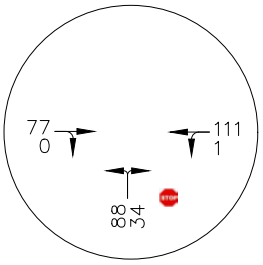
6 PM RELEASE TIME



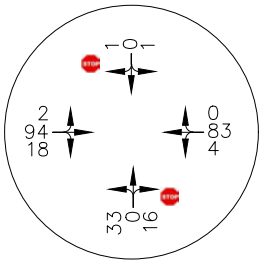
7 PM RELEASE TIME



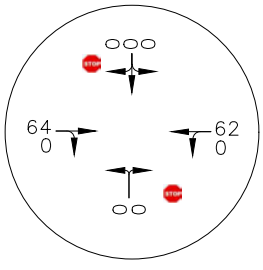
8 PM RELEASE TIME



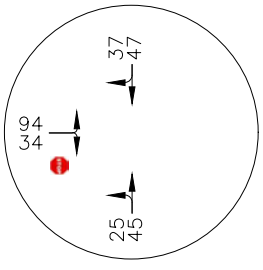
9 PM RELEASE TIME



10 PM RELEASE TIME



11 PM RELEASE TIME



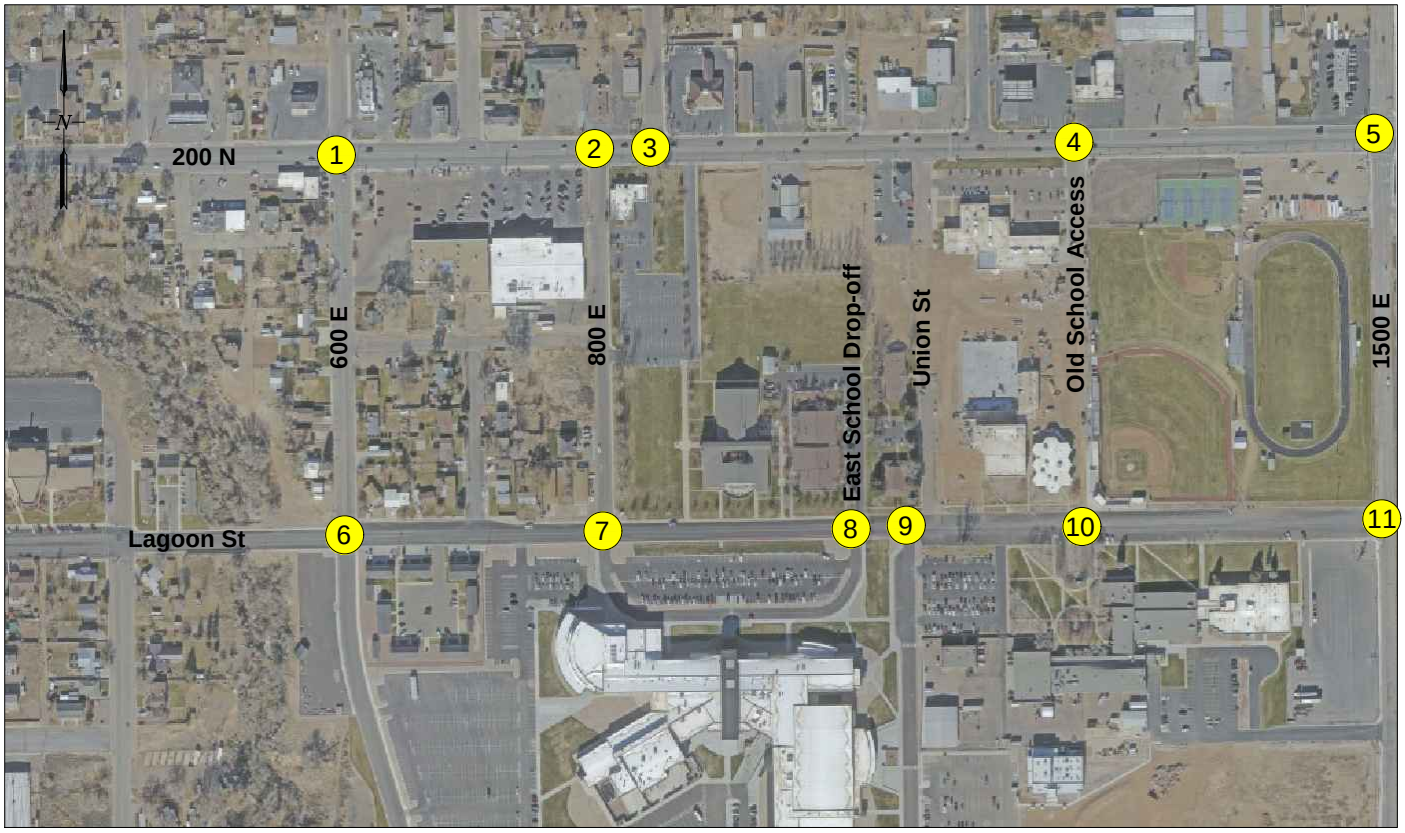
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Existing Traffic
PM Release Time (2:45 PM - 3:45 PM)
Turn Movement Volumes

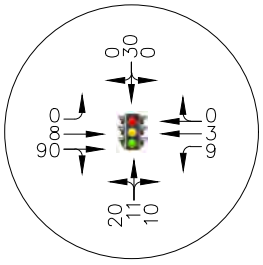
FIGURE F-4

SCALE: N/A

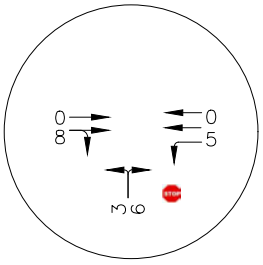
DATE: 09/2019



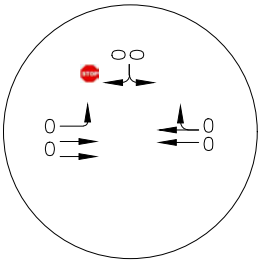
1 AM PEAK HOUR



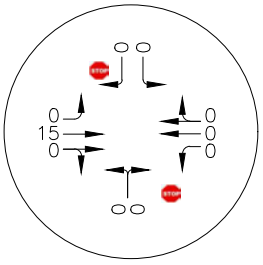
2 AM PEAK HOUR



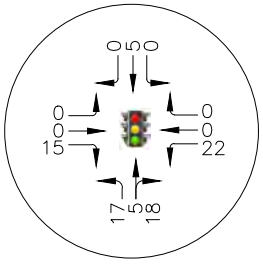
3 AM PEAK HOUR



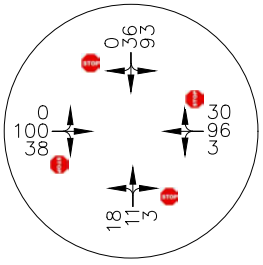
4 AM PEAK HOUR



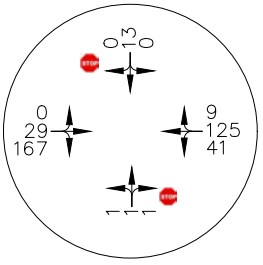
5 AM PEAK HOUR



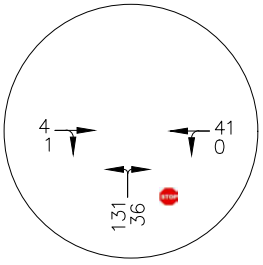
6 AM PEAK HOUR



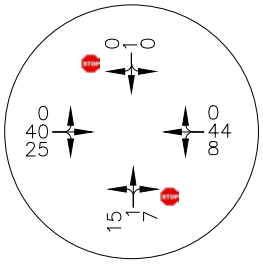
7 AM PEAK HOUR



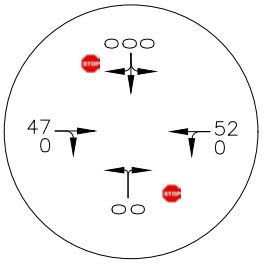
8 AM PEAK HOUR



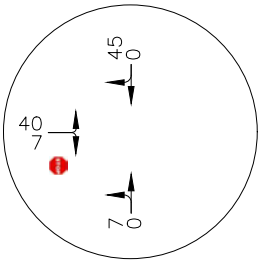
9 AM PEAK HOUR



10 AM PEAK HOUR



11 AM PEAK HOUR



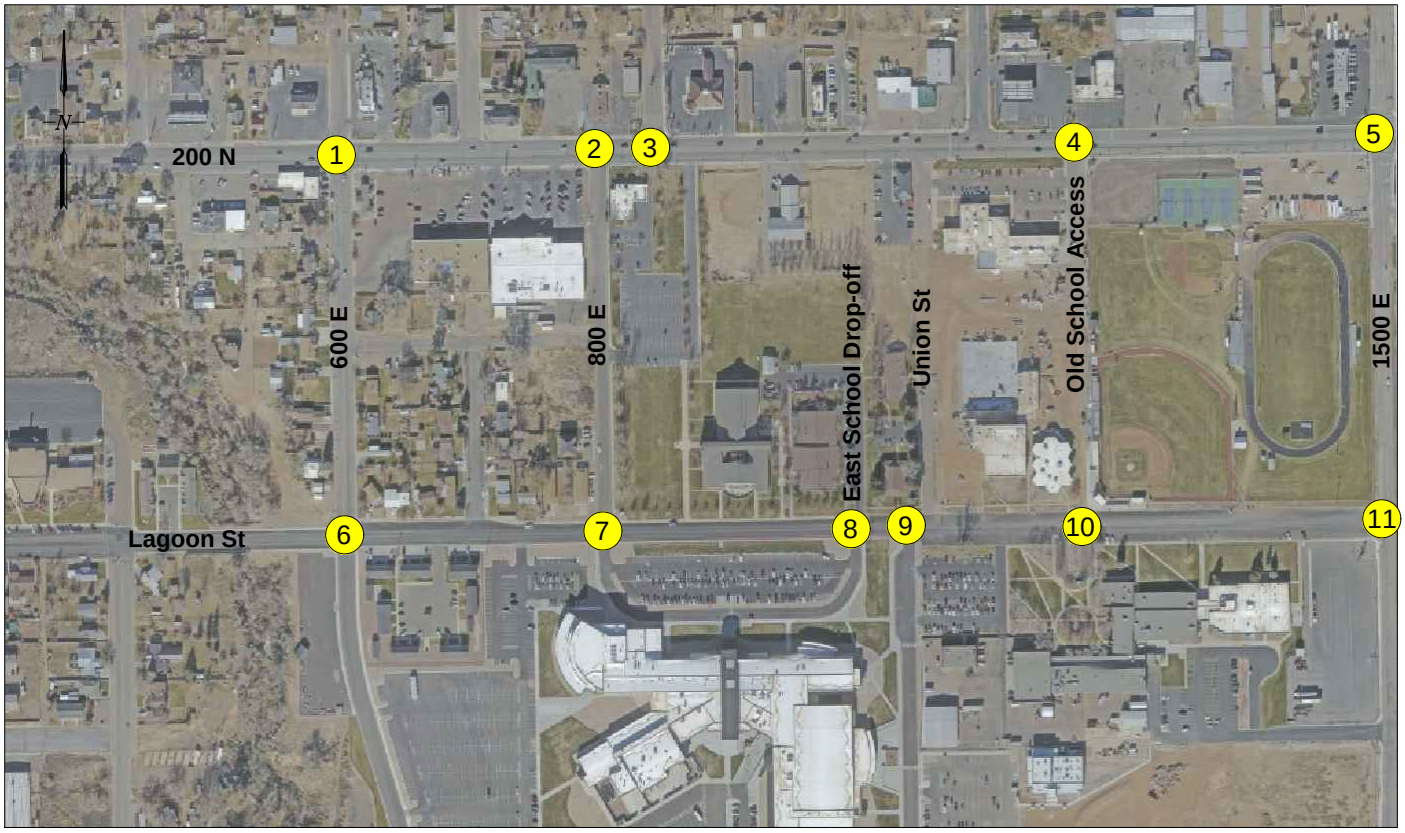
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AM Peak Hour (7:45 AM - 8:45 AM)
Turn Movement Volumes

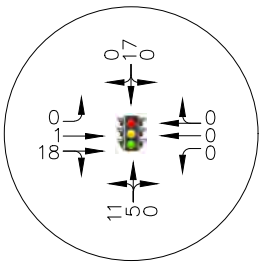
FIGURE F-5

SCALE: N/A

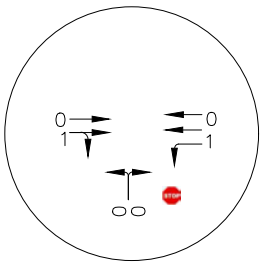
DATE: 09/2019



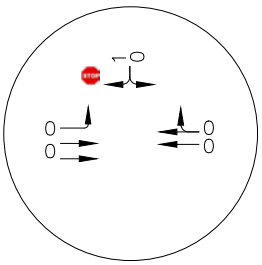
1 PM PEAK HOUR



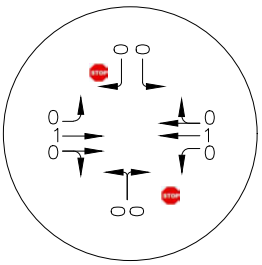
2 PM PEAK HOUR



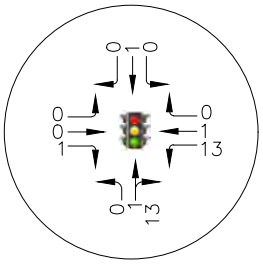
3 PM PEAK HOUR



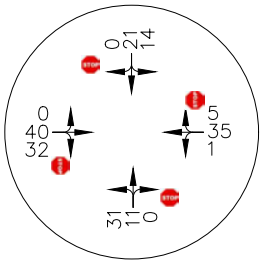
4 PM PEAK HOUR



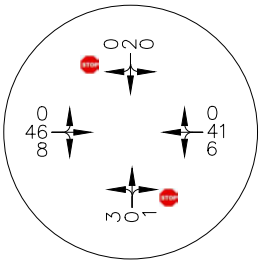
5 PM PEAK HOUR



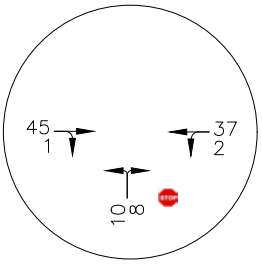
6 PM PEAK HOUR



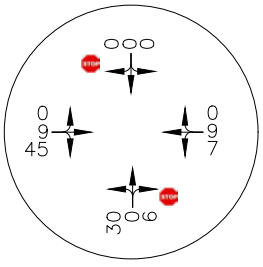
7 PM PEAK HOUR



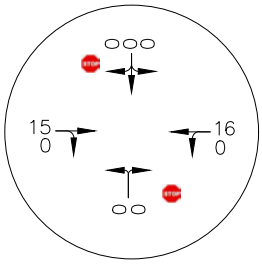
8 PM PEAK HOUR



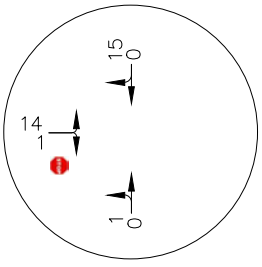
9 PM PEAK HOUR



10 PM PEAK HOUR



11 PM PEAK HOUR



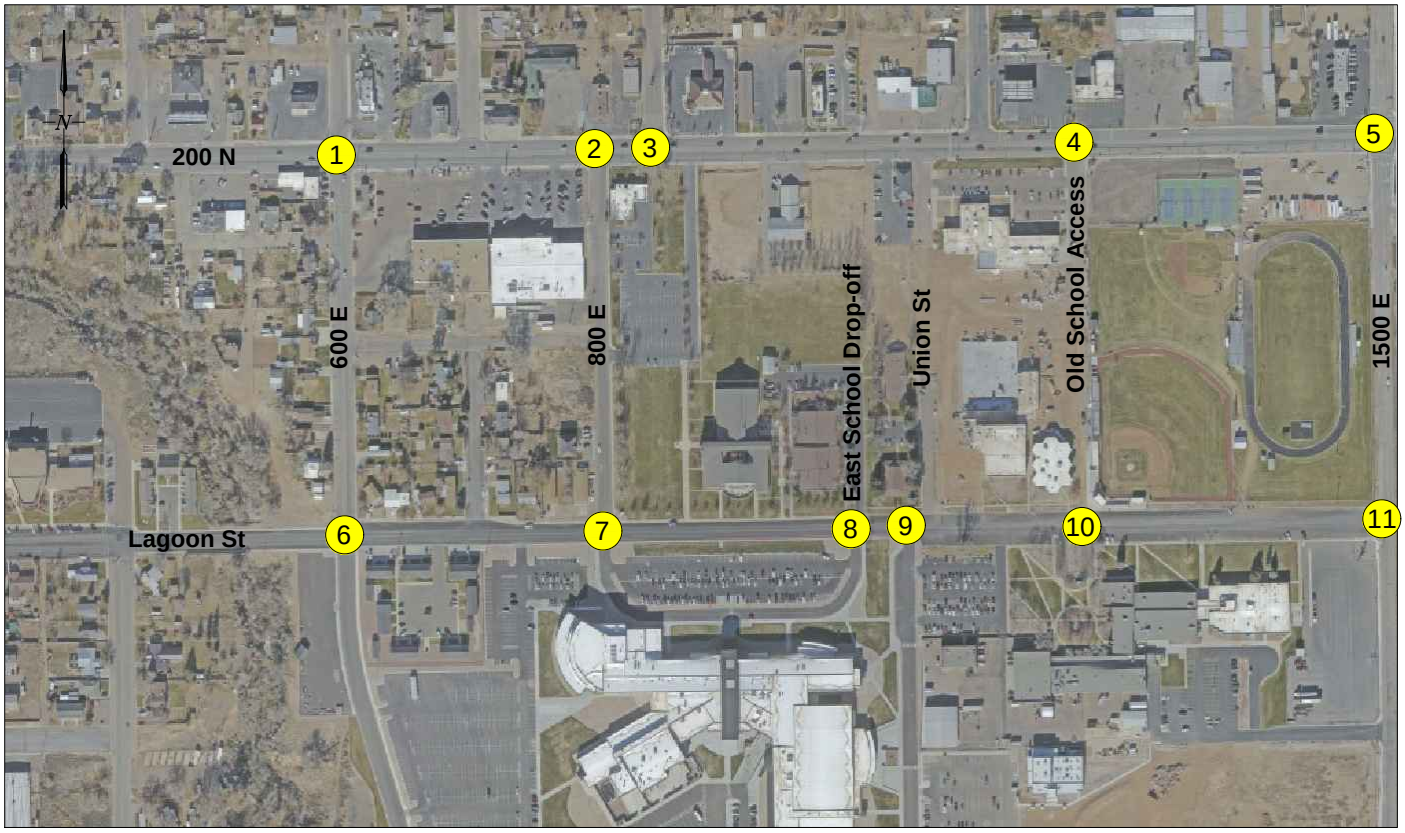
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Turn Movement Volumes

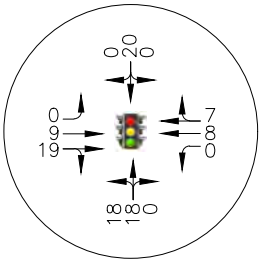
FIGURE F-6

SCALE: N/A

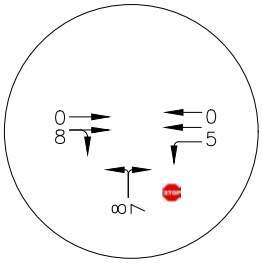
DATE: 09/2019



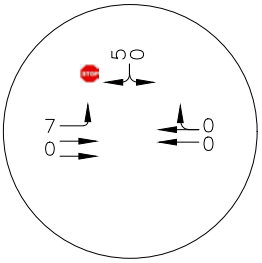
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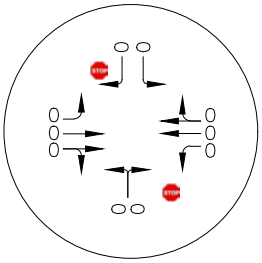
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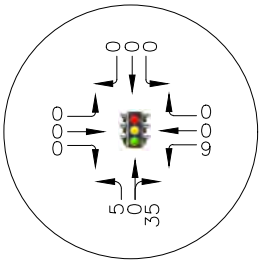
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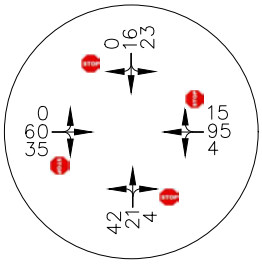
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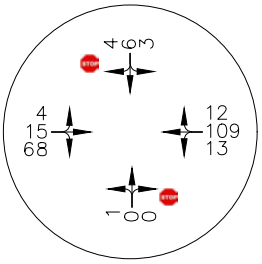
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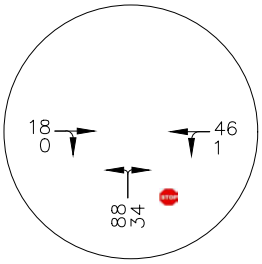
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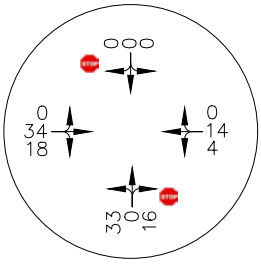
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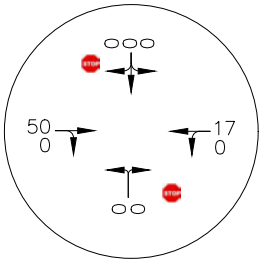
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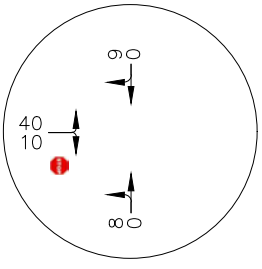
9 PM RELEASE TIME



10 PM RELEASE TIME



11 PM RELEASE TIME



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Roosevelt
Existing High School Traffic Only
PM Release Time (2:45 PM - 3:45 PM)
Turn Movement Volumes

FIGURE F-7

SCALE: N/A

DATE: 09/2019

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Existing Level of Service

In order to quantify the traffic conditions currently exhibited in the study area, the roadway geometries, traffic data, and signal timings were entered in the Trafficware Synchro 10 software package. Using the Highway Capacity Manual (HCM) method of calculating intersection delay, a Level of Service (LOS) grade was assigned to the intersection for the existing AM and PM peak hours and for the hour following the release of Union High School.

Level of Service (LOS) is a term used by the HCM to describe the traffic operations of an intersection, based on congestion and delay. LOS ranges from A (almost no congestion or delay) to F (traffic demand exceeds capacity and intersection experiences long queues and delay). The units for delay in seconds per vehicle (sec/veh). LOS E is the threshold when the intersection exceeds an acceptable standard and intersection improvements are required. The delay criteria used to assign a letter grade to an intersection for signalized and unsignalized intersections is shown below in **Table F-1**.

Table F-1: LOS Delay Criteria

Level of Service	Average Control Delay (sec/veh)	
	Signalized	Unsignalized
A	≤ 10	≤ 10
B	> 10 - 20	> 10 - 15
C	> 20 - 35	> 15 - 25
D	> 35 - 55	> 25 - 35
E	> 55 - 80	> 35 - 50
F	> 80	> 50

Existing LOS

The LOS was calculated for each intersection according to the guidelines explained above. Based on our analysis of roadway network around Union High School, all of the intersections surrounding the high school operate at an acceptable LOS B or better, as shown in **Table F-2**.

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Table F-2: Existing Level of Service

Intersection	AM Peak Hour		PM Peak Hour		School Release Time	
	Average Control Delay (sec/veh)	LOS	Average Control Delay (sec/veh)	LOS	Average Control Delay (sec/veh)	LOS
600 East & 200 North	11.3	B	16.9	B	11.3	B
800 East & 200 North	0.5	A	0.6	A	0.9	A
Old School Access & 200 North	0.5	A	0.5	A	0.5	A
1500 East & 200 North	18.1	B	13.1	B	18.0	B
600 East & Lagoon	10.4	B	8.7	A	10.0	A
800 East & Lagoon	1.7	A	2.6	A	1.7	A
East School drop-off	5.0	A	0.9	A	3.9	A
Union St & Lagoon	1.0	A	2.2	A	2.1	A
Old School Access & Lagoon	0.9	A	0.4	A	1.9	A
1500 East & Lagoon	3.9	A	3.2	A	5.1	A

Mitigations to Existing Deficiencies

No mitigations are currently required to maintain acceptable LOS within the study area.

School Intersection Queuing

Queuing was observed at the eastbound approach of 800 East & Lagoon Street and the northbound approach of the East School Drop-off during the AM Peak hour and the hour following school release time. This queuing stems from the large volume of vehicles passing through the parking lot and the drop off/pick up of students. There is not sufficient storage for these vehicles in the parking lot, so a queue forms at the entrance and exit of the parking lot. The following describe suggested modifications which will improve traffic flow surrounding the school:

- Reconfigure the parking lot to add more storage to the pick-up area.
- Add a right-turn storage lane to the eastbound approach of 800 East & Lagoon Street.
- Add additional drop-off/pick-up locations on school grounds.

Further study is recommended to determine the optimal solution to the queuing experienced due to the drop-off/pick-up location.

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Future Analysis

The analysis of the horizon year and school at capacity is in the following sections.

Growth Rates & Horizon Year

To obtain future traffic volumes, a growth rate of 1.88% per year was applied to background traffic as shown in **Table F-3**. This growth rate was chosen to be consistent with the chosen rate in the 2019 update for the City of Roosevelt. The horizon year for this analysis was chosen to be 25 years.

Table F-3: Background Traffic Growth Rate

Source	Average Annual Growth Rate
Roosevelt City TMP	1.88%

High School Traffic Growth

Union High School currently has a capacity of 1600 students. With only 1050 students currently enrolled at the high school, the number of trips generated by the high school is less than the maximum number of trips possible. To grow the number of trips to the maximum, generating a 'worst case scenario', the Institute of Transportation Engineers (ITE) Trip Generation Manual 10th Edition was used. With a projected growth of 550 students, the average number of trips generated per student during the AM and PM peak hours as well as during school release time was generated per the Trip Generation Manual. Using this methodology, the high school is projected to generate 545 new trips shown in **Table F-4**, with 287 trips entering high school and 258 trips exiting. These trips were then distributed to the roadway network following the same distribution patterns observed in the existing scenario. Turning movement volumes of high school traffic are shown in **Figure F-8**, **Figure F-9**, and **Figure F-10**.

Table F-4: High School Trip Generation (Additional Trips)

High School	Average Rate	In	Out	Total
AM	0.52	192	94	286
PM	0.14	37	40	77
PM Release Time	0.33	58	124	182
Total New Trips		287	258	545

Union Street Closure

Union Street between Lagoon Street and 200 North was closed at the time data collection was performed. To account for this closure, traffic volumes from 800 East and 1500 East were shifted to anticipate the traffic volumes for Union Street. An estimated 30% of traffic was shifted from 800 East to Union Street, and 15% of traffic was shifted from 1500 East to Union Street.

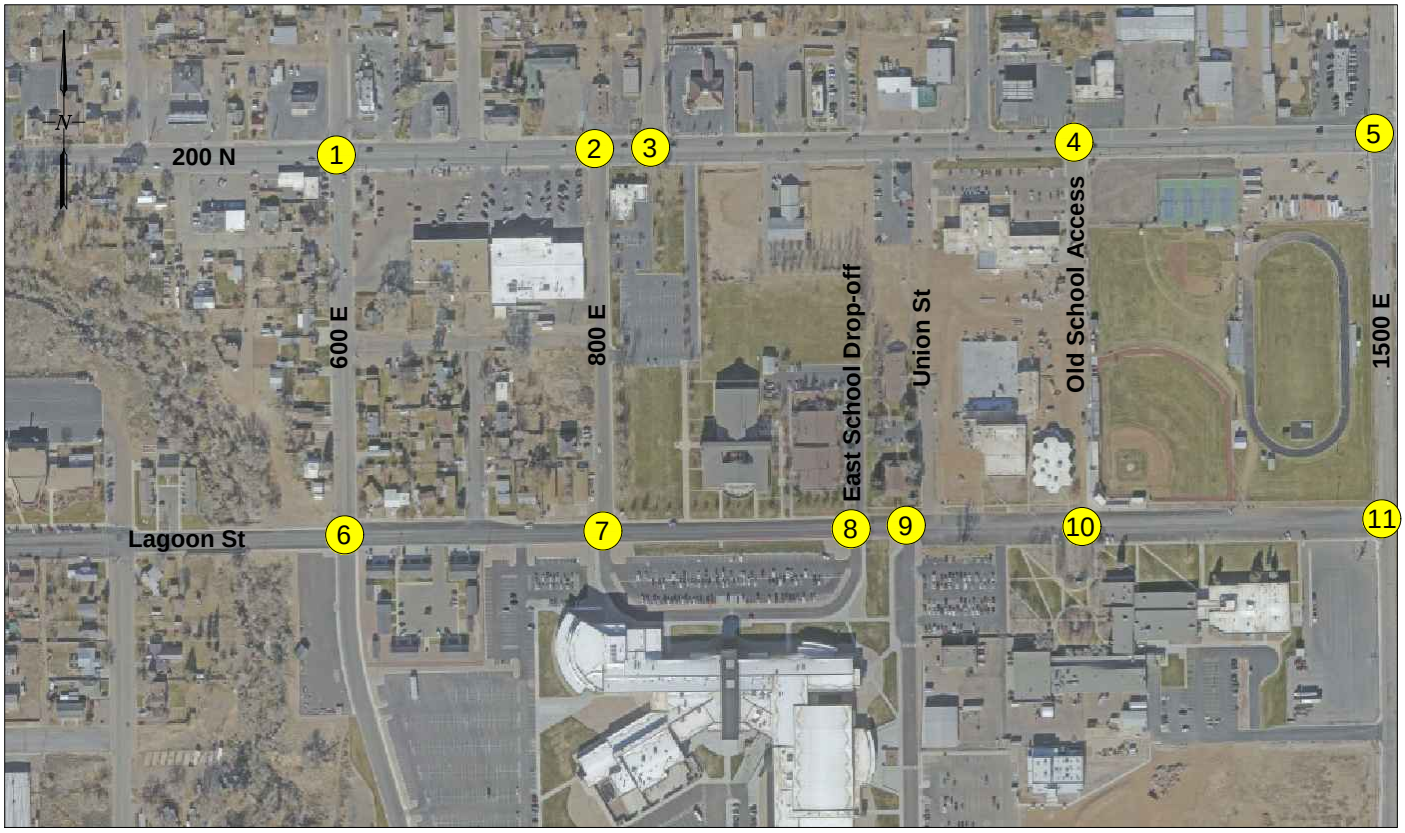
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Horizon Year LOS

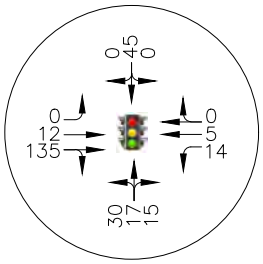
Background traffic and Union High School traffic were combined and entered into the synchro model. Results of the analysis indicate that all intersections operate at an acceptable LOS C or better, as shown in **Table F-5**. Turning movement volumes for all traffic are shown in **Figure F-11**, **Figure F-12**, and **Figure F-13**. Mitigations are not recommended.

Table F-5: Horizon Year LOS.

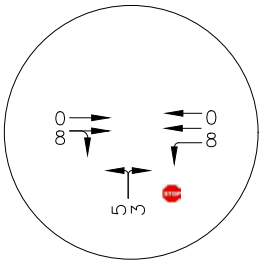
Intersection	AM Peak Hour		PM Peak Hour		School Release Time	
	Average Control Delay (sec/veh)	LOS	Average Control Delay (sec/veh)	LOS	Average Control Delay (sec/veh)	LOS
600 East & 200 North	34.4	C	25.5	C	31.1	C
800 East & 200 North	0.7	A	0.9	A	1.8	A
Old School Access & 200 North	0.5	A	0.1	A	0.5	A
1500 East & 200 North	13.3	B	13.7	B	13.2	B
600 East & Lagoon	14.9	B	9.7	A	13.2	B
800 East & Lagoon	1.8	A	2.3	A	1.5	A
East School drop-off	5.3	A	1.0	A	4.4	A
Union St & Lagoon	2.8	A	3.6	A	3.9	A
Old School Access & Lagoon	1.1	A	0.4	A	0.9	A
1500 East & Lagoon	4.5	A	3.6	A	5.8	A



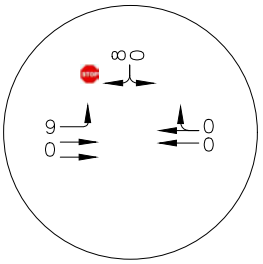
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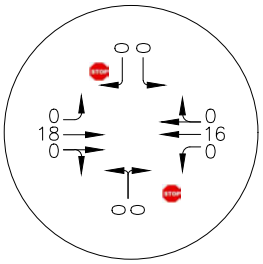
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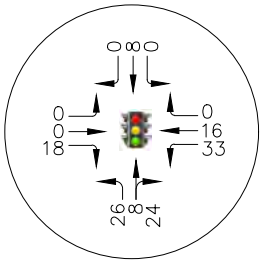
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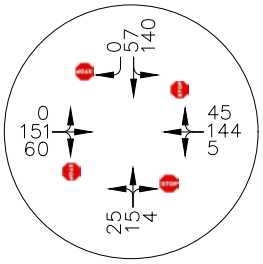
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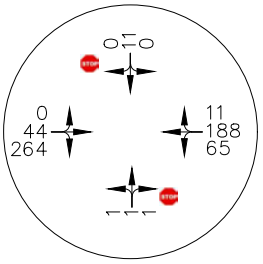
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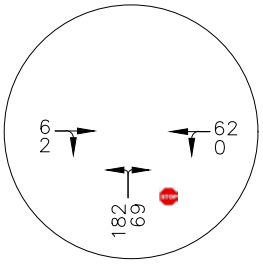
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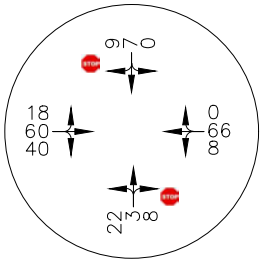
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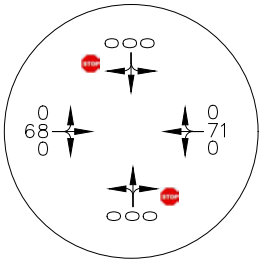
8 AM PEAK HOUR



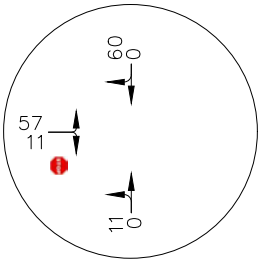
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10 AM PEAK HOUR



11 AM PEAK HOUR



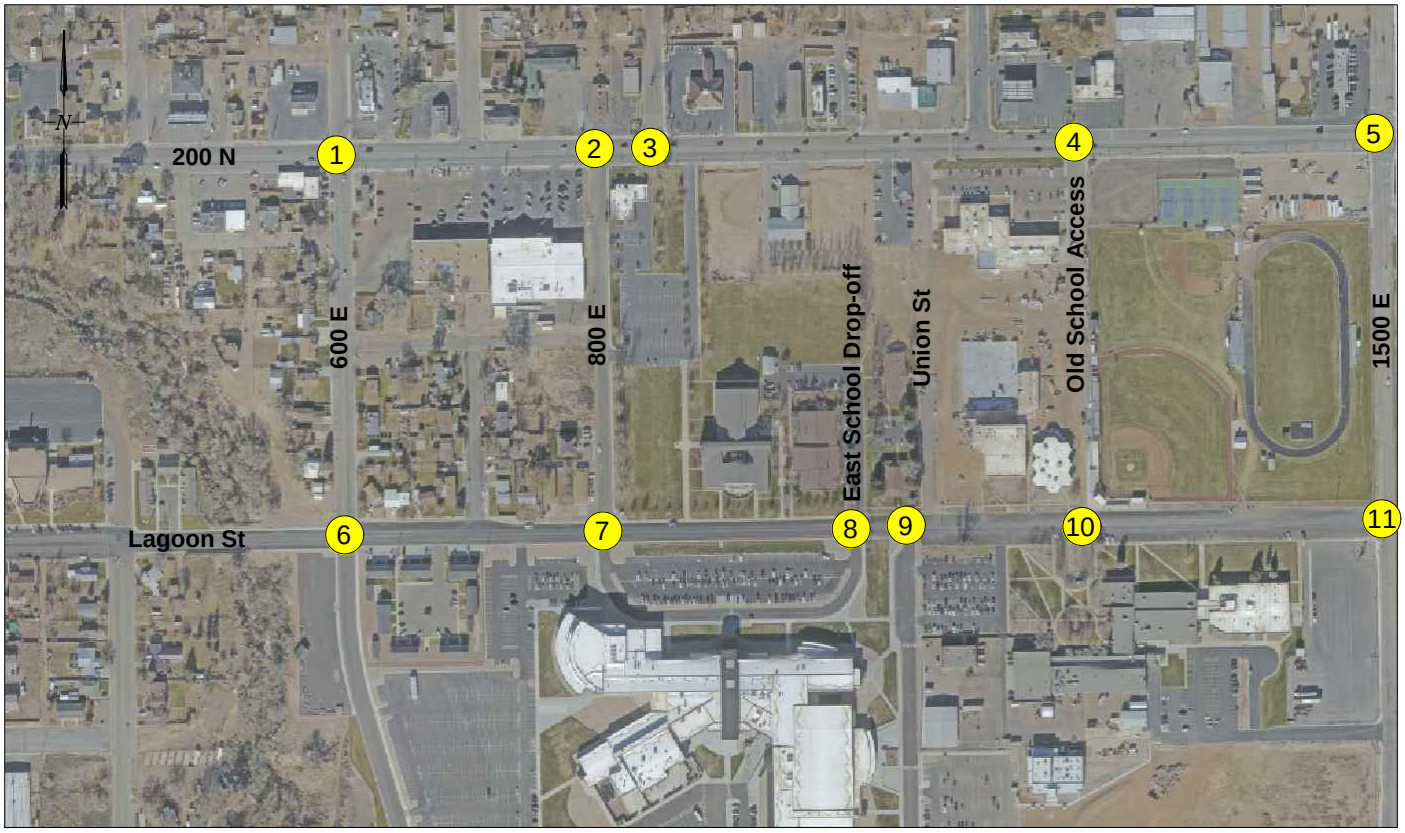
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Roosevelt
High School Traffic Only
Horizon Year AM Peak Hour (7:45 AM - 8:45 AM)
Turn Movement Volumes

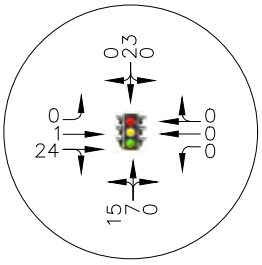
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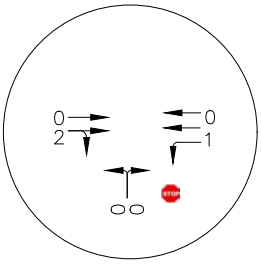
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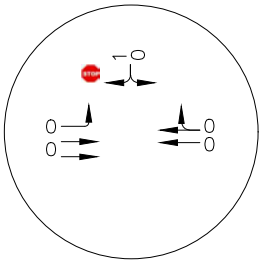
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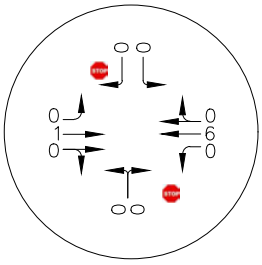
2 PM PEAK HOUR



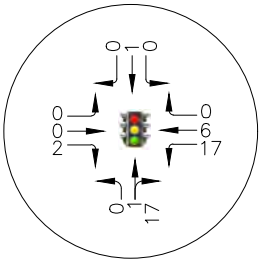
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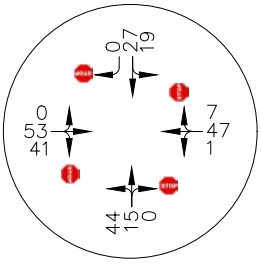
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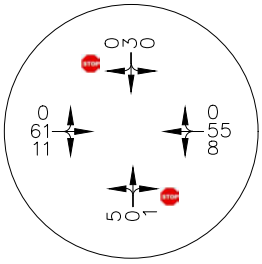
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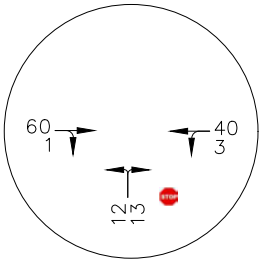
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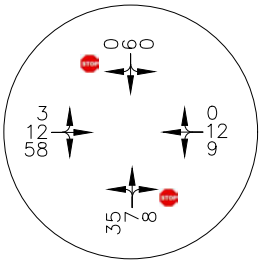
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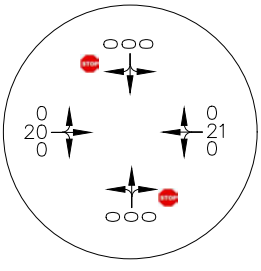
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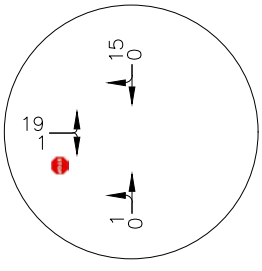
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10 PM PEAK HOUR



11 PM PEAK HOUR



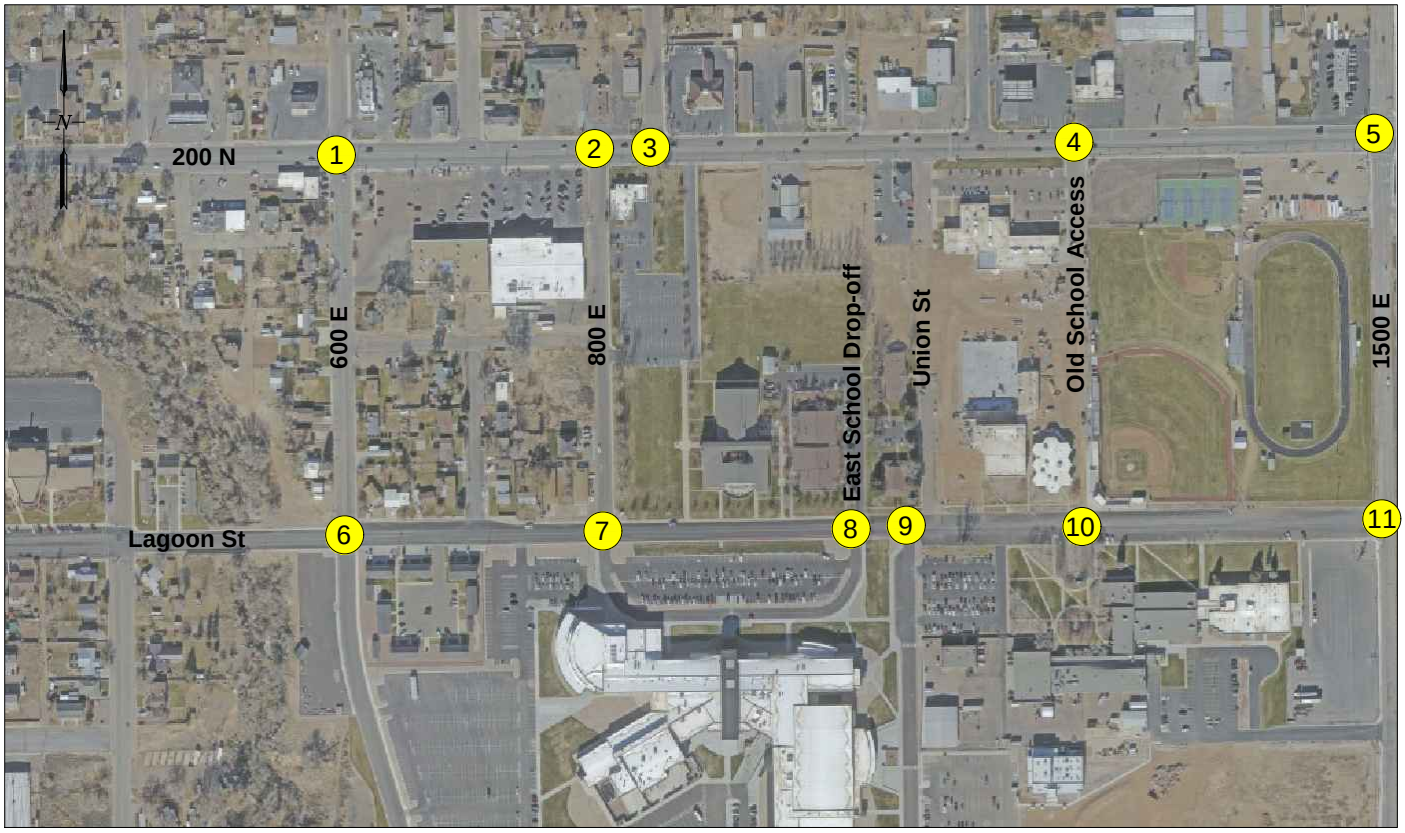
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Roosevelt
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Horizon Year PM Peak Hour (4:15 PM - 5:15 PM)
Turn Movement Volumes

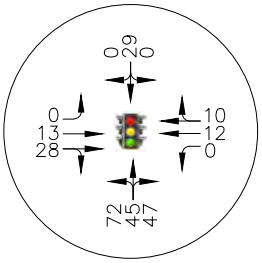
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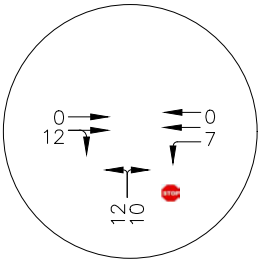
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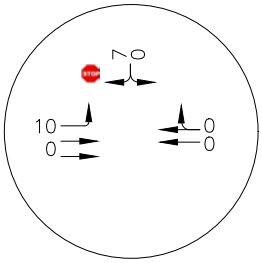
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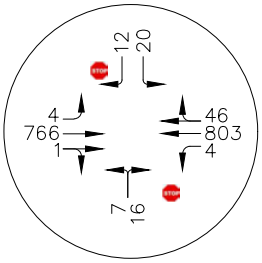
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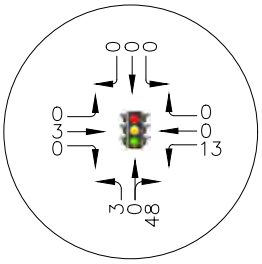
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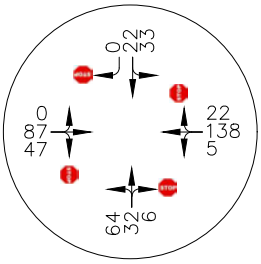
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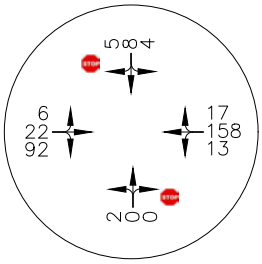
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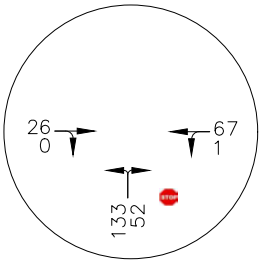
6 PM RELEASE TIME



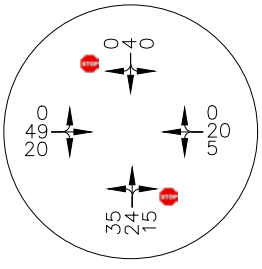
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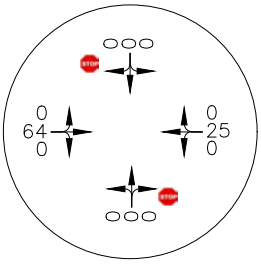
8 PM RELEASE TIME



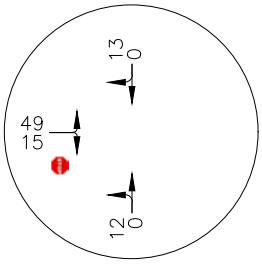
9 PM RELEASE TIME



10 PM RELEASE TIME



11 PM RELEASE TIME



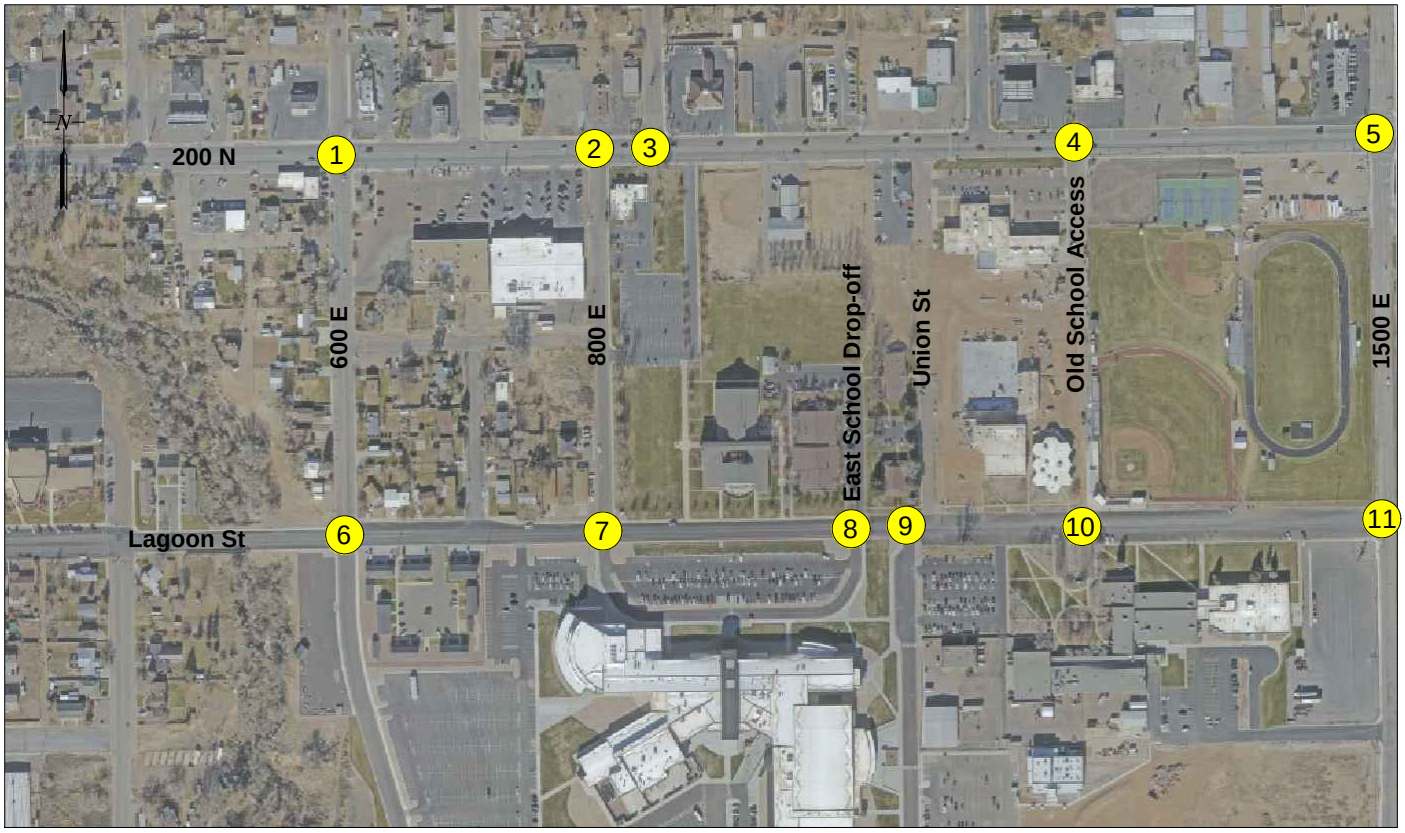
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Roosevelt
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Horizon Year PM Release Time (2:45 PM - 3:45 PM)
Turn Movement Volumes

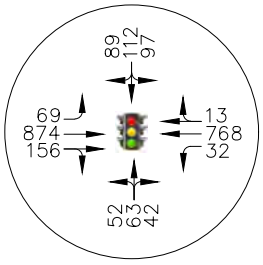
FIGURE F-10

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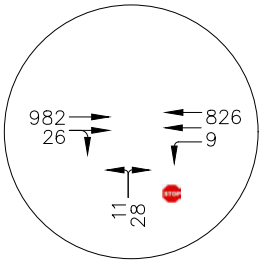
DATE: 09/2019



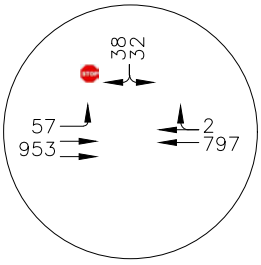
1 AM PEAK HOUR



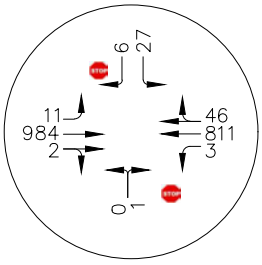
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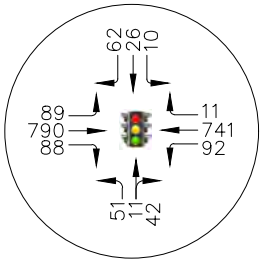
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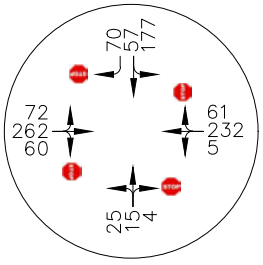
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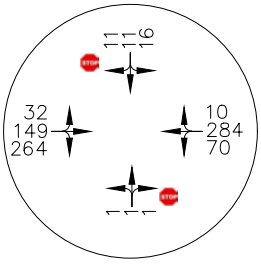
5 AM PEAK HOUR



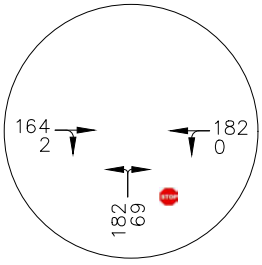
6 AM PEAK HOUR



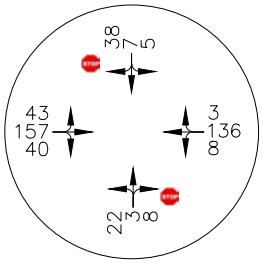
7 AM PEAK HOUR



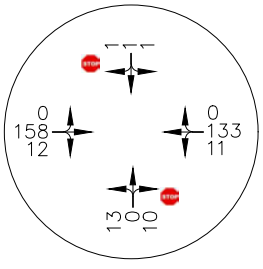
8 AM PEAK HOUR



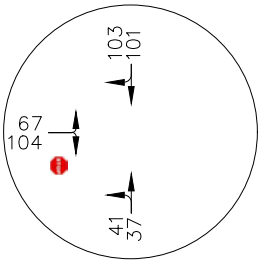
9 AM PEAK HOUR



10 AM PEAK HOUR



11 AM PEAK HOUR



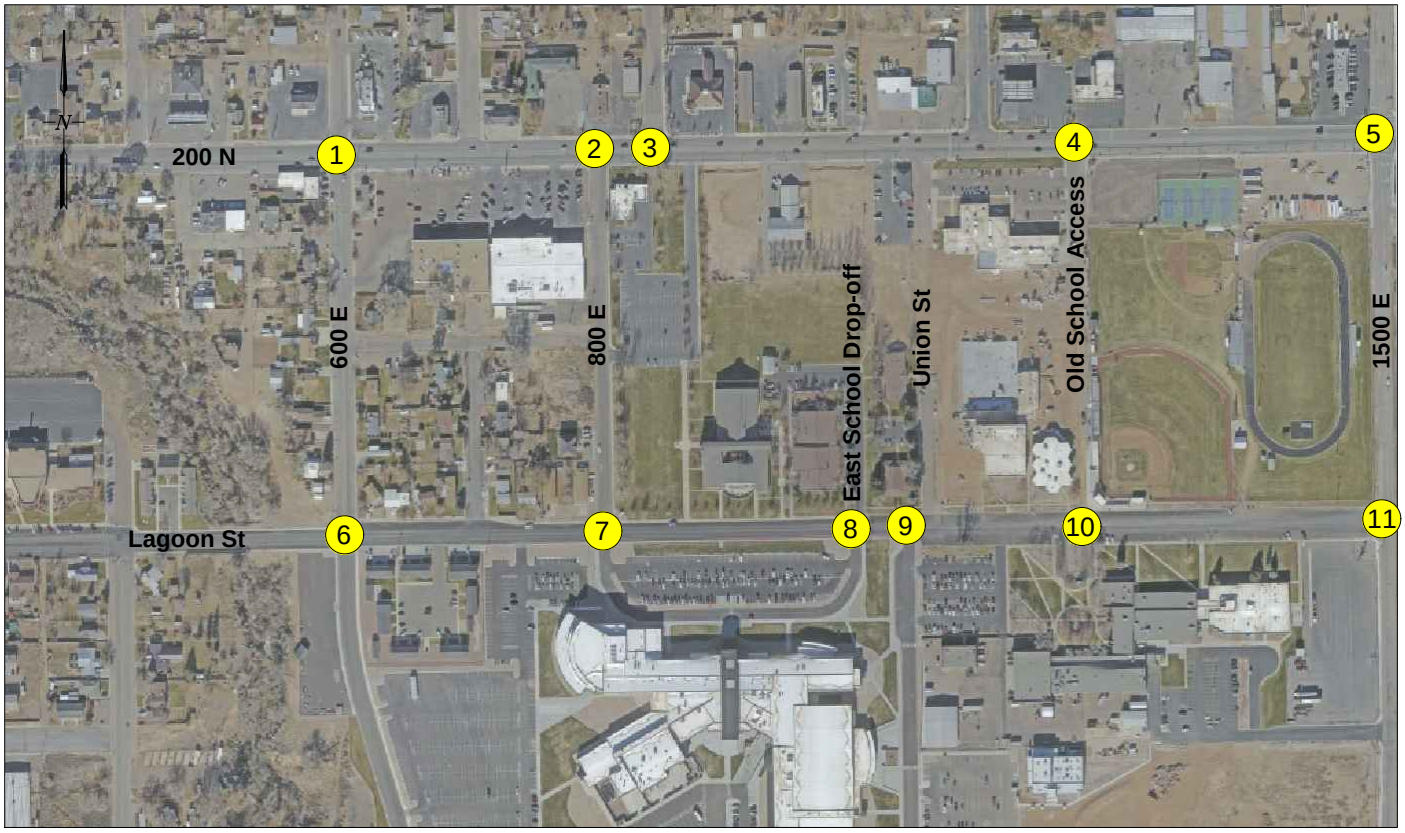
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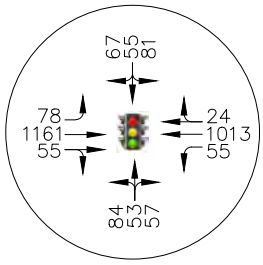
FIGURE F-11

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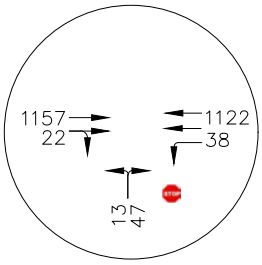
DATE: 09/2019



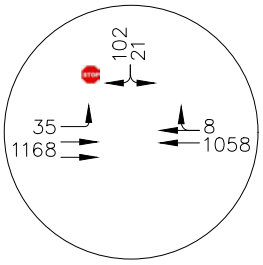
1 PM PEAK HOUR



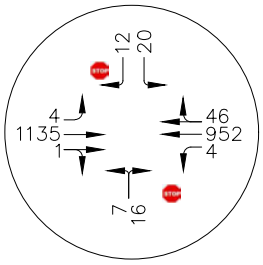
2 PM PEAK HOUR



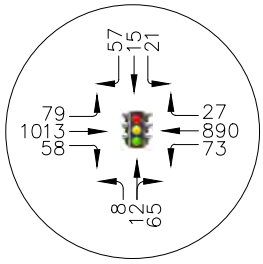
3 PM PEAK HOUR



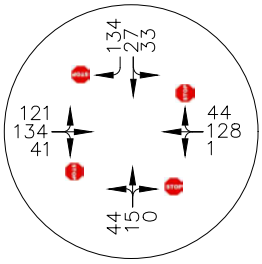
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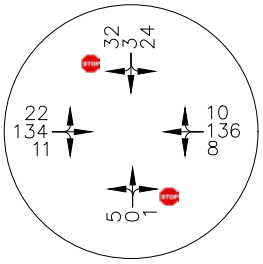
5 PM PEAK HOUR



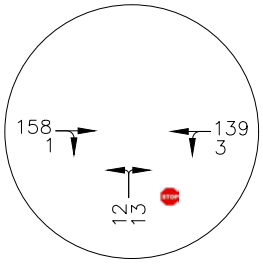
6 PM PEAK HOUR



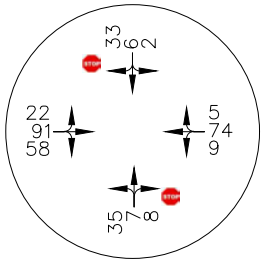
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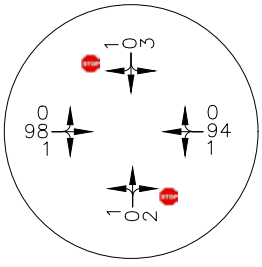
8 PM PEAK HOUR



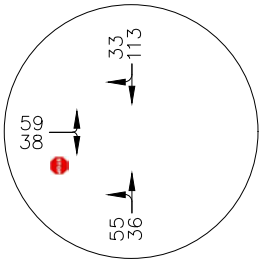
9 PM PEAK HOUR



10 PM PEAK HOUR



11 PM PEAK HOUR



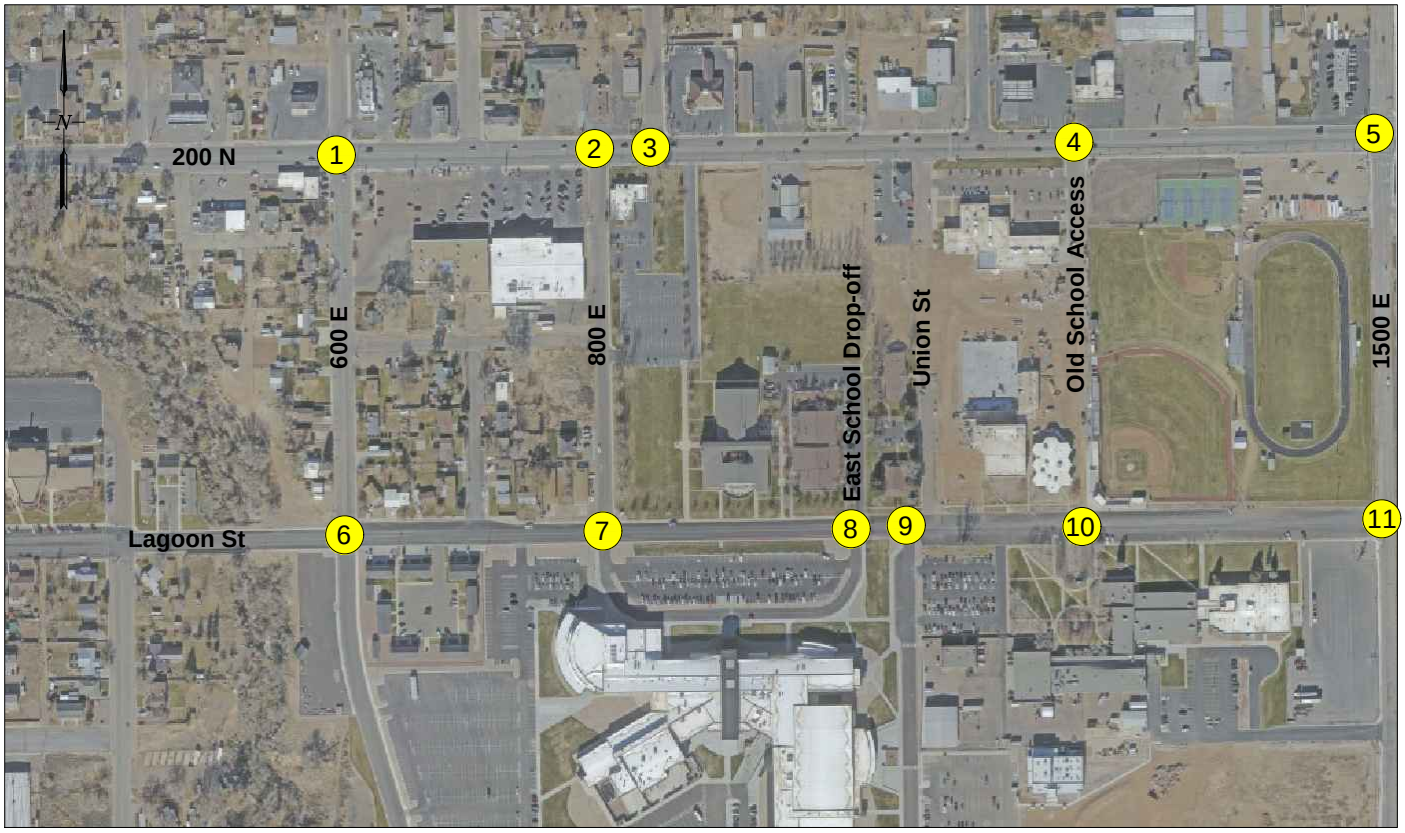
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Roosevelt
All Traffic
Horizon Year PM Peak Hour (4:45 PM - 5:45 PM)
Turn Movement Volumes

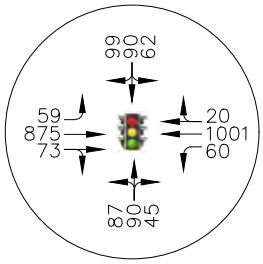
FIGURE F-12

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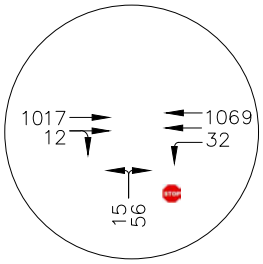
DATE: 09/2019



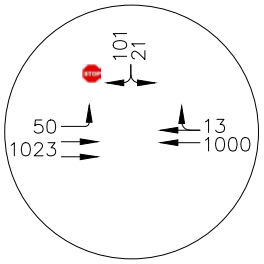
1 PM RELEASE TIME



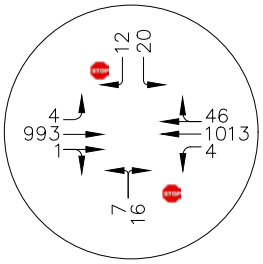
2 PM RELEASE TIME



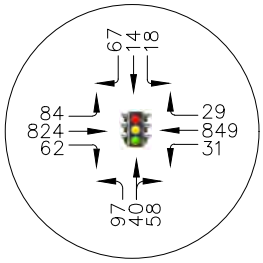
3 PM RELEASE TIME



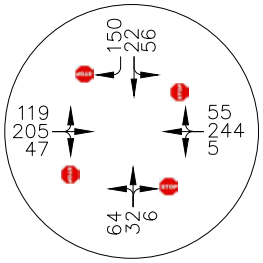
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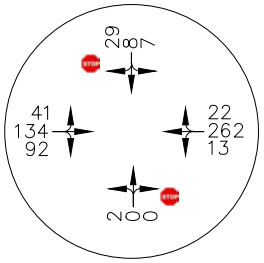
5 PM RELEASE TIME



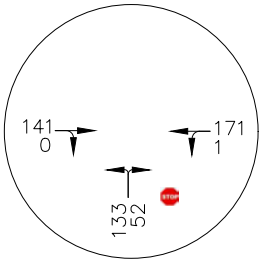
6 PM RELEASE TIME



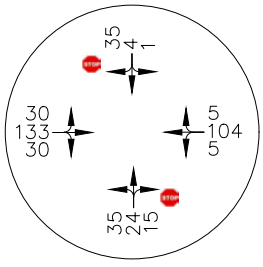
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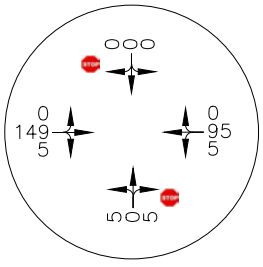
8 PM RELEASE TIME



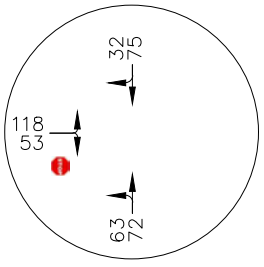
9 PM RELEASE TIME



10 PM RELEASE TIME



11 PM RELEASE TIME



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Turn Movement Volumes

FIGURE F-13

SCALE: N/A

DATE: 09/2019

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Alternative 1: Signalized intersection at Lagoon St. & 600 East

At the request of Roosevelt City, a recent study performed by Horrocks Engineers in April of 2018 has warranted a signalized intersection at Lagoon St & 600 East. At the time of this study, the New Union High School wasn't in operation, but currently under construction, so a lot of assumptions had to be made This intersection met the 'peak hour warrant', meaning vehicles exiting or entering the school would experience large delays during the AM peak hour at a two-way stop controlled intersection. Because a signal is warranted, the intersection was modeled accordingly as a signalized intersection to compare delays with the existing all-way stop controlled intersection. Results of the model indicate that with a signal installed, with optimized timing and splits, average delay to vehicles at this intersection is 13.2 seconds (LOS B) in the AM peak hour, 11.4 seconds (LOS B) in the PM peak hour, and 12.2 seconds (LOS B) during school release time. Compared to the all-way stop control alternative, the AM peak hour and school release time experience an average delay of 1.7 seconds and 1.0 seconds less, respectively, and the PM peak hour and school release times have average delays of 1.7 seconds more, as shown in **Table F-6**.

Table F-6: Signalized vs. All-Way Stop Control Comparison.

Intersection	AM Peak Hour Delay (sec/veh)		PM Peak Hour Delay (sec/veh)		School Release Time Delay (sec/veh)	
	Signalized	All-way stop control	Signalized	All-way stop control	Signalized	All-way stop control
600 East & Lagoon St.	13.2	14.9	11.4	9.7	12.2	13.2
Difference	-1.7		+1.7		-1.0	

Recommendations

Signalization of Lagoon St & 600 East does not markedly improve the performance of the intersection over the performance of an all-way stop control, with the signal operating at LOS B for all peak hours studied. At this time, a traffic signal is not recommended based on current driving conditions as there is little reduction to travel delays over an all-way stop.

Driving conditions may not always remain the same in this area, however, and further study may be necessary in the future to account for changes in driver behavior. A traffic signal could have the following benefits to traffic and pedestrian flow in the area, and future study may determine a signal is needed:

- Improved traffic flow during the peak hour before and after school release time
- Improved pedestrian safety crossing the street
- Reduce queuing
- Improve left-turn safety

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Pedestrian Infrastructure

The streets surrounding the high school have been analyzed using Chapter 7 of the Utah MUTCD to determine any necessary updates to the pedestrian infrastrucure surrounding the school. This analysis includes recommendations for signage and striping at the intersections. Recommendations for striping and signage are found in **Table F-7** as well as **Figure F-14**.

Table F-7: School Zone Analysis Recommendations

School	Intersection	Stop Sign (R1-1)	House Shaped Crossing Sign (S1-1)	Ahead Sign (W16-9P)	Diagonal Arrow (W16-7P)	Left-Turn Arrow (W16-6P)	Right-Turn Arrow (W16-6P)	School Zone Crosswalk Paint	Painted SCHOOL on Pavement	Solid Double Yellow Line
Union High School	600 East & Lagoon Street									
	800 East & Lagoon Street		●	●				●	●	
	Union Street & Lagoon Street									
	East School Dropoff & Lagoon Street		●*	●				●	●	

● = Traffic control device needs to be added to the intersection
A blank box indicates that the required traffic control device has already been installed
*The existing sign is yellow (per 2002 MUTCD) rather than fluorescent yellow-green (per 2009 MUTCD)



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High School Pedestrian Infrastructure

FIGURE F-14

SCALE: N/A

DATE: 09/2019

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Sidewalk Connectivity

Sidewalk connectivity throughout the City has a large impact on the safety of pedestrians, as frequent crossings increase the risk of potentially serious conflicts between pedestrians and vehicles. The current Roosevelt City typical roadway cross-section has sidewalks present on both sides of the road, however, general engineering practice with regards to reducing pedestrian crossings has continuous sidewalk along one side of the street as acceptable. Using data provided by the City, an inventory of existing sidewalks was conducted. **Figure F-15** indicates all roadway segments which have no sidewalk (red), sidewalk on one side (green), or sidewalk on both sides of the road (black). **Table F-8** indicates roadway segments which meet the minimum standard with sidewalk on one side of the roadway. If desired, sidewalk on the other side of the roadway may be installed. **Table F-9** indicates roadway segments which do not meet the minimum standard with no sidewalk installed. It is recommended the City install sidewalk on one side of the roadway at minimum.

Table F-8: Roadway Segments with one Sidewalk Existing

Street	Sidewalk Recommended			
	Beginning	End	Length (ft)	Cost ($)
800 South	State Street	200 E	860	12,040
700 South	500 East	200 East	1360	19,040
200 South	200 East	300 East	440	6,160
200 South	200 West	100 West	500	7,000
100 South	200 West	100 West	500	7,000
360 South	1000 West	800 West	1000	14,000
100 North	400 West	200 West	1000	14,000
200 North	SR-121	Areva Road	3680	51,520
400 North	200 East	400 East	710	9,940
500 North	300 East	400 East	480	6,720
500 North	500 East	600 East	490	6,860
550 North	300 East	400 East	500	7,000
550 North	500 E	600 East	400	5,600
600 North	300 East	500 East	760	10,640
650 North	400 East	500 East	470	6,580
700 North	400 East	500 East	470	6,580
400 East	500 North	600 North	560	7,840
600 East	650 North	750 North	400	5,600
800 East	400 North	200 North	450	6,300
800 East	200 North	Lagoon Street	890	12,460
700 East	100 North	Lagoon Street	435	6,090
Union Street	100 North	Lagoon Street	430	6,020
300 South	State Street	100 E	405	5,670

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Street	Sidewalk Recommended			
	Beginning	End	Length (ft)	Cost ($)
300 East	Roosevelt Circle	400 South	600	8,400
300 East	200 South	Lagoon Street	980	13,720
400 East	100 North	Lagoon Street	390	5,460
500 East	100 North	Lagoon Street	355	4,970
Lagoon Street	300 East	500 East	820	11,480
Lagoon Street	500 West	200 West	1000	14,000
Highway 40	Rodeo Drive	200 E	2420	33,880
Highway 121	Club House Drive	200 N	2640	36,960
100 East	700 South	600 South	590	8,260
State Street	2000 South	1700 South	1100	15,400
State Street	1400 South	1200 south	460	6,440
State Street	1080 South	800 South	1470	20,580
300 West	100 North	Lagoon Street	470	6,580
300 West	350 North	300 North	335	4,690
1000 West	250 North	350 North	620	8,680
1000 West	100 South	360 South	1260	17,640

Table F-9: Roadway Segments with no Sidewalk Existing

Street	Sidewalk Recommended			
	Beginning	End	Length (ft)	Cost ($)
100 East	700 South	800 South	680	19,040
100 East	--	300 North	340	9,520
140 East	500 North	440 North	280	7,840
200 East	Highway 40	800 South	1380	38,640
200 East	500 North	400 North	425	11,900
300 East	200 South	400 South	835	23,380
300 East	200 North	100 North	435	12,180
300 East	Roosevelt Circle	600 South	600	16,800
300 East	600 North	500 North	530	14,840
300 East	400 North	300 North	460	12,880
350 East	Roosevelt Circle	600 South	775	21,700
400 East	Lagoon Street	50 South	205	5,740
400 East	700 North	600 North	500	14,000
450 East	400 South	600 South	1150	32,200
450 East	600 North	550 North	260	7,280
500 East	800 South	Lagoon Street	4300	120,400

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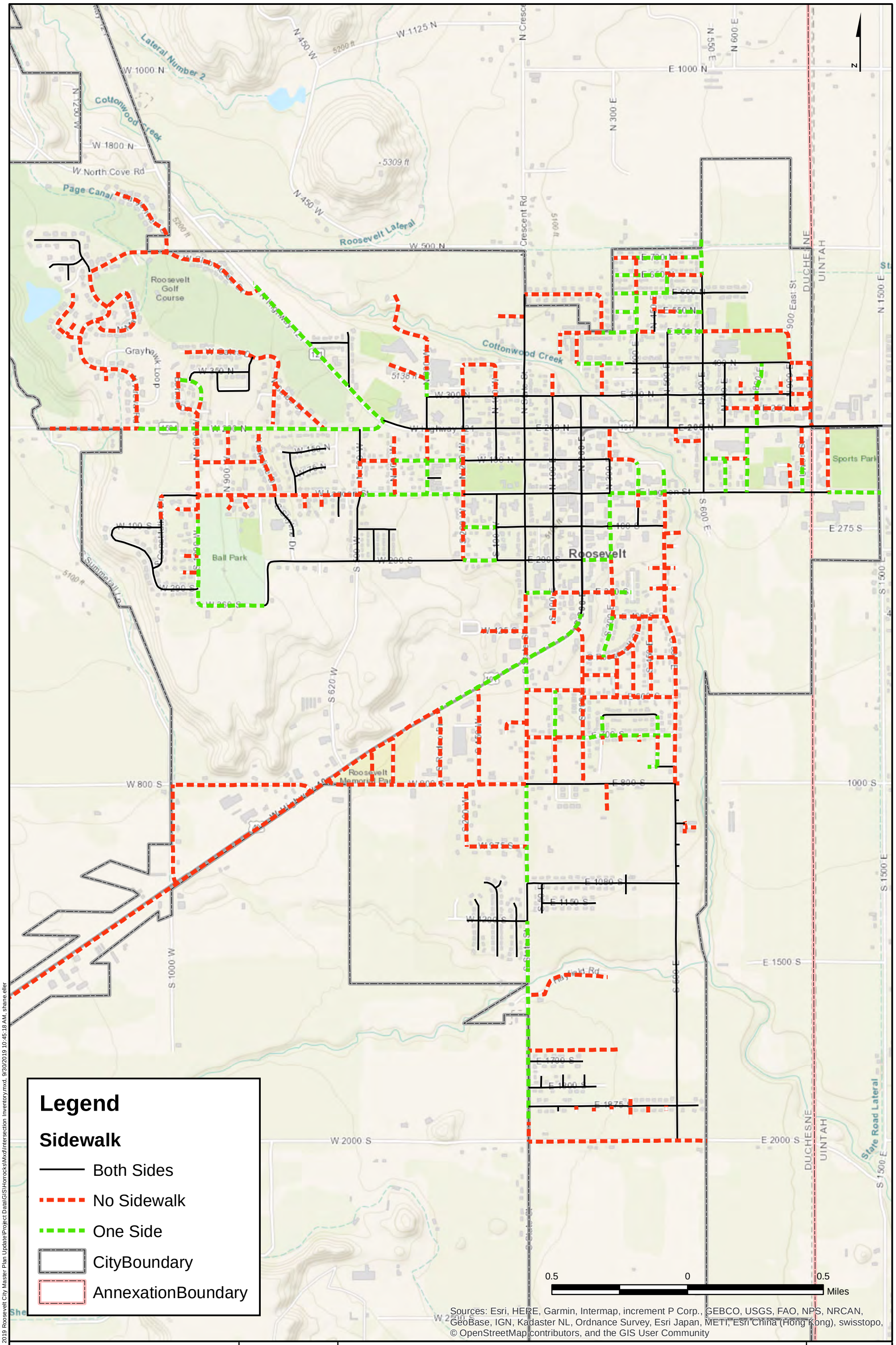
Street	Sidewalk Recommended			
	Beginning	End	Length (ft)	Cost ($)
500 East	700 North	600 North	240	6,720
510 East	200 North	Harmston Avenue	175	4,900
800 East	300 North	200 North	425	11,900
900 East	500 North	400 North	435	12,180
Joyce Avenue	350 North	300 North	210	5,880
Carma Avenue	350 North	300 North	210	5,880
Avera Road	200 North	Clubhouse Drive	3200	89,600
Mason Circle	Avera Road	Avera Road	1465	41,020
Riviera Road	Mason Circle	--	915	25,620
Club House Drive	Areva Road	Highway 121	2740	76,720
Sunset Circle	Areva Road	--	150	4,200
Fairway Circle	Riviera Drive	--	210	5,880
Canyonview Drive	Clubhouse Drive	--	1315	36,820
Gates Drive	200 North	--	2750	77,000
Nelson Drive	Gates Drive	200 North	620	17,360
Bonnie Drive	10th West	1000 West	800	22,400
Skyline Drive	200 North	Lagoon Street	1000	28,000
100 North	300 East	400 East	390	10,920
100 North	700 East	755 East	330	9,240
100 North	500 West	400 West	500	14,000
100 North	1000 West	Skyline Drive	960	26,880
200 North	Summerall Lane	Avera Road	1270	35,560
250 North	700 East	Union Street	1280	35,840
300 North	900 East	Union Street	300	8,400
350 North	900 East	Union Street	300	8,400
400 North	900 East	Union Street	300	8,400
500 North	750 East	900 East	720	20,160
500 North	400 East	540 East	655	18,340
500 North	140 East	300 East	590	16,520
540 North	--	Crescent Road	400	11,200
600 North	Crescent Road	300 East	1090	30,520
650 North	500 East	600 East	500	14,000
700 North	500 East	550 East	230	6,440
700 North	City Boundary	400 East	310	8,680
Union Street	400 North	200 North	920	25,760
Harmston Avenue	520 East	600 East	355	9,940
300 South	100 East	300 East	850	23,800

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Street	Sidewalk Recommended			
	Beginning	End	Length (ft)	Cost ($)
400 South	300 East	500 East	770	21,560
425 South	--	State Street	630	17,640
500 South	450 East	500 East	355	9,940
550 South	200 East	300 East	470	13,160
600 South	State Street	200 East	835	23,380
600 South	200 East	500 East	1375	38,500
700 South	State Street	200 East	835	23,380
100 West	400 North	300 North	455	12,740
200 West	200 North	200 South	1960	54,880
300 West	--	350 North	1465	40,180
300 West	Highway 121	100 North	460	12,880
400 West	200 North	Lagoon Street	860	24,080
500 West	100 North	Lagoon Street	480	13,440
900 West	200 North	100 North	470	13,160
1000 West	250 North	Park View Lane	1450	40,600
Park View Lane	--	1000 West	300	8,400
190 South	--	1000 West	300	8,400
200 South	--	1000 West	300	8,400
Constitution Drive	Lagoon Street	Parkridge Drive	465	13,020
Lagoon Street	1000 West	500 West	2400	67,200
King Arthur Drive	Lagoon Street	--	160	4,480
Guinevere Circle	Lagoon Street	--	160	4,480
Ivie Manor	Lagoon Street	--	190	5,320
Georgia Circle	Lagoon Street	--	195	5,460
Harrison Avenue	700 South	750 South	210	5,880
Roosevelt Circle	200 East	400 South	1200	33,600
State Street	300 South	Highway 40	970	27,160
State Street	1900 South	2000 South	275	7,700
Union Street	200 North	80 North	615	17,200
Rodeo Drive	Highway 40	800 S	1075	30,100
Sunset Drive	Highway 40	800 S	1375	38,500
--	Highway 40	800 S	670	18,760
State Street	600 South	800 South	1380	38,640
670 South	--	State Street	440	12,320
800 South	Highway 40	State Street	3000	84,000
800 South	200 East	500 East	1370	38,360
1000 West	800 South	Highway 40	1400	39,200

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Street	Sidewalk Recommended			
	Beginning	End	Length (ft)	Cost ($)
800 South	1000 West	Highway 40	2065	57,820
200 West	800 South	975 West	890	24,920
Highway 40	Rodeo Drive	--	+9000	+252,000
975 South	200 West	State Street	880	24,640
Hayfield Road	State Street	--	1300	36,400
2000 South	State Street	500 East	2200	52,800



Legend

Sidewalk

- Both Sides
- No Sidewalk
- One Side
- CityBoundary
- AnnexationBoundary

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

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Sidewalk Inventory

High School Traffic Study Memorandum

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F-15

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ROOSEVELT *Utah*

ROOSEVELT INTERSECTION TRAFFIC CONTROL ANALYSIS

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Appendix F

To: **Ryan Snow, Roosevelt City**

From: **Chuck Richins, PE**
Kevin Croshaw, PE

Date: July 12, 2019 **Memorandum**

Subject: **Roosevelt Intersection Traffic Control Analysis**

The purpose of this memorandum is to present the findings of the traffic control study conducted as part of the Transportation Master Plan (TMP) in Roosevelt, Utah. This study investigates traffic flow at intersections throughout the City. This includes a review of the intersection signing inside the city, and recommendations for the removal and/or installation of stop or yield signs in the city.

Analysis

Data Collection

Turning movement and average daily traffic (ADT) data were collected at various locations in January 2019. The locations where data were collected are shown in the attached Data Collection Map as shown in **Figure F-1**. Raw count data can be found at the end of this report.

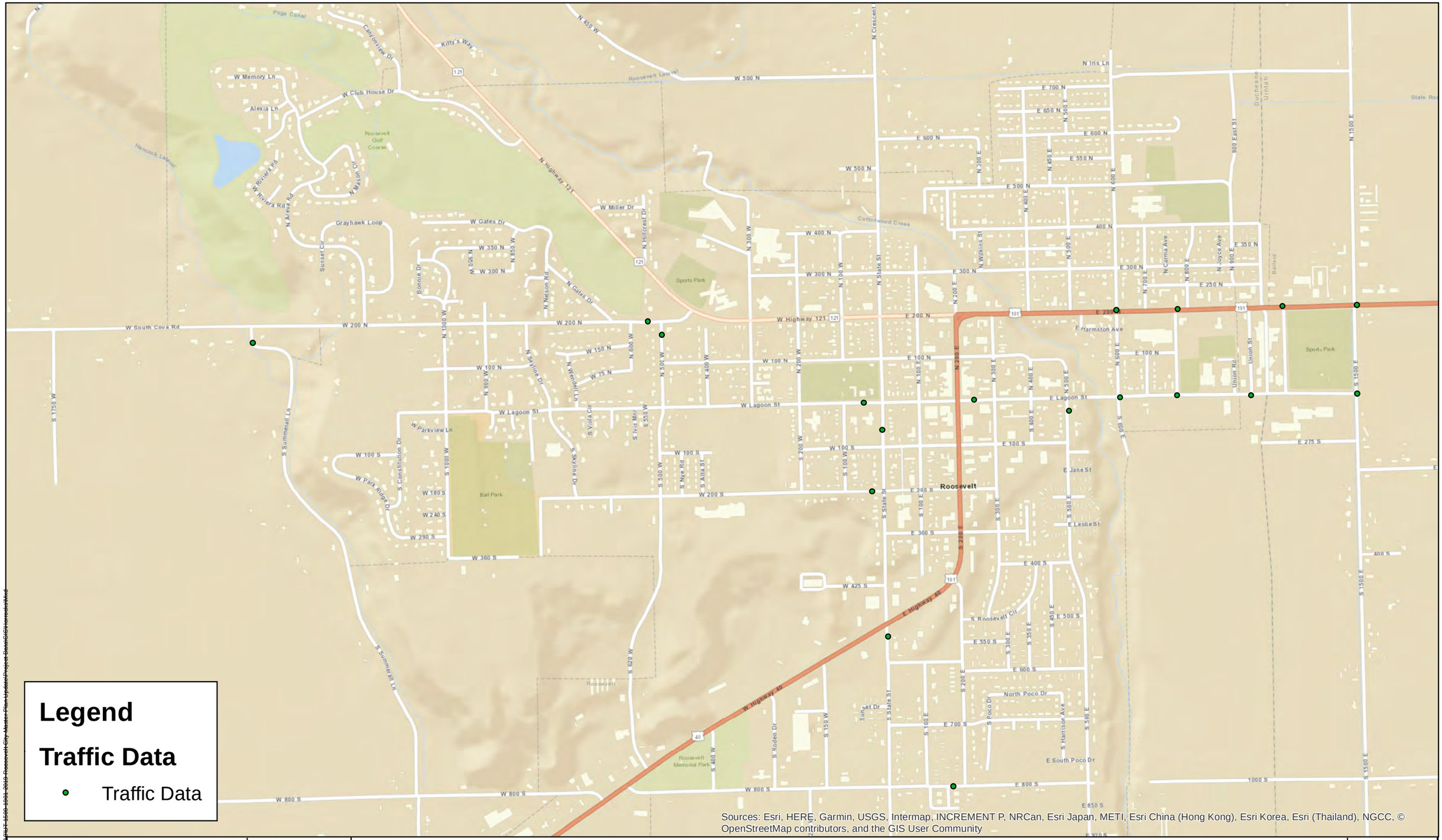
A site visit on March 3, 2019 assessed available sight distance at all yield-controlled intersections as well as 18 'key intersections' within city boundaries. The locations of these intersections are included.

Analysis Criteria

There are two approaches in the decision on the type of traffic control device whether stop signs or yield signs should be installed. The first was a proactive approach, which is primarily based on traffic volumes and available sight distance. The second a reactive approach uses crash data to determine the suitable traffic control device for the intended intersection.

In accordance with the Utah MUTCD (December, 2011), a stop or yield control should be used on the minor approach to an intersection if there is restricted sight distance at the intersection or if crash records indicate that a stop or yield control could mitigate crashes. Placing the stop or yield sign on the minor approach minimizes the overall delay and congestion at each intersection; however, engineering judgment should be used to determine the appropriate control for each intersection.

According to Chapter 9 of AASHTO's A Police on Geometric Design of Highways and Streets,



Legend

Traffic Data

- Traffic Data

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community

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ROOSEVELT COUNT LOCATIONS

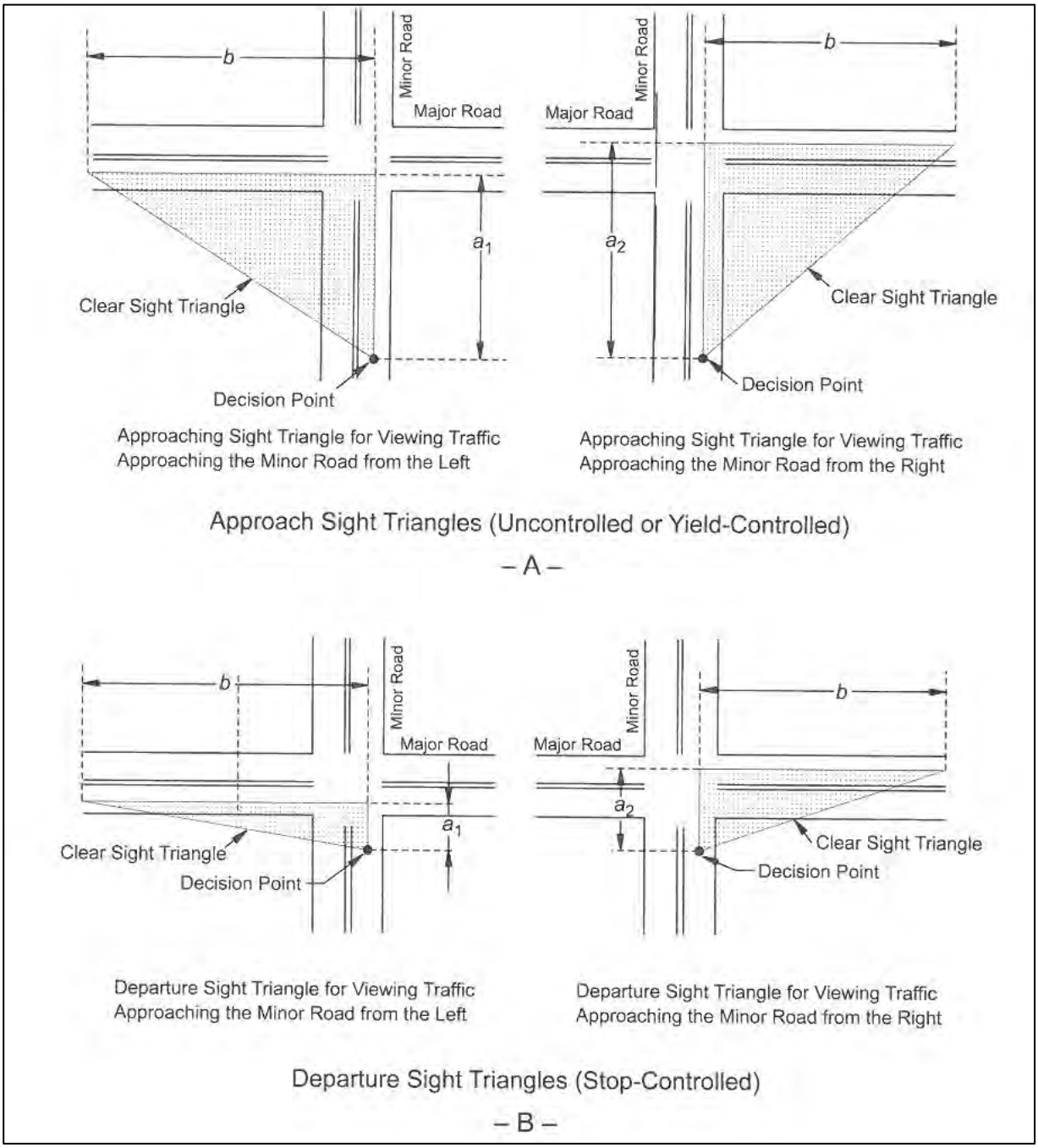
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7th Edition, the sight distance needed by drivers on yield-controlled approaches exceeds that for stop-controlled approaches. **Figure F-2** shows the sight triangles needed for both a yield and stop condition. The recommended length of the sides of each sight triangle is a function of the speed of each approach. **Table F-1** shows the recommended sight distance measurements for a design speed of 25 mph.

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(Source: AASHTO's A Police on Geometric Design of Highways and Streets, 7th Edition)

Figure F-2: Sight Distance Triangles

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Table F-1: Sight Distance Measurements for 25 MPH Design Speed

Type of Control	Maneuver	Minimum Sight Distance Measurement (ft.) for 25 mph (See Figure 1)		
		a_1	a_2	b
Yield	Crossing	130	142	240
	Left Turn			295
Stop	Crossing	20.5	32.5	240
	Left Turn			280

(Source: Chapter 9 of the AASHTO's A Police on Geometric Design of Highways and Streets, 7th Edition)

Multi-way stop locations throughout the City were also analyzed as part of the study to determine the appropriate control for each intersection. Section 2B.07 from the Utah MUTCD outlines the appropriate use for multi-way stop applications. In summary, multi-way stop intersection controls should be used where the volume of traffic on the intersecting roads is approximately equal. A multi-way stop may be considered as an interim solution to a traffic signal where a traffic signal is justified but cannot be installed immediately. A multi-way stop may be justified if five or more crashes that are susceptible to correction by a multi-way stop installation were reported within a 12 month period. Such crashes include right-turn and left-turn collisions as well as right-angle collisions. Minimum volumes suggested for a multi-way stop are as follows:

1. *The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and*
2. *The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but*
3. *If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.*

Other criteria that may be considered when determining if a multi-way stop is appropriate include:

A. *The need to control left-turn conflicts;*
B. *The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;*
C. *Locations where a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop; and*

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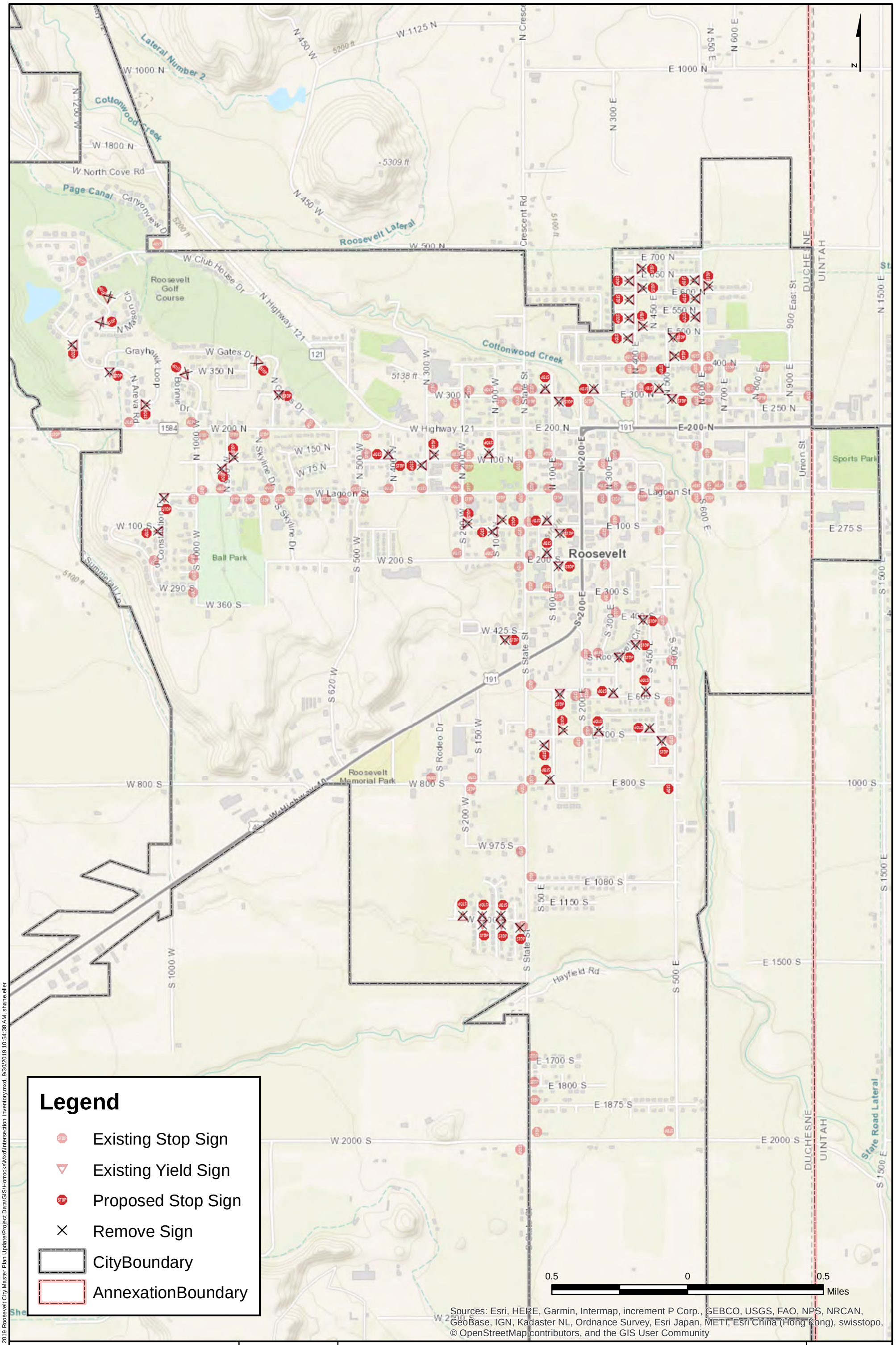
D. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multi-way stop control would improve traffic operational characteristics of the intersection.

Intersection Control Signing Recommendations

Based on the criteria outlined above, each yield-controlled intersection, all-way stop-controlled intersection, and the 18 'key intersections' were evaluated. A site visit was also performed to determine available sight distance at each intersection. In addition, crash data were reviewed to determine the best control type for each intersection (Crash data included in this report, See **Figures F-4 and F-5**). A map has been created to document the existing intersection control signing throughout the city, as well as recommended changes to the intersection control signing as shown in **Figure F-3**. **Table F-2** provides a summary of the total number of sign installations and removals recommended.

Table F-2. Signing Summary

Sign Description	*MUTCD Sign Designation*	*Size (inches)*	*Quantity*
Stop Sign	R1-1	30x30	61
Sign Removal	N/A	N/A	58



Legend

- Existing Stop Sign
- Existing Yield Sign
- Proposed Stop Sign
- Remove Sign
- CityBoundary
- AnnexationBoundary

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

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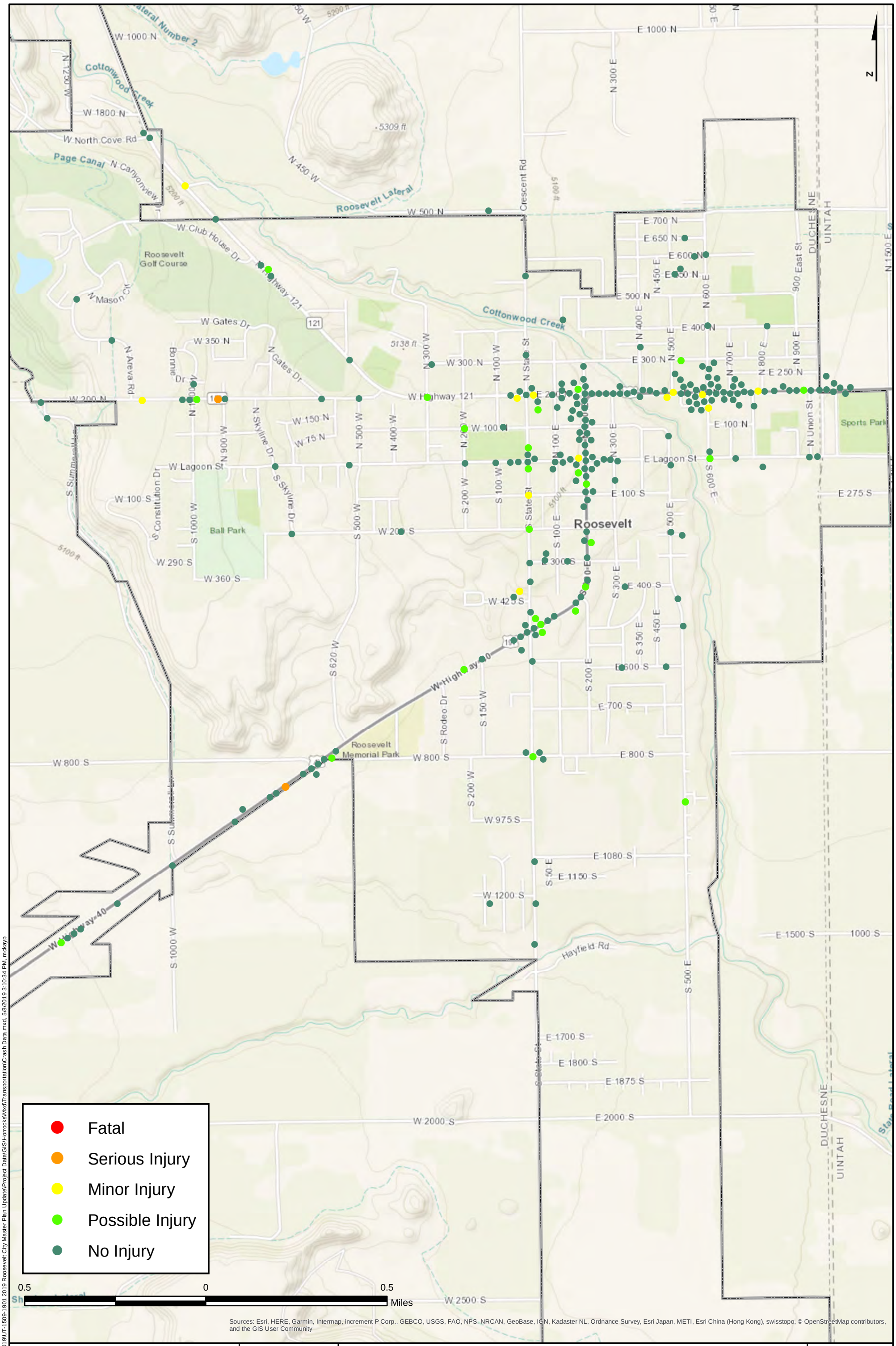
Intersection Traffic Control Recommendations

Intersection Traffic Control Memorandum

DATE 9/30/2019

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F-2



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

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Roosevelt Intersection Traffic Control Memorandum

Roosevelt City Crash Severity (2016-2019) Map

DATE 09/2019

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- Angle
- Front to Rear
- Head On (front-to-front)
- Parked Vehicle
- Rear to Rear
- Rear to Side
- Sideswipe Opposite Direction
- Sideswipe Same Direction
- Single Vehicle

0.5 0 0.5 Miles

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

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Roosevelt City Manner of Collision (2016-2019) Map

DATE 09/2019
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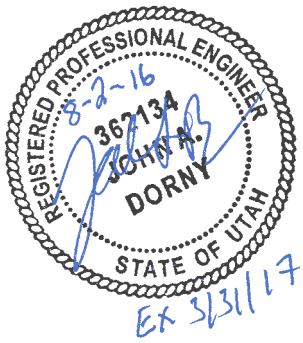
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ROOSEVELT *Utah*

4-WAY STOP WARRANT STUDY- 600 EAST & 300 NORTH

600 East 300 North
4-Way STOP Warrant Study

100 Centennial
Roosevelt City
1913 2013
"The Energy Hub of Utah"



Prepared By:

HORROCKS ENGINEERS

2162 West Grove Pkwy, Suite 400
Pleasant Grove, UT 84062

July 27th, 2016

ROOSEVELT CITY
255 South State
Roosevelt, UT 84066

I INTRODUCTION:

This report presents the findings of our review of the 600 East/300 North intersection. It is our understanding that the study intersection has been both a 2-Way Stop-Controlled intersection and a 4-Way Stop-Controlled (All-Way or Multi-Way Stop) intersection at different times. Detailed below is the determination if a 2-Way Stop-Controlled warrant in the east/west direction on 300 North is needed. We then applied the All-Way Stop warrants at the study intersection.

The study included a review of this intersection's traffic patterns, traffic counts, crash history, as well as the intersection's sight measurements, geometry, and viewing angles.

In order to warrant a 2 or 4-Way Stop-Controlled intersection, an intersection needs to meet specified threshold indicators as set forth in the Utah Manual of Uniform Traffic Control Devices (MUTCD). Utah has adopted a slightly modified version of the MUTCD that we use in this report. However, the stop sign warrants are not modified in the Utah MUTCD and match national standards. The warrants are located in Sections 2B.04 and 2B.07 of the MUTCD.

One primary indicator is of approximately equal traffic volumes at two conflicting directions of travel through the intersection. However, other determining factors include the intersection's crash history, geometric layout, and peak hour volume.

The following is from the Utah MUTCD and includes both the 2-Way and Multi-Way Stop Warrant requirements. The items highlighted in "yellow" indicate the warrant criteria that is discussed in this report.

Utah MUTCD Section 2B.06 STOP Sign Applications

Guidance:

01 *At intersections where a full stop is not necessary at all times, consideration should first be given to using less restrictive measures such as YIELD signs (see Sections 2B.08 and 2B.09).*

02 *The use of STOP signs on the minor-street approaches should be considered if engineering judgment indicates that a stop is always required because of one or more of the following conditions:*

- *A. The vehicular traffic volumes on the through street or highway exceed 6,000 vehicles per day;*
- *B. A restricted view exists that requires road users to stop in order to adequately observe conflicting traffic on the through street or highway; and/or*
- *C. Crash records indicate that three or more crashes that are susceptible to correction by the installation of a STOP sign have been reported within a 12-month period, or that five or more such crashes have been reported within a 2-year period. Such crashes include right-angle collisions involving road users on the minor-street approach failing to yield the right-of-way to traffic on the through street or highway.*

Utah MUTCD Section 2B.07 Multi-Way Stop Applications

Support:

01 Multi-way stop control can be useful as a safety measure at intersections if certain traffic conditions exist.

Safety concerns associated with multi-way stops include pedestrians, bicyclists, and all road users expecting other road users to stop. Multi-way stop control is used where the volume of traffic on the intersecting roads is approximately equal.

02 The restrictions on the use of STOP signs described in Section 2B.04 also apply to multi-way stop applications.

Guidance:

03 *The decision to install multi-way stop control should be based on an engineering study.*

04 *The following criteria should be considered in the engineering study for a multi-way STOP sign installation:*

A. Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.

B. Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.

C. Minimum volumes:

1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and

2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but

3. If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.

D. Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.

Option:

05 Other criteria that may be considered in an engineering study include:

A. The need to control left-turn conflicts;

B. The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;

C. Locations where a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop; and

D. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multi-way stop control would improve traffic operational characteristics of the intersection.

II TRAFFIC DATA:

Continuous, multi-day traffic volumes were collected from May 19 to June 1, 2016. A complete report of the data is included in Appendix B and a peak hour summary is given in Table I.

Table I: Traffic Volume Approaching the Intersection - PM Peak (4–6 pm)

Road Name - Approach	PM Peak Volume
300 NORTH - *eastbound*	18 / hour
300 NORTH - *westbound*	16 / hour
600 EAST - *northbound*	67 / hour
600 EAST - *southbound*	73 / hour
TOTALS	174 / hour

Of note, the posted speed limit for both 600 East and 300 North is 25 mph. Traffic speeds were not measured at this intersection; however, by observation, speeds through the intersection were not excessive during the PM Peak Hour.

III CRASH ANALYSIS:

Crash data available from UDOT's Numetric website indicates none of the past 6 years had five or more accidents (Refer to Table II).

Table II: Accident Data Per Year

Year	# of Accidents
2011	0
2012	0
2013	0
2014	1
2015	1
2012	0

IV OPERATIONS AND GEOMETRY:

Northbound and southbound traffic approaching the intersection on 600 East is currently stop-controlled. Eastbound and westbound traffic along 300 North is also currently stop-controlled. Our analysis assumed that 600 East was the major road and treated it as if there were no stop-control on 600 East at 300 North.

For uncontrolled intersections, drivers from all approaching directions should be able to see conflicting vehicles with adequate time to stop to avoid a crash. The required sight distance for safe operations at an uncontrolled intersection is related to the vehicle speeds and the distances traveled during perception, reaction, and braking time. Photographs of each approach are shown below.



Figure 1: Northbound Approach



Figure 2: Southbound Approach



Figure 3: Eastbound Approach



Figure 4: Westbound Approach

Tables III and IV indicate geometric design conclusions as observed at this intersection.

Table III: Geometric Design Elements

300 NORTH		
Posted Speed Limit:	25 mph	
Design Speed*:	30 mph	** posted speed limit plus 5 mph*
Required "K" value:	–	*Not relevant on non-vertically curved roads*
Field "K" value:	–	
Stopping Sight Distance:	200 feet	*Exhibit 3-1. A Policy on Geometric Design of Highways and Streets*
Road slope in:	–	*Not a significant factor*
Road slope out:	–	*Not a significant factor*
Minimum Sight Distance:	335 feet	*AASHTO: A Policy on Geometric Design of Highways and Streets (Case B1- Left Turn from the Minor Road)*
Measured Sight Distance:	**120 ft**	*Westbound departure sight triangle viewing traffic approaching 300 North from the right is blocked by hedges and light pole*

Table IV: Geometric Design Elements

600 EAST		
Posted Speed Limit:	25 mph	
Design Speed*:	30 mph	** posted speed limit plus 5 mph*
Required "K" value:	–	*Not relevant on non-vertically curved roads*
Field "K" value:	**–**	
Stopping Sight Distance:	200 feet	*Exhibit 3-1. A Policy on Geometric Design of Highways and Streets*
Road slope in:	–	*Not a significant factor*
Road slope out:	–	*Not a significant factor*
Minimum Sight Distance:	245 feet	*AASHTO: A Policy on Geometric Design of Highways and Streets (Case F- Left Turn from the Major Road)*
Measured Sight Distance:	**> 470 ft**	

As noted in Table III, the sight-distance requirements specified by AASHTO guidelines for this type of intersection are not met. Field measurements for sight distance were measured by identifying landmarks visible at each approach of the intersection and subsequently measuring distances.

Intersection sight distances for stop controlled intersections include full-movement intersections where the minor street is stop-controlled, but the major street is free-flowing. Table V shows the sight distance required for full-movement intersections:

Table V: Intersection Sight Distance Requirements

Sight Distance Requirements - Two-Way, Stop-Controlled, Full-Movement Intersection (ft.)	
Design Vehicle	
Passenger Car	335
Single Unit Truck	420
Design Speed = 30 mph; 2-Lane Road *Source: AASHTO: A Policy on Geometric Design of Highways and Streets, Case B1*	

Figure 5 (below) shows the intersection Sight Distance Triangles for stop-controlled minor approaches, similar to the intersection of 600 East and 300 North.

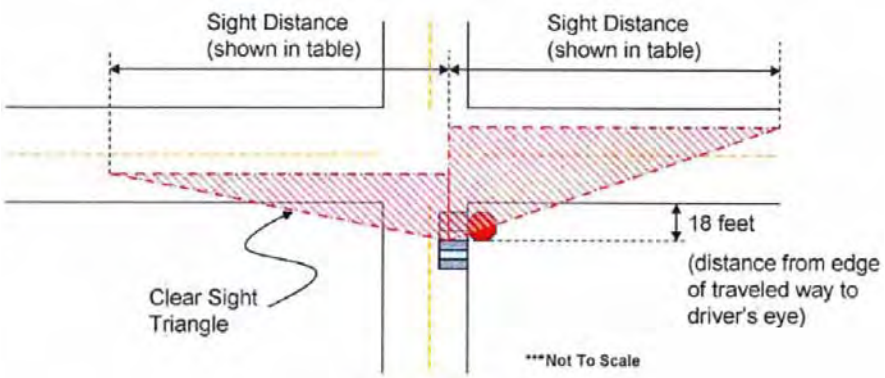


Figure 5: Sight Distance Triangle for Minor Approaches

As shown in Table III, the sight distance for the westbound approach when viewing traffic approaching from the right is inadequate due to hedges and a light pole obstructing the view, shown in Figure 6 below. This means there is insufficient sight distance for drivers to turn left from the westbound approach without interfering with southbound vehicles.



Figure 6: Westbound Sight Obstructions

AASHTO: A Policy on Geometric Design of Highways and Streets, states the following for "Case E—Intersections With All-Way Stop Control":

> At intersections with all-way stop control, the first stopped vehicle on one approach should be visible to the drivers of the first stopped vehicles on each of the other approaches. There are no other sight distance criteria applicable to intersections with all-way stop control and, indeed, **all-way stop control may be the best option at a limited number of intersections where sight distance for other control types cannot be attained**.

Sight distances for this intersection are inadequate, which indicates that an All-Way Stop may be warranted.

V STOP WARRANT RESULTS

Two-Way Stop Controlled Warrant

Table VI: Multi-Way Stop Warrant Summary

Criteria	Description	Condition	Comment
A	Major Street Volume	NOT MET	*600 East does not carry 6,000 vehicles per day near 300 N.*
B	Restricted Views	MET	*Westbound departure sight triangle viewing traffic approaching 300 North from the right is blocked by hedges and light pole*
C	Crash Analysis	NOT MET	*3+ crashes reported in a 12-month period* *5+ crashes reported in a 24-month period*

**Source: Utah MUTCD, Section 2B.06 –Stop Sign Applications*

Based on the warrants results above, stop signs on 300 North in both the east and west directions are justified per restricted views.

Multi-Way Stop Controlled Warrant

The Utah MUTCD suggest three main criteria to be considered in the engineering study for a Multi-Way Stop control. These criteria are summarized in Table VII, below:

Table VII: Multi-Way Stop Warrant Summary

Criteria	Description	Condition	Comment
A	Pending Traffic Signal	–	*Not applicable*
B	Crash Analysis	NOT MET	*5+ crashes reported in a 12-month period*
C.1	Major Street Volume	NOT MET	*Combined approach volumes exceed 300 vehicles/hour*
C.2	Minor Street Volume	NOT MET	*Combined approach volumes exceed 200 vehicles/hour*
C.3	85th-Percentile Speed	NOT MET	*85th-percentile speed does not exceed 40 mph*

* *Source: Utah MUTCD, Section 2B.07 – Multi-Way Stop Applications*

Based on the results of Table VII stop signs at the northbound and southbound on 600 East DOES NOT warrant a stop sign. However, as previously shown, the criteria below represents other options that may warrant a stop sign. Option C discusses the issue of sight distance. This includes the westbound

vehicles seeing southbound vehicles and vice versa. The sight distance was measured to be approximately 120'. The required sight distance per AASHTO is 335'.

Option:

05 Other criteria that may be considered in an engineering study include:

A. The need to control left-turn conflicts;

B. The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;

C. Locations where a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop; and

D. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multi-way stop control would improve traffic operational characteristics of the intersection.

VII CONCLUSIONS

Based on our review of traffic volumes and crash data the MUTCD suggests a Multi-Way Stop-Controlled intersection is required due to poor sight distance. For the same reason, the existing stop signs on 300 North are justified. If the sight distance problem could be permanently addressed per the City's satisfaction, it is possible to NOT require a Multi-Way Stop. However, under the current conditions adequate sight distance is not met.

If an All-Way Stop is installed, required signage is shown in Appendix A.

- *2-Way Stop Warrant*: The east/west stop signs on 300 North are justified per the 2-Way Stop warrant due to lack of visibility of the major roadway (600 East).

- *Limited Visibility:* Drivers, after stopping, can't see conflicting traffic unless the cross-traffic stops. There is limited sight distance at the westbound approach at this intersection. This is true for both the 2-Way and Multi-Way condition.

- *High Number of Crashes:* The 2-Way warrant requires 3+ crashes in a 12-month period or 5+ crashes in a 24 month period. The Multi-Way warrant requires 5+ reported crashes in a 12-month period. There have only been two reported crashes in the past six years at the intersection.

- *Balanced volumes:* If each of the intersecting streets have about the same volume of cars, and the intersection will operate better then adding a Multi-Way Stop may be considered. The northbound/southbound directions has higher volumes than the eastbound/westbound approaches.

- *High Volume of Cars:* 200+ vehicles per hour approach from both the north and south, and 300+ vehicles per hour approach from both the east and west for 8-hours on each of the intersecting streets. The volumes at this intersection do not meet these levels.

APPENDIX A

Signage Reference



R 1-1



R 1-4



W3-1A

APPENDIX B

Traffic Movement Data

Northbound:

*** Thursday, May 19, 2016 - Total=555, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**26**	**39**	**35**	**55**	**60**	**52**	**50**	**48**	**15**	**42**	**51**	**47**	**17**	**18**
0	0	0	0	0	0	0	0	0	0	3	**6**	1	21	11	**24**	18	0	14	1	12	12	4	6	0
0	0	0	0	0	0	0	0	0	0	3	**13**	12	13	**16**	0	20	7	0	14	10	13	6	6	2
0	0	0	0	0	0	0	0	0	0	10	**11**	10	12	**16**	14	12	20	0	7	17	13	5	4	0
0	0	0	0	0	0	0	0	0	0	**10**	9	12	9	**17**	14	0	21	1	20	12	9	2	2	1

AM Peak 1045 - 1145 (40), AM PHF=0.77 PM Peak 1415 - 1515 (73), PM PHF=0.76

*** Friday, May 20, 2016 - Total=841, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

3	**2**	**3**	**0**	**3**	**2**	**8**	**47**	**0**	**54**	**67**	**57**	**65**	**89**	**62**	**58**	**52**	**43**	**44**	**38**	**50**	**44**	**26**	**24**
0	0	1	0	1	0	0	5	0	3	**17**	10	11	**21**	12	17	17	17	9	10	15	13	8	8	4
2	1	0	0	0	0	1	6	0	**17**	11	16	6	**19**	16	9	9	16	12	9	8	5	10	4	1
0	0	0	0	0	1	4	17	0	**18**	22	9	18	**27**	15	19	16	10	12	13	14	15	5	7	2
1	1	2	0	2	1	3	19	0	**16**	17	22	**30**	22	19	13	10	0	11	6	13	11	3	5	3

AM Peak 0915 - 1015 (68), AM PHF=0.94 PM Peak 1245 - 1345 (97), PM PHF=0.81

*** Saturday, May 21, 2016 - Total=629, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

10	**1**	**1**	**1**	**4**	**0**	**6**	**13**	**26**	**41**	**52**	**19**	**54**	**15**	**31**	**40**	**45**	**51**	**39**	**40**	**49**	**49**	**27**	**15**
4	0	0	0	3	0	2	5	2	8	**10**	11	7	10	0	9	7	14	11	8	11	**11**	5	2	3
1	0	1	0	0	0	0	3	5	5	**17**	1	20	5	2	9	11	11	11	10	8	**19**	14	5	0
2	1	0	1	0	0	1	1	7	**12**	8	0	9	0	14	9	16	17	9	15	**12**	9	8	3	0
3	0	0	0	1	0	3	4	12	**16**	17	7	18	0	15	13	11	9	8	7	**18**	10	0	5	1

AM Peak 0930 - 1030 (55), AM PHF=0.81 PM Peak 2030 - 2130 (60), PM PHF=0.79

*** Sunday, May 22, 2016 - Total=546, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

4	**5**	**3**	**0**	**1**	**12**	**7**	**8**	**25**	**19**	**22**	**30**	**70**	**36**	**29**	**38**	**31**	**42**	**49**	**32**	**28**	**34**	**16**	**5**
3	1	0	0	0	0	0	3	4	3	4	5	**18**	18	4	10	7	8	14	13	9	17	5	0	1
0	1	1	0	0	0	2	1	4	4	11	5	**16**	6	9	10	13	13	9	12	6	8	4	3	0
0	2	1	0	1	1	2	2	5	7	3	**6**	**3**	5	6	10	4	13	13	4	6	6	4	1	0
1	1	1	0	0	11	3	2	12	5	4	**14**	**33**	7	10	8	7	8	13	3	7	3	3	1	0

AM Peak 1130 - 1230 (54), AM PHF=0.75 PM Peak 1200 - 1300 (70), PM PHF=0.53

*** Monday, May 23, 2016 - Total=774, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

1	**4**	**2**	**3**	**3**	**6**	**8**	**39**	**38**	**40**	**51**	**50**	**65**	**18**	**26**	**80**	**72**	**71**	**61**	**52**	**42**	**26**	**11**	**5**
1	0	0	1	1	2	2	6	14	7	9	12	**21**	18	0	**25**	22	20	16	22	7	6	0	3	1
0	1	0	0	0	0	1	7	11	14	10	10	**17**	0	9	**22**	12	23	16	6	12	9	3	0	2
0	2	0	1	2	1	1	10	5	9	16	**12**	9	0	1	**23**	21	13	12	10	7	7	4	1	1
0	1	2	1	0	3	4	16	8	10	16	**16**	18	0	**16**	10	17	15	17	14	16	4	4	1	2

AM Peak 1130 - 1230 (66), AM PHF=0.79 PM Peak 1445 - 1545 (86), PM PHF=0.86

*** Tuesday, May 24, 2016 - Total=797, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

6	**1**	**1**	**1**	**1**	**5**	**8**	**54**	**4**	**10**	**30**	**53**	**84**	**58**	**65**	**103**	**65**	**58**	**83**	**69**	**37**	**1**	**0**	**0**
1	0	0	1	0	1	2	8	4	0	6	12	**29**	21	16	**26**	16	21	11	25	18	0	0	0	0
2	1	1	0	0	1	1	8	0	0	5	16	**14**	20	11	**16**	16	2	23	19	10	0	0	0	0
1	0	0	0	0	1	2	8	0	0	10	8	**22**	12	14	**30**	12	16	20	12	1	1	0	0	0
2	0	0	0	1	2	3	30	0	10	9	**17**	19	5	24	**31**	21	19	29	13	8	0	0	0	0

AM Peak 1145 - 1245 (82), AM PHF=0.71 PM Peak 1500 - 1600 (103), PM PHF=0.83

*** Wednesday, May 25, 2016 - Total=900, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

0	**5**	**1**	**0**	**0**	**8**	**16**	**52**	**31**	**34**	**42**	**53**	**86**	**67**	**68**	**66**	**79**	**67**	**64**	**33**	**56**	**55**	**17**	**0**
0	1	1	0	0	0	2	5	15	7	10	11	**24**	18	11	21	15	18	17	4	16	21	7	0	0
0	3	0	0	0	2	5	11	1	10	9	11	**20**	18	12	17	19	19	21	1	15	16	3	0	0
0	1	0	0	0	2	7	13	5	7	12	16	**24**	12	13	15	27	11	14	15	12	9	6	0	0
0	0	0	0	0	4	2	23	10	10	11	**15**	**18**	19	32	13	18	19	12	13	13	9	1	0	0

AM Peak 1145 - 1245 (83), AM PHF=0.86 PM Peak 1200 - 1300 (86), PM PHF=0.90

*** Thursday, May 26, 2016 - Total=781, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

0	**0**	**0**	**0**	**0**	**0**	**9**	**63**	**55**	**49**	**46**	**57**	**67**	**49**	**48**	**67**	**40**	**38**	**32**	**28**	**43**	**42**	**28**	**20**
0	0	0	0	0	0	0	6	**20**	14	10	14	21	16	17	10	**14**	4	15	6	18	9	9	4	4
0	0	0	0	0	0	0	10	**17**	13	13	17	19	13	11	**14**	0	7	14	11	10	12	9	5	0
0	0	0	0	0	0	0	**22**	9	13	9	11	5	11	20	**26**	12	17	3	0	7	11	6	8	2
0	0	0	0	0	0	0	9	**25**	9	9	14	15	22	9	0	**17**	14	10	0	11	8	10	4	3	3

AM Peak 0730 - 0830 (84), AM PHF=0.84 PM Peak 1515 - 1615 (71), PM PHF=0.68

*** Friday, May 27, 2016 - Total=883, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

9	**1**	**1**	**1**	**0**	**4**	**9**	**51**	**49**	**45**	**51**	**48**	**88**	**97**	**23**	**55**	**49**	**58**	**36**	**35**	**36**	**67**	**46**	**24**

APPENDIX B

Traffic Movement Data

4 1 0 0 0 1 1 4 15 9 9 13 **25** **30** 12 24 10 15 10 13 6 18 15 12 4
0 0 1 0 0 0 1 11 9 8 15 16 **19** **28** 9 28 18 20 17 7 9 16 13 6 6
2 0 0 0 0 2 2 13 13 15 10 8 **19** 17 0 1 6 9 9 5 12 15 11 5 3
3 0 0 1 0 1 5 23 12 13 17 **11** **25** 22 2 2 15 14 0 10 9 18 7 1 3
AM Peak 1145 - 1245 (74), AM PHF=0.74 PM Peak 1230 - 1330 (102), PM PHF=0.85

*** Saturday, May 28, 2016 - Total=728, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300
16 8 1 6 1 3 7 22 22 45 48 44 67 44 61 45 31 43 46 42 44 35 27 20
4 2 0 2 0 1 0 11 6 7 **17** 13 4 **13** 16 17 9 11 11 11 10 9 2 7 4
6 2 0 2 1 2 2 4 4 **9** 7 10 **14** 10 14 9 5 12 9 8 9 12 10 6 1
3 4 0 2 0 0 3 4 7 **12** 10 12 **24** 14 19 7 13 12 13 17 13 6 10 5 2
3 0 1 0 0 0 2 3 5 **17** 14 9 **25** 7 12 12 4 8 13 6 12 8 5 2 0
AM Peak 0915 - 1015 (55), AM PHF=0.81 PM Peak 1215 - 1315 (76), PM PHF=0.76

*** Sunday, May 29, 2016 - Total=548, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300
7 6 3 2 2 1 2 17 20 14 45 21 78 45 48 34 30 27 39 21 31 23 18 14
4 1 1 1 0 0 1 2 1 5 7 6 **8** **23** 11 10 7 0 5 7 5 5 9 3 0
1 0 2 0 1 0 0 9 5 3 16 6 **18** 12 14 3 5 10 8 6 6 2 4 6 0
2 3 0 0 1 1 0 4 4 3 8 9 **26** 1 11 9 9 11 11 2 8 12 2 2 1
0 2 0 1 0 0 1 2 10 3 14 **0** **26** 9 12 12 9 6 15 6 12 4 3 3 0
AM Peak 1145 - 1245 (52), AM PHF=0.50 PM Peak 1215 - 1315 (93), PM PHF=0.89

*** Monday, May 30, 2016 - Total=541, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300
1 5 1 1 1 9 3 8 11 26 30 30 46 43 46 41 34 52 34 12 37 33 26 11
0 1 0 1 0 3 1 1 3 8 5 8 **8** 12 14 8 5 10 **12** 12 1 8 9 6 3
0 2 0 0 0 4 1 3 3 5 9 8 **6** 9 10 5 7 **15** 12 0 12 8 9 1 4
1 1 1 0 1 0 0 3 4 8 8 9 **16** 8 12 15 9 **15** 7 0 8 10 3 2 1
0 1 0 0 0 2 1 1 1 5 8 **5** 16 14 10 13 13 **12** 3 0 16 7 5 2 0
AM Peak 1145 - 1245 (35), AM PHF=0.55 PM Peak 1715 - 1815 (54), PM PHF=0.90

*** Tuesday, May 31, 2016 - Total=697, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300
8 2 0 2 3 3 8 23 22 29 35 44 66 64 27 43 55 57 53 44 39 41 21 8
3 0 0 1 0 0 1 4 8 7 10 10 **21** 13 5 5 19 0 **12** 11 7 12 5 3 4
4 1 0 1 0 1 3 7 3 4 7 9 **15** 14 15 10 15 **17** 13 19 9 10 7 4 1
1 0 0 0 1 1 2 7 6 6 12 **11** 10 19 7 13 14 **18** 10 6 12 10 6 0 1
0 1 0 0 2 1 2 5 5 12 6 **14** 20 18 0 15 7 **22** 18 8 11 9 3 1 0
AM Peak 1130 - 1230 (61), AM PHF=0.73 PM Peak 1715 - 1815 (69), PM PHF=0.78

*** Wednesday, June 01, 2016 - Total=508, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300
6 4 1 1 2 7 11 27 35 30 52 41 74 58 67 65 27 0 0 0 0 0 0 0
4 0 0 0 0 1 1 9 20 9 17 7 **20** 12 **20** 19 8 0 0 0 0 0 0 0 0
1 1 0 1 0 1 2 4 7 7 10 6 **25** 11 **12** 16 18 0 0 0 0 0 0 0 0
1 3 0 0 0 0 6 6 2 6 14 11 **15** 12 **21** 11 1 0 0 0 0 0 0 0 0
0 0 1 0 2 5 2 8 6 8 11 **17** 14 **23** 14 19 0 0 0 0 0 0 0 0 0
AM Peak 1145 - 1245 (77), AM PHF=0.77 PM Peak 1345 - 1445 (76), PM PHF=0.83

APPENDIX B

Traffic Movement Data

Southbound:

*** Thursday, May 19, 2016 - Total=754, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**23**	**40**	**64**	**62**	**70**	**110**	**76**	**83**	**72**	**55**	**50**	**23**	**14**	**12**
0	0	0	0	0	0	0	0	0	0	9	**22**	14	12	**38**	18	13	22	15	15	5	4	3	1
0	0	0	0	0	0	0	0	0	0	9	10	**17**	14	11	**24**	21	24	17	15	12	5	4	4	2
0	0	0	0	0	0	0	0	0	0	5	**14**	13	16	23	**18**	23	20	22	10	13	7	3	5	1
0	0	0	0	0	0	0	0	0	0	9	**7**	12	18	24	**30**	14	26	11	15	10	6	3	0	0

AM Peak 1130 - 1230 (60), AM PHF=0.68 PM Peak 1500 - 1600 (110), PM PHF=0.72

*** Friday, May 20, 2016 - Total=1104, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
4	**2**	**3**	**0**	**1**	**17**	**27**	**103**	**88**	**69**	**87**	**68**	**72**	**106**	**59**	**82**	**55**	**57**	**59**	**51**	**26**	**35**	**17**	**16**
1	1	0	0	0	2	9	10	**40**	24	19	18	21	**20**	13	25	12	15	17	8	8	8	3	6	1
2	0	1	0	0	4	6	**25**	24	16	20	18	23	**42**	14	11	8	15	18	10	6	12	1	3	0
1	0	1	0	0	3	5	**26**	10	14	26	16	15	**26**	14	29	15	13	7	20	7	7	8	3	2
0	1	1	0	1	8	7	**42**	14	15	22	16	13	**18**	18	17	20	14	17	13	5	8	5	4	0

AM Peak 0715 - 0815 (133), AM PHF=0.79 PM Peak 1300 - 1400 (106), PM PHF=0.63

*** Saturday, May 21, 2016 - Total=796, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
3	**2**	**2**	**0**	**4**	**10**	**10**	**23**	**41**	**48**	**77**	**60**	**63**	**46**	**50**	**48**	**67**	**47**	**55**	**31**	**42**	**34**	**17**	**16**
1	1	1	0	1	2	3	5	5	11	11	**22**	24	15	10	14	**23**	13	12	8	11	8	8	2	4
0	1	0	0	0	1	1	5	13	15	**23**	6	10	11	16	9	**22**	12	10	9	9	10	5	6	0
2	0	0	0	1	2	4	10	12	10	**25**	14	16	9	8	11	**15**	9	17	9	13	12	3	5	0
0	0	1	0	2	5	2	3	11	12	**18**	18	13	11	16	**14**	7	13	16	5	9	4	1	3	1

AM Peak 1015 - 1115 (88), AM PHF=0.88 PM Peak 1545 - 1645 (74), PM PHF=0.80

*** Sunday, May 22, 2016 - Total=624, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
5	**2**	**0**	**0**	**0**	**5**	**5**	**13**	**36**	**20**	**36**	**20**	**61**	**29**	**65**	**47**	**77**	**49**	**39**	**33**	**42**	**23**	**14**	**3**
4	0	0	0	0	1	1	2	11	3	6	8	**27**	11	14	12	**23**	16	11	15	16	5	3	2	2
0	2	0	0	0	3	2	1	13	8	11	4	**10**	3	30	8	**22**	12	15	7	9	6	6	1	0
0	0	0	0	0	1	1	6	6	4	9	5	**11**	7	12	12	**22**	6	5	4	9	5	2	0	0
1	0	0	0	0	0	1	4	6	5	10	**3**	13	8	9	**15**	10	15	8	7	8	7	3	0	0

AM Peak 1145 - 1245 (51), AM PHF=0.47 PM Peak 1545 - 1645 (82), PM PHF=0.89

*** Monday, May 23, 2016 - Total=1084, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
2	**0**	**2**	**2**	**6**	**13**	**32**	**103**	**82**	**49**	**56**	**64**	**73**	**66**	**76**	**113**	**65**	**72**	**58**	**44**	**61**	**21**	**17**	**7**
2	0	0	0	1	2	3	14	**30**	14	9	13	24	14	12	**38**	23	18	23	13	6	7	5	4	2
0	0	0	0	0	4	7	17	**27**	11	12	18	12	21	15	**25**	12	16	17	10	27	6	8	0	0
0	0	2	1	2	3	9	**30**	13	13	16	16	13	13	12	**22**	14	18	10	13	16	6	4	1	1
0	0	0	1	3	4	13	**42**	12	11	19	17	24	18	**37**	28	16	20	8	8	12	2	0	2	0

AM Peak 0730 - 0830 (129), AM PHF=0.77 PM Peak 1445 - 1545 (122), PM PHF=0.80

*** Tuesday, May 24, 2016 - Total=1031, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
3	**0**	**1**	**0**	**4**	**16**	**31**	**113**	**90**	**44**	**42**	**52**	**63**	**70**	**63**	**103**	**68**	**72**	**48**	**53**	**50**	**21**	**17**	**7**
2	0	0	0	0	1	7	11	**42**	10	11	5	29	21	17	**43**	18	18	10	16	9	2	4	0	2
0	0	1	0	0	4	7	15	**19**	11	9	27	10	15	11	**23**	15	23	9	10	14	10	5	6	0
1	0	0	0	1	6	7	**36**	13	7	10	10	11	22	13	**17**	14	16	14	15	18	2	4	0	1
0	0	0	0	3	5	10	**51**	16	16	12	10	13	12	**22**	20	21	15	15	12	9	7	4	1	2

AM Peak 0730 - 0830 (148), AM PHF=0.73 PM Peak 1445 - 1545 (105), PM PHF=0.61

*** Wednesday, May 25, 2016 - Total=1063, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
5	**3**	**3**	**0**	**2**	**19**	**36**	**112**	**89**	**52**	**50**	**53**	**55**	**59**	**76**	**97**	**77**	**73**	**58**	**54**	**37**	**33**	**11**	**9**
2	0	0	0	0	4	10	9	**41**	10	11	9	17	12	20	**36**	20	14	14	14	14	12	2	5	0
0	1	0	0	0	2	7	**22**	20	16	15	18	14	17	13	**23**	16	22	12	12	7	9	2	4	1
1	1	3	0	0	2	8	**26**	10	11	15	12	11	10	20	**21**	22	19	10	7	7	4	3	0	0
2	1	0	0	2	11	11	**55**	18	15	9	14	13	20	**23**	17	19	18	22	21	9	8	4	0	1

AM Peak 0715 - 0815 (144), AM PHF=0.65 PM Peak 1445 - 1545 (103), PM PHF=0.72

*** Thursday, May 26, 2016 - Total=1113, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
2	**1**	**0**	**1**	**3**	**16**	**36**	**93**	**97**	**42**	**73**	**84**	**70**	**54**	**62**	**95**	**77**	**84**	**46**	**57**	**55**	**29**	**24**	**12**
0	0	0	0	0	2	5	8	**42**	8	16	19	25	15	9	**37**	25	19	13	13	25	7	8	3	2
1	0	0	1	0	3	7	14	**23**	12	24	28	16	11	19	**16**	14	20	9	17	7	8	4	1	0
0	1	0	0	0	1	7	**34**	17	8	16	15	17	13	17	**16**	26	29	12	9	16	10	7	3	0
1	0	0	0	3	10	17	**37**	15	14	17	22	12	15	17	**26**	12	16	12	18	7	4	5	5	0

AM Peak 0730 - 0830 (136), AM PHF=0.81 PM Peak 1500 - 1600 (95), PM PHF=0.64

*** Friday, May 27, 2016 - Total=1217, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
2	**0**	**0**	**1**	**1**	**13**	**27**	**84**	**106**	**72**	**80**	**82**	**71**	**130**	**87**	**71**	**68**	**87**	**73**	**40**	**23**	**43**	**42**	**14**
2	0	0	0	0	1	1	9	**47**	24	19	19	23	**31**	20	23	17	25	23	9	7	7	11	6	1

APPENDIX B

Traffic Movement Data

0 0 0 0 0 2 7 16 **22** 17 12 18 12 **64** 21 16 19 28 30 7 7 11 7 4 6
0 0 0 0 0 4 8 **24** 17 16 28 22 **22** 17 18 14 19 21 9 13 4 10 9 3 1
0 0 0 1 1 6 11 **35** 20 15 21 23 **14** 18 28 18 13 13 11 11 5 15 15 1 1

AM Peak 0730 - 0830 (128), AM PHF=0.68 PM Peak 1230 - 1330 (131), PM PHF=0.51

* Saturday, May 28, 2016 - Total=826, 15 minute drops

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

9 5 2 4 0 5 18 32 46 46 70 40 60 71 66 49 42 57 55 43 43 27 24 12

1 1 1 0 0 1 5 11 10 11 14 **15** 15 14 **24** 12 12 12 14 4 14 9 8 5 0
6 3 1 1 0 0 3 9 13 7 **18** 10 14 13 **17** 14 11 18 12 11 13 8 8 0 3
1 1 0 0 0 1 5 5 11 13 **18** 8 18 **19** 13 14 12 16 16 12 10 9 1 2 1
1 0 0 3 0 3 5 7 12 15 **20** 7 13 **25** 12 9 7 11 13 16 6 1 7 5 0

AM Peak 1015 - 1115 (71), AM PHF=0.89 PM Peak 1330 - 1430 (85), PM PHF=0.85

* Sunday, May 29, 2016 - Total=594, 15 minute drops

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

4 8 0 0 0 0 4 12 31 14 41 37 74 36 71 34 72 26 38 26 31 20 8 7

0 2 0 0 0 0 1 3 3 5 3 8 **21** 7 29 5 33 10 15 8 6 3 4 1 4
3 1 0 0 0 0 0 3 11 1 15 16 **24** 13 18 14 14 6 10 8 6 9 1 4 0
1 3 0 0 0 0 1 3 7 2 8 6 **12** 5 16 9 13 5 9 4 15 5 2 1 0
0 2 0 0 0 0 2 3 10 6 15 **7** **17** 11 8 6 12 5 4 6 4 3 1 1 1

AM Peak 1145 - 1245 (64), AM PHF=0.67 PM Peak 1200 - 1300 (74), PM PHF=0.77

* Monday, May 30, 2016 - Total=609, 15 minute drops

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

5 4 3 0 0 7 22 27 16 24 57 33 46 42 43 42 37 49 43 34 25 27 14 9

4 2 0 0 0 0 3 11 4 9 **13** 11 10 **16** 7 8 11 12 9 14 9 11 4 3 1
0 0 3 0 0 1 5 3 5 9 **11** 7 9 **12** 16 12 7 15 10 9 5 8 5 1 1
0 1 0 0 0 2 5 2 4 4 **12** 5 **16** 8 10 12 9 16 11 6 5 4 3 2 1
1 1 0 0 0 4 9 11 3 2 **21** 10 **11** 6 10 10 10 6 13 5 6 4 2 3 1

AM Peak 1000 - 1100 (57), AM PHF=0.68 PM Peak 1230 - 1330 (55), PM PHF=0.86

* Tuesday, May 31, 2016 - Total=841, 15 minute drops

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

4 1 2 0 1 15 25 53 49 27 51 55 65 67 50 58 53 55 56 47 52 27 21 7

1 0 1 0 0 1 5 7 16 6 16 12 **26** **15** 14 10 19 8 20 15 11 8 1 1 1
1 0 1 0 1 3 6 12 15 4 11 12 **15** **13** 12 18 10 18 10 15 13 5 12 5 0
1 0 0 0 0 3 7 15 7 6 13 12 **14** **19** 14 19 11 17 9 7 12 9 2 1 0
1 1 0 0 0 8 7 19 11 11 11 **19** 10 **20** 10 11 13 12 17 10 16 5 6 0 0

AM Peak 1145 - 1245 (74), AM PHF=0.71 PM Peak 1300 - 1400 (67), PM PHF=0.84

* Wednesday, June 01, 2016 - Total=613, 15 minute drops

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

1 5 1 1 2 16 38 56 55 42 70 54 70 61 68 54 19 0 0 0 0 0 0 0

1 1 0 0 1 3 8 8 16 9 **18** 12 19 11 **22** 16 7 0 0 0 0 0 0 0
0 1 0 0 0 1 5 12 13 16 **17** 12 15 18 **8** 14 12 0 0 0 0 0 0 0 0
0 0 1 0 0 2 6 16 10 4 **20** 8 12 13 **24** 10 0 0 0 0 0 0 0 0 0
0 3 0 1 1 10 19 20 16 13 **15** 22 24 **19** 14 14 0 0 0 0 0 0 0 0 0

AM Peak 1000 - 1100 (70), AM PHF=0.88 PM Peak 1345 - 1445 (73), PM PHF=0.76

APPENDIX B

Traffic Movement Data

Eastbound:

*** Thursday, May 19, 2016 - Total=170, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**14**	**12**	**20**	**17**	**17**	**27**	**15**	**12**	**13**	**5**	**9**	**3**	**0**	
0	0	0	0	0	0	0	0	0	0	1	**3**	6	5	5	**4**	4	5	3	3	3	1	0	0
0	0	0	0	0	0	0	0	0	0	0	**3**	2	5	3	8	**6**	4	2	3	0	2	0	0
0	0	0	0	0	0	0	0	0	0	4	**4**	1	7	6	3	**10**	3	3	2	0	1	1	0
0	0	0	0	0	0	0	0	0	0	2	**6**	6	2	3	1	**7**	4	2	5	2	3	1	0

AM Peak 1115 - 1215 (16), AM PHF=0.67 PM Peak 1600 - 1700 (27), PM PHF=0.68

*** Friday, May 20, 2016 - Total=244, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**0**	**0**	**1**	**3**	**0**	**5**	**12**	**18**	**12**	**19**	**21**	**18**	**22**	**21**	**23**	**9**	**21**	**14**	**8**	**10**	**4**	**1**	**2**
0	0	0	0	0	0	0	1	7	2	2	3	**4**	2	**5**	4	2	9	3	2	4	0	0	0
0	0	0	1	1	0	1	1	5	3	4	5	**8**	**6**	5	6	2	6	3	3	1	2	0	0
0	0	0	0	0	1	0	2	5	3	3	6	**5**	4	**10**	6	7	1	4	6	1	1	0	1
0	0	0	0	1	0	2	5	3	4	7	**8**	2	**4**	5	6	4	2	2	2	4	2	0	1

AM Peak 1130 - 1230 (25), AM PHF=0.78 PM Peak 1315 - 1415 (25), PM PHF=0.63

*** Saturday, May 21, 2016 - Total=149, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**1**	**0**	**0**	**1**	**0**	**3**	**3**	**10**	**11**	**11**	**16**	**9**	**8**	**12**	**9**	**10**	**6**	**13**	**8**	**7**	**4**	**5**	**2**
0	1	0	0	0	0	1	1	1	2	3	**6**	5	4	1	**3**	5	0	2	1	3	1	3	1	0
0	0	0	0	0	0	0	0	0	5	5	0	**1**	0	2	**7**	2	0	2	1	2	1	1	1	0	0
0	0	0	0	0	0	0	1	2	0	3	4	**4**	1	0	**2**	2	3	2	6	2	3	2	1	0	0
0	0	0	0	0	1	0	1	0	4	1	4	**5**	3	2	**2**	2	2	2	4	3	0	0	0	1	0

AM Peak 1100 - 1200 (16), AM PHF=0.67 PM Peak 1415 - 1515 (14), PM PHF=0.50

*** Sunday, May 22, 2016 - Total=104, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**0**	**0**	**0**	**2**	**0**	**2**	**1**	**6**	**2**	**12**	**11**	**19**	**9**	**8**	**2**	**4**	**6**	**8**	**7**	**2**	**2**	**0**	**1**
0	0	0	0	1	0	0	0	0	1	3	5	**6**	4	1	1	0	2	4	1	1	0	0	0	0
0	0	0	0	0	0	0	0	0	1	0	2	1	**6**	1	3	1	1	1	1	3	1	1	0	1	0
0	0	0	0	0	0	0	0	0	0	1	3	**1**	**1**	2	1	0	1	1	3	1	0	0	0	0	1
0	0	0	0	1	0	2	1	5	0	4	**4**	**6**	2	3	0	2	2	0	2	0	1	0	0	0	0

AM Peak 1130 - 1230 (17), AM PHF=0.71 PM Peak 1200 - 1300 (19), PM PHF=0.79

*** Monday, May 23, 2016 - Total=229, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
1	**0**	**0**	**0**	**2**	**0**	**3**	**9**	**20**	**13**	**10**	**7**	**19**	**23**	**20**	**21**	**14**	**25**	**14**	**9**	**10**	**5**	**3**	**1**
0	0	0	0	1	0	1	1	3	**4**	2	2	6	5	4	5	1	**7**	3	3	3	1	1	0	0
0	0	0	0	1	0	0	1	**3**	1	4	2	5	8	4	5	3	**7**	5	2	1	3	1	0	0
1	0	0	0	0	0	1	4	**9**	4	1	1	5	5	8	6	5	**8**	1	3	5	1	0	0	0
0	0	0	0	0	0	0	1	3	**5**	4	3	2	3	5	4	5	**5**	3	5	1	1	0	1	1	0

AM Peak 0815 - 0915 (21), AM PHF=0.58 PM Peak 1645 - 1745 (27), PM PHF=0.84

*** Tuesday, May 24, 2016 - Total=299, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**0**	**0**	**0**	**1**	**1**	**4**	**20**	**10**	**10**	**16**	**22**	**24**	**17**	**21**	**27**	**22**	**17**	**39**	**17**	**21**	**7**	**2**	**1**
0	0	0	0	0	0	2	1	5	4	4	4	**8**	5	4	4	8	9	**10**	3	8	4	1	0	0
0	0	0	0	1	0	0	5	2	2	5	5	**5**	1	5	6	4	4	**10**	5	8	2	0	0	0
0	0	0	0	0	0	0	0	4	1	2	3	5	**7**	1	4	12	2	3	**10**	5	4	1	1	1	0
0	0	0	0	0	0	1	2	10	2	2	4	**8**	4	10	8	5	8	1	**9**	4	1	0	0	0	0

AM Peak 1145 - 1245 (28), AM PHF=0.88 PM Peak 1800 - 1900 (39), PM PHF=0.97

*** Wednesday, May 25, 2016 - Total=249, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**0**	**0**	**1**	**1**	**3**	**3**	**22**	**18**	**10**	**16**	**12**	**24**	**16**	**16**	**23**	**15**	**18**	**18**	**8**	**9**	**11**	**2**	**3**
0	0	0	0	1	0	1	1	**4**	2	4	2	**9**	6	2	6	4	4	2	3	3	3	2	0	0
0	0	0	1	0	1	1	2	**5**	2	5	2	**6**	1	5	6	2	7	6	2	1	5	0	3	0
0	0	0	0	0	0	1	1	**11**	3	3	3	5	**6**	3	4	5	4	3	6	1	2	3	0	0	0
0	0	0	0	0	0	1	0	**8**	6	3	4	3	**3**	6	5	6	5	4	4	2	3	0	0	0	0

AM Peak 0730 - 0830 (28), AM PHF=0.64 PM Peak 1200 - 1300 (24), PM PHF=0.67

*** Thursday, May 26, 2016 - Total=229, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**0**	**0**	**0**	**2**	**2**	**3**	**20**	**15**	**9**	**9**	**23**	**21**	**18**	**10**	**15**	**18**	**18**	**14**	**14**	**9**	**5**	**1**	**3**
0	0	0	0	0	1	0	1	0	**3**	2	1	6	5	5	1	3	0	**6**	5	2	4	0	0	1	0
0	0	0	0	0	1	0	0	1	**4**	0	3	2	5	3	1	3	**8**	4	2	7	1	2	0	1	0
0	0	0	0	0	0	0	0	**7**	6	3	1	7	3	5	6	5	**5**	2	7	2	3	1	1	0	0
0	0	0	0	0	0	2	2	**12**	2	4	4	8	8	5	2	4	**5**	6	0	3	1	2	0	1	0

AM Peak 0730 - 0830 (26), AM PHF=0.54 PM Peak 1615 - 1715 (24), PM PHF=0.75

*** Friday, May 27, 2016 - Total=246, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**0**	**0**	**0**	**1**	**2**	**1**	**8**	**23**	**20**	**21**	**25**	**18**	**25**	**11**	**11**	**19**	**12**	**19**	**8**	**5**	**9**	**5**	**3**
0	0	0	0	0	0	0	3	6	6	5	**7**	5	**6**	2	4	6	2	4	2	4	3	0	0	0

APPENDIX B

Traffic Movement Data

0 0 0 0 1 0 1 1 7 5 4 **8** 4 **7** 3 1 3 5 5 1 1 2 0 0 0
0 0 0 0 0 1 0 2 6 4 5 **6** 4 **6** 3 2 3 1 6 2 0 2 1 2 0
0 0 0 0 0 1 0 2 4 5 **7** 4 5 **6** 3 4 7 4 4 3 0 2 4 1 0

AM Peak 1045 - 1145 (28), AM PHF=0.88 PM Peak 1300 - 1400 (25), PM PHF=0.89

*** Saturday, May 28, 2016 - Total=205, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

0 0 0 0 0 0 3 6 13 15 12 17 20 19 15 15 13 9 16 13 9 6 1 3

0 0 0 0 0 0 1 2 2 2 3 0 **5** **3** 3 3 2 2 3 1 3 1 0 0 0
0 0 0 0 0 0 1 0 4 3 4 **5** 3 **5** 5 4 3 3 3 4 2 3 1 2 2
0 0 0 0 0 0 1 1 2 5 2 **4** 2 **3** 3 2 1 3 3 3 3 2 0 0 0
0 0 0 0 0 0 0 3 5 5 3 **8** **10** 8 4 6 7 1 7 5 1 0 0 1 1

AM Peak 1115 - 1215 (22), AM PHF=0.69 PM Peak 1245 - 1345 (21), PM PHF=0.53

*** Sunday, May 29, 2016 - Total=146, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

3 0 0 0 0 0 2 1 2 13 9 3 12 16 18 11 11 8 11 7 5 7 3 4

0 0 0 0 0 0 0 1 1 **1** 1 2 5 3 **8** 1 5 0 1 0 2 4 0 0 1
2 0 0 0 0 0 0 1 0 0 **3** 3 0 2 3 **4** 4 2 1 5 2 1 2 1 1 0
0 0 0 0 0 0 0 0 0 1 **5** 2 0 2 **6** 5 4 2 4 3 3 0 0 1 2 0
1 0 0 0 0 0 0 1 0 0 **4** 3 1 3 **4** 1 2 2 3 2 2 2 1 1 1 0

AM Peak 0900 - 1000 (13), AM PHF=0.65 PM Peak 1330 - 1430 (22), PM PHF=0.69

*** Monday, May 30, 2016 - Total=185, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

1 2 0 1 0 0 1 2 7 10 11 15 16 12 19 8 14 21 14 12 5 7 4 3

1 1 0 1 0 0 1 0 0 2 1 **5** 1 2 1 1 3 3 **2** 3 1 2 0 1 0
0 0 0 0 0 0 0 0 0 1 2 2 **3** 5 3 7 2 3 2 **6** 1 1 2 2 0 0
0 1 0 0 0 0 0 0 1 2 3 3 **6** 5 5 6 4 4 **5** 3 5 1 2 1 0 0
0 0 0 0 0 0 0 0 1 4 3 **5** 1 5 2 5 1 4 **11** 3 3 2 1 1 2 0

AM Peak 1045 - 1145 (19), AM PHF=0.79 PM Peak 1730 - 1830 (24), PM PHF=0.55

*** Tuesday, May 31, 2016 - Total=335, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

0 0 0 0 0 2 6 15 17 21 27 31 27 27 30 22 13 33 24 17 8 13 2 0

0 0 0 0 0 0 2 2 4 4 **10** 7 5 9 4 3 3 **6** 5 3 3 7 0 0 0
0 0 0 0 0 1 1 3 8 3 **6** 6 5 3 8 4 1 **7** 6 5 1 3 0 0 0
0 0 0 0 0 0 0 6 0 6 **7** 8 9 7 7 9 5 **10** 8 3 2 2 2 0 1
0 0 0 0 0 1 3 4 5 **8** 4 10 8 8 11 6 4 **10** 5 6 2 1 0 0 0

AM Peak 0945 - 1045 (31), AM PHF=0.78 PM Peak 1700 - 1800 (33), PM PHF=0.82

*** Wednesday, June 01, 2016 - Total=157, 15 minute drops**

0000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300

1 0 0 2 1 3 4 7 12 15 13 24 23 19 10 15 8 0 0 0 0 0 0 0 0

0 0 0 1 0 1 2 1 3 8 1 **5** 6 **1** 3 6 3 0 0 0 0 0 0 0 0
0 0 0 0 1 0 1 1 5 2 1 **5** 5 **12** 3 2 5 0 0 0 0 0 0 0 0
1 0 0 1 0 1 1 5 0 1 4 **8** **6** 2 3 6 0 0 0 0 0 0 0 0 0
0 0 0 0 0 1 0 0 4 4 **7** 6 **6** 4 1 1 0 0 0 0 0 0 0 0 0

AM Peak 1045 - 1145 (25), AM PHF=0.78 PM Peak 1230 - 1330 (25), PM PHF=0.52

APPENDIX B

Traffic Movement Data

Westbound:

*** Thursday, May 19, 2016 - Total=151, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**13**	**6**	**10**	**15**	**18**	**26**	**14**	**22**	**8**	**5**	**3**	**3**	**6**	**1**	
0	0	0	0	0	0	0	0	0	**3**	2	3	4	1	**9**	2	6	4	1	0	1	2	0	0
0	0	0	0	0	0	0	0	0	**1**	2	2	4	5	**4**	4	10	1	1	3	1	0	0	0
0	0	0	0	0	0	0	0	0	**4**	1	4	4	2	**5**	4	2	1	2	0	1	2	1	0
0	0	0	0	0	0	0	0	1	**5**	1	1	3	**10**	8	4	4	2	1	0	0	2	0	0

AM Peak 1000 - 1100 (13), AM PHF=0.65 PM Peak 1445 - 1545 (28), PM PHF=0.70

*** Friday, May 20, 2016 - Total=204, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**0**	**1**	**1**	**0**	**2**	**5**	**10**	**12**	**13**	**14**	**13**	**14**	**29**	**20**	**8**	**16**	**18**	**11**	**7**	**5**	**1**	**2**	**2**
0	0	1	0	0	1	1	2	**7**	3	3	4	4	**8**	4	2	5	5	3	3	0	0	0	2
0	0	0	1	0	0	2	1	**1**	2	3	4	3	**8**	4	1	4	5	1	2	1	0	0	1	0
0	0	0	0	0	0	1	1	1	**2**	7	5	2	3	**9**	7	4	4	2	3	1	2	0	2	1	0
0	0	0	0	0	0	0	1	**6**	2	1	3	3	**4**	4	5	1	3	6	4	1	2	1	0	0	0

AM Peak 0745 - 0845 (16), AM PHF=0.57 PM Peak 1245 - 1345 (29), PM PHF=0.81

*** Saturday, May 21, 2016 - Total=103, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
2	**0**	**0**	**0**	**1**	**1**	**2**	**1**	**2**	**4**	**7**	**10**	**13**	**12**	**7**	**5**	**4**	**5**	**13**	**4**	**3**	**2**	**4**	**1**
2	0	0	0	0	0	0	1	1	0	2	4	**4**	**6**	2	1	2	1	4	2	3	2	1	0	0
0	0	0	0	0	1	0	1	0	0	1	1	1	**2**	**3**	3	1	1	2	3	0	0	0	1	0	0
0	0	0	0	0	0	1	0	0	1	1	1	1	**3**	3	1	1	0	1	5	1	0	0	2	0	0
0	0	0	0	0	0	0	1	0	0	2	3	**4**	**4**	0	1	2	1	1	1	1	0	0	0	1	1

AM Peak 1145 - 1245 (13), AM PHF=0.81 PM Peak 1230 - 1330 (16), PM PHF=0.67

*** Sunday, May 22, 2016 - Total=65, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
1	**1**	**0**	**1**	**0**	**0**	**1**	**3**	**5**	**2**	**2**	**6**	**6**	**3**	**1**	**1**	**8**	**6**	**5**	**5**	**2**	**6**	**0**	**0**
0	0	0	0	0	0	0	0	0	**1**	1	3	2	0	0	0	1	**3**	2	1	0	3	0	0	0
0	1	0	0	0	0	0	0	**0**	0	0	1	2	2	0	1	0	**2**	1	1	1	1	0	0	0
0	0	0	1	0	0	1	2	**1**	0	1	0	0	1	1	0	**5**	0	1	1	1	1	0	0	2
1	0	0	0	0	0	0	1	**4**	1	0	2	2	0	0	0	**2**	1	1	2	0	1	0	0	0

AM Peak 0815 - 0915 (6), AM PHF=0.38 PM Peak 1630 - 1730 (12), PM PHF=0.60

*** Monday, May 23, 2016 - Total=196, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
2	**0**	**0**	**1**	**1**	**0**	**3**	**8**	**13**	**12**	**8**	**6**	**12**	**27**	**22**	**27**	**13**	**17**	**9**	**7**	**2**	**4**	**1**	**1**
0	0	0	1	0	0	1	0	**2**	5	2	1	1	5	2	**14**	4	7	1	2	1	0	1	0	0
0	0	0	0	1	0	0	0	**3**	1	4	3	0	7	4	**5**	3	3	4	4	0	2	0	0	0
2	0	0	0	0	0	0	0	1	**4**	2	1	1	2	6	**3**	3	3	3	3	0	0	2	0	1	0
0	0	0	0	0	0	0	2	**7**	4	4	1	1	9	9	**13**	5	3	4	1	1	1	0	0	0	0

AM Peak 0745 - 0845 (16), AM PHF=0.57 PM Peak 1430 - 1530 (35), PM PHF=0.63

*** Tuesday, May 24, 2016 - Total=230, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**0**	**0**	**0**	**0**	**1**	**4**	**10**	**13**	**9**	**10**	**18**	**26**	**22**	**19**	**35**	**13**	**12**	**14**	**11**	**8**	**1**	**4**	**0**
0	0	0	0	0	0	0	0	7	0	1	2	**4**	5	5	**9**	3	3	3	2	0	0	1	0	0
0	0	0	0	0	0	0	2	1	2	3	2	6	**7**	7	4	**9**	3	5	2	2	4	0	0	0	0
0	0	0	0	0	0	1	0	1	2	3	4	**5**	5	4	2	**5**	2	4	5	3	3	0	1	0	0
0	0	0	0	0	0	0	2	8	2	3	3	**5**	10	6	8	**12**	5	0	4	4	1	1	2	0	0

AM Peak 1130 - 1230 (21), AM PHF=0.75 PM Peak 1500 - 1600 (35), PM PHF=0.73

*** Wednesday, May 25, 2016 - Total=243, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**0**	**0**	**1**	**1**	**1**	**4**	**11**	**12**	**12**	**5**	**19**	**27**	**25**	**20**	**25**	**16**	**16**	**19**	**12**	**11**	**4**	**2**	**0**
0	0	0	0	0	0	0	0	7	5	1	1	**4**	6	3	**11**	7	3	4	2	2	2	1	0	0
0	0	0	1	1	0	2	0	2	4	1	7	**5**	6	3	**6**	5	5	5	3	4	1	0	0	0
0	0	0	0	0	1	0	2	1	0	1	4	**11**	8	**5**	1	0	3	6	2	2	1	0	0	0
0	0	0	0	0	0	2	9	2	3	2	**7**	7	5	**9**	7	4	5	4	5	3	0	1	0	0

AM Peak 1145 - 1245 (27), AM PHF=0.61 PM Peak 1430 - 1530 (31), PM PHF=0.70

*** Thursday, May 26, 2016 - Total=204, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**2**	**0**	**0**	**1**	**1**	**4**	**9**	**15**	**5**	**14**	**17**	**21**	**16**	**20**	**15**	**16**	**11**	**7**	**14**	**7**	**1**	**3**	**5**
0	0	0	0	0	0	2	0	5	0	5	6	**7**	5	4	**8**	2	2	2	2	3	0	2	2	1
0	0	0	0	0	0	0	0	0	4	2	4	3	**6**	2	**2**	2	4	4	1	5	1	0	0	1	0
0	0	0	0	0	0	1	1	3	2	2	4	**2**	2	6	**6**	4	7	4	2	6	2	1	0	2	1
0	2	0	0	1	0	1	6	4	1	1	**6**	6	3	**8**	1	3	1	2	1	1	0	1	0	0

AM Peak 1130 - 1230 (21), AM PHF=0.75 PM Peak 1415 - 1515 (24), PM PHF=0.75

*** Friday, May 27, 2016 - Total=225, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
2	**0**	**0**	**0**	**0**	**2**	**3**	**6**	**16**	**14**	**17**	**15**	**20**	**32**	**18**	**20**	**16**	**12**	**9**	**9**	**6**	**4**	**3**	**1**
1	0	0	0	0	0	2	0	2	3	**5**	5	2	**5**	1	5	5	4	3	3	3	3	0	1	0

APPENDIX B

Traffic Movement Data

0	0	0	0	0	0	0	1	9	2	**3**	3	2	**12**	2	6	3	3	4	3	2	0	3	0	0
1	0	0	0	0	1	0	2	3	3	**4**	2	9	**10**	5	6	5	2	1	1	0	1	0	0	0
0	0	0	0	0	1	1	3	2	**6**	5	5	**7**	5	10	3	3	3	1	2	1	0	0	0	0

AM Peak 0945 - 1045 (18), AM PHF=0.75 PM Peak 1245 - 1345 (34), PM PHF=0.71

* Saturday, May 28, 2016 - Total=146, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**3**	**3**	**1**	**0**	**1**	**4**	**2**	**7**	**12**	**9**	**3**	**16**	**8**	**13**	**11**	**9**	**9**	**10**	**7**	**10**	**4**	**1**	**3**
0	0	0	0	0	0	0	1	0	1	0	0	**7**	1	5	1	0	4	1	2	2	1	0	1	0
0	0	2	0	0	0	0	0	4	2	3	0	**7**	1	3	1	2	1	3	2	0	2	0	0	0
0	2	1	1	0	1	0	1	0	4	4	0	**1**	3	2	6	4	2	1	2	2	1	0	2	0
0	1	0	0	0	0	4	0	3	5	2	**3**	**1**	3	3	3	3	2	5	1	6	0	1	0	0

AM Peak 1145 - 1245 (18), AM PHF=0.64 PM Peak 1200 - 1300 (16), PM PHF=0.57

* Sunday, May 29, 2016 - Total=92, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**7**	**11**	**3**	**8**	**5**	**5**	**10**	**11**	**6**	**0**	**9**	**5**	**3**	**3**	**3**	**0**
0	0	2	0	0	0	0	0	2	**3**	1	0	1	2	4	**4**	2	0	0	1	0	0	2	0	0
0	0	1	0	0	0	0	0	0	**0**	1	5	2	0	1	**1**	0	0	2	2	0	1	1	0	0
0	0	0	0	0	0	0	0	2	**3**	1	0	1	0	2	**3**	2	0	5	1	2	2	0	0	1
0	0	0	0	0	0	0	0	3	**5**	0	3	1	3	**3**	3	2	0	2	1	1	0	0	0	0

AM Peak 0900 - 1000 (11), AM PHF=0.55 PM Peak 1445 - 1545 (11), PM PHF=0.69

* Monday, May 30, 2016 - Total=121, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
1	**1**	**0**	**0**	**0**	**1**	**0**	**6**	**5**	**5**	**8**	**9**	**15**	**11**	**13**	**3**	**6**	**5**	**7**	**5**	**7**	**5**	**4**	**4**
0	0	0	0	0	0	0	1	2	1	3	**4**	**1**	1	5	1	1	0	3	1	0	2	3	1	1
0	0	0	0	0	0	0	1	2	1	1	**3**	**2**	2	2	0	3	0	1	1	2	1	1	2	0
1	1	0	0	0	1	0	2	0	2	**2**	1	**5**	3	2	0	1	2	2	1	3	1	0	0	0
0	0	0	0	0	0	0	0	2	1	1	**2**	1	**7**	5	4	2	1	3	1	2	2	1	0	1	0

AM Peak 1030 - 1130 (11), AM PHF=0.69 PM Peak 1200 - 1300 (15), PM PHF=0.54

* Tuesday, May 31, 2016 - Total=216, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
1	**0**	**0**	**1**	**1**	**2**	**3**	**13**	**7**	**16**	**9**	**4**	**22**	**22**	**21**	**20**	**18**	**21**	**13**	**7**	**7**	**5**	**2**	**1**
1	0	0	1	0	0	1	4	2	4	2	2	**7**	4	**8**	4	6	9	6	1	2	2	0	0	0
0	0	0	0	0	0	1	2	1	4	2	0	**5**	**4**	1	6	4	3	2	1	3	1	0	0	0
0	0	0	0	0	2	0	2	1	5	3	1	**4**	**5**	8	5	4	4	2	4	2	2	2	0	0
0	0	0	0	1	0	1	5	3	3	2	**1**	6	**9**	4	5	4	5	3	1	0	0	0	1	0

AM Peak 1145 - 1245 (17), AM PHF=0.61 PM Peak 1315 - 1415 (26), PM PHF=0.72

* Wednesday, June 01, 2016 - Total=129, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
0	**2**	**0**	**1**	**1**	**1**	**3**	**1**	**12**	**11**	**11**	**12**	**29**	**10**	**13**	**14**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
0	0	0	0	0	0	1	0	2	3	2	3	**6**	2	3	4	2	0	0	0	0	0	0	0	0
0	2	0	0	0	0	0	0	4	5	4	6	**5**	4	4	3	5	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	1	2	3	2	**7**	2	2	5	1	0	0	0	0	0	0	0
0	0	0	1	1	0	2	1	5	1	2	**1**	**11**	2	4	2	0	0	0	0	0	0	0	0	0

AM Peak 1145 - 1245 (19), AM PHF=0.68 PM Peak 1200 - 1300 (29), PM PHF=0.66

APPENDIX C

PC-Warrants Analysis

Horrocks Engineers

Warrant Study

(801) 763-5100

Study Name : **Roosevelt Stop Warrant**
Study Date : **07/18/16**

Multi-Way Stop Warrant Report

Major Street Approaches

Northbound: **600 East**
Total Approach Volume: **900**
85% Speed < 40 MPH.

Southbound: **600 East**
Total Approach Volume: **1,063**
85% Speed < 40 MPH.

Minor Street Approaches

Eastbound: **300 North**
Total Approach Volume: **249**

Westbound: **300 North**
Total Approach Volume: **243**

Warrant Summary

Criteria A - Interim Measure ..... Not Evaluated
If traffic signals are justified, stop signs can be installed as an interim measure.

Criteria B - Crash Experience ..... **Not Satisfied**
Number of crashes (0) is less than the minimum required (5).

Criteria C - Minimum Volumes and Delays ..... **Not Satisfied**
Delay data not evaluated
Average of 8 highest hours does not meet volume criteria.

Criteria D - 80% of Volumes, Delays, and Crashes ..... **Not Satisfied**
Delay data not evaluated
Number of crashes (0) is less than the minimum required (4).
Average of 8 highest hours does not meet volume criteria.

Analysis of 8-Hour Volume Warrants:

Time	Major Total	Major Avg	Minor Total	Minor Avg	Crit C Major	Crit C Minor	Crit C Meets?	Crit D Major	Crit D Minor	Crit D Meets?
07:00 - 08:00	164	144.5	33	38.9	300-No	200-No	No	240-No	160-No	No
15:00 - 16:00	163		48							
16:00 - 17:00	156		31							
14:00 - 15:00	144		36							
12:00 - 13:00	141		51							
17:00 - 18:00	140		34							
13:00 - 14:00	126		41							
18:00 - 19:00	122		37							
08:00 - 09:00	120		30							
11:00 - 12:00	106		31							
20:00 - 21:00	93		20							
10:00 - 11:00	92		21							
21:00 - 22:00	88		15							
19:00 - 20:00	87		20							
09:00 - 10:00	86		22							
06:00 - 07:00	52		7							
22:00 - 23:00	28		4							
05:00 - 06:00	27		4							
23:00 - 00:00	9		3							
01:00 - 02:00	8		0							
00:00 - 01:00	5		0							
02:00 - 03:00	4		0							
04:00 - 05:00	2		2							
03:00 - 04:00	0		2							

ROOSEVELT *Utah*

AREVA RD. & CLUBHOUSE DR. TRAFFIC CONTROL ANALYSIS

To: Ryan Snow
Roosevelt City

From: Kelly Ash, PE, PTOE
Daniel Thurgood, PE

Date: October 17, 2017

Subject: Areva Rd & Club House Dr Traffic Control Evaluation

The purpose of this memorandum is to present the findings of the traffic study performed for Roosevelt City. The study area is the intersection of Areva Road and Club House Drive as shown in Figure 1. The purpose of the study was to analyze the existing traffic control and provide recommendations for the removal and/or installation of stop or yield signs for each approach.



Figure 1. Study Location

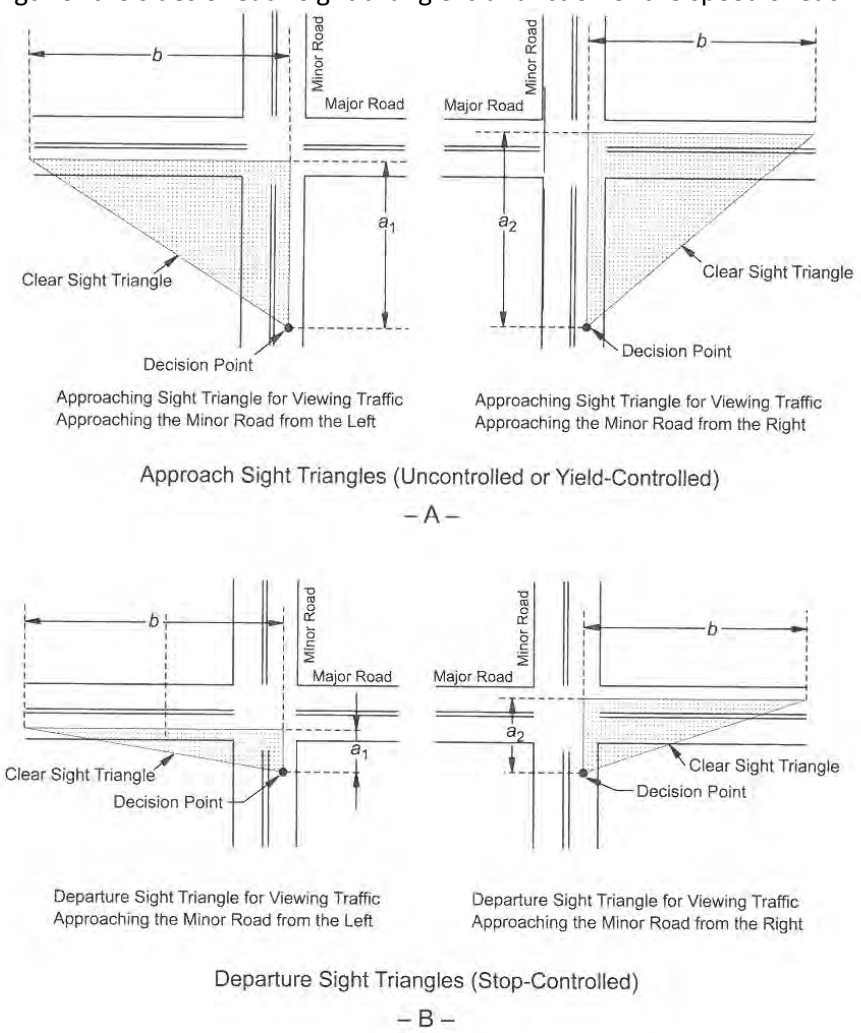
Intersection Characteristics

The study area is a T-intersection located in residential area in northwest portion of Roosevelt, Utah. The speed limit is 25 MPH throughout the study area. Currently there is no signed traffic control for the westbound or northbound approaches. A stop sign was recently installed for the southbound approach. Roosevelt Golf Course is located east of the study area. The south and east legs of the intersection are identified on the City's Transportation Master Plan as a collector road. The north leg of the intersection is a dead end local street.

Procedure

The decision whether stop signs or yield signs should be installed was primarily based on traffic volumes and available sight distance. In accordance with the Utah MUTCD (December, 2011), a stop or yield control should be used on the minor approach to an intersection if there is restricted sight distance at the intersection or if crash records indicate that a stop or yield control could mitigate crashes. Placing the stop or yield sign on the minor approach minimizes the overall delay and congestion at each intersection; however, engineering judgment should be used to determine the appropriate control for each intersection.

According to Chapter 9 of AASHTO's A Police on Geometric Design of Highways and Streets, 6th Edition, the sight distance needed by drivers on yield-controlled approaches exceeds that for stop-controlled approaches. Figure 2 below shows the sight triangles needed for both a yield and stop condition. The recommended length of the sides of each sight triangle is a function of the speed of each approach.



(Source: AASHTO's A Police on Geometric Design of Highways and Streets, 6th Edition)

Figure 2. Sight Distance Triangles

Section 2B.07 from the Utah MUTCD outlines the appropriate use for multi-way stop applications. In summary, multi-way stop intersection controls should be used where the volume of traffic on the intersecting roads is approximately equal. A multi-way stop may be considered as an interim solution to a traffic signal where a traffic signal is justified but cannot be installed immediately. A multi-way stop may be justified if five or more crashes that are susceptible to correction by a multi-way stop installation were reported within a 12 month period. Such crashes include right-turn and left-turn collisions as well as right-angle collisions. Minimum volumes suggested for a multi-way stop are as follows:

1. *The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and*
2. *The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but*
3. *If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.*

Other criteria that may be considered when determining if a multi-way stop is appropriate include:

A. *The need to control left-turn conflicts;*
B. *The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;*
C. *Locations where a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop; and*
D. *An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multi-way stop control would improve traffic operational characteristics of the intersection.*

Analysis

The study area was analyzed based on the criteria outlined above. Traffic volumes and speed data were collected for each approach on Wednesday, October 4th, 2017. A summary of the traffic volume and 85th percentile speed for each approach is shown in Table 1. Raw count data can be found in the appendix of this report.

Table 1. Traffic Volume and 85th Percentile Speed Summary

Leg	Daily Traffic Volume	85th Percentile Speed (MPH)
North	412	21.5
South	582	23.7
East	784	27.3

Crash data was evaluated using the State's crash database (Numetric). No crashes have been report at the study location in recent years.

Table 2 shows the recommended sight distance measurements according to Chapter 9 of AASHTO's A

Police on Geometric Design of Highways and Streets using a design speed of 25 mph.

Table 2. Sight Distance Measurements for 25 MPH Design Speed

Type of Control	Maneuver	Minimum Sight Distance Measurement (ft) for 25 mph (See Figure 1)		
		Length of Minor Leg to Near Lane of Major Roadway (a_1)	Length of Minor Leg to Far Lane (a_2)	Length of Major Leg (b)
Yield	Crossing	130	142	240
	Left Turn			295
Stop	All	20.5	32.5	280

(Source: Chapter 9 of the AASHTO's A Police on Geometric Design of Highways and Streets, 6th Edition)

A site visit was conducted on Thursday, October 12th, 2017 to evaluate the sight distance of each approach. Due to sight obstructions created by roadside vegetation and adjacent homes on the northeast and southeast corner of the study area, as well as the horizontal curvature of the roadway, it was determined that there was insufficient sight distance to allow yield control of any of the approaches.

When performing the analysis for possible stop control, it was determined there is insufficient sight distance to accommodate a stop control for the westbound approach due to sight distance restrictions from the northbound approach (assuming the northbound approach is uncontrolled). Additionally, there was insufficient sight distance to accommodate a stop control for the northbound approach due to sight distance restrictions for the westbound approach (assuming westbound is uncontrolled).

Recommendations

Due to the limited sight distance resulting from the horizontal curvature of the northbound approach, as well as sight obstructions created by roadside vegetation and adjacent homes, it is recommended the intersection be converted to an all-way stop. This includes the installation of new stop signs (with "ALL WAY" R1-3P supplemental plaques) for both the northbound and westbound approaches, as well as the addition of an "ALL WAY" R1-3P supplemental plaque to the existing stop sign for the southbound approach.

Additionally, the installation of a Stop Ahead (W3-1) warning sign is also recommended for the northbound approach due to the sight distance restriction created by the horizontal curvature of the roadway. According to Table 2C-4 of the Utah MUTCD, the sign should be installed at least 100 feet prior to the intersection.

If you have any questions or do not agree with our conclusions, please contact us. Thanks.



Figure 3. Northbound Approach Near View



Figure 4. Northbound Approach Far View



Figure 5. Northbound looking East



Figure 6. Westbound looking South



Figure 7. Southbound Approach



Figure 8. Westbound Approach

MetroCount Traffic Executive
Vehicle Counts

VehicleCount-60 -- English (ENU)

Datasets:

Site:	**[Roosevelt] Box 6- South Side of Club House On Mason Cir**
Attribute:	Box 6
Direction:	7 - North bound A>B, South bound B>A. **Lane:** 1
Survey Duration:	14:06 Monday, October 2, 2017 => 10:19 Thursday, October 12, 2017,
Zone:	
File:	Roosevelt Box 6.EC1 (Plus)
Identifier:	DD047A35 MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v4.05)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**14:07 Monday, October 2, 2017 => 10:19 Thursday, October 12, 2017 (9.84227)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	6 - 99 mph.
Direction:	North, East, South, West (bound), P = North
Separation:	Headway > 0 sec, Span 0 - 328.084 ft
Name:	Default Profile
Scheme:	Vehicle classification (Scheme F3)
Units:	Non metric (ft, mi, ft/s, mph, lb, ton)
In profile:	Vehicles = 1032 / 1038 (99.42%)

* Tuesday, October 3, 2017 - Total=355, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**19**	**27**	**14**	**30**	**60**	**45**	**45**	**47**	**22**	**23**	**9**	**9**	**5**	
0	0	0	0	0	0	0	0	0	0	0	0	**6**	3	8	**13**	12	13	17	3	6	4	2	1	3
0	0	0	0	0	0	0	0	0	0	0	5	**6**	8	7	**24**	10	13	18	5	6	2	2	1	0
0	0	0	0	0	0	0	0	0	0	0	**7**	4	2	5	**9**	12	8	6	8	6	1	3	2	0
0	0	0	0	0	0	0	0	0	0	0	**7**	11	1	10	**14**	11	11	6	6	5	2	2	1	0

AM Peak 1130 - 1230 (26), AM PHF=0.93 PM Peak 1500 - 1600 (60), PM PHF=0.63

* Wednesday, October 4, 2017 - Total=582, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
3	**0**	**1**	**0**	**2**	**5**	**16**	**21**	**29**	**14**	**19**	**35**	**30**	**33**	**43**	**86**	**57**	**82**	**37**	**36**	**23**	**8**	**2**	**0**	
3	0	0	0	0	1	5	2	17	6	4	7	**11**	7	8	**21**	18	31	9	9	9	1	2	0	0
0	0	0	0	0	0	4	5	2	4	8	**11**	5	8	2	**27**	15	16	12	13	4	2	0	0	0
0	0	1	0	0	4	2	6	4	4	4	**5**	6	13	23	**15**	13	18	8	6	8	2	0	0	0
0	0	0	0	2	0	5	8	6	0	3	**12**	8	5	10	**23**	11	17	8	8	2	3	0	0	0

AM Peak 1115 - 1215 (39), AM PHF=0.81 PM Peak 1500 - 1600 (86), PM PHF=0.80

* Thursday, October 5, 2017 - Total=95, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**1**	**0**	**2**	**5**	**13**	**23**	**21**	**20**	**10**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
0	0	0	0	0	1	2	1	**8**	5	7	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	**4**	3	2	3	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	1	2	**6**	3	9	0	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	2	2	6	**12**	7	4	0	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0

AM Peak 0715 - 0815 (30), AM PHF=0.63 PM Peak 1200 - 1300 (0), PM PHF=1.00

MetroCount Traffic Executive
Speed Statistics

Datasets:

Site:	**[Roosevelt] Box 6- South Side of Club House On Mason Cir**
Attribute:	Box 6
Direction:	7 - North bound A>B, South bound B>A. **Lane:** 1
Survey Duration:	14:06 Monday, October 02, 2017 => 10:19 Thursday, October 12, 2017,
File:	Roosevelt Box 6.EC1 (Plus)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Wednesday, October 04, 2017 => 0:00 Thursday, October 05, 2017 (1)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Direction:	North, East, South, West (bound), P = North
Scheme:	Vehicle classification (Scheme F2)
In profile:	Vehicles = 580 / 1038 (55.88%)

Speed Statistics

SpeedStat-470
Site: Roosevelt.1.2NS
Description: **Box 6- South Side of Club House On Mason Cir**
Filter time: **0:00 Wednesday, October 04, 2017 => 0:00 Thursday, October 05, 2017**
Scheme: Vehicle classification (Scheme F2)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12 13) Dir(NESW) Sp(6,99) Headway(>0) Span(0 - 328.084)

Vehicles = 580
Posted speed limit = 25 mph, Exceeding = 53 (9.14%), Mean Exceeding = 26.81 mph
Maximum = 30.8 mph, **Minimum** = 7.2 mph, **Mean** = 20.3 mph
85% Speed = 23.7 mph, **95% Speed** = 25.9 mph, **Median** = 20.1 mph
10 mph Pace = 15 - 25, **Number in Pace** = 494 (85.17%)
Variance = 13.48, **Standard Deviation** = 3.67 mph

Speed Bins

Speed	Bin		Below		Above		Energy	vMult	n * vMult
0 - **6**	0	0.0%	0	0.0%	580	100.0%	0.00	0.00	0.00
6 - **12**	18	3.1%	18	3.1%	562	96.9%	0.00	0.00	0.00
12 - **19**	159	27.4%	177	30.5%	403	69.5%	0.00	0.00	0.00
19 - **25**	344	59.3%	521	89.8%	59	10.2%	0.00	0.00	0.00
25 - **31**	59	10.2%	580	100.0%	0	0.0%	0.00	0.00	0.00
31 - **37**	0	0.0%	580	100.0%	0	0.0%	0.00	0.00	0.00
37 - **43**	0	0.0%	580	100.0%	0	0.0%	0.00	0.00	0.00
43 - **50**	0	0.0%	580	100.0%	0	0.0%	0.00	0.00	0.00
50 - **56**	0	0.0%	580	100.0%	0	0.0%	0.00	0.00	0.00
56 - **62**	0	0.0%	580	100.0%	0	0.0%	0.00	0.00	0.00
62 - **68**	0	0.0%	580	100.0%	0	0.0%	0.00	0.00	0.00
68 - **75**	0	0.0%	580	100.0%	0	0.0%	0.00	0.00	0.00
75 - **81**	0	0.0%	580	100.0%	0	0.0%	0.00	0.00	0.00
81 - **87**	0	0.0%	580	100.0%	0	0.0%	0.00	0.00	0.00
87 - **93**	0	0.0%	580	100.0%	0	0.0%	0.00	0.00	0.00
93 - **99**	0	0.0%	580	100.0%	0	0.0%	0.00	0.00	0.00
99 - **106**	0	0.0%	580	100.0%	0	0.0%	0.00	0.00	0.00
106 - **112**	0	0.0%	580	100.0%	0	0.0%	0.00	0.00	0.00
112 - **118**	0	0.0%	580	100.0%	0	0.0%	0.00	0.00	0.00
118 - **124**	0	0.0%	580	100.0%	0	0.0%	0.00	0.00	0.00

Total Speed Rating = 0.00
Total Moving Energy (Estimated) = 0.00

Speed limit fields

	Limit	Below		Above	
0	25 (PSL)	527	90.9%	53	9.1%

MetroCount Traffic Executive
Vehicle Counts

VehicleCount-59 -- English (ENU)

Datasets:

Site:	**[Roosevelt] Box 9 - Club House Dr**
Attribute:	Box 9_-_
Direction:	8 - East bound A>B, West bound B>A. **Lane:** 1
Survey Duration:	14:02 Monday, October 2, 2017 => 8:44 Tuesday, October 17, 2017,
Zone:	
File:	Roosevelt Box 9.EC1 (Plus)
Identifier:	FT46PE47 MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v4.05)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**14:03 Monday, October 2, 2017 => 8:44 Tuesday, October 17, 2017 (14.7791)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	6 - 99 mph.
Direction:	North, East, South, West (bound), P = East
Separation:	Headway > 0 sec, Span 0 - 328.084 ft
Name:	Default Profile
Scheme:	Vehicle classification (Scheme F3)
Units:	Non metric (ft, mi, ft/s, mph, lb, ton)
In profile:	Vehicles = 1322 / 1326 (99.70%)

* Tuesday, October 3, 2017 - Total=407, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**41**	**19**	**22**	**71**	**53**	**54**	**59**	**26**	**27**	**13**	**6**	**9**	
0	0	0	0	0	0	0	0	0	0	0	0	**8**	10	0	**18**	20	12	18	4	4	4	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0	**7**	9	0	**22**	9	18	20	7	6	6	1	4	0
0	0	0	0	0	0	0	0	0	0	0	0	**11**	0	5	**16**	14	14	8	9	11	2	1	3	0
0	0	0	0	0	0	0	0	0	0	0	**7**	15	0	**17**	15	10	10	13	6	6	1	3	1	0

AM Peak 1145 - 1245 (33), AM PHF=0.75 PM Peak 1445 - 1545 (73), PM PHF=0.83

* Wednesday, October 4, 2017 - Total=784, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
1	**0**	**0**	**0**	**5**	**9**	**16**	**42**	**34**	**31**	**33**	**48**	**45**	**41**	**61**	**96**	**58**	**108**	**64**	**47**	**29**	**7**	**7**	**2**	
1	0	0	0	0	1	4	8	16	10	7	9	**13**	10	12	**28**	6	44	15	10	8	2	4	1	0
0	0	0	0	0	4	2	7	5	7	9	**13**	7	12	11	**31**	21	25	21	19	8	0	2	0	0
0	0	0	0	2	3	6	16	4	8	6	**7**	10	11	24	**37**	16	22	15	10	9	1	1	1	0
0	0	0	0	3	1	4	11	9	6	11	**19**	15	8	**14**	0	15	17	13	8	4	4	0	0	1

AM Peak 1115 - 1215 (52), AM PHF=0.68 PM Peak 1445 - 1545 (110), PM PHF=0.74

* Thursday, October 5, 2017 - Total=131, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
1	**0**	**0**	**0**	**5**	**6**	**12**	**38**	**31**	**19**	**19**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
0	0	0	0	1	1	2	5	**11**	4	13	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	4	**7**	4	4	6	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	1	3	**13**	6	2	0	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	3	3	3	**13**	10	9	0	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0

AM Peak 0715 - 0815 (44), AM PHF=0.85 PM Peak 1200 - 1300 (0), PM PHF=1.00

MetroCount Traffic Executive
Speed Statistics

Datasets:

Site:	**[Roosevelt] Box 9 - Club House Dr**
Attribute:	Box 9_-_
Direction:	8 - East bound A>B, West bound B>A. **Lane:** 1
Survey Duration:	14:02 Monday, October 02, 2017 => 8:44 Tuesday, October 17, 2017,
File:	Roosevelt Box 9.EC1 (Plus)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Wednesday, October 04, 2017 => 0:00 Thursday, October 05, 2017 (1)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Direction:	North, East, South, West (bound), P = East
Scheme:	Vehicle classification (Scheme F2)
In profile:	Vehicles = 784 / 1326 (59.13%)

Speed Statistics

SpeedStat-471
Site: Roosevelt.1.2EW
Description: **Box 9 - Club House Dr**
Filter time: **0:00 Wednesday, October 04, 2017 => 0:00 Thursday, October 05, 2017**
Scheme: Vehicle classification (Scheme F2)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12 13) Dir(NESW) Sp(6,99) Headway(>0) Span(0 - 328.084)

Vehicles = 784
Posted speed limit = 25 mph, Exceeding = 235 (29.97%), Mean Exceeding = 27.97 mph
Maximum = 37.2 mph, **Minimum** = 6.4 mph, **Mean** = 22.0 mph
85% Speed = 27.3 mph, **95% Speed** = 30.2 mph, **Median** = 22.4 mph
10 mph Pace = 17 - 27, **Number in Pace** = 510 (65.05%)
Variance = 29.55, **Standard Deviation** = 5.44 mph

Speed Bins

Speed	Bin		Below		Above		Energy	vMult	n * vMult
0 - **6**	0	0.0%	0	0.0%	784	100.0%	0.00	0.00	0.00
6 - **12**	39	5.0%	39	5.0%	745	95.0%	0.00	0.00	0.00
12 - **19**	169	21.6%	208	26.5%	576	73.5%	0.00	0.00	0.00
19 - **25**	334	42.6%	542	69.1%	242	30.9%	0.00	0.00	0.00
25 - **31**	218	27.8%	760	96.9%	24	3.1%	0.00	0.00	0.00
31 - **37**	24	3.1%	784	100.0%	0	0.0%	0.00	0.00	0.00
37 - **43**	0	0.0%	784	100.0%	0	0.0%	0.00	0.00	0.00
43 - **50**	0	0.0%	784	100.0%	0	0.0%	0.00	0.00	0.00
50 - **56**	0	0.0%	784	100.0%	0	0.0%	0.00	0.00	0.00
56 - **62**	0	0.0%	784	100.0%	0	0.0%	0.00	0.00	0.00
62 - **68**	0	0.0%	784	100.0%	0	0.0%	0.00	0.00	0.00
68 - **75**	0	0.0%	784	100.0%	0	0.0%	0.00	0.00	0.00
75 - **81**	0	0.0%	784	100.0%	0	0.0%	0.00	0.00	0.00
81 - **87**	0	0.0%	784	100.0%	0	0.0%	0.00	0.00	0.00
87 - **93**	0	0.0%	784	100.0%	0	0.0%	0.00	0.00	0.00
93 - **99**	0	0.0%	784	100.0%	0	0.0%	0.00	0.00	0.00
99 - **106**	0	0.0%	784	100.0%	0	0.0%	0.00	0.00	0.00
106 - **112**	0	0.0%	784	100.0%	0	0.0%	0.00	0.00	0.00
112 - **118**	0	0.0%	784	100.0%	0	0.0%	0.00	0.00	0.00
118 - **124**	0	0.0%	784	100.0%	0	0.0%	0.00	0.00	0.00

Total Speed Rating = 0.00
Total Moving Energy (Estimated) = 0.00

Speed limit fields

	Limit	Below		Above	
0	25 (PSL)	549	70.0%	235	30.0%

MetroCount Traffic Executive
Vehicle Counts

VehicleCount-61 -- English (ENU)

Datasets:

Site:	**[Roosevelt] Box 10- North Side of Club House Dr on Mason Cir**
Attribute:	Box 10
Direction:	7 - North bound A>B, South bound B>A. **Lane:** 1
Survey Duration:	14:05 Monday, October 2, 2017 => 10:21 Thursday, October 12, 2017,
Zone:	
File:	Roosevelt Box 10.EC1 (Plus)
Identifier:	FZ10RDWC MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v4.05)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**14:06 Monday, October 2, 2017 => 10:21 Thursday, October 12, 2017 (9.84378)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	6 - 99 mph.
Direction:	North, East, South, West (bound), P = North
Separation:	Headway > 0 sec, Span 0 - 328.084 ft
Name:	Default Profile
Scheme:	Vehicle classification (Scheme F3)
Units:	Non metric (ft, mi, ft/s, mph, lb, ton)
In profile:	Vehicles = 741 / 748 (99.06%)

* Tuesday, October 3, 2017 - Total=251, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	**18**	**16**	**26**	**35**	**33**	**27**	**33**	**18**	**19**	**8**	**3**	**6**	
0	0	0	0	0	0	0	0	0	0	0	0	**4**	7	4	8	**12**	7	12	6	6	0	1	1	3
0	0	0	0	0	0	0	0	0	0	0	0	**5**	1	5	**9**	6	10	7	6	4	4	0	3	0
0	0	0	0	0	0	0	0	0	0	0	5	**6**	4	10	**8**	10	4	7	3	5	3	2	1	0
0	0	0	0	0	0	0	0	0	0	0	**4**	3	4	7	**10**	5	6	7	3	4	1	0	1	0

AM Peak 1145 - 1245 (19), AM PHF=0.79 PM Peak 1515 - 1615 (39), PM PHF=0.81

* Wednesday, October 4, 2017 - Total=412, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
3	**0**	**1**	**0**	**1**	**3**	**12**	**25**	**18**	**15**	**19**	**30**	**35**	**18**	**31**	**42**	**29**	**48**	**34**	**23**	**14**	**5**	**5**	**1**	
3	0	0	0	0	0	0	6	10	6	6	**10**	11	3	4	7	5	**21**	6	6	3	1	2	1	0
0	0	0	0	0	2	1	3	3	3	3	**9**	5	8	10	8	11	**12**	9	10	4	2	2	0	0
0	0	1	0	1	0	6	11	2	4	1	**3**	7	6	13	17	5	**7**	9	5	5	2	1	0	0
0	0	0	0	0	1	5	5	3	2	**9**	8	12	1	4	10	**8**	8	10	2	2	0	0	0	1

AM Peak 1045 - 1145 (31), AM PHF=0.78 PM Peak 1645 - 1745 (48), PM PHF=0.57

* Thursday, October 5, 2017 - Total=78, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
1	**0**	**1**	**0**	**3**	**2**	**11**	**19**	**17**	**15**	**9**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
0	0	0	0	1	0	0	3	**8**	1	6	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	3	**4**	1	2	3	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	1	0	4	**8**	5	6	0	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	1	1	4	**4**	3	6	0	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0

AM Peak 0715 - 0815 (24), AM PHF=0.75 PM Peak 1200 - 1300 (0), PM PHF=1.00

MetroCount Traffic Executive
Speed Statistics

Datasets:

Site:	**[Roosevelt] Box 10- North Side of Club House Dr on Mason Cir**
Attribute:	Box 10
Direction:	7 - North bound A>B, South bound B>A. **Lane:** 1
Survey Duration:	14:05 Monday, October 02, 2017 => 10:21 Thursday, October 12, 2017,
File:	Roosevelt Box 10.EC1 (Plus)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Wednesday, October 04, 2017 => 0:00 Thursday, October 05, 2017 (1)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Direction:	North, East, South, West (bound), P = North
Scheme:	Vehicle classification (Scheme F2)
In profile:	Vehicles = 411 / 748 (54.95%)

Speed Statistics

SpeedStat-472
Site: Roosevelt.1.2NS
Description: **Box 10- North Side of Club House Dr on Mason Cir**
Filter time: **0:00 Wednesday, October 04, 2017 => 0:00 Thursday, October 05, 2017**
Scheme: Vehicle classification (Scheme F2)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12 13) Dir(NESW) Sp(6,99) Headway(>0) Span(0 - 328.084)

Vehicles = 411
Posted speed limit = 25 mph, Exceeding = 9 (2.19%), Mean Exceeding = 27.40 mph
Maximum = 34.1 mph, **Minimum** = 6.4 mph, **Mean** = 17.0 mph
85% Speed = 21.5 mph, **95% Speed** = 23.7 mph, **Median** = 16.8 mph
10 mph Pace = 13 - 23, **Number in Pace** = 333 (81.02%)
Variance = 16.40, **Standard Deviation** = 4.05 mph

Speed Bins

Speed	Bin		Below		Above		Energy	vMult	n * vMult
0 - **6**	0	0.0%	0	0.0%	411	100.0%	0.00	0.00	0.00
6 - **12**	47	11.4%	47	11.4%	364	88.6%	0.00	0.00	0.00
12 - **19**	225	54.7%	272	66.2%	139	33.8%	0.00	0.00	0.00
19 - **25**	127	30.9%	399	97.1%	12	2.9%	0.00	0.00	0.00
25 - **31**	11	2.7%	410	99.8%	1	0.2%	0.00	0.00	0.00
31 - **37**	1	0.2%	411	100.0%	0	0.0%	0.00	0.00	0.00
37 - **43**	0	0.0%	411	100.0%	0	0.0%	0.00	0.00	0.00
43 - **50**	0	0.0%	411	100.0%	0	0.0%	0.00	0.00	0.00
50 - **56**	0	0.0%	411	100.0%	0	0.0%	0.00	0.00	0.00
56 - **62**	0	0.0%	411	100.0%	0	0.0%	0.00	0.00	0.00
62 - **68**	0	0.0%	411	100.0%	0	0.0%	0.00	0.00	0.00
68 - **75**	0	0.0%	411	100.0%	0	0.0%	0.00	0.00	0.00
75 - **81**	0	0.0%	411	100.0%	0	0.0%	0.00	0.00	0.00
81 - **87**	0	0.0%	411	100.0%	0	0.0%	0.00	0.00	0.00
87 - **93**	0	0.0%	411	100.0%	0	0.0%	0.00	0.00	0.00
93 - **99**	0	0.0%	411	100.0%	0	0.0%	0.00	0.00	0.00
99 - **106**	0	0.0%	411	100.0%	0	0.0%	0.00	0.00	0.00
106 - **112**	0	0.0%	411	100.0%	0	0.0%	0.00	0.00	0.00
112 - **118**	0	0.0%	411	100.0%	0	0.0%	0.00	0.00	0.00
118 - **124**	0	0.0%	411	100.0%	0	0.0%	0.00	0.00	0.00

Total Speed Rating = 0.00
Total Moving Energy (Estimated) = 0.00

Speed limit fields

	Limit	Below		Above	
0	25 (PSL)	402	97.8%	9	2.2%

ROOSEVELT *Utah*

TRAFFIC CONTROL STUDY- LAGOON STREET & 600 EAST, ROOSEVELT

To: Ryan Snow, Roosevelt City

From: Chuck Richins, PE
Ashley Dowell, PE

Date: April 25, 2018

Subject: Traffic Control Analysis – Lagoon Street & 600 East, Roosevelt

Horrocks Engineers has studied the intersection of Lagoon Street & 600 East in Roosevelt to determine the appropriate traffic control at the intersection upon completion of the new high school.

Data Collection

Turning movement counts were collected on February 15, 2018 at Lagoon Street & 600 East during the AM peak (7 AM – 9 AM), after-school peak (2:30 PM – 3:30 PM), and PM peak (4 PM – 6 PM) periods. Additionally daily volumes were collected on each approach of the intersection along with Union Street and the road between Union Street and the sports fields. These volumes were used to determine an approximate demand throughout the day at the new high school. See the appendix for count data.

Crash data were obtained from the Utah Department of Transportation Traffic & Safety Division from January 2010 through March 2018. There were a total of 9 crashes including one that would be corrected by a traffic signal or all-way stop control.

Assumptions

Using the site plan for the new school, it was determined that approximately 60 percent of the parking stalls would use 600 East as the access. Therefore, 60 percent of observed traffic at the existing Union High School was assumed to use 600 East to access the parking lot.

It was assumed that vehicles entering Union Street and the Sports Park Access from US-191 (Main St) would access the new high school from 600 East. Vehicles observed entering and exiting Union High School on the south side of the existing high school were assumed to access the new high school from Lagoon Street.

Since the 85th percentile speeds measured on Lagoon Street is less than 40 MPH, the 100 percent values for the all-way stop and traffic signal warrants were used in the analyses.

Multi-Way Stop Analysis

An analysis was performed using the procedure outlined in the Utah MUTCD Chapter 2B.07 to determine if multi-way stop control is warranted at the intersection. The MUTCD guidelines for an all-way stop consider crash history and the average 8-hour approach volumes per hour on the major and minor streets. Section 2B.07.04A of the Utah MUTCD also indicates a multi-way stop may be installed as an interim measure when a traffic signal is justified.

Crash data were obtained from the Utah Department of Transportation Traffic & Safety Division from January 2010 through March 2018. There were a total of 9 crashes including one that could be corrected by a multi-way stop control. Therefore, a multi-way stop is not justified based on crash history.

Based on the estimated volumes at Lagoon Street & 600 East, the average 8-hour volumes on 600 East

were not high enough to meet the warrants as outlined in the MUTCD. Refer to the appendix for more information.

Traffic Signal Analysis

An analysis was performed using the procedure outlined in the Utah MUTCD Chapter 4C to determine if a traffic signal is warranted at the intersection.

Since there was only one crash correctable by a traffic signal since 2010, the crash history warrant is not met.

Traffic volumes were evaluated for the 8-hour, 4-hour, and peak hour volume warrants. Based on the estimated volumes at Lagoon Street & 600 East, Warrant 3 (Peak Hour) is met during the AM peak hour (7:30 AM – 8:30 AM). See the appendix for more information.

Conclusions

Results of the analysis indicate that a traffic signal will be warranted during the AM peak hour upon completion of the high school. It is recommended that an all-way stop be installed as an interim measure and the intersection be reevaluated upon opening of the new school to determine if additional signal warrants are met.

Horrocks Engineers

(801)-763-5100

Study Date : **04/19/18**

Multi-Way Stop Warrant Report

Major Street Approaches

Eastbound: **Lagoon St**

Total Approach Volume: **2,127**

85% Speed < 40 MPH.

Westbound: **Lagoon St**

Total Approach Volume: **1,730**

85% Speed < 40 MPH.

Minor Street Approaches

Northbound: **600 East**

Total Approach Volume: **674**

Southbound: **600 East**

Total Approach Volume: **1,470**

Warrant Summary

Criteria A - Interim Measure ..... **Satisfied**

If traffic signals are justified, stop signs can be installed as an interim measure.

Criteria B - Crash Experience ..... **Not Satisfied**

Criteria C - Minimum Volumes and Delays ..... **Not Satisfied**

Delay data not evaluated

Average of 8 highest hours does not meet volume criteria.

Criteria D - 80% of Volumes, Delays, and Crashes ..... **Not Satisfied**

Delay data not evaluated

Number of crashes (1) is less than the minimum required (4).

Average of 8 highest hours exceeds volume criteria.

Analysis of 8-Hour Volume Warrants:

Time	Major Total	Major Avg	Minor Total	Minor Avg	Crit C Major Crit	Crit C Minor	Crit C Meets?	Crit D Major Crit	Crit D Minor	Crit D Meets?
07:00 - 08:00	473	329.3	282	188.4	300-Yes	200-No	Major	240-Yes	160-Yes	Both
14:00 - 15:00	384		204							
15:00 - 16:00	357		217							
13:00 - 14:00	314		210							
12:00 - 13:00	312		166							
18:00 - 19:00	275		115							
16:00 - 17:00	270		160							
08:00 - 09:00	249		153							
11:00 - 12:00	248		120							
17:00 - 18:00	222		130							
09:00 - 10:00	185		94							
10:00 - 11:00	179		103							
19:00 - 20:00	166		74							
20:00 - 21:00	92		47							
06:00 - 07:00	68		37							
05:00 - 06:00	63		32							
23:00 - 00:00	0		0							
22:00 - 23:00	0		0							
21:00 - 22:00	0		0							
04:00 - 05:00	0		0							
03:00 - 04:00	0		0							
02:00 - 03:00	0		0							
01:00 - 02:00	0		0							
00:00 - 01:00	0		0							

Horrocks Engineers
(801)-763-5100

Study Date **: 04/20/18**

Signal Warrants - Summary

Major Street Approaches

Eastbound: **Lagoon**
Number of Lanes: **1**
85% Speed < 40 MPH.
Total Approach Volume: **2,127**

Westbound: **Lagoon**
Number of Lanes: **1**
85% Speed < 40 MPH.
Total Approach Volume: **1,730**

Minor Street Approaches

Northbound: **600 East**
Number of Lanes: **1**
Total Approach Volume: **674**

Southbound: **600 East**
Number of Lanes: **1**
Total Approach Volume: **1,470**

Warrant Summary **(Rural values apply.)**

Warrant 1 - Eight Hour Vehicular Volumes ..... **Not Satisfied**

Warrant 1A - Minimum Vehicular Volume ..... **Not Satisfied**
Required volumes reached for 3 hours, 8 are needed

Warrant 1B - Interruption of Continuous Traffic ..... **Not Satisfied**
Required volumes reached for 1 hours, 8 are needed

Warrant 1C - Combination of Warrants ..... **Not Satisfied**
Required 1A volumes reached for 5 hours, 8 are needed
Required 1B volumes reached for 1 hours, 8 are needed

Warrant 2 - Four Hour Volumes ..... **Not Satisfied**
Number of hours (2) volumes exceed minimum < minimum required (4).

Warrant 3 - Peak Hour ..... **Satisfied**

Warrant 3A - Peak Hour Delay ..... **Satisfied**
Number of hours (2) volumes exceed minimum >= required (1). Delay data not evaluated.

Warrant 3B - Peak Hour Volumes ..... **Satisfied**
Volumes exceed minimums for at least one hour.

Warrant 4 - Pedestrian Volumes ..... **Not Evaluated**

Warrant 5 - School Crossing ..... **Not Evaluated**

Warrant 6 - Coordinated Signal System ..... **Not Evaluated**

Warrant 7 - Crash Experience ..... **Not Satisfied**

Warrant 8 - Roadway Network ..... **Not Evaluated**

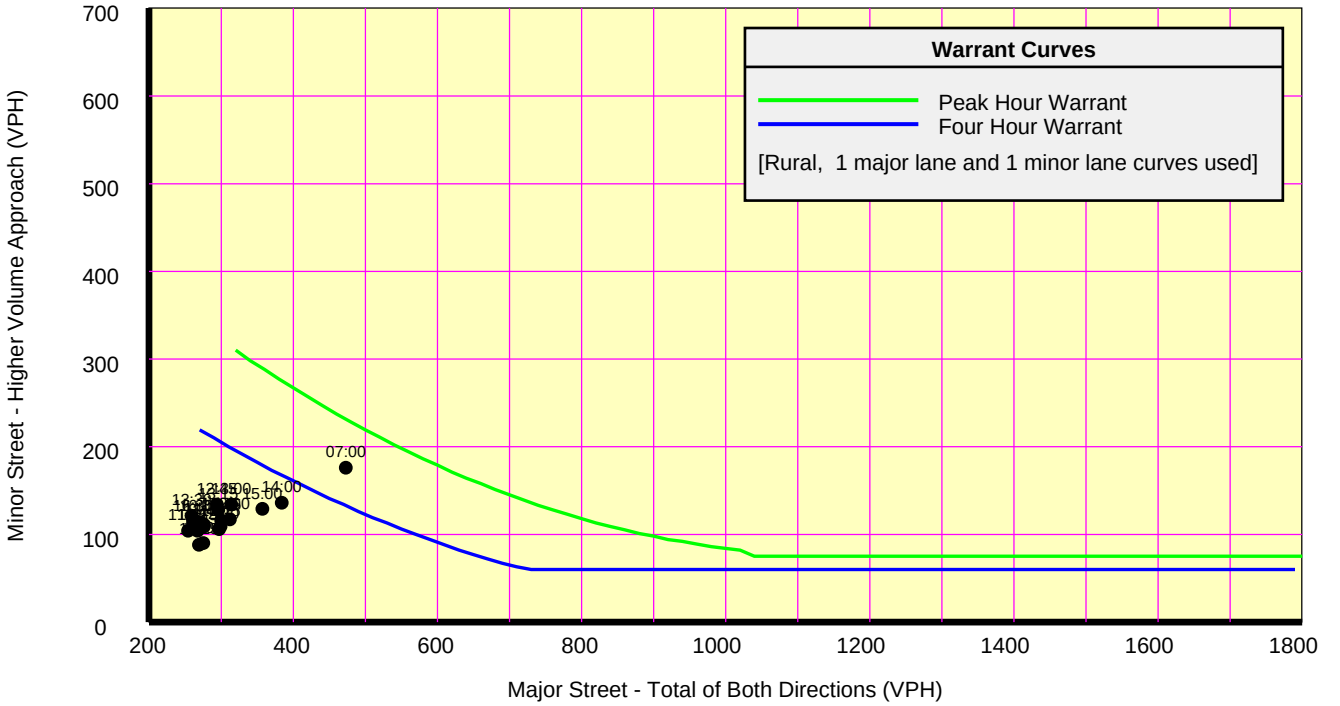
Warrant 9 - Intersection Near a Grade Crossing ..... **Not Evaluated**

Horrocks Engineers

(801)-763-5100

Study Date : **04/20/18**

Signal Warrants - Summary



Analysis of 8-Hour Volume Warrants:

War 1A-Minimum Volume | **War 1B-Interruption of Traffic** | **War 1C-Combination of Warrants**

Hour Begin	Major Total	Minor Vol	Minor Dir	Maj 350	Min 105	Hour Begin	Major Total	Minor Vol	Minor Dir	Maj 525	Min 53	Hour Begin	Major Total	Minor Vol	Minor Dir	1A Met	1B Met
07:00	473	176	SB	Yes	Yes	07:15	555	201	SB	Yes	Yes	07:00	473	176	SB	Yes	Yes
14:00	384	136	SB	Yes	Yes	14:30	506	165	SB	No	Yes	14:15	460	164	SB	-	Yes
15:00	357	129	SB	Yes	Yes	14:45	492	154	SB	No	Yes	14:00	384	136	SB	Yes	No
13:00	314	134	SB	No	Yes	07:00	473	176	SB	No	Yes	15:00	357	129	SB	Yes	-
12:00	312	117	SB	No	Yes	14:15	460	164	SB	No	Yes	11:45	300	116	SB	Yes	No
11:45	300	116	SB	No	Yes	14:00	384	136	SB	No	Yes	12:45	294	134	SB	Yes	No
12:15	299	109	SB	No	Yes	15:00	357	129	SB	No	Yes	13:00	314	134	SB	-	No
12:30	297	106	SB	No	Yes	13:00	314	134	SB	No	Yes	12:00	312	117	SB	-	No
13:15	296	128	SB	No	Yes	12:00	312	117	SB	No	Yes	15:15	306	106	SB	-	No
12:45	294	134	SB	No	Yes	15:15	306	106	SB	No	Yes	12:15	299	109	SB	-	No
13:45	276	109	SB	No	Yes	11:45	300	116	SB	No	Yes	12:30	297	106	SB	-	No
11:30	276	111	SB	No	Yes	12:15	299	109	SB	No	Yes	13:15	296	128	SB	-	No
18:00	275	90	SB	No	No	12:30	297	106	SB	No	Yes	13:45	276	109	SB	No	No
16:00	270	114	SB	No	Yes	13:15	296	128	SB	No	Yes	11:30	276	111	SB	No	No
18:15	269	88	SB	No	No	12:45	294	134	SB	No	Yes	18:00	275	90	SB	No	No
16:15	267	104	SB	No	No	13:45	276	109	SB	No	Yes	15:30	272	108	SB	-	No
16:30	261	115	SB	No	Yes	11:30	276	111	SB	No	Yes	16:00	270	114	SB	No	No
13:30	259	121	SB	No	Yes	18:00	275	90	SB	No	Yes	18:15	269	88	SB	No	No
11:15	254	104	SB	No	No	15:30	272	108	SB	No	Yes	16:15	267	104	SB	No	No
18:30	249	84	SB	No	No	16:00	270	114	SB	No	Yes	16:30	261	115	SB	No	No
08:00	249	106	SB	No	Yes	18:15	269	88	SB	No	Yes	15:45	260	110	SB	-	No
11:00	248	89	SB	No	No	16:15	267	104	SB	No	Yes	13:30	259	121	SB	-	No
16:45	247	104	SB	No	No	16:30	261	115	SB	No	Yes	11:15	254	104	SB	No	No
10:45	239	84	SB	No	No	15:45	260	110	SB	No	Yes	18:30	249	84	SB	No	No

Table 1. Estimated Traffic Volumes (Existing plus Project)

Projected Volumes									North/South:	600 East	% of School Traffic Using 600 East	60%					
									East/West:	Lagoon St							
									Weather:	Clear							
	600 East Northbound				600 East Southbound				Lagoon St Eastbound				Lagoon St Westbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
Period																	**TOTAL**
7:00	1	1	1	0	1	9	8	0	4	12	2	0	2	10	1	0	52
7:15	5	3	4	0	3	14	4	0	8	15	3	0	6	15	3	0	83
7:30	15	7	10	0	9	40	9	0	20	44	9	0	10	39	8	0	219
7:45	23	16	20	0	9	60	10	1	22	117	13	0	16	75	19	0	399
8:00	8	14	7	0	5	23	15	0	21	39	4	0	5	41	3	0	184
8:15	1	3	1	0	6	10	11	0	12	20	1	0	3	10	3	0	81
8:30	2	1	2	0	2	4	6	0	9	19	2	0	2	9	1	0	58
8:45	4	2	2	0	3	12	9	0	4	16	3	0	2	19	1	0	77
9:00	5	5	4	0	0	25	0	0	0	36	1	0	1	26	0	0	103
9:15	3	1	2	0	0	12	0	0	0	31	1	0	1	23	0	0	74
9:30	2	1	2	0	0	10	0	0	0	20	1	0	1	11	0	0	49
9:45	2	2	2	0	0	16	0	0	0	18	1	0	1	12	0	0	53
10:00	8	2	7	0	0	15	0	0	0	27	2	0	2	21	0	0	85
10:15	4	2	4	0	0	21	0	0	0	20	1	0	1	26	0	0	79
10:30	1	2	1	0	0	10	0	0	0	21	2	0	2	13	0	0	51
10:45	3	1	3	0	0	19	0	0	0	26	0	0	0	15	0	0	67
11:00	5	2	4	0	0	23	0	0	0	37	2	0	2	33	0	0	109
11:15	2	6	2	0	0	24	0	0	0	35	1	0	2	38	0	0	109
11:30	2	1	2	0	0	18	0	0	0	25	1	0	1	21	0	0	69
11:45	2	2	1	0	0	24	0	0	0	33	0	0	0	17	0	0	80
12:00	5	1	4	0	0	38	0	0	0	49	2	0	3	26	0	0	128
12:15	12	2	10	0	0	31	0	0	0	38	2	0	3	55	0	0	154
12:30	1	4	1	0	0	23	0	0	0	44	1	0	1	26	0	0	100
12:45	3	4	2	0	0	25	0	0	0	30	0	0	0	32	0	0	96
13:00	3	4	2	0	0	30	0	0	0	44	2	0	3	18	0	0	105
13:15	15	5	12	0	0	28	0	0	0	30	2	0	3	61	0	0	156
13:30	6	4	6	0	0	51	0	0	0	42	2	0	3	22	0	0	135
13:45	9	3	7	0	0	25	0	0	0	43	2	0	2	35	0	0	126
14:00	4	2	4	0	0	24	0	0	0	21	1	0	1	26	0	0	83
14:15	2	1	1	0	0	21	0	0	0	28	1	0	1	29	0	0	84
14:30	3	4	3	0	4	15	20	0	9	42	3	0	3	27	2	0	135
14:45	20	10	14	2	6	16	30	1	16	28	7	0	8	111	20	0	287
15:00	14	7	11	0	2	11	39	1	28	32	3	0	6	46	10	0	209
15:15	13	8	11	1	2	13	7	3	21	24	2	0	3	46	9	0	159
15:30	6	4	5	0	0	28	0	0	0	39	1	0	2	30	0	0	115
15:45	3	4	2	0	0	27	0	0	0	32	1	0	1	21	0	0	90
16:00	5	8	4	1	0	7	22	0	19	18	1	0	2	25	9	0	121
16:15	5	4	4	1	1	6	17	0	22	20	1	1	2	24	2	0	107
16:30	2	3	2	0	3	4	23	0	20	16	1	0	1	19	3	0	97
16:45	2	5	2	0	3	8	20	1	16	22	0	0	0	26	1	0	105
17:00	5	2	4	0	4	3	12	0	15	22	1	0	1	28	4	0	102
17:15	4	2	3	0	1	7	27	0	18	28	0	0	0	18	1	0	109
17:30	3	3	2	0	1	4	14	0	19	8	1	0	0	17	1	0	73
17:45	2	1	3	0	0	4	19	0	12	11	1	0	1	13	2	0	68
18:00	2	1	2	0	0	22	0	0	0	43	2	0	2	16	0	0	89
18:15	2	0	2	0	0	20	0	0	0	30	1	0	2	29	0	0	87
18:30	2	0	2	0	0	24	0	0	0	33	5	0	6	17	0	0	88
18:45	6	1	5	0	0	24	0	0	0	50	7	0	9	23	0	0	125

Table 2. Peak Hour Summary – Lagoon St & 600 East

Traffic Count Summary									North/South:	600 E			Date:	February 15, 2018			
									East/West:	Lagoon St			Weather:	Clear			
	600 East				600 East				Lagoon Street				Lagoon Street				
	Northbound				Southbound				Eastbound				Westbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
AM PEAK PERIOD COUNT DATA																	
Period																	**TOTAL**
7:00 AM - 7:15 AM	0	0	0	0	1	1	8	0	4	12	0	0	0	10	1	0	**37**
7:15 AM - 7:30 AM	0	0	0	0	3	0	4	0	8	15	0	0	3	15	3	0	**51**
7:30 AM - 7:45 AM	3	0	0	0	9	2	9	0	20	44	0	0	0	39	8	0	**134**
7:45 AM - 8:00 AM	0	0	0	0	9	1	10	1	22	117	0	0	0	75	19	0	**253**
8:00 AM - 8:15 AM	0	0	0	0	5	0	15	0	21	39	0	0	0	41	3	0	**124**
8:15 AM - 8:30 AM	0	0	0	0	6	2	11	0	12	20	0	0	2	10	3	0	**66**
8:30 AM - 8:45 AM	0	0	0	0	2	0	6	0	9	19	1	0	1	9	1	0	**48**
8:45 AM - 9:00 AM	2	0	0	0	3	0	9	0	4	16	1	0	0	19	1	0	**55**
AFTER SCHOOL PERIOD COUNT DATA																	
Period																	**TOTAL**
2:30 PM - 2:45 PM	0	0	1	0	4	0	20	0	9	42	0	0	0	27	2	0	**105**
2:45 PM - 3:00 PM	5	2	1	2	6	1	30	1	16	28	1	0	1	111	20	0	**222**
3:00 PM - 3:15 PM	3	4	1	0	2	1	39	1	28	32	0	0	2	46	10	0	**168**
3:15 PM - 3:30 PM	0	1	0	1	2	0	7	3	21	24	0	0	0	46	9	0	**110**
PM PEAK PERIOD COUNT DATA																	
Period																	**TOTAL**
4:00 PM - 4:15 PM	0	0	0	1	0	1	22	0	19	18	0	0	0	25	9	0	**94**
4:15 PM - 4:30 PM	0	1	0	1	1	0	17	0	22	20	0	1	0	24	2	0	**87**
4:30 PM - 4:45 PM	0	0	0	0	3	0	23	0	20	16	0	0	0	19	3	0	**84**
4:45 PM - 5:00 PM	0	0	0	0	3	0	20	1	16	22	0	0	0	26	1	0	**88**
5:00 PM - 5:15 PM	0	0	0	0	4	0	12	0	15	22	0	0	0	28	4	0	**85**
5:15 PM - 5:30 PM	0	0	0	0	1	0	27	0	18	28	0	0	0	18	1	0	**93**
5:30 PM - 5:45 PM	1	3	0	0	1	0	14	0	19	8	1	0	0	17	1	0	**65**
5:45 PM - 6:00 PM	1	1	2	0	0	0	19	0	12	11	0	0	0	13	2	0	**61**

	45	5	29	
75				33
220		AM		165
0				2
	3	0	0	

	96	2	14	
74				41
126		After School		230
1				3
	8	7	3	

	82	1	7	
77				15
76		PM		94
0				0
	0	1	0	

MetroCount Traffic Executive
Vehicle Counts

VehicleCount-63 -- English (ENU)

Datasets:

Site:	**[Roosevelt] Box 1- Lagoon St. Between 500 E & 600 E**
Attribute:	Box_1
Direction:	8 - East bound A>B, West bound B>A. **Lane:** 1
Survey Duration:	10:30 Friday, February 9, 2018 => 10:46 Monday, February 19, 2018,
Zone:	
File:	BOX 1-Roosevelt_2.16.18.EC1 (Plus)
Identifier:	DD252GHQ MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v4.05)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Thursday, February 15, 2018 => 0:00 Friday, February 16, 2018 (1)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range:	6 - 99 mph.
Separation:	Headway > 0 sec, Span 0 - 328.084 ft
Name:	Default Profile
Scheme:	Vehicle classification (Scheme F3)
Units:	Non metric (ft, mi, ft/s, mph, lb, ton)

EASTBOUND

*** Thursday, February 15, 2018 - Total=2085, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
2	**2**	**2**	**3**	**7**	**35**	**34**	**236**	**144**	**105**	**94**	**130**	**161**	**159**	**143**	**176**	**152**	**133**	**156**	**105**	**45**	**33**	**18**	**10**	
0	1	1	1	1	7	5	16	**59**	36	27	37	49	44	21	61	38	39	43	37	11	11	5	3	-
0	1	0	2	0	2	6	23	**33**	31	20	35	38	30	28	44	40	44	30	24	12	12	5	2	-
1	0	0	0	3	5	9	**64**	30	20	21	25	44	42	50	39	36	27	33	17	10	5	5	5	-
1	0	1	0	3	21	14	**133**	22	18	26	33	30	43	44	32	38	23	50	27	12	5	3	0	-

AM Peak 0730 - 0830 (289), AM PHF=0.54

WESTBOUND

*** Thursday, February 15, 2018 - Total=2362, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
2	**2**	**2**	**2**	**3**	**26**	**43**	**173**	**125**	**93**	**105**	**153**	**195**	**178**	**267**	**226**	**175**	**149**	**137**	**94**	**66**	**104**	**29**	**13**	
1	0	0	1	1	3	12	17	**59**	36	22	42	52	35	40	88	48	40	33	27	12	41	9	4	-
0	1	1	0	0	3	5	20	**21**	26	38	48	69	60	37	52	39	44	38	24	17	35	10	5	-
1	1	0	1	0	2	14	**52**	15	11	16	32	32	36	45	48	42	32	31	20	20	23	6	2	-
0	0	1	0	2	18	12	**84**	30	20	29	31	42	47	145	38	46	33	35	23	17	5	4	2	-

AM Peak 0730 - 0830 (216), AM PHF=0.64

MetroCount Traffic Executive
Vehicle Counts

VehicleCount-66 -- English (ENU)

Datasets:

Site: **[Roosevelt] Box 2- 600 E Between Lagoon St & Main St**
Attribute: Box_2_
Direction: 7 - North bound A>B, South bound B>A. **Lane:** 2
Survey Duration: 10:35 Friday, February 9, 2018 => 10:55 Monday, February 19, 2018,
Zone:
File: BOX 2-Roosevelt_2.16.18.EC1 (Plus)
Identifier: CH465X6W MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm: Factory default axle (v4.05)
Data type: Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time: **0:00 Thursday, February 15, 2018 => 0:00 Friday, February 16, 2018 (1)**
Included classes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range: 6 - 99 mph.
Separation: Headway > 0 sec, Span 0 - 328.084 ft
Name: Default Profile
Scheme: Vehicle classification (Scheme F3)
Units: Non metric (ft, mi, ft/s, mph, lb, ton)

NORTHBOUND

*** Thursday, February 15, 2018 - Total=1082, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
1	**2**	**2**	**3**	**3**	**10**	**11**	**87**	**53**	**46**	**43**	**83**	**88**	**93**	**85**	**112**	**92**	**76**	**66**	**45**	**31**	**31**	**12**	**7**	
0	1	1	1	1	4	3	5	**23**	10	11	26	27	15	15	41	28	19	25	13	7	10	5	2	-
0	1	0	2	0	1	3	11	**15**	10	9	19	25	31	19	31	25	19	16	10	7	11	4	2	-
1	0	0	0	0	2	0	**28**	10	14	10	14	21	21	10	20	22	23	15	11	9	5	2	3	-
0	0	1	0	2	3	5	**43**	5	12	13	24	15	26	41	20	17	15	10	11	8	5	1	0	-

AM Peak 0730 - 0830 (109), AM PHF=0.63

SOUTHBOUND

*** Thursday, February 15, 2018 - Total=1031, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
2	**2**	**2**	**2**	**0**	**13**	**25**	**60**	**59**	**34**	**45**	**65**	**85**	**85**	**90**	**92**	**89**	**76**	**72**	**52**	**30**	**29**	**15**	**7**	
1	0	0	1	0	2	8	11	20	12	8	17	**30**	20	17	36	23	15	22	16	9	10	4	2	-
0	1	1	0	0	1	1	6	19	8	13	16	**25**	19	16	9	20	27	15	14	7	11	5	3	-
1	1	0	1	0	1	7	22	8	5	9	13	**16**	29	22	23	24	15	19	9	8	6	5	2	-
0	0	1	0	0	9	9	21	12	9	15	**19**	14	17	35	24	22	19	16	13	6	2	1	0	-

AM Peak 1145 - 1245 (90), AM PHF=0.75

MetroCount Traffic Executive
Vehicle Counts

VehicleCount-68 -- English (ENU)

Datasets:

Site: **[Roosevelt] Box 3- Lagoon St between 600 E & 700 E**
Attribute: Box 3
Direction: 8 - East bound A>B, West bound B>A. **Lane:** 1
Survey Duration: 10:38 Friday, February 9, 2018 => 10:59 Monday, February 19, 2018,
Zone:
File: BOX 3-Roosevelt_2.16.18.EC1 (Plus)
Identifier: DD24V0HT MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm: Factory default axle (v4.05)
Data type: Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time: **0:00 Thursday, February 15, 2018 => 0:00 Friday, February 16, 2018 (1)**
Included classes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range: 6 - 99 mph.
Separation: Headway > 0 sec, Span 0 - 328.084 ft
Name: Default Profile
Scheme: Vehicle classification (Scheme F3)
Units: Non metric (ft, mi, ft/s, mph, lb, ton)

EASTBOUND

*** Thursday, February 15, 2018 - Total=1391, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
1	**0**	**0**	**0**	**4**	**23**	**22**	**208**	**110**	**71**	**63**	**78**	**100**	**109**	**112**	**100**	**81**	**73**	**116**	**72**	**24**	**14**	**6**	**4**	
0	0	0	0	0	3	4	13	**44**	28	22	19	30	29	12	33	16	25	29	29	6	8	1	2	-
0	0	0	0	0	1	0	18	**26**	26	13	24	21	19	18	26	21	27	21	19	6	3	1	0	-
0	0	0	0	3	2	7	**52**	21	11	12	14	30	37	47	25	19	9	23	6	5	2	3	2	-
1	0	0	0	1	17	11	**125**	19	6	16	21	19	24	35	16	25	12	43	18	7	1	1	0	-

AM Peak 0730 - 0830 (247), AM PHF=0.49

WESTBOUND

*** Thursday, February 15, 2018 - Total=1704, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**3**	**20**	**30**	**170**	**89**	**72**	**75**	**109**	**139**	**136**	**219**	**163**	**109**	**84**	**85**	**52**	**42**	**86**	**15**	**6**	
0	0	0	0	1	1	8	10	**44**	26	21	33	26	18	26	58	35	32	16	15	4	38	6	2	-
0	0	0	0	0	2	6	**21**	14	23	26	38	55	61	29	54	25	19	29	16	10	26	5	2	-
0	0	0	0	0	2	8	**47**	12	11	13	21	26	22	30	30	23	18	17	11	15	18	1	0	-
0	0	0	0	2	15	8	**92**	19	12	15	17	32	35	134	21	26	15	23	10	13	4	3	2	-

AM Peak 0715 - 0815 (204), AM PHF=0.55

MetroCount Traffic Executive
Vehicle Counts

VehicleCount-70 -- English (ENU)

Datasets:

Site:	**[Roosevelt] Box 4- North end of N Union St between Main St & Lagoon St**
Attribute:	Box4
Direction:	7 - North bound A>B, South bound B>A. **Lane:** 2
Survey Duration:	10:46 Friday, February 9, 2018 => 10:51 Monday, February 19, 2018,
Zone:	
File:	BOX 4-Roosevelt_2.16.18.EC1 (Plus)
Identifier:	DD15ABV2 MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v4.05)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Thursday, February 15, 2018 => 0:00 Friday, February 16, 2018 (1)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range:	6 - 99 mph.
Separation:	Headway > 0 sec, Span 0 - 328.084 ft
Name:	Default Profile
Scheme:	Vehicle classification (Scheme F3)
Units:	Non metric (ft, mi, ft/s, mph, lb, ton)

NORTHBOUND

*** Thursday, February 15, 2018 - Total=268, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**0**	**5**	**42**	**34**	**15**	**12**	**19**	**19**	**25**	**25**	**30**	**29**	**5**	**3**	**1**	**0**	**4**	**0**	**0**	
0	0	0	0	0	0	0	1	**23**	9	4	4	2	6	4	5	11	3	2	0	0	3	0	0	-
0	0	0	0	0	0	0	**5**	5	1	3	10	4	8	2	12	5	2	0	1	0	1	0	0	-
0	0	0	0	0	0	1	**11**	2	2	3	1	6	6	5	7	5	0	0	0	0	0	0	0	-
0	0	0	0	0	0	4	**25**	4	3	2	4	7	5	14	6	8	0	1	0	0	0	0	0	-

AM Peak 0715 - 0815 (64), AM PHF=0.64

SOUTHBOUND

*** Thursday, February 15, 2018 - Total=370, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**0**	**8**	**101**	**39**	**18**	**16**	**22**	**30**	**28**	**42**	**31**	**20**	**8**	**4**	**2**	**0**	**0**	**1**	**0**	
0	0	0	0	0	0	0	11	**20**	9	6	3	7	8	8	8	5	2	0	1	0	0	0	0	-
0	0	0	0	0	0	1	**12**	8	2	6	9	4	5	5	17	6	3	0	1	0	0	1	0	-
0	0	0	0	0	0	3	**28**	4	4	1	5	6	13	14	4	3	1	0	0	0	0	0	0	-
0	0	0	0	0	0	4	**50**	7	3	3	5	13	2	15	2	6	2	4	0	0	0	0	0	-

AM Peak 0715 - 0815 (110), AM PHF=0.55

MetroCount Traffic Executive
Vehicle Counts

VehicleCount-72 -- English (ENU)

Datasets:

Site:	**[Roosevelt] Box 5- North End of Athletic/School access between Main St & Lagoon St**
Attribute:	Box 5
Direction:	7 - North bound A>B, South bound B>A. **Lane:** 1
Survey Duration:	10:40 Friday, February 9, 2018 => 10:53 Monday, February 19, 2018,
Zone:	
File:	BOX 5-Roosevelt_2.16.18.EC1 (Plus)
Identifier:	DD19JWCH MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v4.05)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Thursday, February 15, 2018 => 0:00 Friday, February 16, 2018 (1)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range:	6 - 99 mph.
Separation:	Headway > 0 sec, Span 0 - 328.084 ft
Name:	Default Profile
Scheme:	Vehicle classification (Scheme F3)
Units:	Non metric (ft, mi, ft/s, mph, lb, ton)

NORTHBOUND

*** Thursday, February 15, 2018 - Total=18, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**3**	**1**	**0**	**3**	**1**	**7**	**0**	**0**	
0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	0	0	3	0	0	1	1	2	0	0	-
0	0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	4	0	0	-
0	0	0	**0**	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	-
0	0	0	**0**	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	-

AM Peak 0330 - 0430 (1), AM PHF=0.25

SOUTHBOUND

*** Thursday, February 15, 2018 - Total=455, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**2**	**23**	**3**	**99**	**39**	**32**	**18**	**17**	**22**	**52**	**27**	**21**	**21**	**23**	**27**	**13**	**7**	**8**	**0**	**1**	
0	0	0	0	0	3	2	3	**19**	13	6	7	6	8	3	8	5	3	0	6	3	8	0	0	-
0	0	0	0	1	2	0	**12**	5	5	8	4	6	10	3	5	4	9	9	3	3	0	0	0	-
0	0	0	0	0	1	0	**36**	2	5	1	3	5	23	11	5	4	6	8	1	0	0	0	0	-
0	0	0	0	1	17	1	**48**	13	9	3	3	5	11	10	3	8	5	10	3	1	0	0	1	-

AM Peak 0715 - 0815 (115), AM PHF=0.60

MetroCount Traffic Executive
Vehicle Counts

VehicleCount-74 -- English (ENU)

Datasets:

Site:	**[Roosevelt] Box 6- South end of N Union St between Main St & Lagoon St**
Attribute:	Box 6
Direction:	7 - North bound A>B, South bound B>A. **Lane:** 2
Survey Duration:	10:42 Friday, February 9, 2018 => 11:01 Monday, February 19, 2018,
Zone:	
File:	BOX 6-Roosevelt_2.16.18.EC1 (Plus)
Identifier:	DD047A35 MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v4.05)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Thursday, February 15, 2018 => 0:00 Friday, February 16, 2018 (1)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range:	6 - 99 mph.
Separation:	Headway > 0 sec, Span 0 - 328.084 ft
Name:	Default Profile
Scheme:	Vehicle classification (Scheme F3)
Units:	Non metric (ft, mi, ft/s, mph, lb, ton)

NORTHBOUND

*** Thursday, February 15, 2018 - Total=368, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**1**	**13**	**7**	**89**	**24**	**9**	**16**	**13**	**19**	**31**	**36**	**23**	**8**	**5**	**47**	**14**	**9**	**4**	**0**	**0**	
0	0	0	0	0	0	1	5	**14**	3	7	7	7	8	3	11	3	4	3	8	5	4	0	0	-
0	0	0	0	1	0	1	**10**	3	2	3	4	9	9	1	8	4	0	3	4	1	0	0	0	-
0	0	0	0	0	3	3	**28**	1	2	5	1	3	8	10	3	1	0	14	2	0	0	0	0	-
0	0	0	0	0	10	2	**46**	6	2	1	1	0	6	22	1	0	1	27	0	3	0	0	0	-

AM Peak 0715 - 0815 (98), AM PHF=0.53

SOUTHBOUND

*** Thursday, February 15, 2018 - Total=366, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**1**	**6**	**2**	**63**	**20**	**9**	**18**	**14**	**21**	**29**	**35**	**42**	**17**	**6**	**17**	**5**	**14**	**43**	**4**	**0**	
0	0	0	0	0	0	1	0	**12**	4	7	8	7	6	7	21	5	5	2	1	3	24	1	0	-
0	0	0	0	1	0	0	**6**	2	3	3	1	12	15	2	13	6	1	0	3	6	13	3	0	-
0	0	0	0	0	0	0	**13**	3	1	2	2	0	3	3	5	4	0	3	1	2	3	0	0	-
0	0	0	0	0	6	1	**44**	3	1	6	3	2	5	23	3	2	0	12	0	3	3	0	0	-

AM Peak 0715 - 0815 (75), AM PHF=0.43

MetroCount Traffic Executive
Vehicle Counts

VehicleCount-78 -- English (ENU)

Datasets:

Site: **[Roosevelt] Box 7 - South End of Athletic/School Access between Main St & Lagoon St**
Attribute: Box 7
Direction: 7 - North bound A>B, South bound B>A. **Lane:** 1
Survey Duration: 10:44 Friday, February 9, 2018 => 10:58 Monday, February 19, 2018,
Zone:
File: BOX 7-Roosevelt_2.16.18.EC1 (Plus)
Identifier: DD99RYGP MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm: Factory default axle (v4.05)
Data type: Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time: **0:00 Thursday, February 15, 2018 => 0:00 Friday, February 16, 2018 (1)**
Included classes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range: 6 - 99 mph.
Separation: Headway > 0 sec, Span 0 - 328.084 ft
Name: Default Profile
Scheme: Vehicle classification (Scheme F3)
Units: Non metric (ft, mi, ft/s, mph, lb, ton)

NORTHBOUND

*** Thursday, February 15, 2018 - Total=45, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**2**	**1**	**6**	**2**	**2**	**1**	**2**	**1**	**0**	**0**	**3**	**5**	**6**	**3**	**8**	**2**	**0**	**1**	**0**	
0	0	0	0	0	1	0	**1**	0	0	0	0	1	0	0	0	1	2	0	3	1	0	1	0	-
0	0	0	0	0	1	0	**0**	0	1	0	1	0	0	0	2	0	1	0	2	0	0	0	0	-
0	0	0	0	0	0	1	**3**	1	1	1	1	0	0	0	0	2	2	1	3	1	0	0	0	-
0	0	0	0	0	0	0	**2**	1	0	0	0	0	0	0	1	2	1	2	0	0	0	0	0	-

AM Peak 0700 - 0800 (6), AM PHF=0.50

SOUTHBOUND

*** Thursday, February 15, 2018 - Total=488, 15 minute drops**

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**1**	**3**	**1**	**63**	**20**	**28**	**33**	**19**	**44**	**71**	**38**	**58**	**25**	**30**	**20**	**14**	**5**	**14**	**0**	**1**	
0	0	0	0	0	0	1	4	**12**	11	19	8	9	2	6	14	11	11	4	8	2	7	0	0	-
0	0	0	0	1	0	0	**8**	2	6	10	5	25	30	3	26	8	11	7	2	2	7	0	0	-
0	0	0	0	0	0	0	**23**	3	6	0	4	4	17	6	13	2	6	3	1	1	0	0	0	-
0	0	0	0	0	3	0	**28**	3	5	4	2	6	22	23	5	4	2	6	3	0	0	0	1	-

AM Peak 0715 - 0815 (71), AM PHF=0.63

ROOSEVELT *Utah*

TRAFFIC SIGNAL STUDY – SR-121 & 300 WEST, ROOSEVELT

State of Utah

DEPARTMENT OF TRANSPORTATION
Division of Traffic & Safety
4501 South 2700 West
Box 143200
Salt Lake City, Utah 84119-3200
Phone: (801) 965-4195, Fax: (801) 965-4736

MEMORANDUM

September 20, 2019

TO: Brian Phillips, P.E.
UDOT Region Three Traffic Operations Engineer

FROM: Jesse Sweeten, P.E.
Traffic and Safety Design Engineer

SUBJECT: Traffic Signal Study for SR-121 & 300 West in Roosevelt
Study # 19-TS1506-03-SIG,LT 0121 (MP 0.428)



Figure 1. Study Location

Study Findings

The Division of Traffic and Safety has studied the subject location to determine if a traffic signal is warranted. Based on the signal warrant criteria outlined in the Utah MUTCD **a traffic signal is not warranted at SR-121 & 300 West.** A left-turn analysis was also performed if a traffic signal was installed at this location, none of the approaches meet the criteria for permissive/protected or protected only left-turn phasing.

Intersection Characteristics

The study location is the intersection of SR-121 (200 North) and 300 West in Roosevelt, Utah. SR-121 has a two-way left-turn lane, a thru lane, and a shoulder wide enough to be used as a right-turn lane in both directions. On 300 West, there is a shared left-turn/thru lane and a shoulder wide enough to be used as a right-turn lane in each direction. There are pedestrian ramps at all four corners of the intersection with a marked school crosswalk across the eastbound approach. SR-121 is uncontrolled at the study location and 300 West is stop controlled. The posted speed limit on SR-121 is 35 MPH but there is a reduced school speed zone of 20 MPH when flashing. The speed limit on 300 West is 25 MPH.

Analysis

An analysis was performed using the procedure outlined in the Utah MUTCD Chapter 4C to determine if a traffic signal is warranted at the study location. The following assumptions and observations were made regarding the intersection in question:

- Traffic turning-movement count data were collected on September 17, 2019. Data were collected from 7:00 AM to 7:00 PM and speed data were collected on September 18, 2019 See the appendix for traffic count and speed data.
- Since the population of Roosevelt is less than 10,000, the 70 percent values for the warrants were used in the analysis.
- The 85th percentile speed in the study area was 36 MPH.
- Since there is a shoulder wide enough to be used as a right-turn lane in all approach directions, the analysis did not include right-turn volumes for these approaches.
- During the evening peak hour on the southbound approach, the maximum queue length reached 10 cars but the wait time did not exceed 30 seconds.

As presented below, existing vehicular and pedestrian volumes do NOT meet the various warrant thresholds.

- Vehicular Volume Based Warrants (Warrants 1 to 3)
    - Traffic volumes at the intersection were not high enough to meet the volume based warrants for a traffic signal (Warrants 1 to 3). Traffic volumes would have to increase by approximately 106 percent to meet Warrant 1 (Eight-Hour Volumes), by 57 percent to meet Warrant 2 (Four-Hour Volumes), and by 64 percent to meet Warrant 3 (Peak Hour Volumes).

- In all applicable cases, the warrants were also analyzed using the option to evaluate the major street left-turns versus the opposing major street traffic when the original warrant criteria was not met. Traffic volumes were not high enough to meet the warrants for a traffic signal using this option. Traffic volumes would have to increase by approximately 211 percent to meet Warrant 1 (Eight-Hour Volumes), by 137 percent to meet Warrant 2 (Four-Hour Volumes), and by 116 percent to meet Warrant 3 (Peak Hour Volumes).

- Pedestrian Based Warrant (Warrant 4)
  - There were 72 pedestrians observed at the intersection (crossing all approaches) during the 12 hour counts.
  - The criteria for Warrant 4 (Pedestrian Volume) requires at least 75 pedestrians crossing the major street per hour for any four hours or at least 93 pedestrians crossing the major street per hour during a peak hour. At this intersection, the maximum number of crossings for the major street observed in any given hour was 41. Therefore, Warrant 4 (Pedestrian Volume) is not met.
- Crash Experience Warrant (Warrant 7)
  - Crash data were obtained from the UDOT Traffic and Safety Division. A review of crashes reported from January 2010 through May 2019 revealed a total of 6 crashes, 4 of which could be corrected by a traffic signal as summarized below:
    - 2010 – 0 crashes correctable by signal; 0 total crashes (0 severe)
    - 2011 – 2 crashes correctable by signal; 2 total crashes (0 severe)
    - 2012 – 1 crash correctable by signal; 2 total crashes (0 severe)
    - 2013 – 0 crashes correctable by signal; 0 total crashes (0 severe)
    - 2014 – 0 crashes correctable by signal; 1 total crash (0 severe)
    - 2015 – 0 crashes correctable by signal; 0 total crashes (0 severe)
    - 2016 – 0 crashes correctable by signal; 0 total crashes (0 severe)
    - 2017 – 0 crashes correctable by signal; 0 total crashes (0 severe)
    - 2018 – 1 crash correctable by signal; 1 total crash (0 severe)
    - 2019 – 0 crashes correctable by signal; 0 total crashes (0 severe)
  - Since there were less than 5 crashes correctable by a signal within a 12 month period, Warrant 7 (Crash Experience) is not met.

- Intersection Near a Grade Crossing (Warrant 9)
  - An at-grade railroad crossing is not in the vicinity of the intersection. Therefore, Warrant 9 (intersection Near a Grade Crossing) is not met.

A summary of the peak hour volumes is shown in Table 1.

Table 1. Peak Hour Summary

Peak Period	Peak Hour	300 West						SR-121 (200 North)					
		Northbound			Southbound			Eastbound			Westbound		
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
AM	7:30 – 8:30	0	1	10	19	4	83	159	374	2	5	183	93
PM	5:00 – 6:00	2	1	6	12	7	23	13	292	2	13	532	21

An analysis was performed using the procedure outlined in UDOT's Left-turn Phasing Guidelines. UDOT Left-turn Phasing Guidelines are included in the appendix of this report. The results of the analysis are discussed below.

- None of the crashes in recent years were left-turn related.
- An adjacent signalized intersection is located approximately 0.28 miles east of the intersection at State Street. The assumptions for arrival type and corresponding required cross product are shown in Table 2.

Table 2. Volume Cross Product Analysis Requirements

Approach	Opposing Thru Lanes	Arrival Type	Minimum Required Cross Product
Northbound	1	Random	50,000
Southbound	1	Random	50,000
Eastbound	1	Platoon	60,000
Westbound	1	Random	50,000

- A summary of the analysis for each approach is shown in Table 3. The values shown are the highest volume cross product during the peak period. The left-turn volume shown in the table is the left-turn volume that corresponds to the highest volume cross product and may not be the highest overall left-turn volume.

Table 3. Left-turn Analysis Summary for SR-121 & 300 West

Approach	Posted Speed Limit (mph)	Opposing Thru Lanes	AM Peak Hour		PM Peak Hour	
			LT Volume	Volume Cross Product*	LT Volume	Volume Cross Product*
NBL	25	1	0	0	3	21
SBL	25	1	11	44	28	28
EBL	35	1	**159**	29,097	22	8,954
WBL	35	1	5	1,870	13	3,796

*Volume cross product is the left-turn hourly volume multiplied by the opposing thru hourly volume.

UDOT's Left-turn Phasing Guidelines require a minimum volume criteria of 100 left-turn vehicles per hour for left-turn phasing to be considered. The analysis indicates the volume cross product is not high enough to warrant permissive/protected left-turn phasing for the any of the approaches.

Conclusions

Based on the warrants criteria outlined in Chapter 4C of the Utah MUTCD, **a traffic signal is not warranted at SR-121 & 300 West.** A left-turn analysis was also performed if a traffic signal was installed at this location, none of the approaches meet the criteria for permissive/protected or protected only left-turn phasing.

If you have any questions or do not agree with our conclusions, please contact the Traffic Studies office at (801) 766-4343.

JS/horrocks

cc: Robert Miles, Jesse Sweeten, Carrie O'Neill, Leslie Calderwood, Doug Bassett, Adam Lough, Mark Taylor, Devin Squire

*Supporting electronic data available on request

TRAFFIC STUDY

19-TS1506-03-SIG,LT,LT-P 0121P (MP 0.428)

Traffic Signal Analysis (Warrants: 1,2,3,4,7,9),Left-turn Signal ,Protectec

Year: **2019** City: **Roosevelt** Region: **3**

Status: **In Progress**

Next Action Due: **09/12/2019**

Printed: Sep 12, 2019

Request Details

Requester Name: Brian Phillips

Requester Email: brianphillips@utah.gov

Date Submitted: 09/12/2019

Project Pin *No PIN*

Last Study Number: *No Number*

Study Type

- Traffic Signal Analysis (Warrants: 1,2,3,4,7,9)
- Left-turn Signal
- Protected Left (pt, pm+pt, FYA)

Study Details: Please study this location for a signal

Supporting Documentation

No Supporting Documentation

This report may be protected under 23 USC 409

Location

Region: 3

Station: *No Station*

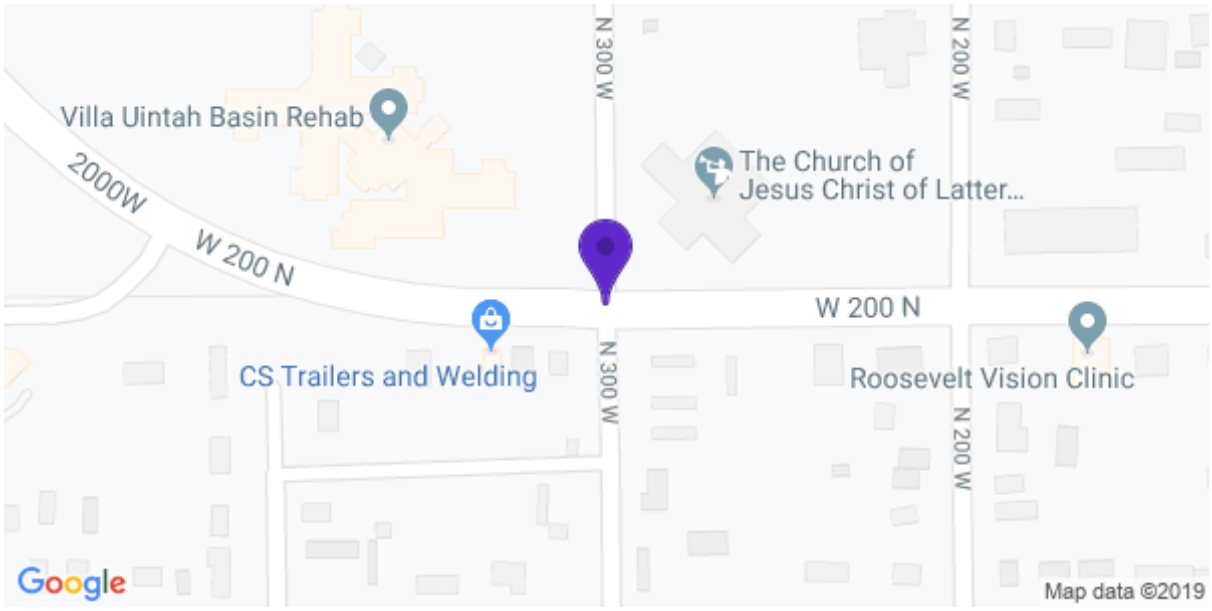
County: *No County*

City Roosevelt

Route: 0121P

MP 0.428

Cross Street/Boundaries: 300 West



This report may be protected under 23 USC 409

Bidding

Date Submitted: Sep 12th, 2019

Requested Due Date: *No requested due date*

Awarded Due Date: Sep 20th, 2019

Awarded To Horrocks

This report may be protected under 23 USC 409

Overlaps: Route 0121P

2022

2021

2020

2019 19-TS1506-03-SIG,LT,LT-P 0121P (MP 0.428)
MP: **0.428** City: **Roosevelt** Stage: **In Progress**

2018

2017

2016

This report may be protected under 23 USC 409

Notes & History

09/12/2019	Study awarded to: UDOTtrafficstudies@horrocks.com.
09/12/2019	Bid submitted by UDOTtrafficstudies@horrocks.com.
09/12/2019	Bid submitted by udottrafficstudies@rsginc.com.
09/12/2019	Study request submitted by brianphillips@utah.gov.

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Figure 2. Northbound Approach



Figure 3. Southbound Approach



Figure 4. Eastbound Approach



Figure 5. Westbound Approach

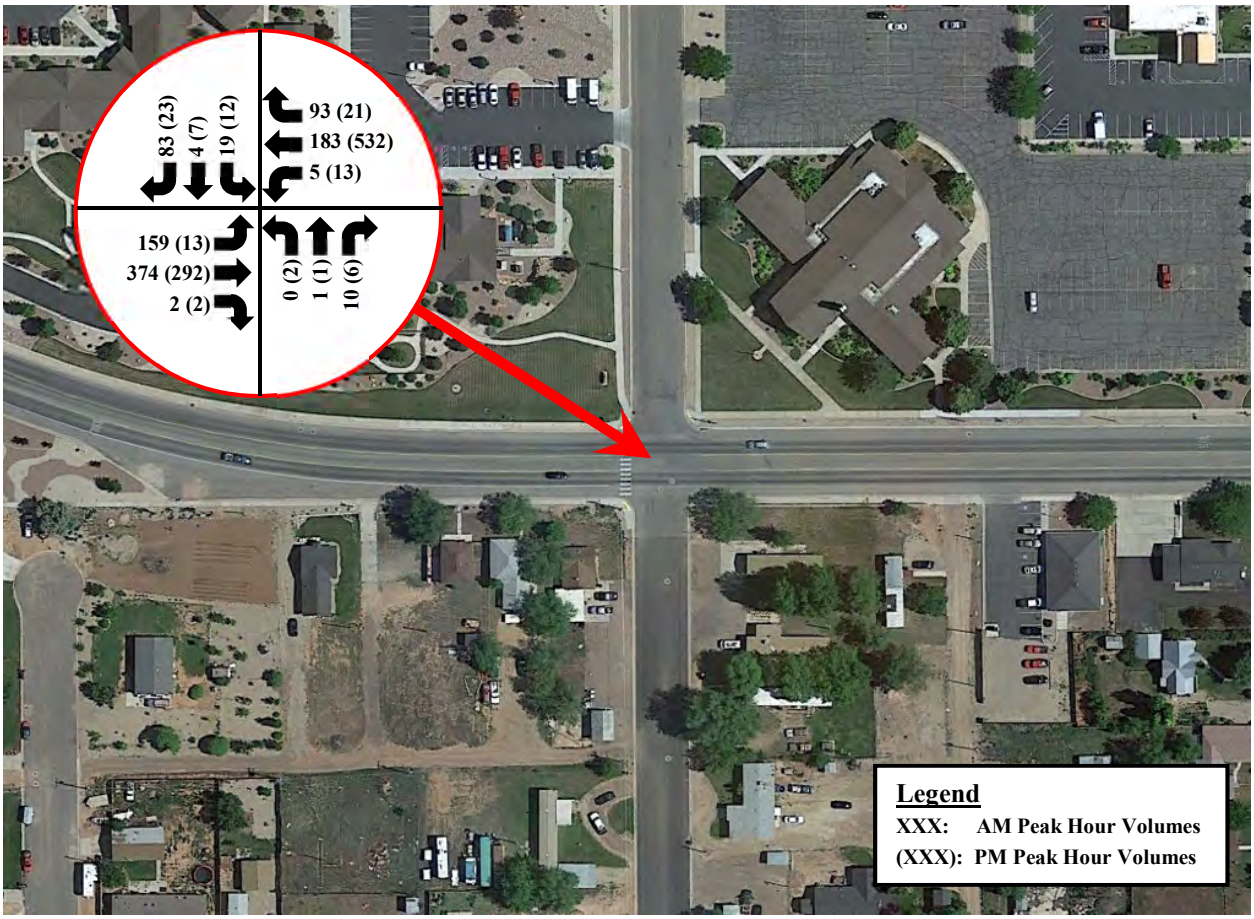


Figure 6. Peak Hour Summary

Table 4. Traffic Count Summary

Daily Count Summary																	
									North/South:	300 West			Date:	Tuesday, September 17, 2019			
									East/West:	SR-121			Counter:	Derrick, Kelsey			
									Weather:	Clear			Supervisor:	Derrick Marchant			
	300 West Northbound				300 West Southbound				SR-121 Eastbound				SR-121 Westbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
RAW COUNT DATA																	
Period																	**TOTAL**
7:00	0	2	2	0	4	0	5	0	8	47	0	0	1	24	8	0	101
7:15	0	1	1	0	1	0	1	0	19	78	0	1	0	14	4	0	119
7:30	0	0	1	0	4	1	7	0	21	102	0	2	0	38	18	0	192
7:45	0	1	3	0	2	1	21	0	67	125	2	1	0	51	30	0	303
8:00	0	0	3	0	10	0	42	0	57	83	0	0	4	52	34	0	285
8:15	0	0	3	0	3	2	13	0	14	64	0	0	1	42	11	0	153
8:30	0	0	1	0	4	0	4	0	7	81	0	2	0	39	8	0	144
8:45	0	0	1	0	1	0	4	0	17	72	0	0	0	45	8	0	148
9:00	0	1	1	0	7	1	1	0	5	45	0	0	1	43	3	0	108
9:15	1	1	0	0	8	0	3	0	8	54	0	0	0	48	7	0	130
9:30	0	0	0	0	9	1	2	0	9	52	1	0	1	40	3	0	118
9:45	1	0	2	0	3	1	4	1	4	53	0	0	2	46	6	0	122
10:00	0	2	1	0	8	0	7	0	11	46	0	0	1	52	9	0	137
10:15	0	1	0	0	3	1	7	0	11	42	0	0	0	41	9	0	115
10:30	0	2	3	0	6	5	9	0	5	53	1	0	0	59	5	0	148
10:45	1	1	3	0	3	2	8	0	18	75	0	0	0	62	11	0	184
11:00	0	0	0	0	9	0	7	0	24	59	0	0	1	48	11	0	159
11:15	0	2	0	0	13	1	15	0	7	50	0	0	1	45	9	0	143
11:30	0	0	0	0	4	0	3	0	8	64	0	0	1	63	11	0	154
11:45	0	0	0	2	14	2	11	0	20	56	0	2	0	75	13	0	191
12:00	1	0	1	0	6	3	6	0	7	69	1	0	2	78	3	0	177
12:15	1	2	0	0	7	3	7	0	7	53	0	0	0	74	10	0	164
12:30	0	2	0	0	10	7	8	0	9	56	0	0	2	69	6	4	169
12:45	0	5	0	0	5	0	4	0	5	61	0	0	0	62	9	0	151
13:00	0	1	0	0	10	0	3	0	8	49	0	0	2	71	2	0	146
13:15	0	0	0	0	4	0	7	0	4	57	0	0	1	70	5	0	148
13:30	0	0	1	0	5	0	6	0	2	57	0	0	0	67	6	0	144
13:45	0	3	1	0	7	0	7	0	1	59	0	0	2	68	5	0	153
14:00	0	0	0	1	3	0	5	0	6	48	1	3	2	58	8	0	131
14:15	0	0	0	0	4	0	7	0	5	50	0	0	1	73	10	0	150
14:30	0	0	0	0	2	0	7	0	23	71	2	3	0	54	20	0	179
14:45	0	0	0	0	4	1	10	0	43	61	1	5	5	83	23	0	231
15:00	1	0	3	0	16	8	35	0	12	84	0	32	0	140	10	0	309
15:15	0	3	3	4	8	1	12	0	6	77	1	1	2	99	5	0	217
15:30	0	0	1	0	6	1	3	0	7	54	1	1	4	74	8	0	159
15:45	1	2	1	0	5	2	7	0	4	53	1	0	3	83	5	0	167
16:00	1	1	1	0	2	2	17	0	9	66	0	0	0	94	5	0	198
16:15	0	0	1	0	12	0	4	0	3	85	0	0	4	114	3	0	226
16:30	0	0	2	1	10	0	14	0	5	56	0	3	5	108	0	0	200
16:45	1	0	3	0	2	1	14	0	5	51	0	0	1	91	7	0	176
17:00	0	1	4	0	4	2	11	0	3	78	1	0	4	156	2	0	266
17:15	0	0	1	0	1	3	4	0	5	78	0	0	4	135	5	0	236
17:30	2	0	0	0	4	1	5	0	4	73	0	0	4	134	5	3	232
17:45	0	0	1	0	3	1	3	0	1	63	1	0	1	107	9	0	190
18:00	0	0	0	0	11	1	11	0	6	54	0	0	0	92	0	0	175
18:15	0	0	2	0	2	1	5	0	2	39	2	0	1	89	3	0	146
18:30	0	0	0	0	5	0	7	0	2	40	0	0	2	70	2	0	128
18:45	0	0	2	0	3	0	6	0	1	51	1	0	3	79	3	0	149

Table 5. Speed Data

Radar Speed Collection

Route	SR-121
Counter:	Derrick , Kelsey
Combined 85th Percentile:	36

Location			Sample #	Speed	Sorted
Location		300 West	46	30	31
Travel Direction		EB	47	24	31
Date	Time	Posted Speed	48	27	32
			49	28	32
18-Sep	9:00 AM	35	50	29	32
Average		31.69	51	34	32
Maximum		39	52	32	32
Minimum		23	53	34	32
85th Percentile		35	54	36	32
Sample #	Speed	Sorted	55	30	32
1	30	23	56	27	32
2	31	23	57	31	32
3	38	24	58	37	33
4	29	25	59	32	33
5	35	26	60	36	33
6	33	27	61	34	33
7	34	27	62	35	33
8	36	27	63	31	33
9	30	27	64	31	33
10	33	27	65	34	33
11	33	27	66	25	33
12	35	28	67	30	34
13	38	28	68	32	34
14	33	28	69	32	34
15	28	28	70	29	34
16	36	28	71	33	34
17	32	28	72	35	34
18	30	29	73	34	34
19	39	29	74	39	34
20	27	29	75	30	34
21	31	29	76	29	34
22	30	29	77	30	34
23	32	29	78	37	35
24	34	29	79	28	35
25	30	29	80	32	35
26	36	29	81	35	35
27	33	29	82	32	35
28	35	30	83	34	35
29	31	30	84	32	35
30	29	30	85	35	35
31	27	30	86	29	35
32	29	30	87	27	35
33	29	30	88	29	35
34	23	30	89	33	36
35	32	30	90	35	36
36	35	30	91	34	36
37	31	30	92	28	36
38	36	30	93	30	36
39	33	30	94	23	36
40	34	31	95	34	37
41	28	31	96	35	37
42	27	31	97	29	38
43	35	31	98	26	38
44	33	31	99	28	39
45	30	31	100	31	39

Location			Sample #	Speed	Sorted
Location		300 West	46	36	33
Travel Direction		WB	47	29	34
Date	Time	Posted Speed	48	33	34
			49	33	34
18-Sep	9:00 AM	35	50	36	34
Average		33.71	51	31	34
Maximum		46	52	28	34
Minimum		25	53	34	34
85th Percentile		36	54	34	34
Sample #	Speed	Sorted	55	35	34
1	40	25	56	35	34
2	32	26	57	40	34
3	38	26	58	34	34
4	36	27	59	35	34
5	33	28	60	35	34
6	34	28	61	31	34
7	36	29	62	29	34
8	35	29	63	29	35
9	34	29	64	35	35
10	36	29	65	34	35
11	31	29	66	33	35
12	32	29	67	36	35
13	38	29	68	33	35
14	39	30	69	39	35
15	45	31	70	31	35
16	35	31	71	34	35
17	29	31	72	46	35
18	26	31	73	30	35
19	33	31	74	31	35
20	34	31	75	39	35
21	34	31	76	33	35
22	35	31	77	35	35
23	32	31	78	31	35
24	34	31	79	35	35
25	31	31	80	31	36
26	35	32	81	35	36
27	32	32	82	33	36
28	34	32	83	34	36
29	39	32	84	35	36
30	33	32	85	31	36
31	29	32	86	38	36
32	31	32	87	34	38
33	29	32	88	25	38
34	32	33	89	33	38
35	35	33	90	34	38
36	33	33	91	33	39
37	32	33	92	34	39
38	35	33	93	33	39
39	28	33	94	32	39
40	27	33	95	40	40
41	36	33	96	31	40
42	29	33	97	32	40
43	35	33	98	34	42
44	38	33	99	35	45
45	26	33	100	42	46

Table 6. Left-turn Analysis for SR-121 & 300 West

Left-turn Warrant Analysis	300 West Northbound			300 West Southbound			SR-121 Eastbound			SR-121 Westbound		
	Opposing Lanes*:		1	**Opposing Lanes*:**		1	**Opposing Lanes*:**		1	**Opposing Lanes*:**		1
	Arrival Type:		Random	**Arrival Type:**		Random	**Arrival Type:**		Platoon	**Arrival Type:**		Random
	Left Volume	Opposing Thru Volume	LT Cross Product**	Left Volume	Opposing Thru Volume	LT Cross Product**	Left Volume	Opposing Thru Volume	LT Cross Product**	Left Volume	Opposing Thru Volume	LT Cross Product**
AM												
Hour												
7:00 AM - 8:00 AM	0	2	-	11	4	44	115	127	14,605	1	352	352
7:15 AM - 8:15 AM	0	2	-	17	2	34	164	155	25,420	4	388	1,552
7:30 AM - 8:30 AM	0	4	-	19	1	19	159	183	29,097	5	374	1,870
7:45 AM -8:45 AM	0	3	-	19	1	19	145	184	26,680	5	353	1,765
8:00 AM -9:00 AM	0	2	-	18	0	-	95	178	16,910	5	300	1,500
PM												
Hour												
4:00 PM -5:00 PM	2	3	6	26	1	26	22	407	8,954	10	258	2,580
4:15 PM -5:15 PM	1	3	3	28	1	28	16	469	7,504	14	270	3,780
4:30 PM - 5:30 PM	1	6	6	17	1	17	18	490	8,820	14	263	3,682
4:45 PM -5:45 PM	3	7	21	11	1	11	17	516	8,772	13	280	3,640
5:00 PM -6:00 PM	2	7	14	12	1	12	13	532	6,916	13	292	3,796

* Random Arrival = no other traffic signal with 0.5 miles, Platoon Arrival = other traffic signal with 0.5 miles

** Minimum Criteria = 50,000 for Random Arrivals with One opposing lane

= 100,000 for Random Arrivals with two or three opposing lanes

= 60,000 for Platoon Arrivals with One opposing lane

= 120,000 for Platoon Arrivals with Two or Three opposing lanes

Utah Department of Transportation

Division of Traffic and Safety

(801) 766-4343

Study Name : **19-TS1506-03-SIG 0121 (MP 0.428)**
Study Date : **09/17/19**

Signal Warrants - Summary

Major Street Approaches

Eastbound: **SR-121**
Number of Lanes: **1**
85% Speed < 40 MPH.
Total Approach Volume: **3,529**

Westbound: **SR-121**
Number of Lanes: **1**
85% Speed < 40 MPH.
Total Approach Volume: **3,488**

Minor Street Approaches

Northbound: **300 West**
Number of Lanes: **1**
Total Approach Volume: **45**

Southbound: **300 West**
Number of Lanes: **1**
Total Approach Volume: **333**

Warrant Summary **(Rural values apply.)**

Warrant 1 - Eight Hour Vehicular Volumes ..... **Not Satisfied**

Warrant 1A - Minimum Vehicular Volume ..... **Not Satisfied**
Required volumes reached for 0 hours, 8 are needed

Warrant 1B - Interruption of Continuous Traffic ..... **Not Satisfied**
Required volumes reached for 0 hours, 8 are needed

Warrant 1C - Combination of Warrants ..... **Not Satisfied**
Required 1A volumes reached for 0 hours, 8 are needed
Required 1B volumes reached for 2 hours, 8 are needed

Warrant 2 - Four Hour Volumes ..... **Not Satisfied**
Number of hours (0) volumes exceed minimum < minimum required (4).

Warrant 3 - Peak Hour ..... **Not Satisfied**

Warrant 3A - Peak Hour Delay ..... **Not Satisfied**
Approach volumes on minor street don't exceed minimums for any hour. Delay data not evaluated.

Warrant 3B - Peak Hour Volumes ..... **Not Satisfied**
Volumes do not exceed minimums for any hour.

Warrant 4 - Pedestrian Volumes ..... **Not Satisfied**
Required 4 Hr pedestrian volume reached for 0 hour(s) and the single hour volume for 0 hour(s)

Warrant 5 - School Crossing ..... **Not Evaluated**

Warrant 6 - Coordinated Signal System ..... **Not Evaluated**

Warrant 7 - Crash Experience ..... **Not Satisfied**
Number of accidents (2) is less than minimum (5). Volume minimums are not met.

Warrant 8 - Roadway Network ..... **Not Evaluated**

Warrant 9 - Intersection Near a Grade Crossing ..... **Not Satisfied**
No Railroad Crossing Within 140ft on minor approach.

Utah Department of Transportation

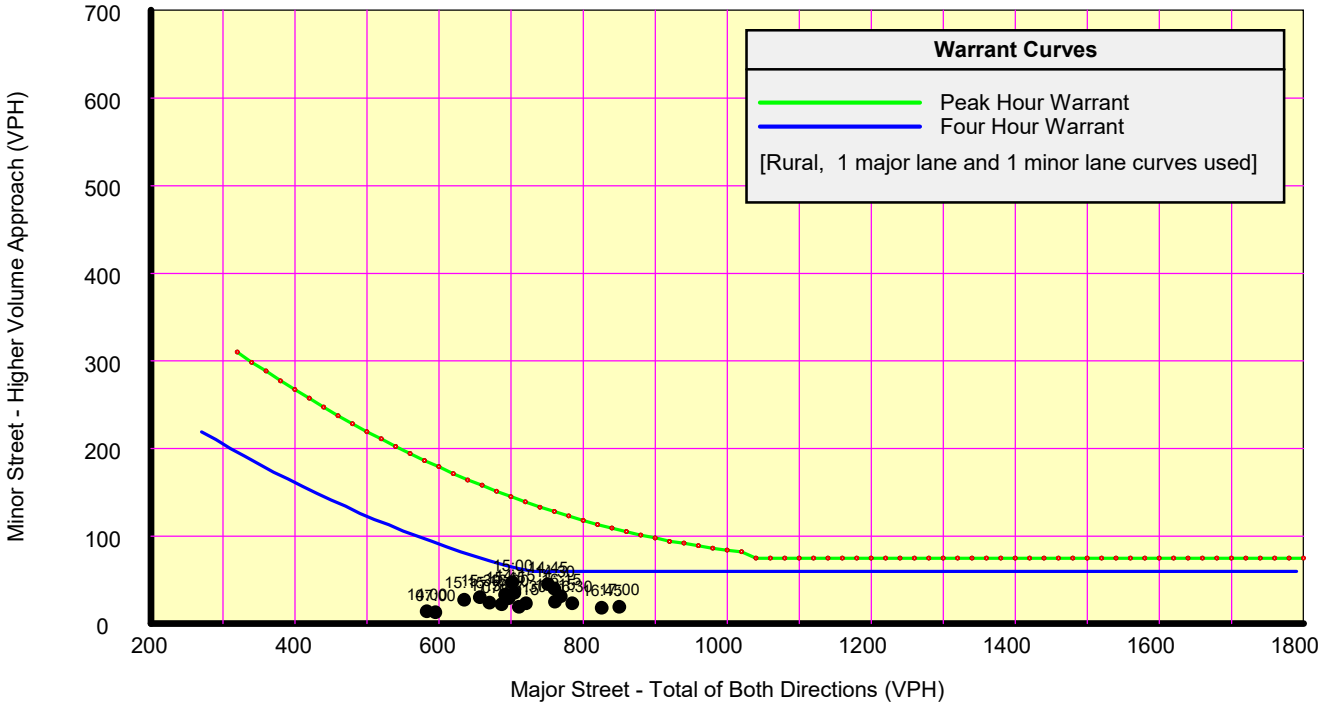
Division of Traffic and Safety

(801) 766-4343

Study Name : **19-TS1506-03-SIG 0121 (MP 0.428)**

Study Date : **09/17/19**

Signal Warrants - Summary



Analysis of 8-Hour Volume Warrants:

War 1A-Minimum Volume

Hour Begin	Major Total	Minor Vol	Minor Dir	Maj 350	Min 105
17:00	850	19	SB	Yes	No
16:45	826	18	SB	Yes	No
16:30	785	23	SB	Yes	No
16:15	769	31	SB	Yes	No
17:15	761	25	SB	Yes	No
14:30	760	40	SB	Yes	No
14:45	751	45	SB	Yes	No
07:30	721	23	SB	Yes	No
07:15	711	19	SB	Yes	No
14:15	705	35	SB	Yes	No
15:00	702	47	SB	Yes	No
16:00	697	29	SB	Yes	No
15:45	692	33	SB	Yes	No
07:45	687	22	SB	Yes	No
17:30	670	24	SB	Yes	No
15:30	657	30	SB	Yes	No
15:15	635	27	SB	Yes	No
07:00	595	13	SB	Yes	No
14:00	583	14	SB	Yes	No
08:00	578	20	SB	Yes	No
11:45	577	52	SB	Yes	No
11:30	577	39	SB	Yes	No
17:45	569	24	SB	Yes	No
12:00	554	41	SB	Yes	No

War 1B-Interruption of Traffic

Hour Begin	Major Total	Minor Vol	Minor Dir	Maj 525	Min 53
17:00	850	19	SB	Yes	No
16:45	826	18	SB	Yes	No
16:30	785	23	SB	Yes	No
16:15	769	31	SB	Yes	No
17:15	761	25	SB	Yes	No
14:30	760	40	SB	Yes	No
14:45	751	45	SB	Yes	No
07:30	721	23	SB	Yes	No
07:15	711	19	SB	Yes	No
14:15	705	35	SB	Yes	No
15:00	702	47	SB	Yes	No
16:00	697	29	SB	Yes	No
15:45	692	33	SB	Yes	No
07:45	687	22	SB	Yes	No
17:30	670	24	SB	Yes	No
15:30	657	30	SB	Yes	No
15:15	635	27	SB	Yes	No
07:00	595	13	SB	Yes	No
14:00	583	14	SB	Yes	No
08:00	578	20	SB	Yes	No
11:45	577	52	SB	Yes	No
11:30	577	39	SB	Yes	No
17:45	569	24	SB	Yes	No
12:00	554	41	SB	Yes	No

War 1C-Combination of Warrants

Hour Begin	Major Total	Minor Vol	Minor Dir	1A Met	1B Met
14:45	751	45	SB	No	Yes
12:15	528	42	SB	No	Yes
11:00	522	43	SB	No	Yes
17:00	850	19	SB	No	No
16:45	826	18	SB	No	No
16:30	785	23	SB	No	No
16:15	769	31	SB	No	No
17:15	761	25	SB	No	No
14:30	760	40	SB	No	No
07:30	721	23	SB	No	No
07:15	711	19	SB	No	No
14:15	705	35	SB	No	No
15:00	702	47	SB	No	-
16:00	697	29	SB	No	No
15:45	692	33	SB	No	No
07:45	687	22	SB	No	No
17:30	670	24	SB	No	No
15:30	657	30	SB	No	-
15:15	635	27	SB	No	-
07:00	595	13	SB	No	No
14:00	583	14	SB	No	No
08:00	578	20	SB	No	No
11:45	577	52	SB	No	-
11:30	577	39	SB	No	-

Utah Department of Transportation

Division of Traffic and Safety

(801) 766-4343

Study Name : **19-TS1506-03-SIG 0121 (MP 0.428) LT Vs Thru**

Study Date : **09/17/19**

Signal Warrants - Summary

Major Street Approaches

SR-121 WB Thru

Number of Lanes: **1**

85% Speed < 40 MPH.

Total Approach Volume: **3,419**

Minor Street Approaches

SR-121 EB LT

Number of Lanes: **1**

Total Approach Volume: **414**

Warrant Summary **(Rural values apply.)**

Warrant 1 - Eight Hour Vehicular Volumes ..... **Not Satisfied**

Warrant 1A - Minimum Vehicular Volume ..... **Not Satisfied**

Required volumes reached for 0 hours, 8 are needed

Warrant 1B - Interruption of Continuous Traffic ..... **Not Satisfied**

Required volumes reached for 0 hours, 8 are needed

Warrant 1C - Combination of Warrants ..... **Not Satisfied**

Required 1A volumes reached for 0 hours, 8 are needed

Required 1B volumes reached for 0 hours, 8 are needed

Warrant 2 - Four Hour Volumes ..... **Not Satisfied**

Number of hours (0) volumes exceed minimum < minimum required (4).

Warrant 3 - Peak Hour ..... **Not Satisfied**

Warrant 3A - Peak Hour Delay ..... **Not Satisfied**

Approach volumes on minor street don't exceed minimums for any hour. Delay data not evaluated.

Warrant 3B - Peak Hour Volumes ..... **Not Satisfied**

Volumes do not exceed minimums for any hour.

Warrant 4 - Pedestrian Volumes ..... **Not Satisfied**

Required 4 Hr pedestrian volume reached for 0 hour(s) and the single hour volume for 0 hour(s)

Warrant 5 - School Crossing ..... **Not Evaluated**

Warrant 6 - Coordinated Signal System ..... **Not Evaluated**

Warrant 7 - Crash Experience ..... **Not Satisfied**

Number of accidents (2) is less than minimum (5). Volume minimums are not met.

Warrant 8 - Roadway Network ..... **Not Evaluated**

Warrant 9 - Intersection Near a Grade Crossing ..... **Not Satisfied**

No Railroad Crossing Within 140ft on minor approach.

Utah Department of Transportation

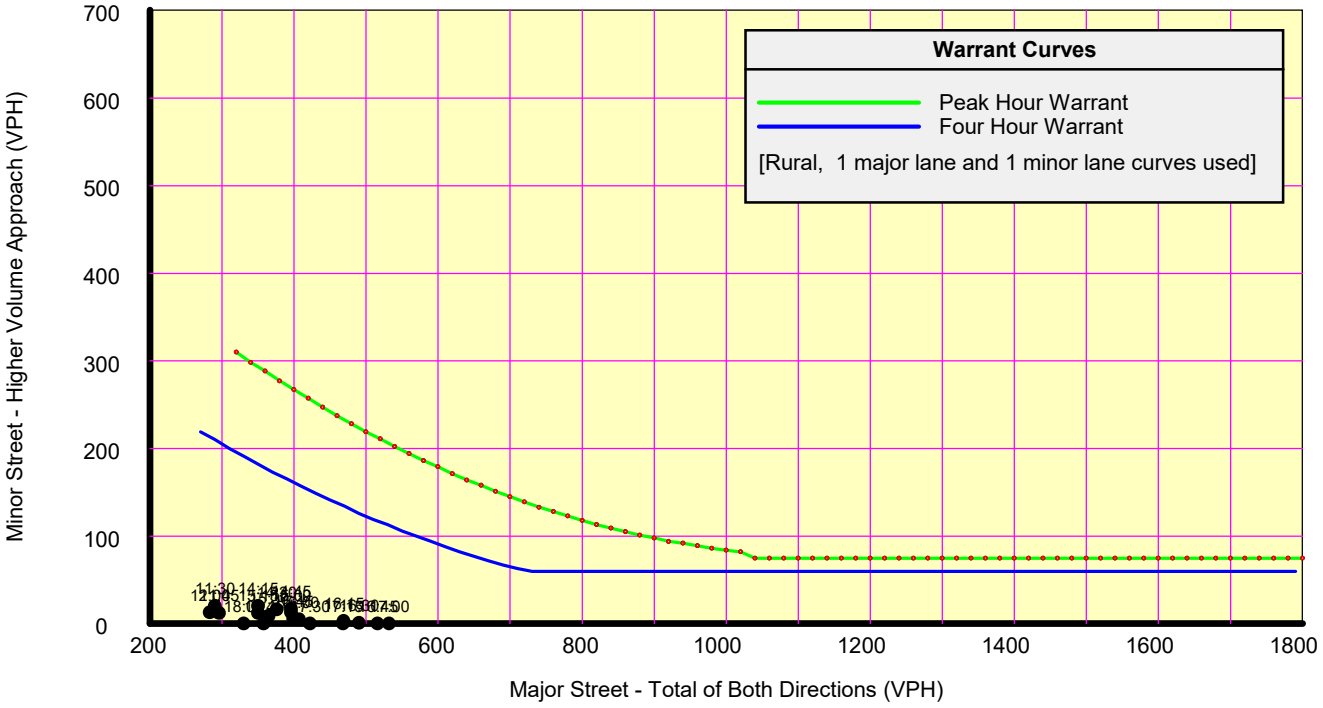
Division of Traffic and Safety

(801) 766-4343

Study Name : **19-TS1506-03-SIG 0121 (MP 0.428) LT Vs Thru**

Study Date : **09/17/19**

Signal Warrants - Summary



Analysis of 8-Hour Volume Warrants:

War 1A-Minimum Volume | **War 1B-Interruption of Traffic** | **War 1C-Combination of Warrants**

Hour Begin	Major Total	Minor Vol	Minor Dir	Maj 350	Min 105	Hour Begin	Major Total	Minor Vol	Minor Dir	Maj 525	Min 53	Hour Begin	Major Total	Minor Vol	Minor Dir	1A Met	1B Met
17:00	532	0	SB	Yes	No	17:00	532	0	SB	Yes	No	17:00	532	0	SB	No	No
16:45	516	0	SB	Yes	No	16:45	516	0	SB	No	No	16:45	516	0	SB	No	No
16:30	490	1	SB	Yes	No	16:30	490	1	SB	No	No	16:30	490	1	SB	No	No
16:15	469	3	SB	Yes	No	16:15	469	3	SB	No	No	16:15	469	3	SB	No	No
17:15	468	0	SB	Yes	No	17:15	468	0	SB	No	No	17:15	468	0	SB	No	No
17:30	422	0	SB	Yes	No	17:30	422	0	SB	No	No	17:30	422	0	SB	No	No
16:00	407	5	SB	Yes	No	16:00	407	5	SB	No	No	16:00	407	5	SB	No	No
15:45	399	6	SB	Yes	No	15:45	399	6	SB	No	No	15:45	399	6	SB	No	No
15:00	396	13	SB	Yes	No	15:00	396	13	SB	No	No	15:00	396	13	SB	No	No
14:45	396	17	SB	Yes	No	14:45	396	17	SB	No	No	14:45	396	17	SB	No	No
14:30	376	16	SB	Yes	No	14:30	376	16	SB	No	No	14:30	376	16	SB	No	No
15:30	365	9	SB	Yes	No	15:30	365	9	SB	No	No	15:30	365	9	SB	No	No
17:45	358	0	SB	Yes	No	17:45	358	0	SB	No	No	17:45	358	0	SB	No	No
15:15	350	12	SB	Yes	No	15:15	350	12	SB	No	No	15:15	350	12	SB	No	No
14:15	350	20	SB	Yes	No	14:15	350	20	SB	No	No	14:15	350	20	SB	No	No
18:00	330	0	SB	No	No	18:00	330	0	SB	No	No	18:00	330	0	SB	No	No
11:45	296	12	SB	No	No	11:45	296	12	SB	No	No	11:45	296	12	SB	No	No
11:30	290	20	SB	No	No	11:30	290	20	SB	No	No	11:30	290	20	SB	No	No
12:00	283	13	SB	No	No	12:00	283	13	SB	No	No	12:00	283	13	SB	No	No
13:00	276	84	SB	No	No	13:00	276	84	SB	No	Yes	13:00	276	84	SB	No	No
12:15	276	32	SB	No	No	12:15	276	32	SB	No	No	12:15	276	32	SB	No	No
12:30	272	73	SB	No	No	12:30	272	73	SB	No	Yes	12:30	272	73	SB	No	No
12:45	270	84	SB	No	No	12:45	270	84	SB	No	Yes	12:45	270	84	SB	No	No
14:00	268	21	SB	No	No	14:00	268	21	SB	No	No	14:00	268	21	SB	No	No

Left-Turn Phases at Signalized Intersections UDOT

Updated November 13, 2014

Purpose

To define the process for warranting left-turn phasing at existing signalized intersections.

UDOT Recommended Guidelines

Guidelines for Left-Turn Phasing

The following flow-chart has been established as criteria for recommending left-turn phasing at signalized intersections. A left-turn phase may be installed after less restrictive measures to reduce delay, congestion, and crashes have been considered. The overall signalized corridor/network operations should be considered when evaluating the impacts of left-turn phasing. Even if the criteria in the flowchart are met for left-turn phasing, engineering judgment should be used to determine whether left-turn phasing is implemented.

Before completing the flowchart for left-turn phasing, the intersection should be evaluated by the TOC to determine if signal timing adjustments can mitigate the problem. The intersection should also be evaluated for sight distance and geometric issues that may determine whether a protected-only left-turn phase is required. A field review is recommended for all sites before changes to left-turn phasing are implemented. Criteria for left-turn phasing are found on the attached flowchart.

Guidelines for Dual Left-Turn Lanes

UDOT recommends the following guidelines in helping to make decisions when to install dual left-turn lanes.

I. A capacity sensitivity analysis should be performed. When performing the capacity sensitivity analysis, the default analysis values in Synchro should be:
    a. Cycle length: 120 seconds
    b. Ideal saturation flow rate: 1900 vphpl
    c. Percent heavy vehicles: 2%
    d. Lane widths: 12 feet
    e. Analyze with no parking and non CBD
    f. Optimize splits

    Table 1 below shows the recommended left turn volumes and the opposing through volume to capacity (v/c) ratio to use in assisting to make the decision for dual left-turns. The v/c ratio is calculated using HCM 2010 methodologies.

Table 1: Capacity Analysis Guidelines

Left-Turn Volume	Opposing Through V/C ≥	Recommend
250 - 269	0.95	Dual Left-Turn Lanes
270 - 279	0.75	Dual Left-Turn Lanes
280 - 319	0.65	Dual Left-Turn Lanes
320 - 359	0.6	Dual Left-Turn Lanes
360 - 389	0.55	Dual Left-Turn Lanes
390 - 420	0.5	Dual Left-Turn Lanes
≥ 420		Dual Left-Turn Lanes

II. The number of hours where left-turn volume meets the guidelines in the capacity analysis in Table 1 should be considered where the dual left-turn lanes provide a benefit. A comparison with the vehicle delays should be made during the other non-peak hours in the day.

III. The location of the intersection where the dual left is being considered should also consider the lane distribution that will be obtained. For example, if the intersection is close to a freeway on-ramp, there may not be good lane utilization since vehicles will favor the lane providing the best access to the ramp.

IV. Consideration should be given for the need to minimize the green time given to left turns on one approach so that added green time is available for the other phases.

V. Compatibility of the dual left exclusive phasing operations with the signal coordination should be evaluated.

VI. The Designer and Project Manager shall consult with the Region Traffic Operations Engineer and the Division of Traffic & Safety before adding dual left-turn lanes when the left-turn volume is less than 420 vph.

VII. If there is no opposing through movement, such as at a three-way “T” intersection, then no additional signal phase is needed. Instead of using the above volume and v/c criteria, consideration should be given to opposing pedestrian phases, available right-of-way needed for the additional lane, and existing left-turn queue lengths at the intersection. If cycle failure (queue doesn’t clear during each signal cycle) is occurring often, dual left-turn lanes should be considered.

Left-Turn Phasing Guidelines

Updated November 13, 2014

LT Vol < 100 veh/hr

100 ≤ LT Vol ≤ 250 veh/hr

LT Vol > 250 veh/hr

yes

yes

yes

(1) - The number of opposing lanes and the posted speed limit should be considered together. If there is a high speed limit with a large number of opposing thru lanes, protected phasing could be considered. However, if there is a high speed limit with only one or two opposing thru lanes, permitted phasing could be appropriate.

(2) - If there is a history of severe left-turn crashes at the study location during the last three years, further study is recommended. A safety study, similar to an operational safety report (OSR) should be completed to determine whether protected left-turn phasing would reduce crashes at the study location. Even if a safety study is needed, the rest of the flow chart should still be evaluated.

no

Dual LT Lanes Warranted ? (3)

(3) - See Dual Left-Turn Lane Guidelines

Four Opposing Thru Lanes? (1)

yes

yes

no

Speed Limit ≥ 60 mph? (1)

yes

yes

no

History of Severe LT Crashes? (2)

yes

Safety Study says Prot LT?

History of Severe LT Crashes? (2)

yes

Safety Study says Prot LT?

yes

no

no

no

no

Volume Based Warrant (4)

no

Cycle Failure / Queuing Issues? (5)

yes

yes

no

(4) - Volume cross product (opposing thru hourly volume multiplied by left-turn hourly volume) exceeds the appropriate following value:
a) **Random arrivals** (no other traffic signals within 0.5 mile)
One opposing lane: 50,000
Two or three opposing lanes: 100,000
b) **Platoon arrivals** (other traffic signals within 0.5 mile)
One opposing lane: 60,000
Two or three opposing lanes: 120,000

(5) - Cycle failure (queues do not completely discharge during each signal cycle) or excessive queuing that blocks thru traffic or adjacent major intersections may indicate that permissive / protected left-turn phasing is needed.

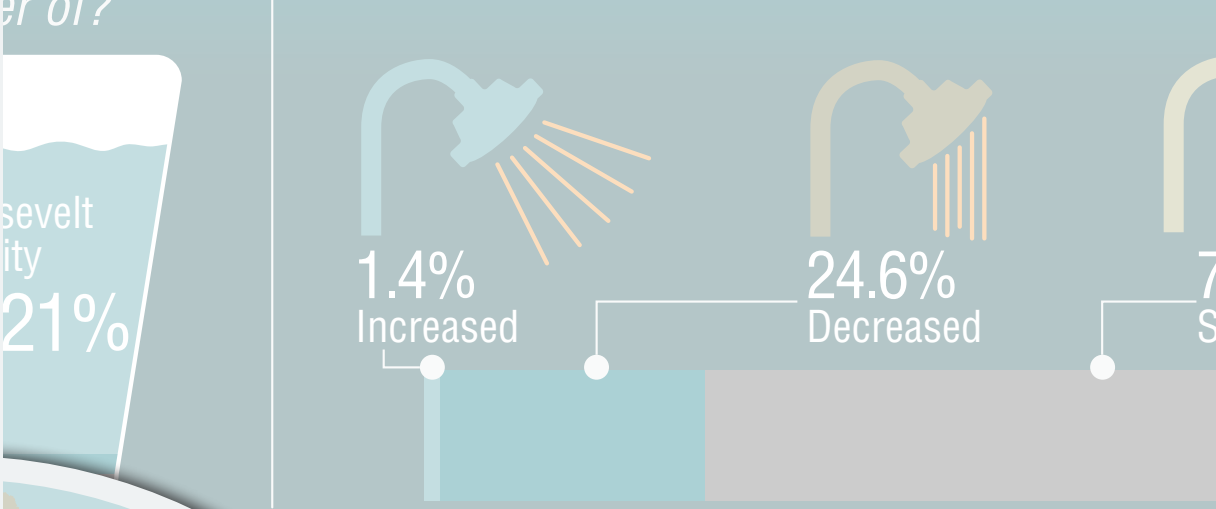
Permissive LT Phasing

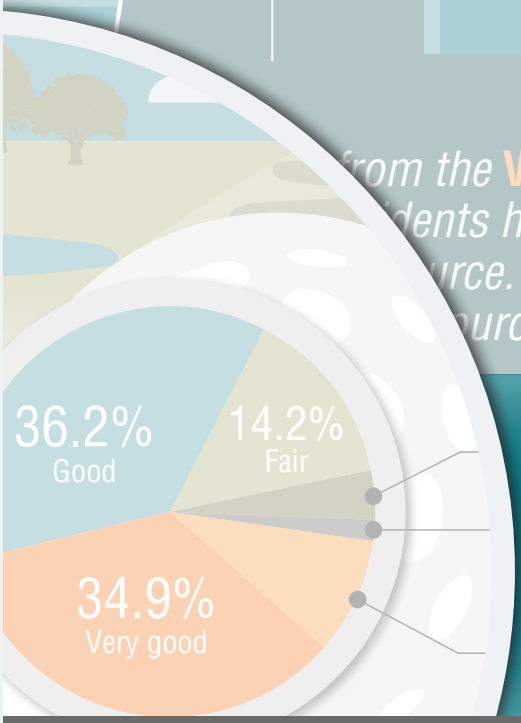
Permissive / Protected LT Phasing

Protected LT Phasing

Roosevelt City Master Plan Survey Appendix G

HORROCKS ENGINEERS

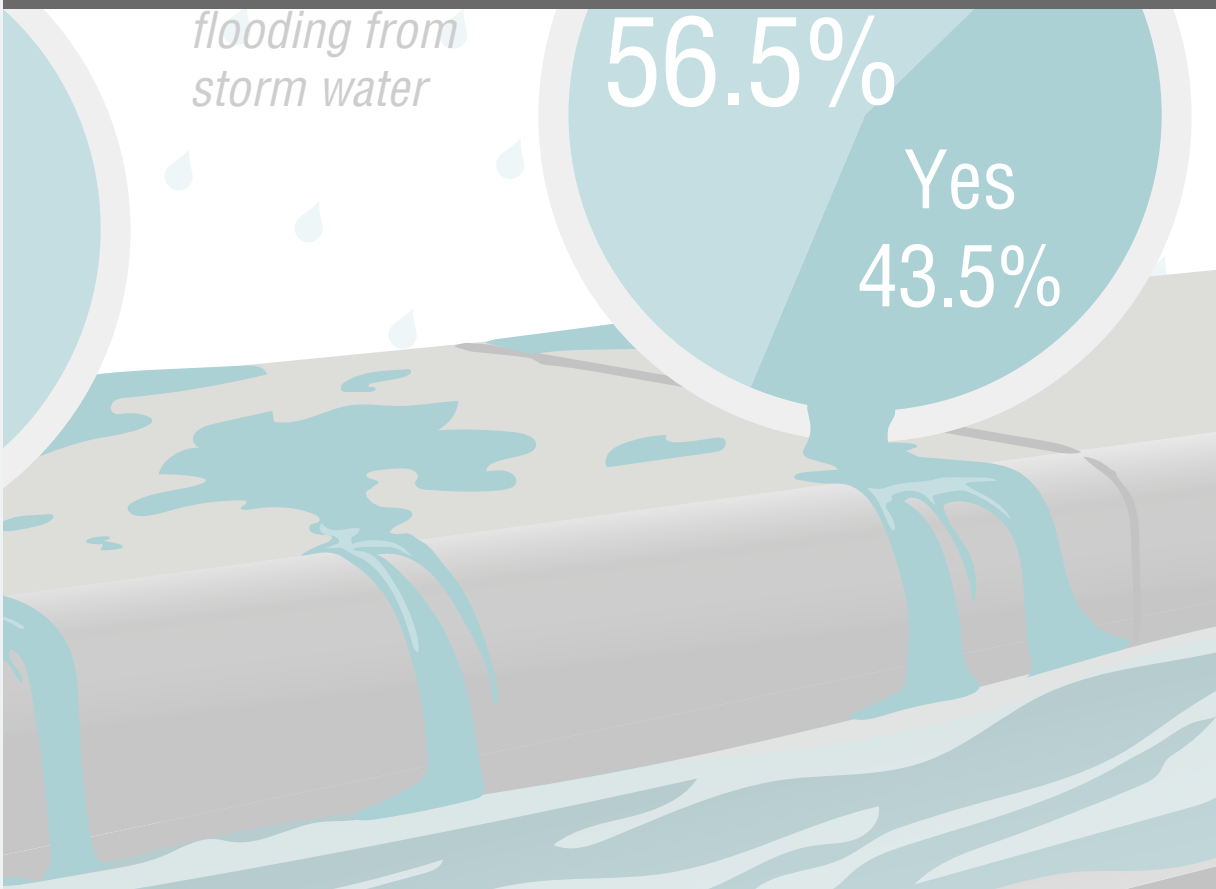




from the Victory
dents have noticed
urce. Based on
urchase:

If the City could provi
portal that would sho
water usage, what wo
willing to pay for that

flooding from storm water



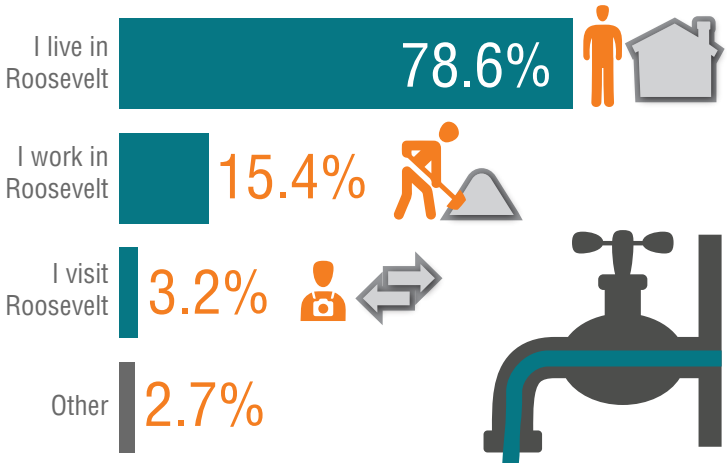
ROOSEVELT Utah

ROOSEVELT CITY MASTER PLAN SURVEY

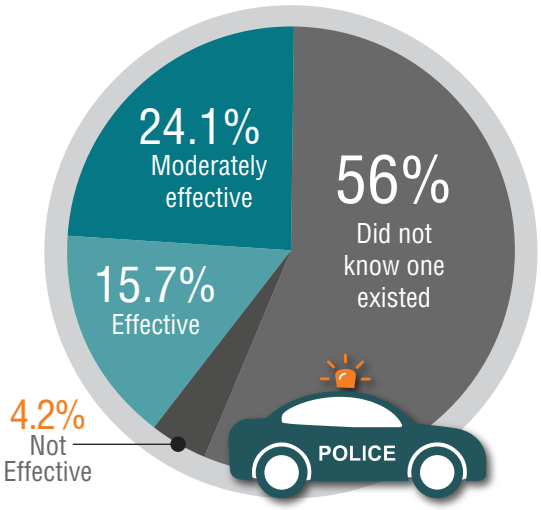
220 Respondants
Between March 9 and April 27, 2019

ROOSEVELT CITY MASTER PLAN SURVEY

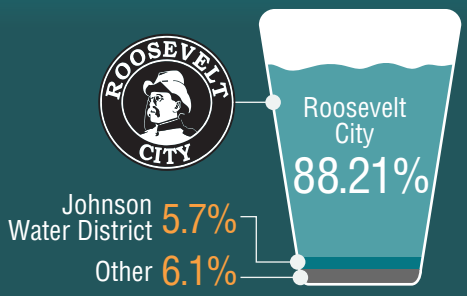
What is your relationship to Roosevelt City?



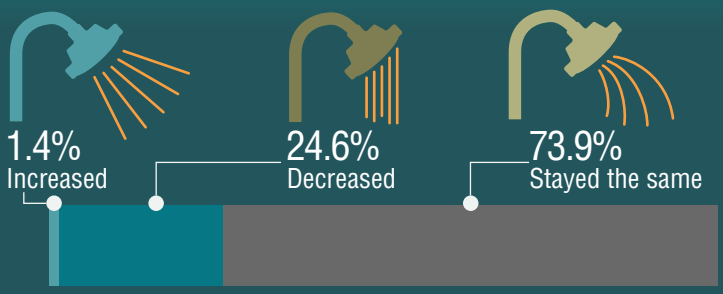
How effective do you feel Roosevelt City's Emergency Response plan is?



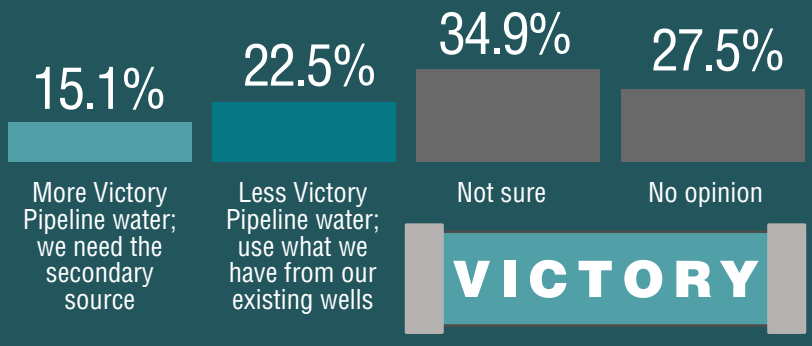
Which public water service provider are you a customer of?



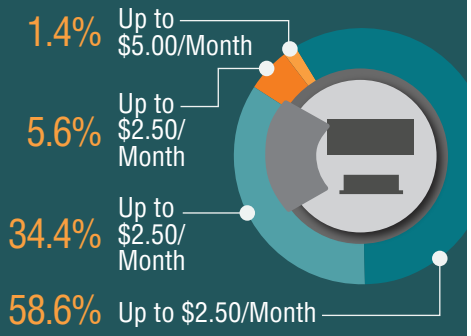
In the last twelve months, has your water pressure:



*Roosevelt City has recently incorporated water from the **Victory Pipeline** into its culinary water system. Some residents have noticed a change in taste and/or smell with the additional source. Based on your experience, would you recommend that the city purchase:*

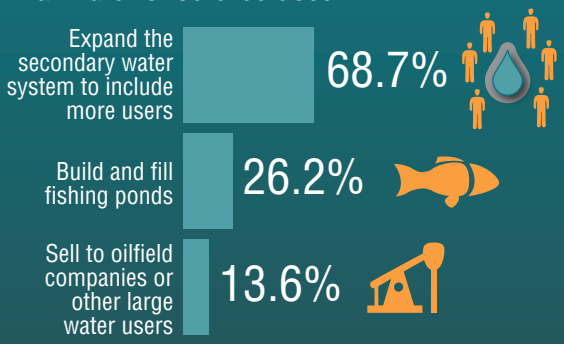


If the City could provide an online portal that would show your daily water usage, what would you be willing to pay for that service?

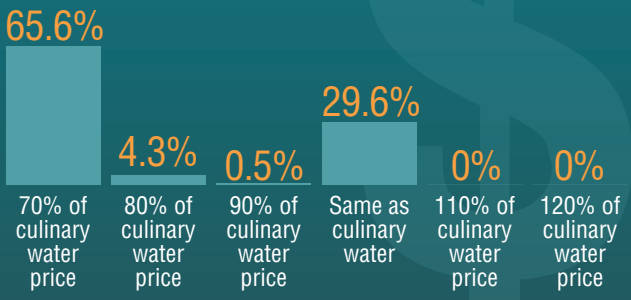


NOTE: Numbers may not add up to 100% due to rounding.

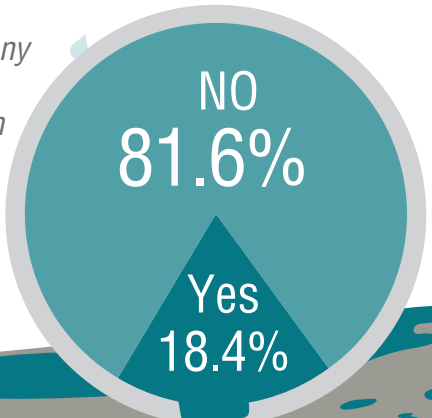
Roosevelt City will soon have an additional 1500 acre-feet of water available in its secondary water system. How do you feel that water should be used?



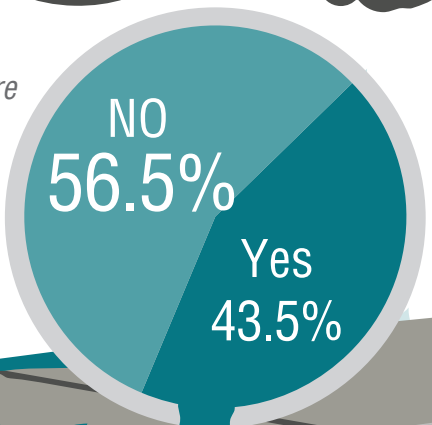
If you're not currently on Roosevelt City's secondary water system, what is the most you would be willing to pay to be added to the system?

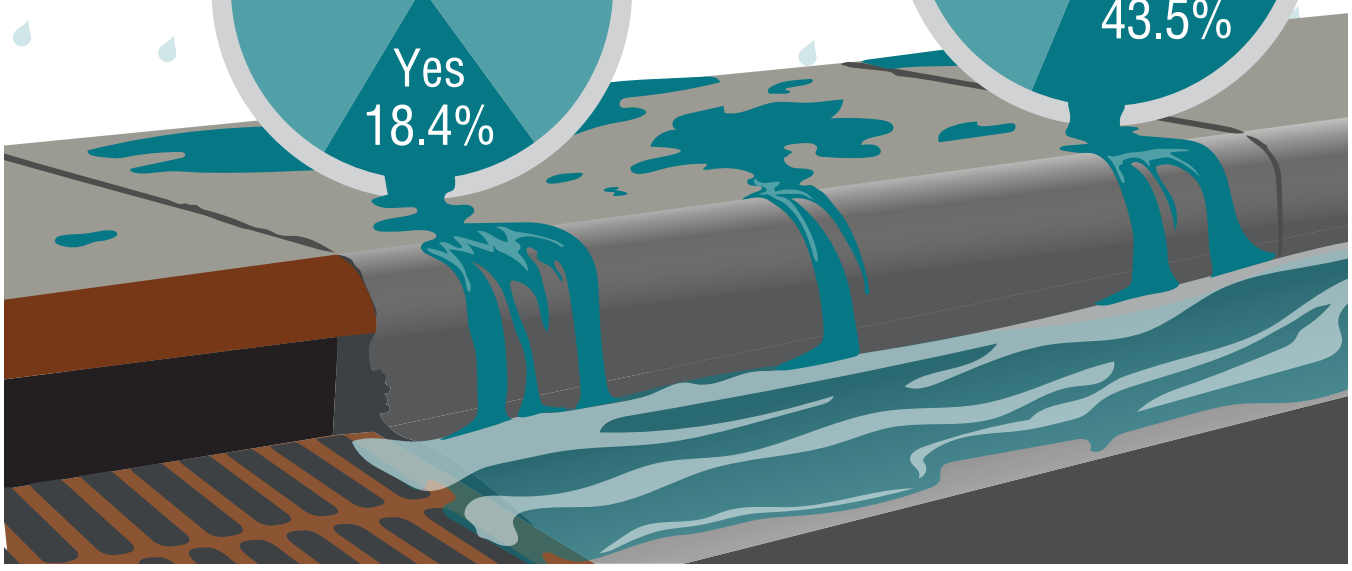


In the last five years, have experienced any problems resulting from storm water



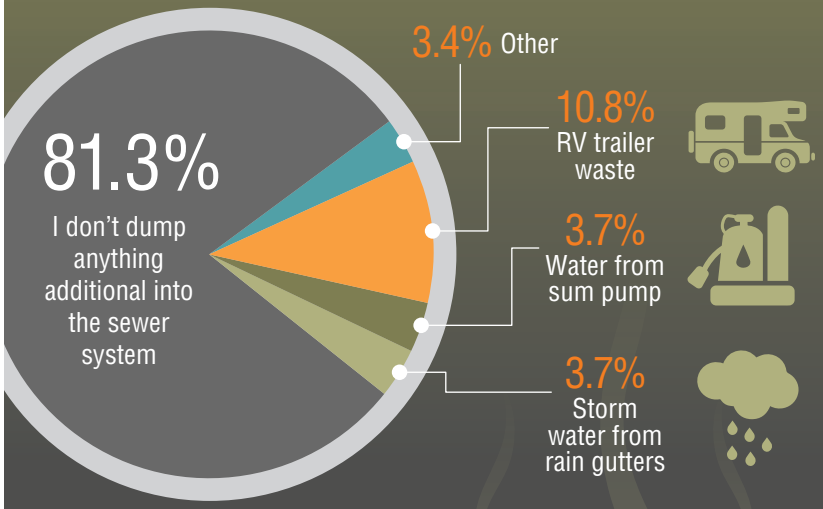
Are there any public areas where you have noticed flooding from storm water





NOTE: Numbers may not add up to 100% due to rounding.

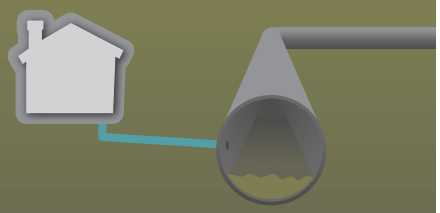
Roosevelt City's sewer plans are based on the average flow of household effluent. If anything else is going into the sewer system, we need to be able to plan infrastructure accordingly. Have you ever used the sewer system to dump:



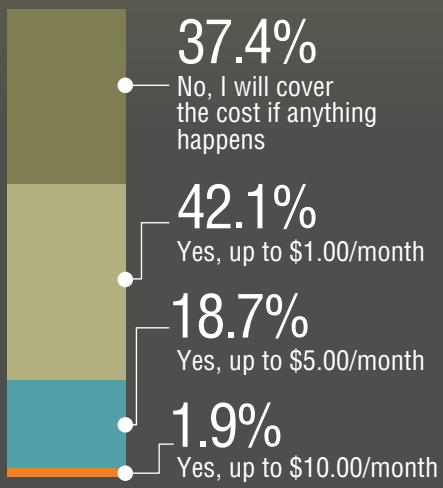
Sewer smell is always more prevalent during changes of the seasons, especially in spring and fall. With that in mind, do you find that sewer smell is a problem in your area at other times of the year?



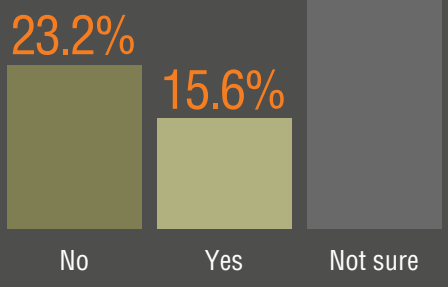




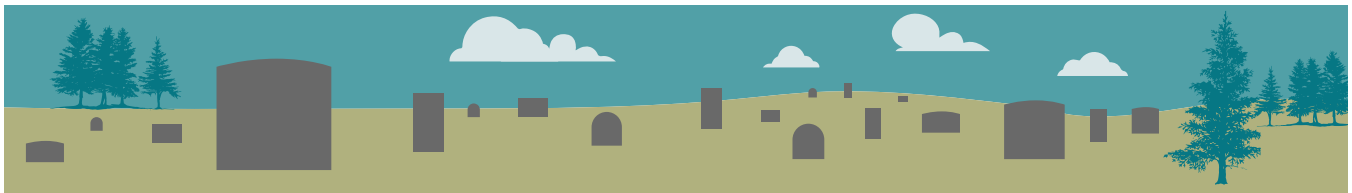
All sewer laterals extending from the City main-line to a residence are the property and responsibility of the homeowner. Would you support paying a fee to a third-party to provide insurance for those lines?



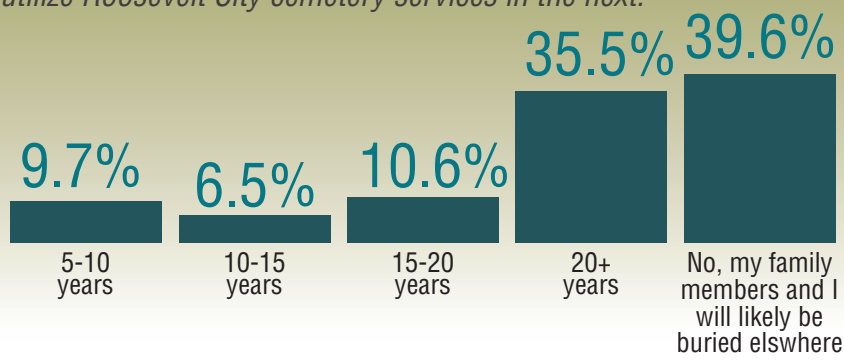
Do you have an operating backflow preventer on your sewer between the City's main-line and your home?



NOTE: Numbers may not add up to 100% due to rounding.

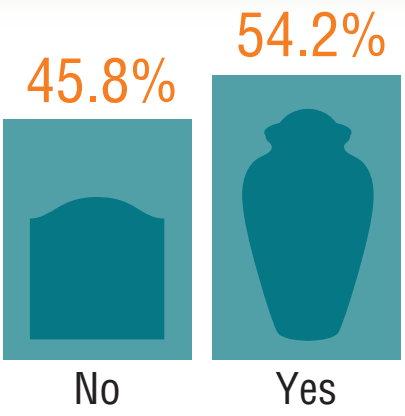


Do you expect that a member of your household will utilize Roosevelt City cemetery services in the next:



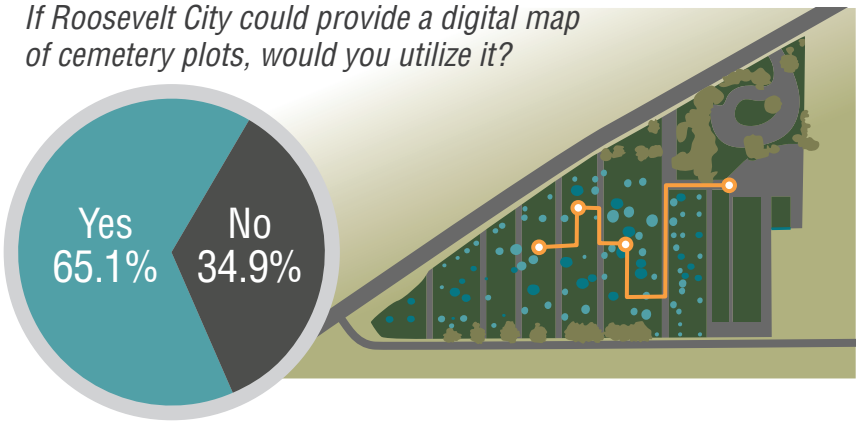


With the rate of cremations on the rise, should Roosevelt City consider constructing a columbarium at the cemetery?*

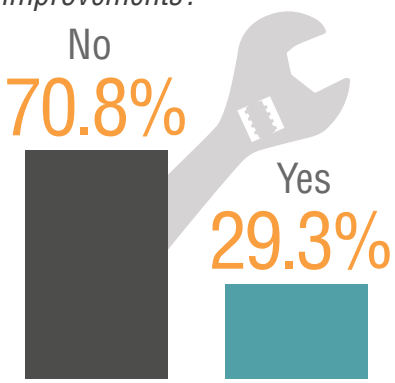


*A building or wall with niches for funeral urns to be stored

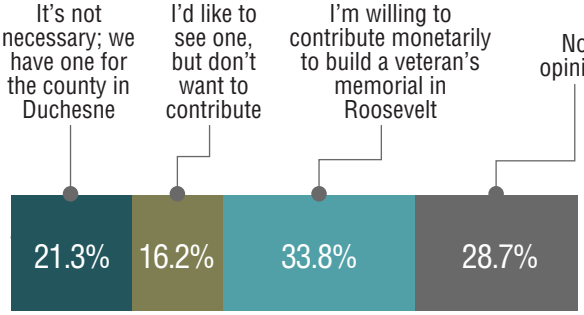
If Roosevelt City could provide a digital map of cemetery plots, would you utilize it?

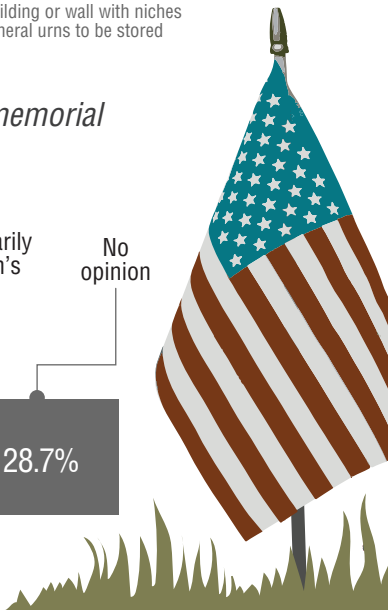


Do you think that the Roosevelt City Cemetery could use some improvements?



What is your opinion of a veteran's memorial at the Roosevelt City Cemetary





NOTE: Numbers may not add up to 100% due to rounding.

ROOSEVELT CITY MASTER PLAN SURVEY

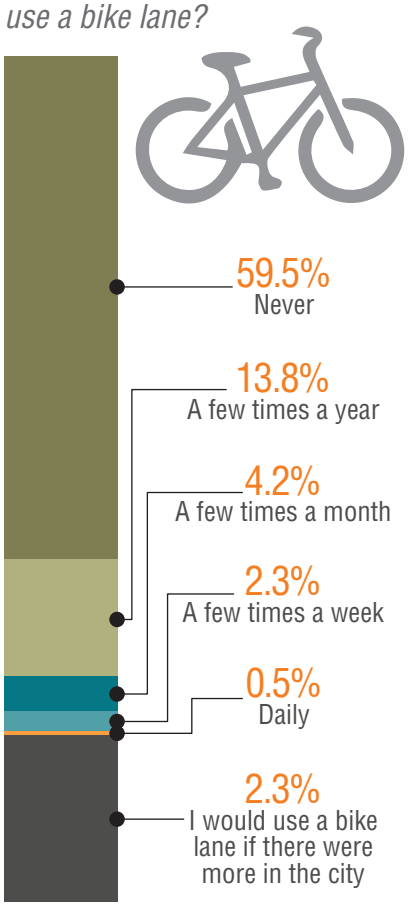


Are there any specific areas the City should study for traffic congestion?

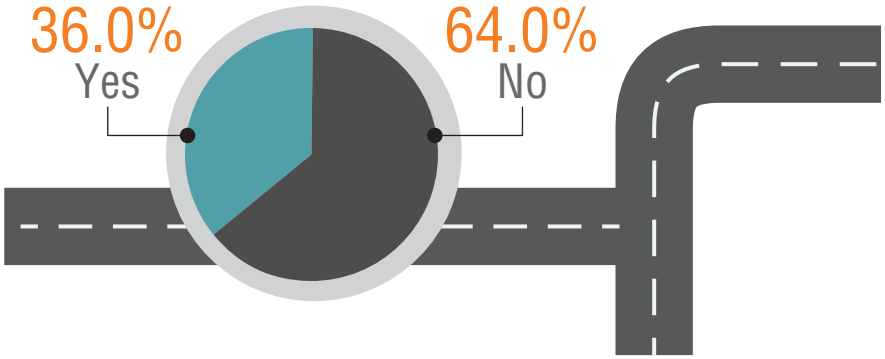


Do you feel that Roosevelt City streets are easy to navigate with the current addressing system (a grid system)?

How often do you use a bike lane?



As the City develops roads over the next 5-10 years, are there any City streets that should connect that currently DO NOT?



Which surface do you prefer for chip seal road maintenance?



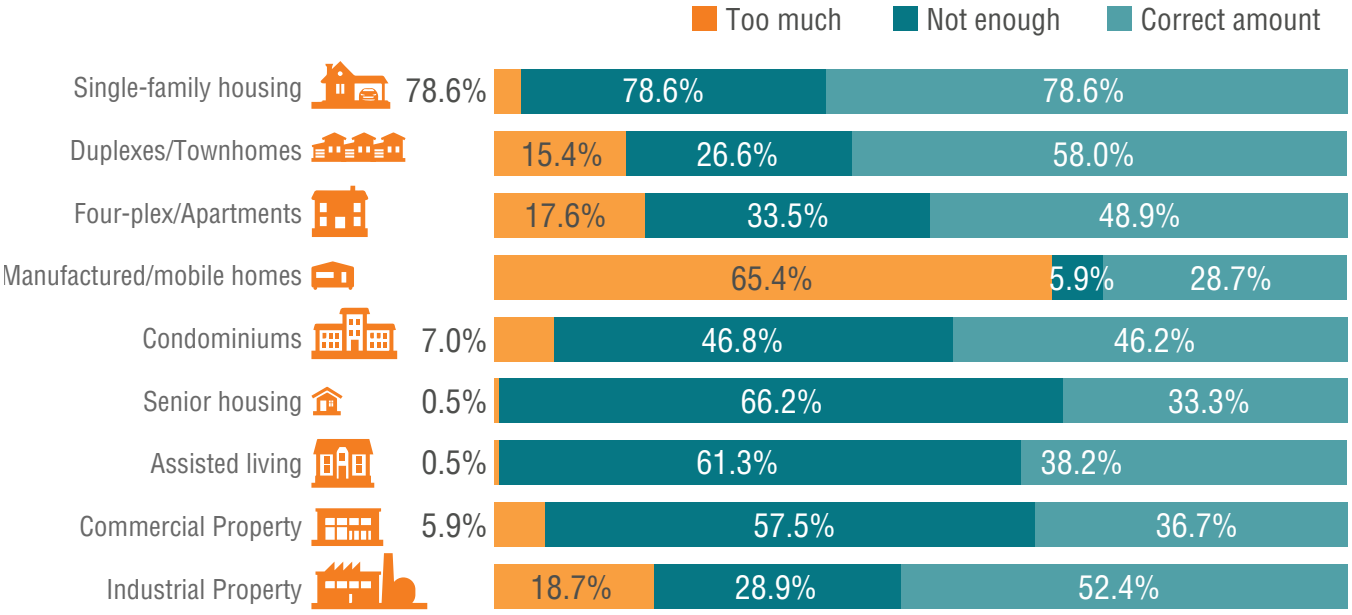
Ceramic Chips *(Used by the city in 2017 and 2018; darker and smoother roads)*

Rock Chips *(Used by the city prior to 2016; lighter and rougher roads)*

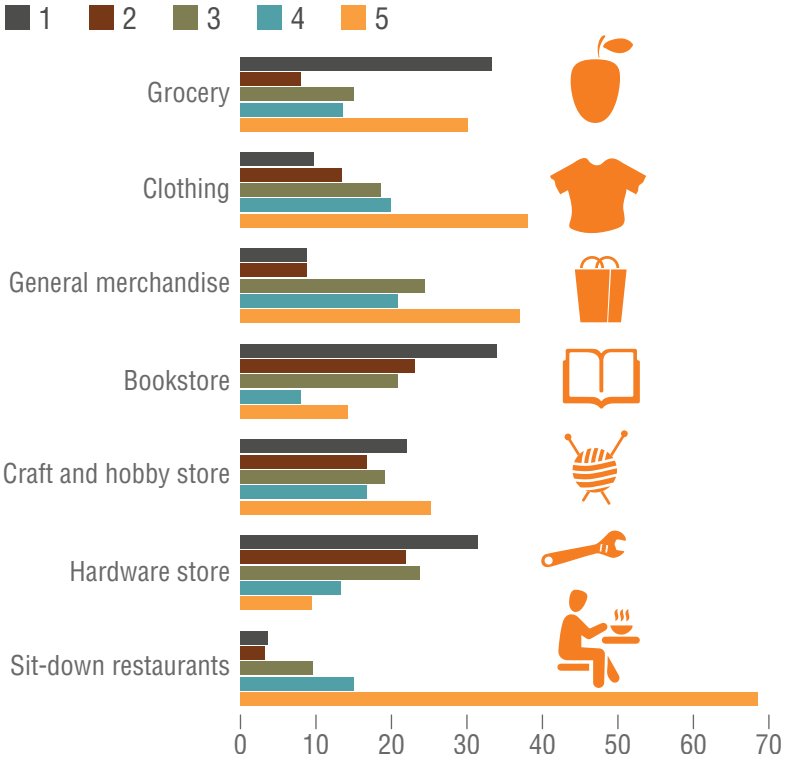
No preferance

NOTE: Numbers may not add up to 100% due to rounding.

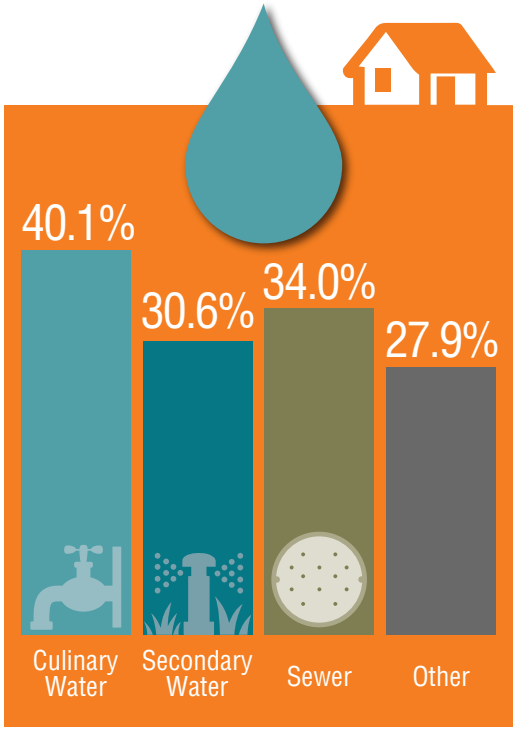
For each of the following types of property, would you say that Roosevelt City has too much, not enough, or the correct amount?



On a scale of 1 to 5, please tell us how important it is for the City to attract additional businesses of the following types: (1=Not important, 5=Very important)

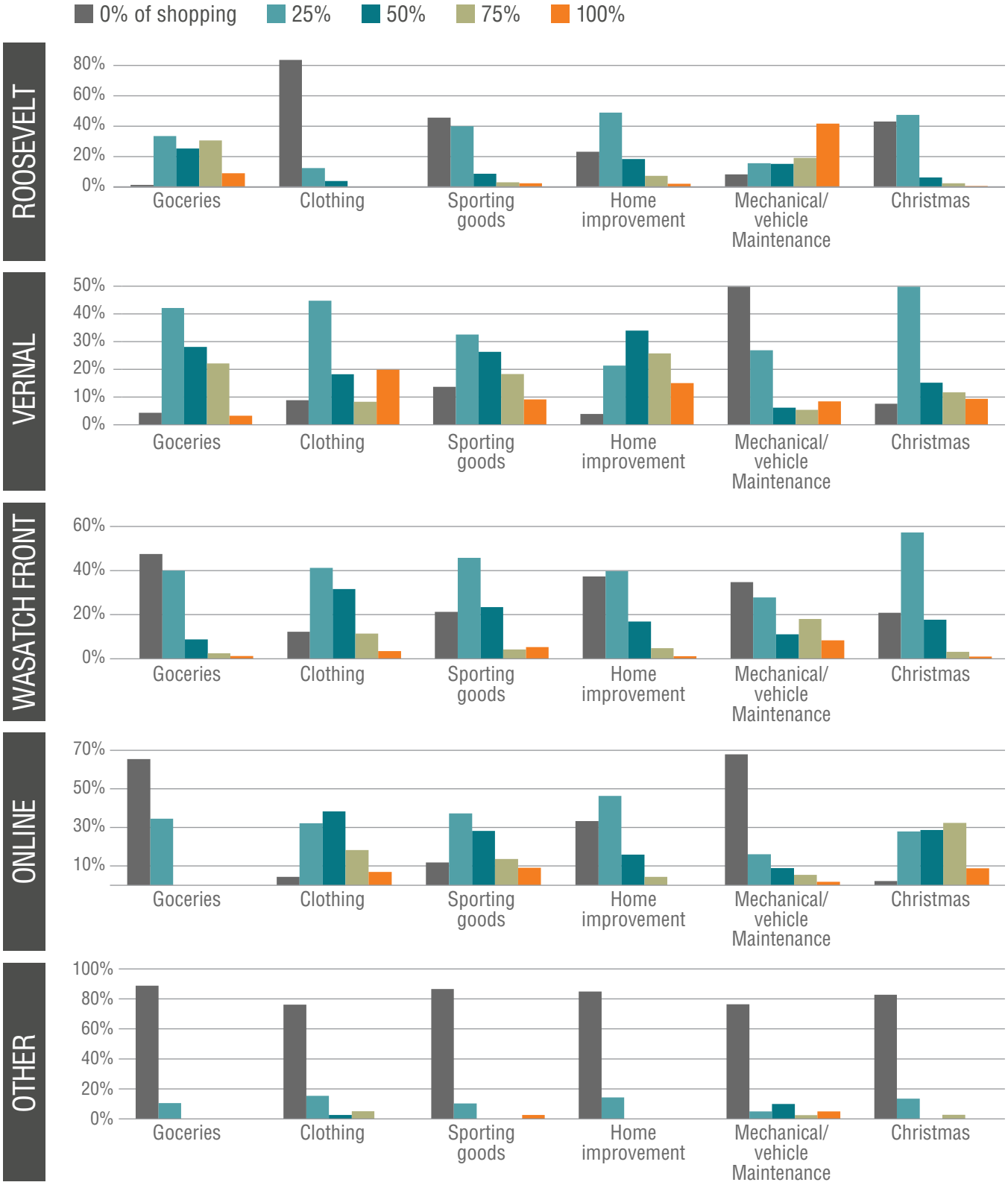


If you are not currently a resident of Roosevelt City, what services would motivate you to annex (become incorporated in the City)?

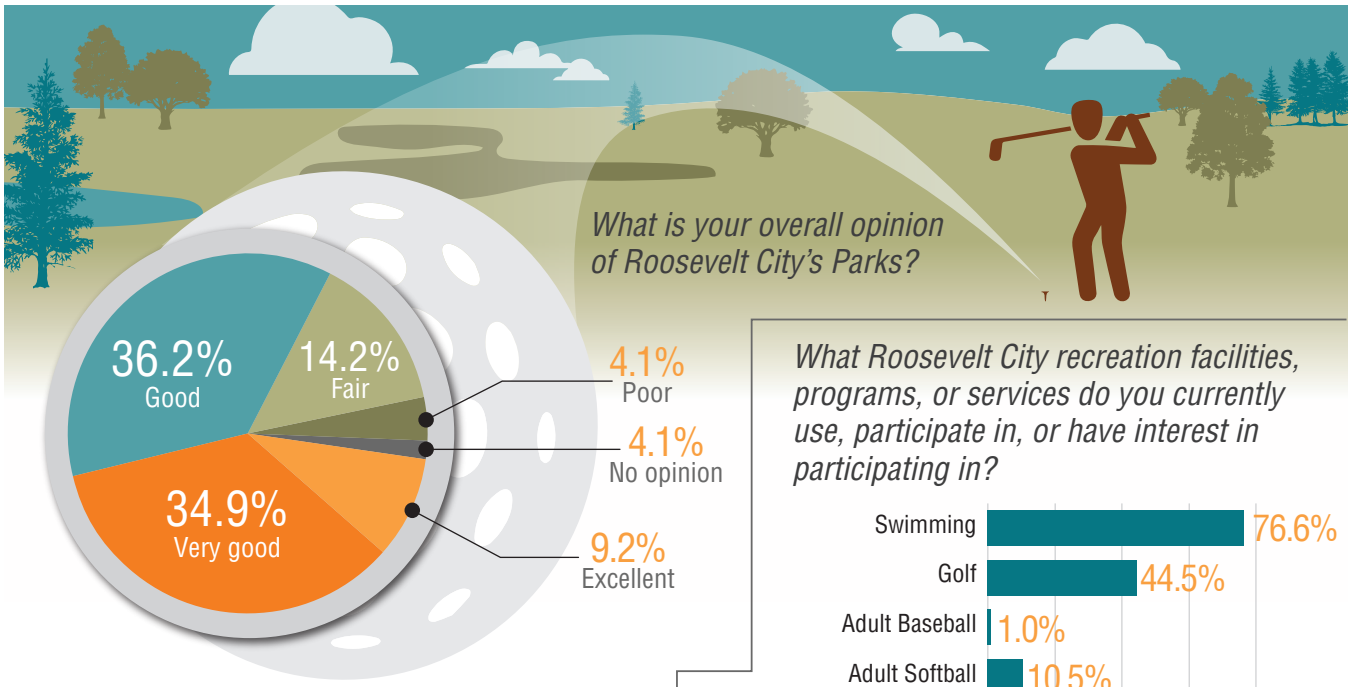


NOTE: Numbers may not add up to 100% due to rounding.

Please indicate what percentage of your shopping takes place at the following locations:

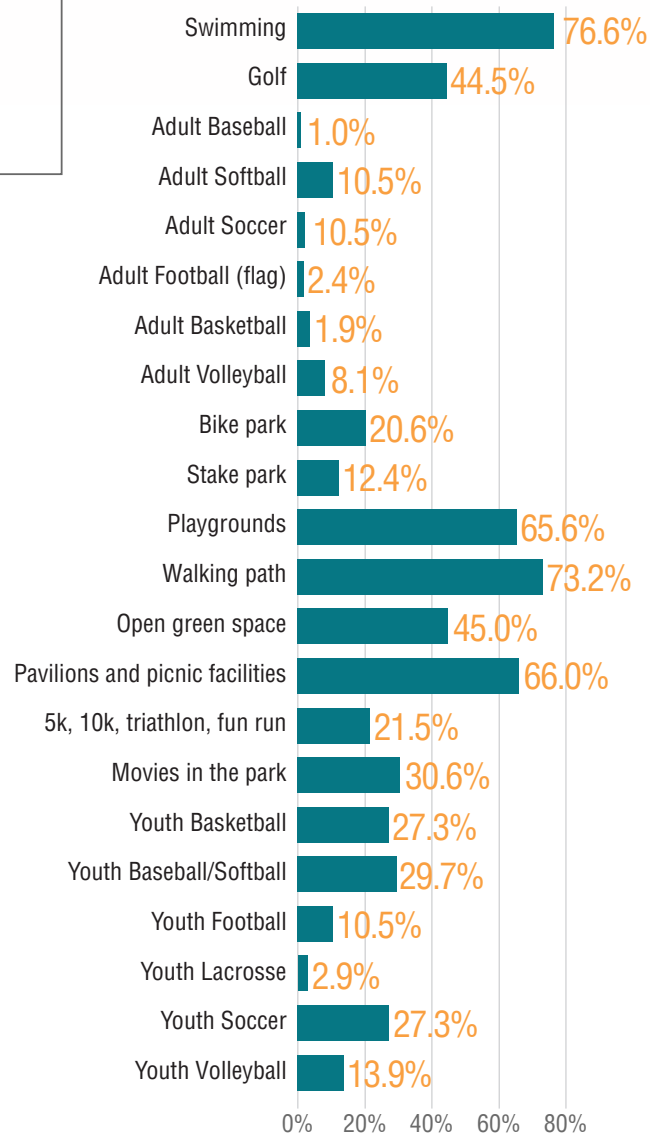


NOTE: Numbers may not add up to 100% due to rounding.



What is your overall opinion of Roosevelt City's Parks?

What Roosevelt City recreation facilities, programs, or services do you currently use, participate in, or have interest in participating in?

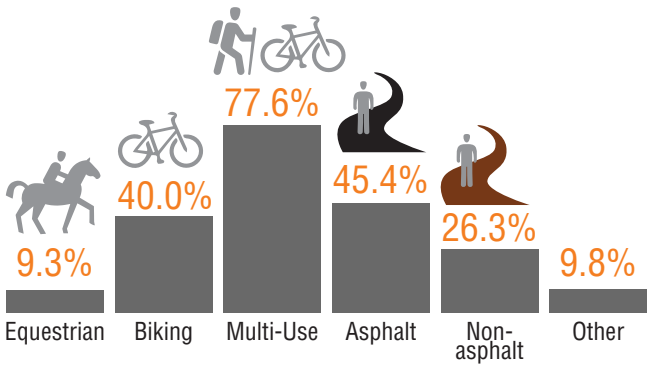


Do you use Roosevelt City's trails and parks systems?

34.6% No

65.4% Yes

What types of trails do you feel Roosevelt City needs?

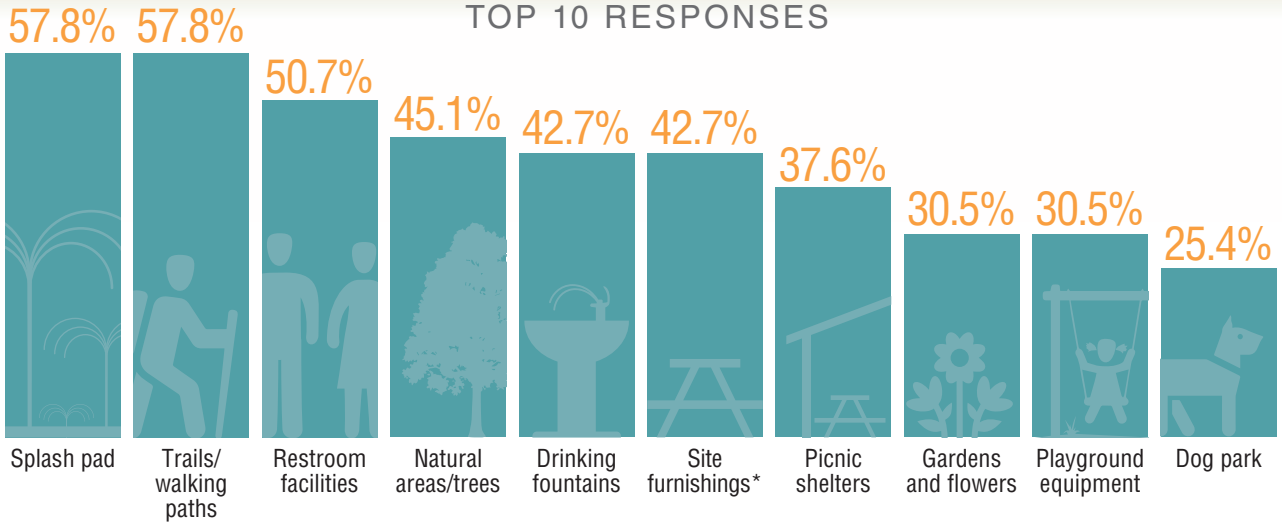


NOTE: Numbers may not add up to 100% due to rounding.



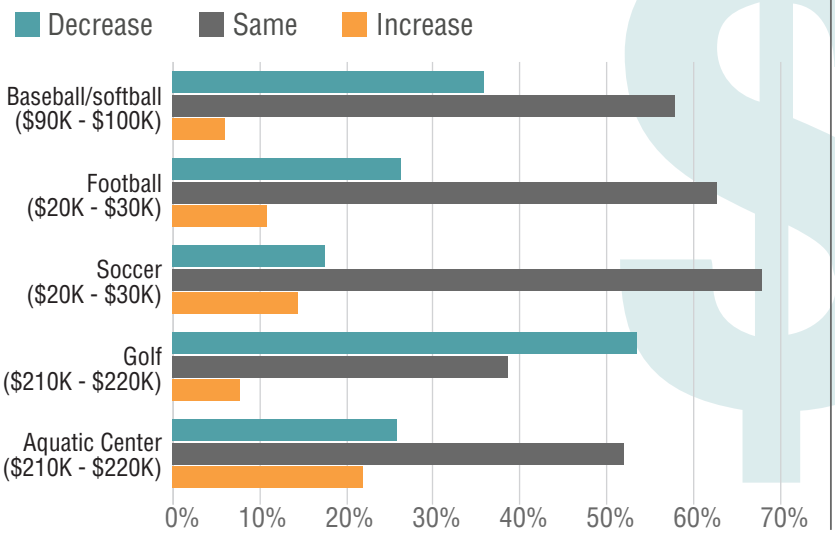
What specific park improvements do you most want to see in future parks?

TOP 10 RESPONSES

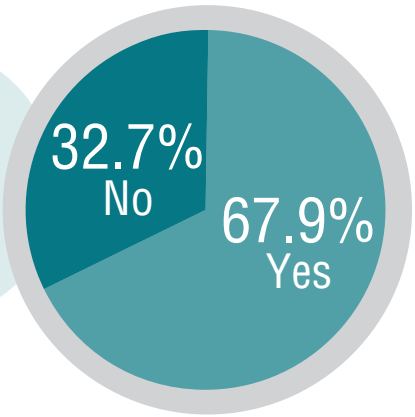


*benches, tables, trash receptacles

Do you believe that the city should increase spending, decrease spending, or keep spending the same for these activities in the future?



If arts and recreation programs are expanded in the city, costs will increase. If it became necessary, would you support an increase in taxes to expand arts and recreation?



NOTE: Numbers may not add up to 100% due to rounding.





Utah LTAP Survey Appendix H



Analysis and Recommendations for Street Network

Roosevelt

2019

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Appendix A. Inventory of Streets

Appendix B. Condition Survey Evaluation Sheet

Appendix C. Condition Survey of Street Network

Appendix D. Distress Deterioration Table and Recommended Preservation Strategies

Appendix E. Recommended Preservation Strategies for Each Street Segment

Appendix F. Preservation Strategies, Treatments, and Associated Costs

Appendix G. Recommended Pavement Preservation Program and Proposed Funding Allocation

Introduction

One of Roosevelt City's most valuable infrastructure assets is the approximately 36 miles of local streets within its network. Maintaining the street network at a high level of service will promote the prosperity of Roosevelt's entire community. Many state and local transportation agencies currently use a pavement management system and/or a maintenance management system to cost effectively preserve and improve their street network. The Utah Local Technical Assistance Program (LTAP) assists local agencies in the state of Utah and surrounding states to implement and use pavement management software to maintain, preserve, and enhance their road and street assets and more effectively manage the allocation of funding as it pertains to the existing street network.

The City of Roosevelt asked the Utah LTAP to develop a pavement management system that could be used in their transportation plan. This report describes the system's major elements, the processes, and the work accomplished to facilitate its implementation in Roosevelt. The pavement management system provides:

- A complete GIS-based physical inventory and condition survey of the street network
- A needs assessment process
- Analyses of root causes of pavement deterioration
- Analysis of current street maintenance programs
- Recommended maintenance and preservation treatments
- Treatment costs and budget proposals
- A method to evaluate alternate funding scenarios to maximize the average remaining service life (RSL) of the street network

Figure 1 outlines the major elements and processes incorporated in Roosevelt's Pavement Management System. The following sections of this report describe each step of the process in detail, the results of field surveys and analyses, and the conclusions and recommendations offered to assist in the full implementation of the system in Roosevelt

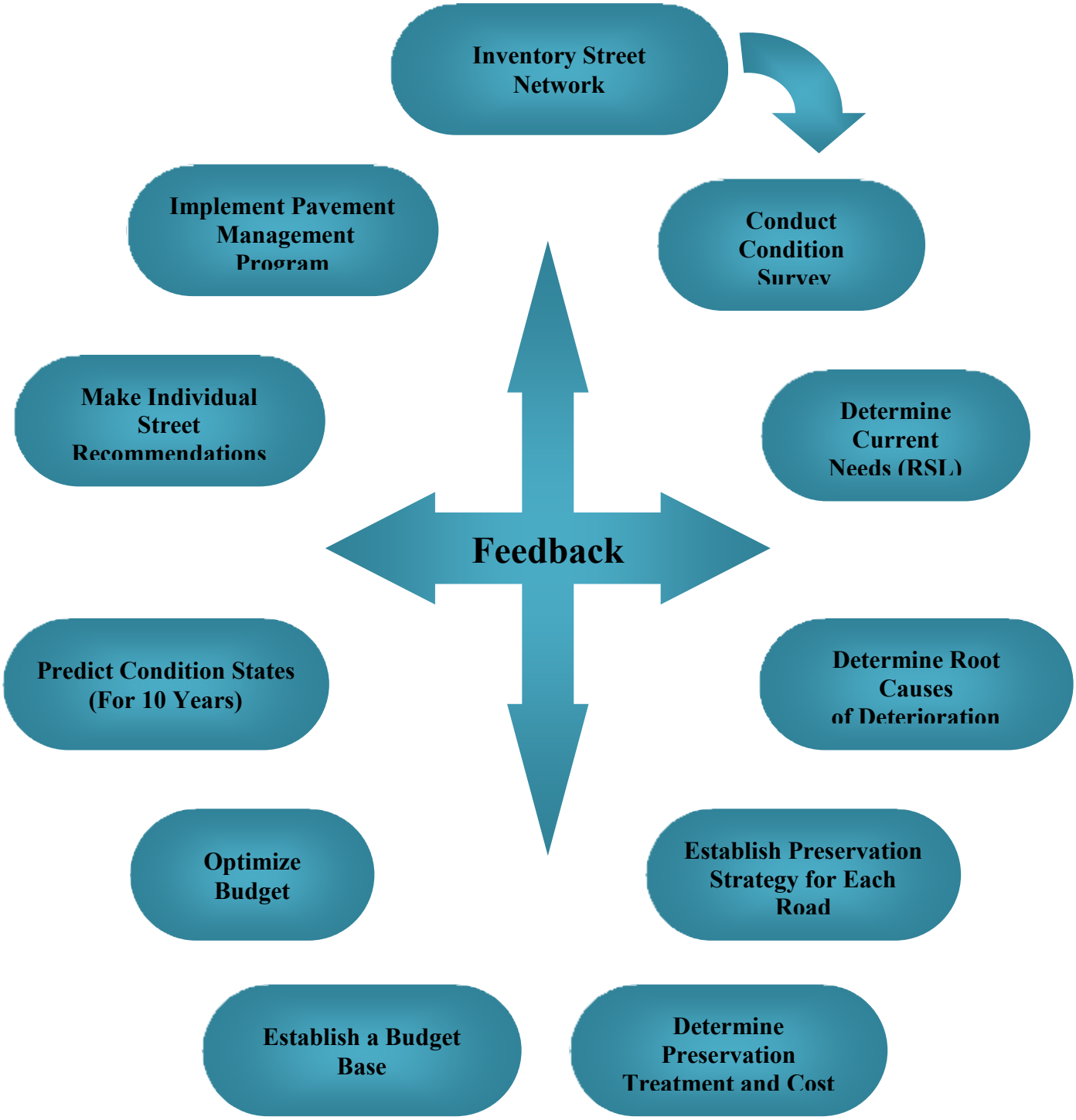


Figure 1. Pavement Management Process Diagram

Inventory of Road Network

The first step in the process of inventorying Roosevelt's local street network involved assigning a functional classification to each street. City officials assisted in making these classifications. Excluding the state routes, the inventory identified three functional classifications: residential, major collector, and major arterial.

The second step in the inventory process involved a GIS map with shape files of the road network previously developed by Roosevelt City. In addition to using the existing centerline shape file for the street network a measuring wheel was used to measure the street widths. Data from the GPS mapping process was used to calculate the lengths of all street segments. Measured widths and lengths were used to calculate the street surface areas.

A complete condition survey of Roosevelt's local road network was conducted during the summer of 2018. Employees from the Utah LTAP (Local Technical Assistance Program) Center used the Strategic Highway Research Program (SHRP) Distress Manual as a guide to conduct the pavement distress survey

Roosevelt City Public Works continued with their road maintenance and construction projects as the employees of Utah LTAP performed the survey and analyzed the condition of the road network. These construction projects did not interfere with survey techniques or influence the results of the analysis.

Appendix A contains the complete results of the inventory processes. Inventory details include street name, starting and ending addresses of the segment, functional classification, segment width and length, estimated remaining service life (RSL), surface area of the pavement in square yards, and the percent of network area represented by each segment. Table 1 contains a sample of the inventory of roads as found in Appendix A.

Table 1. Excerpt Showing Details in the Inventory Process of the Local Street Network

ID	Street Name	From	To	Class	Width (ft)	Length (ft)	RSL	%Area	Area (sq yd)
1	800 E	250 N	US 40	Residential	44	274	0	0.15%	1261.33
154	Lagoon St	Viola Cir	Georgia Cir	Residential	51	256	12	0.17%	1450.67
42	600 E	550 N	600 N	Major Collector	36	280	6	0.13%	1120
262	State St	300 N	HWY 121	Major Collector	55	475	8	0.34%	2902.78
387	Hayfield Rd	State St	Dead End	Major Collector	48	1334	16	0.83%	7114.67
361	South Cove Rd	500 W	HWY 121	Major Arterial	40	413	16	0.21%	1835.56
72	200 N	1000 W	900 W	Major Arterial	54	456	12	0.32%	2736

Table 2 provides a summary of the street inventory information with respect to each functional class in terms of surface area and the percent of the street network represented by each functional class.

Table 2. Functional Classification by Surface Area and Percent of Local Street Network

	Major Arterial	Major Collector	Residential
Area (yd2)	22,226	156,190	680,806
Percent of Road Network	2.59%	18.18%	79.23%

Figure 2 illustrates the information from Table 2 in graphical form.

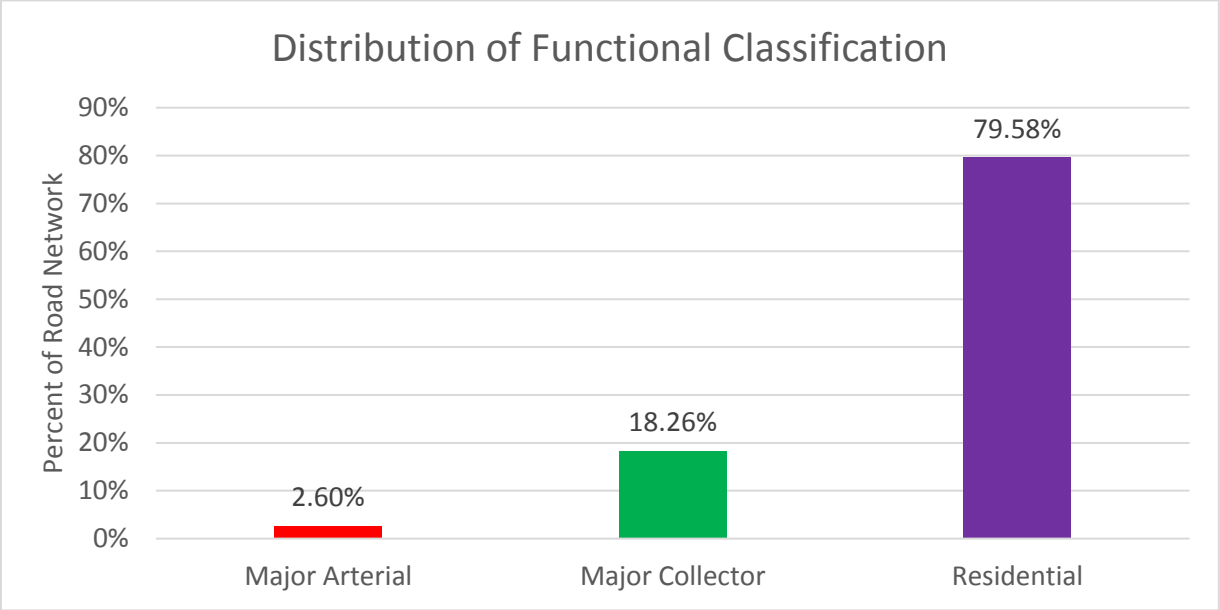


Figure 2. Distribution of Street Network by Functional Classification

This inventory excludes pavement structure details regarding date of initial construction, layer thickness, and pavement design criteria of each street. This information can be obtained from historical records, maintenance personnel, or sampling and testing of the pavement structure. This information should be incorporated through further implementation efforts and by working closely with Roosevelt City Public Works.

Pavement Condition Survey

Road Network

A complete condition survey covering pavement distress of Roosevelt's road network was conducted during the summer of 2018. Employees from the Utah LTAP (Local Technical Assistance Program) Center used the Strategic Highway Research Program (SHRP) manual, Distress Identification Manual for the Long-Term Pavement Performance Project as a guide to conduct the pavement distress survey.

The principal focus of the asphalt condition survey was to identify and determine the severity level and extent of each distress type. Each asphalt street segment was closely surveyed for the presence of potholes/utility cuts, transverse cracking, longitudinal cracking, block cracking, edge cracking, and fatigue (alligator) cracking. The severity level and extent of each distress type were evaluated in accord with the condition survey evaluation sheet shown in Appendix B. Appendix C shows the detailed distress information for each road segment.

Pavement Design & Performance

Typically, asphalt pavements, designed in accord with the AASHTO Guide for Design of Pavement Structures, ought to provide for twenty years of traffic loading (18 kip ESAL's) before reaching a terminal serviceability level at which point reconstruction is required (RSL = 0). Conventional practice usually provides for a preventative maintenance treatment and rehabilitative treatment to be applied to the asphalt pavement during its 20-year service life. Timing is critical in the placement of the preventative maintenance and the rehabilitative treatment to achieve the best level of service at the least amount of cost.

Figure 3 shows a typical pavement performance curve for asphalt pavements. This figure emphasizes the time relationship between street pavement condition and the cost of repair.

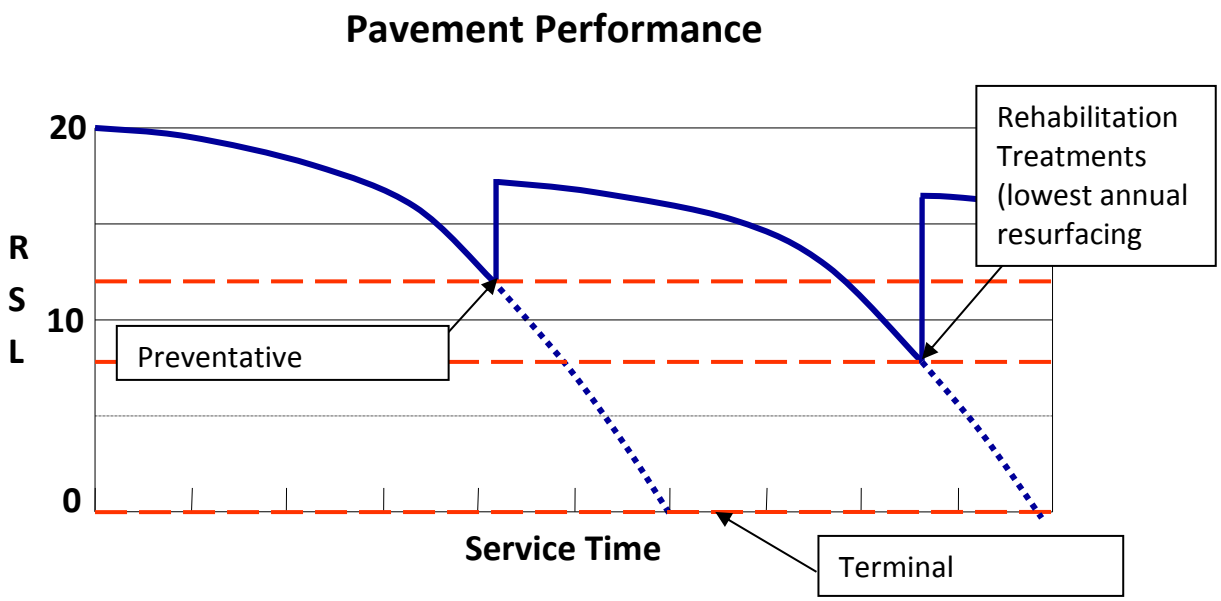


Figure 3. Pavement Performance Curve

After eight years of service (RSL = 12), most asphalt pavements will deteriorate to a "good" condition category. This relates to a thirty-three percent (33%) drop in the service life of the pavement and is the optimal point in time at which a preventative maintenance treatment should be placed. After twelve years of service (RSL = 8), most asphalt pavements will deteriorate to a “fair” condition rating. This represents a sixty percent (60%) drop in the service life of the pavement and is the best point in time at which to consider a rehabilitation treatment. If no renovation action occurs at this point, the street will likely deteriorate to the "poor" category within three years (RSL = 5). Cost comparisons show that reconstruction will cost two to three times more than rehabilitation strategies. The cost to maintain a pavement with preventative maintenance strategies relates to about one-fifth the cost of rehabilitation strategies, or one-tenth the cost of reconstruction.

The RSL of a road is not affected by the appearance of the road. A road may be rough on the surface or have some small bumps and cracks, but this does not necessarily mean that the road is in poor condition. The RSL is based on the structural integrity of the road. A responsible maintenance program will be built around maintenance strategies that improve the service life of the roadway, not simply applying treatments to improve the appearance or smoothness of the road.

Major Causes of Pavement Distress

The predominant asphalt pavement distresses affecting Roosevelt's streets were determined from the pavement distress survey information. Analysis of this information showed that there were five of the seven major distress types prevalent in the street network. Pavement roughness results from these distresses. Fatigue cracking was the major distress type found occurring most frequently in the asphalt street network.

The root causes of each of the seven main distress types are described as follows, along with respective suggestions on how to mitigate the development of each:

Transverse cracking in asphalt pavements is normally attributed to thermal changes in the pavement structure. As seasonal temperatures change, the pavement expands and contracts beyond the limits that asphalt can tolerate, thus causing transverse cracking. If these transverse cracks are not sealed early in their development, they will continue to grow in terms of both severity and extent, and they will allow surface moisture to enter the pavement causing further distress to develop. Recent developments in asphalt technology known as the Superpave System have shown the potential to preclude the development of transverse cracking if used in new asphalt pavements. Use of performance graded (PG) asphalt cements and the Superpave mix design system, along with good quality control and good hot mix asphalt construction practice can potentially eliminate this type of distress from occurring. Using the Superpave System on newly constructed or reconstructed streets that serve a relatively high volume of traffic is recommended.

Longitudinal cracking is related to two different causes. The first is poor construction. When a street is constructed, it is normally built in two or more sections. Problems, such as poor compaction or segregation in the asphalt mix, will cause longitudinal cracks along the construction seam. The second cause of longitudinal cracks is load related. These longitudinal cracks are found in the wheel paths of the travel lanes. These cracks are due to early fatigue

failure and should be treated as fatigue cracks. On some street segments that are extremely wide, longitudinal cracking may be caused by thermal changes as with transverse cracks.
Block cracking is a combination of transverse and longitudinal cracking that occurs when the transverse and longitudinal cracks intersect. The combination of these two distresses allows greater opportunity for surface water to enter the pavement structure, thus decreasing the load carrying capacity of the pavement. Once a block forms, water enters and softens the base. As the base softens, normal traffic loading progressively breaks the pavement into smaller and smaller blocks. This leads to the development of fatigue cracking.

Utility cuts are man-made cuts and have been shown to reduce the service life of a street by as much as five to seven years. Although utility cuts are sometimes inevitable, good planning and coordination of utility work can reduce the number of utility cuts made in newer streets.

Only limited rutting of the pavement surface was observed in Roosevelt's street network. This form of distress typically occurs in the wheel paths and is a result of deformation in the pavement structure or subgrade. This deformation comes from heavy axle loads acting in combination with moisture to deform and rut the pavement. Inadequate compaction during construction can also result in deformation. Rutting may also occur in hot weather when the asphalt is less viscous and has less shear strength. In this case, rutting usually results from the use of poor materials, poor asphalt mix design, poor quality control, or poor construction.

Edge cracking was generally found in street segments where pavement edges had little or no support. Those segments that had no paved shoulders or supporting curb and gutter sections were more prone to this type of distress.

Fatigue cracking is the main governing distress in the majority of the streets and affects thirty percent (30.38%) of the network surface area. Fatigue cracking in asphalt pavements is largely caused by loss of base and subgrade support due to moisture infiltrating the pavement. Once moisture softens the base and subgrade layers, the asphalt pavement can no longer effectively carry the traffic loading. This results in pavement cracking and breakup. The fatigue cracking prevalent in the streets of Roosevelt is most likely caused by water saturating the base and

subgrade layers. With the subgrade saturated, the road structure flexes and gives under the weight of a vehicle that drives over the street.
Heavy vehicle traffic on the streets also causes fatigue cracking, by applying greater stresses to the pavement than it is designed to support. In those areas of the city where new homes are being constructed, concrete trucks or other heavy vehicles can cause major damage to the streets. Heavy commercial trucks fall within the heavy vehicle traffic designation.

Pavement Distress Survey & Analysis

The first step in the analysis of the pavement distress survey information involves determining the governing distress type for each street segment. A governing distress is one that is most detrimental to the condition of the pavement, and so should be the focus of treatment. Each rating for each distress is associated with an RSL value; a higher distress rating results in a lower RSL rating. To analyze a segment, find the lowest RSL value associated with any of the distresses assigned to the segment. This value becomes the RSL for the entire segment and the corresponding distress is the governing distress.

Figure 4 shows an example rating sheet for a road segment and Table 3 shows the RSL values associated with fatigue cracking ratings. The distress rating of 5 for fatigue cracking corresponds with an RSL of 6. Similar tables would be used for the other distresses reported on the segment. An analysis of the distresses shown below shows that fatigue cracking is the governing distress because it gives the lowest RSL value (besides being the highest numerical rating).

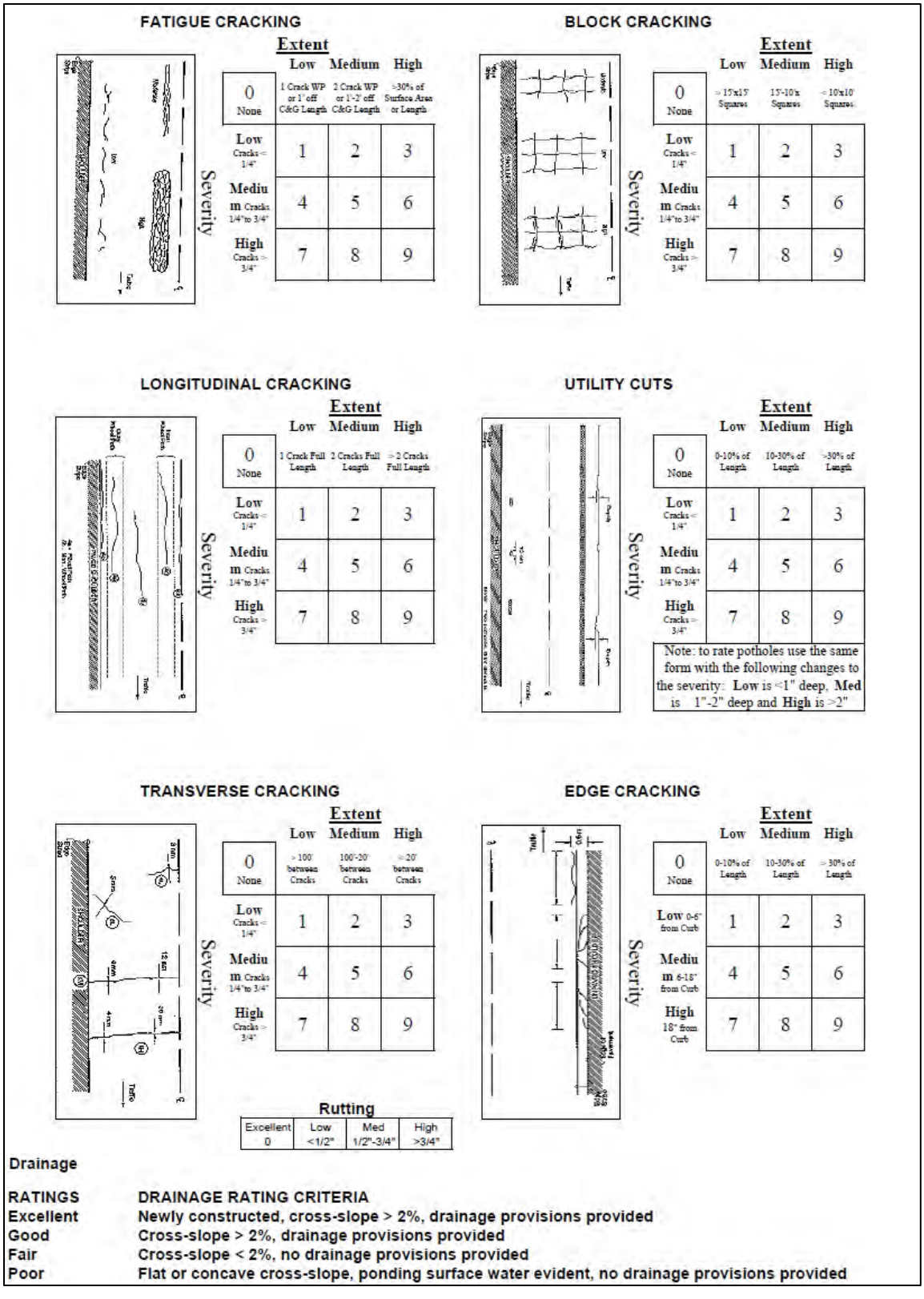


Figure 4. Condition Rating Sheet

Table 3. Fatigue Cracking Distress Table

RATING	SEVERITY & EXTENT	RSL
0	No Alligator Cracking	20
1	Low, Low	10
2	Low, Medium	8
3	Low, High	6
4	Medium, Low	8
5	Medium, Medium	6
6	Medium, High	4
7	High, Low	6
8	High, Medium	2
9	High, High	0

The governing distress is the distress most likely to cause the pavement to deteriorate the soonest and reduce the serviceability of the street. Appendix D contains the deterioration tables for the other distress types. These tables can be adjusted by experienced personnel to more accurately reflect the effects of local environmental and traffic loading conditions.

Table 4 includes several recommended preservation strategies and treatments, the estimated cost of each treatment, and the estimated remaining service life the road is expected to gain after the treatment is applied.

Table 4. Maintenance Performance Table

Treatment Type	Maint. Category	Cost	0	1-3	4-6	7-9	10-12	13-15	16-18	19-21
Crack Seal	Routine	**$0.45**	0	0	0	0	1	2	3	2
Cold Patch	Routine	$0.45	0	0	0	0	0	0	0	0
Digout and Hot Patch	Routine	**$0.68**	0	0	0	0	0	0	0	0
High Perf. Cold Patch	Routine	$0.90	0	0	0	0	0	0	0	0
Fog Coat	Routine	**$0.68**	0	0	0	1	1	2	2	2
High Mineral Asphalt Emulsion	Preventative	**$1.80**	0	0	0	1	2	3	5	5
Sand Seal	Preventative	**$0.98**	0	0	0	1	2	2	2	2
Scrub Seal	Preventative	**$1.50**	0	1	3	5	5	5	5	5
Single Chip Seal	Preventative	**$1.95**	0	1	3	5	5	5	5	5
Slurry Seal	Preventative	**$1.06**	0	1	3	5	5	5	5	5
Microsurfacing	Preventative	**$3.60**	0	2	3	5	7	7	7	7
Plant Mix Seal	Rehabilitation	**$8.40**	0	3	4	5	7	7	7	7
Cold In-place Recycling (2 in with chip seal)	Rehabilitation	**$7.50**	0	3	4	5	6	7	7	7
Thin Hot Mix Overlay (<2 in)	Rehabilitation	**$10.13**	0	4	6	7	7	7	7	7
HMA (leveling) & Overlay (<2 in.)	Rehabilitation	**$11.25**	0	4	6	8	8	8	8	8
Hot Surface Recycling	Rehabilitation	**$7.50**	0	3	5	7	8	8	8	8
Rotomill & Overlay (<2 in)	Rehabilitation	**$12.60**	0	4	7	8	8	8	8	8
Cold In-place Recycling (2/2 in.)	Reconstruction	**$15.45**	15	15	15	15	15	15	15	15
Thick Overlay (3 in.)	Reconstruction	**$15.00**	12	12	12	12	12	12	12	12
Rotomill & Thick Overlay (3 in.)	Reconstruction	**$16.50**	12	12	12	12	12	12	12	12
Base Repair\Pavement Replacement	Reconstruction	**$18.00**	16	16	16	16	16	16	16	16
Cold Recycling & Overlay (3/3 in.)	Reconstruction	**$16.73**	14	14	14	14	14	14	14	14
Full Depth Reclamation& Overlay (3/3 in.)	Reconstruction	**$19.88**	20	20	20	20	20	20	20	20
Base/Pavement Replacement (3/3/6 in.)	Reconstruction	**$28.50**	20	20	20	20	20	20	20	20
***Fit the current RSL into a category along the top row and then move downward to the applied treatment to find the additional RSL that will be achieved from the selected treatment.**										
(2/2 in.) Means 2" overlay with 2" recycle	(3/3/6) Means 3" HMA over 3" Road Base over 6" Base									

The previous procedure was used to determine the governing distress and the RSL for each asphalt segment. Figure 5 shows the governing distress types in the asphalt street network along with the percent of the total asphalt street network area affected by each type.

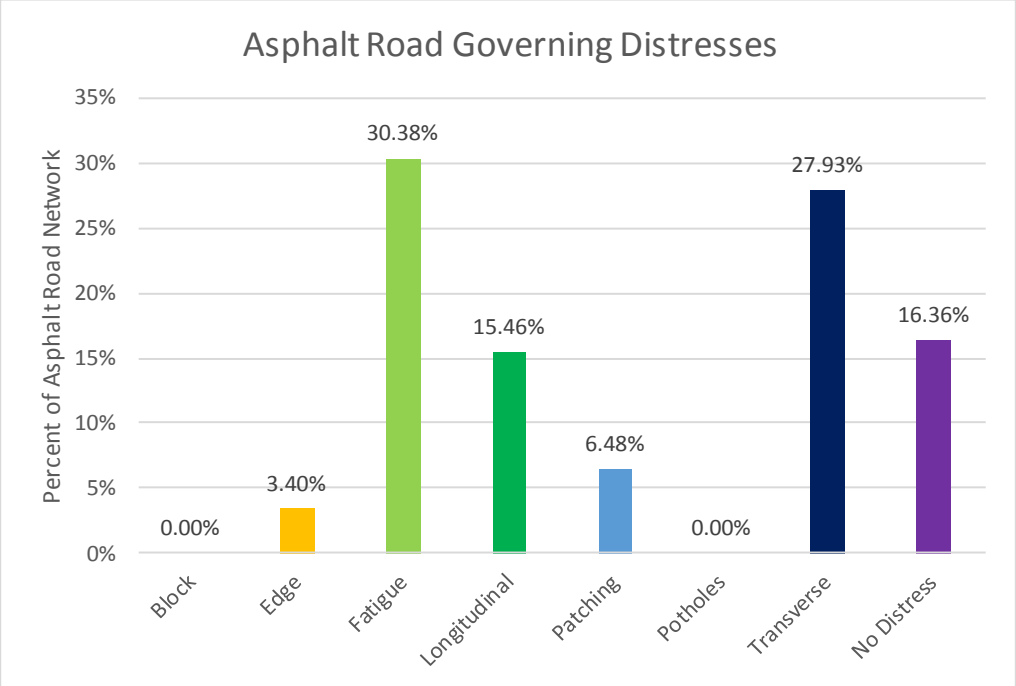


Figure 5. Governing Distress Rating Distribution for Asphalt Roads

As a reference, one percent (1%) of Roosevelt's asphalt street network represents approximately 0.36 miles in length. Figure 5 also illustrates that some governing distress types are more common to the street network. Fatigue is the most common governing distress types in Roosevelt's asphalt street network.

The governing distress type of each segment provided the means of calculating the average RSL for the street network. For management purposes, the estimated RSL values are grouped incrementally in three-year categories. Figure 6 shows the current RSL distribution for Roosevelt's street network in terms of percent of surface area of the network.

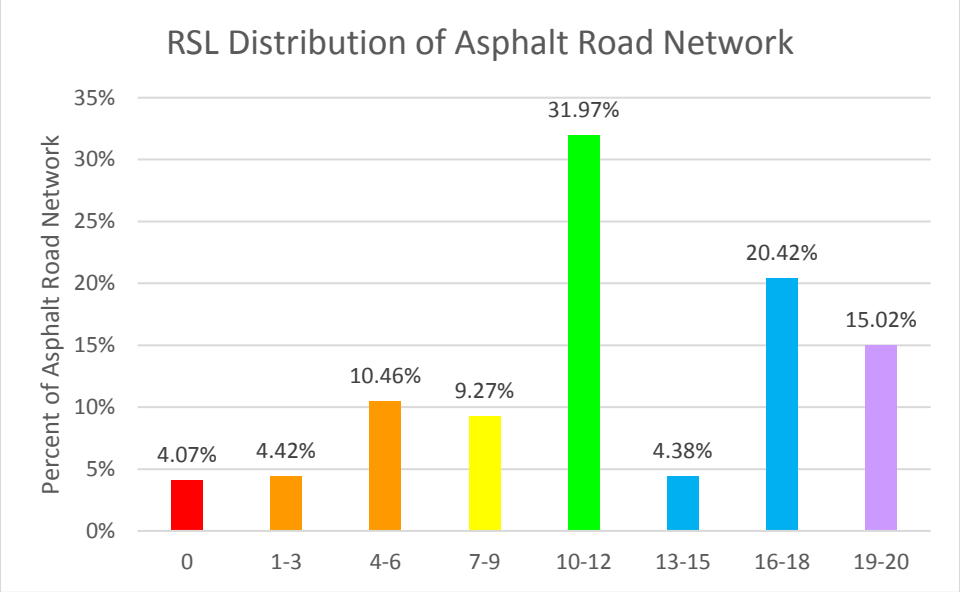


Figure 6. Current RSL Distribution for Asphalt Street Network

The estimated average RSL of Roosevelt's street network is 11.77 years. The average RSL value for Roosevelt is slightly above the average RSL value of 10.89 years for all Utah cities surveyed since 2002 by the Utah LTAP Center. Table 5 shows this same information along with the corresponding subjective condition ratings of failed, poor, fair, good, very good, and excellent.

Table 5. Subjective Condition Rating of Asphalt Street Network

SUBJECTIVE CONDITION RATING OF STREET NETWORK								
	FAILED	POOR		FAIR	GOOD	VERY GOOD		EXCELLENT
RSL (Years)	0	1-3	4-6	7-9	10-12	13-15	16-18	19-20
% of Network	4.07%	4.42%	10.46%	9.27%	31.97%	4.38%	20.42%	15.02%

Four percent (4.07%) of the paved street network in Roosevelt is considered to be in a failed condition. Fifth teen percent (14.88%) is considered to be in poor condition. Nine percent (9. 27%) is rated to be in fair condition, thirty-two percent (31.97%) is in good condition, twenty-five percent (24.8%) is in very good condition, and fifth teen percent (15.02%) of the street network is rated to be in excellent condition.

For further illustrative purposes, the following photographs show examples of the condition ratings of failed, poor, fair, good, very good, and excellent and their respective RSL estimates.



Photo 1. Failed Condition – Gates Dr from 200 N to Nelson Ave (RSL = 0 years)



Photo 2. Poor Condition – 400 N from 700 E to 800 E (RSL = 2 years)



Photo 3. Fair Condition – 500 E from 400 S to 500 S (RSL = 8 years)



Photo 4. Good Condition – Lagoon St from Guinevere Cir to Skyline Dr (RSL = 10 years)



Photo 5. Very Good Condition – 100 W from Lagoon St to 100 S (RSL = 14 years)



Photo 6. Excellent Condition – Areva Rd from 200 N to Sunset Cir (RSL = 20 years)

Currently, Roosevelt's paved street network is in "good" condition. Four percent (4.07%) of the network is at a terminal serviceability level as shown in Table 5. If no preservation or rehabilitation work is undertaken, 8.5 % can be expected to deteriorate to a terminal serviceability level in three years.

On average, each street segment will most likely lose one year of service life per year without some preservation work being done. Within three years, if no pavement preservation is performed, about 19.7% of the asphalt paved network will probably deteriorate to a poor condition. This could place a major financial burden on the city to reconstruct these segments to provide adequate roads, as well as reduce the amount of public satisfaction with the street network. If a systematic pavement management program is continued now, a balanced set of preservation strategies (e.g., routine maintenance, preventative maintenance, rehabilitation, and reconstruction) can be used to preclude the development of a backlog of needs and the overall decline in the service life of the network.

Development of Preservation Strategies and Recommended Treatments

After determining the governing distress types for each street segment, pavement preservation strategies and treatments that can effectively correct or remove the root causes were identified. Frequently, more than one strategy or treatment can be used to cost effectively remedy the governing distress and other accompanying distresses that may exist. As an example, the distress deterioration table for fatigue cracking is shown in Table 6. This table shows the various combinations of severity and extent (rating) levels that may occur, along with their preservation strategies and recommended treatments. The corresponding estimated RSL of each rating level is also shown.

Table 6. Fatigue Cracking Preservation Strategies and Treatments

RATING	SEVERITY & EXTENT	RSL	STRATEGY	TREATMENT
0	No Alligator Cracking	20	No Maintenance	No Maintenance
1	Low, Low	10	Routine	Slurry Seal
2	Low, Medium	8	Rehabilitation	Thin Hot Mix Overlay (<2 in)
3	Low, High	6	Rehabilitation	Thin Hot Mix Overlay (<2 in)
4	Medium, Low	8	Rehabilitation	Thin Hot Mix Overlay (<2 in)
5	Medium, Medium	6	Reconstruct	Thick Overlay (3 in)
6	Medium, High	4	Reconstruct	Rotomill & Thick Overlay
7	High, Low	6	Reconstruct	Thick Overlay (3 in)
8	High, Medium	2	Reconstruct	Cold Recycle & Overlay (3 in)
9	High, High	0	Reconstruct	Full Depth Reclamation (3/3 in.)

Distress deterioration tables with their preservation strategies and recommended treatments similar to this were developed for each distress type and are given in Appendix D.

The preservation strategies and recommended treatments given in Appendix F are grouped in the general preservation strategies of routine maintenance, preventative maintenance, rehabilitation, and reconstruction. Each major preservation strategy represents a particular level of work effort and a specific goal with regard to preserving or restoring the pavement.

Routine maintenance is primarily proactive and includes the work items of crack sealing, fog sealing, dig-outs, and patching.

Preventative maintenance is designed to slow pavement deterioration, as well as preserve and improve the functional condition of the pavement. Preventative maintenance strategies do not substantially increase structural capacity. Treatments in the category of preventative maintenance include sand seals, fog seals, chip seals, scrub seals, cape seals, slurry seals, and microsurfacing.

Rehabilitation serves to correct or remove root causes of distress and to add structural capacity and service life to the pavement. Rehabilitation treatments include thin hot mix asphalt overlays, hot surface recycling, bonded wearing courses, and combinations of leveling courses or rotomilling with overlays.

Reconstruction covers all types of work involved in totally reconstructing or replacing the pavement structure, thus providing a completely new pavement.

A detailed listing of all preservation strategies and their associated treatments with unit costs are given in Appendix F. The unit costs, separately provided by Road Science, L.L.C. and Roosevelt, are based on the average costs per square yard. A special inventory form built within the Transportation Asset Management System (TAMS) computer program facilitates the analysis process and allows engineering judgment to be exercised at any point. An example of this form is shown in Figure 7. The program uses the previously entered distress information to determine appropriate treatments. For the segment shown in Figure 7, the recommended treatment is a Thick Overlay (3 in.).

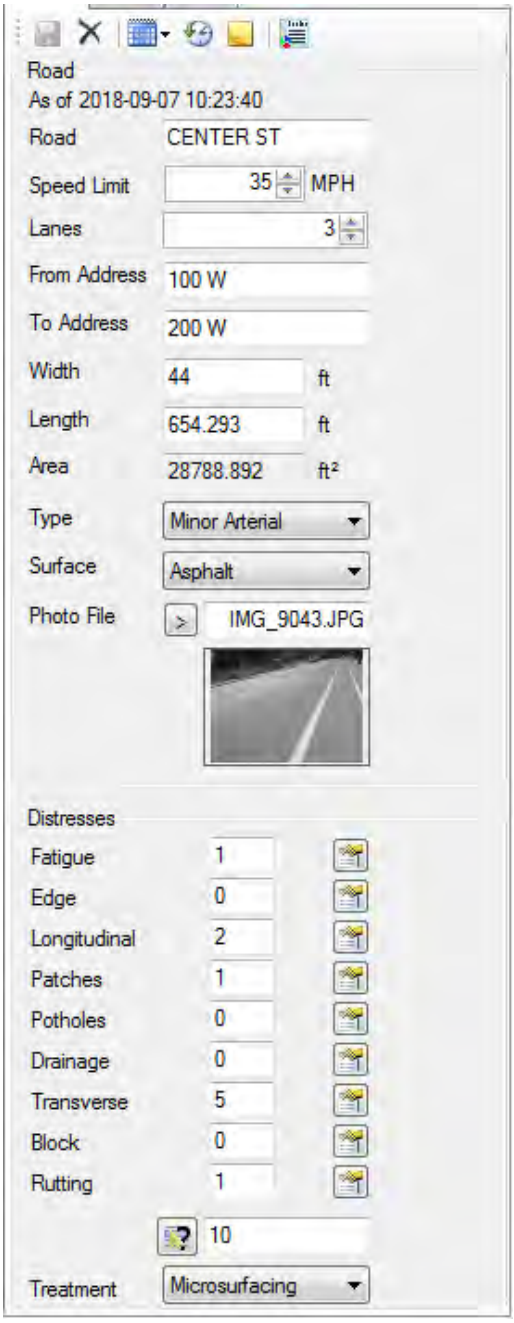


Figure 7. TAMS Inventory Form

At the top of the form, inventory information pertaining to the street segment is shown. This information includes the address and location of the segment, surface type, number of lanes, length, width, area, posted speed limit, and date inventoried. At the bottom, the distress ratings, RSL value, and recommended preservation treatment are listed.

Appendix E shows the initial recommended pavement preservation strategies to be used on each street segment. Table 7 gives an example of the information contained in Appendix E. This information is sorted by treatment type and street name.

Table 7. Recommended Preservation Treatments for Each Segment (Appendix E)

ID	STREET NAME	FROM	TO	CLASS	TREATMENT	AREA (YD^2)
165	500 E	650 N	700 N	Residential	Base Repair/Pavement Replacement	2,183
203	100 E	700 S	600 S	Residential	Chip Seal	1,908
304	Alexia Lane	Haydon Dr	Areva Rd	Residential	Crack Seal	2,648
287	400 N	900 E	Union St	Residential	Full Depth Relcamation & Overlay	1,279
42	600 E	550 N	600 N	Major Collector	Rotomill & Thick Overlay	2,820
134	200 N	Skyline Dr	Gates Dr	Major Arterial	Base Repair/Pavement Replacement	3,366

Assessment of Current Street Maintenance Program Funding

Asphalt Road Network

Maintaining and preserving Roosevelt's street network at a high service level is vital to the well-being of the community. It is helpful for elected official to understand that the cost of construction and pavement preservation has increased significantly in the last ten years. Since cities have had little increase in the B & C gas tax fund, they can preserve only a fraction of the roads that they could in the past with the same money. This is putting road departments in the position of not being able to stay up with cost effective pavement preservation in the early years of a pavement's life. The only solution is to find other sources of funds or let some of the lower functional class roads go, hoping that low volume roads will last a little longer than the higher volume arterials and collectors. Segments in Appendix G were selected and prioritized based on of their level of functional importance to the road network so that the higher functionally classified roads could be done first.

Systematic and balanced pavement preservation programs providing for routine and preventative maintenance, rehabilitation, and reconstruction, will enable Roosevelt to cost effectively maintain the street network. A pavement preservation program recommended for cities and towns is one that maintains an estimated average RSL of 10 years with no more than three percent (3%) of the street network at the terminal serviceability level (i.e. RSL = 0). Roosevelt's 2018 RSL distribution is shown in Figure 8.

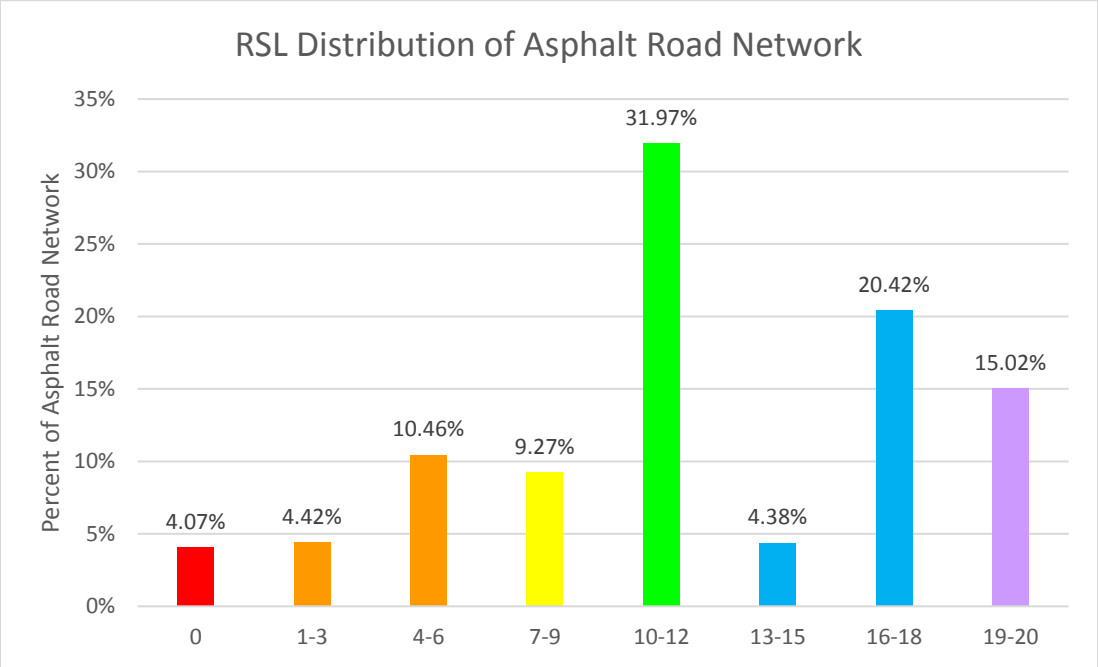


Figure 8. Current RSL Distribution for Asphalt Street Network

The average RSL for Roosevelt's asphalt street network for 2019 is estimated at 11.77 years with four percent (4.07%) of the road network at a terminal service level. The current condition of Roosevelt's asphalt street network meets the given recommended standards by having an estimated average RSL value above 10 years but greater than three percent of the street network at the terminal serviceability level. This illustrates that Roosevelt has been maintaining its road network at a satisfactory level.

Figure 9 and Figure 10 illustrate the estimated RSL distribution for 2024 and 2029 if no maintenance is performed on the street network. The number of streets at a terminal service level (RSL = 0) would increase from 4.07 % to 46.36% by 2029.

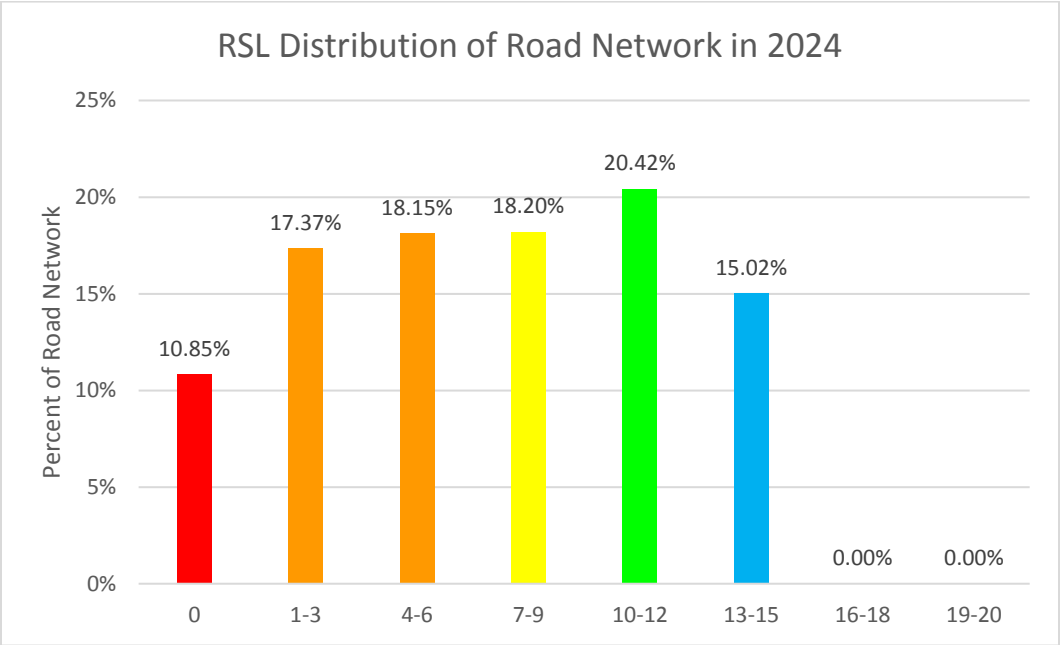


Figure 9. Estimated RSL Distribution for 2024 with No Maintenance

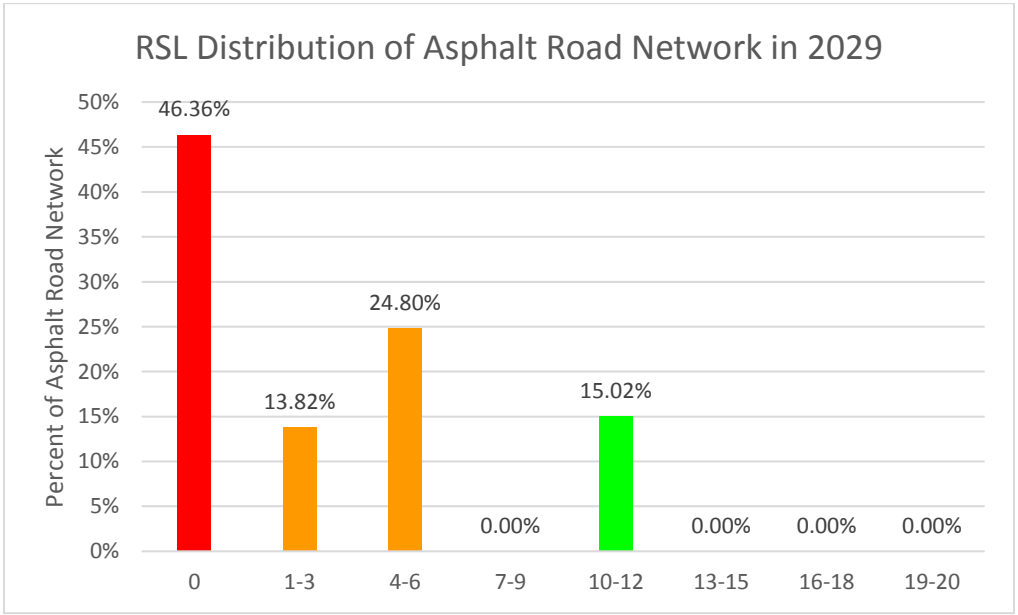


Figure 10. Estimated RSL Distribution for Year 2029 with No Maintenance

The resulting estimated average RSL for the year 2024 is 7.13 years, and for the year 2029 is 3.18 years.

With the recommended maintenance budget included in this report, the estimated number of streets at a terminal service level (RSL = 0) will increase from 4.07% to 7.5% by 2024. The resulting estimated average RSL for the year 2024 is 10.71. These resulting values meet the recommended standard of less than three percent (3%) of streets at the terminal service level and an average RSL of above 10 years. The overall RSL distribution of the road network has also improved.

Development of Recommended Pavement Preservation Program

Asphalt Road Network

A five-year pavement preservation program is recommended to increase the level of service of Roosevelt's road network. The first year of the program focuses on preservation treatments on major collector roads and the last four years put more focus on maintaining residential roads. The focus of the treatment plan is preventative maintenance strategies such as crack seal and slurry seal to help preserve the life of the road network with the most cost effective methods. This will result in lower future maintenance costs for these roads thus leaving additional funding to be used in rehabilitation and reconstruction methods on the roads needing those treatments.

A five-year plan was chosen as opposed to a ten-year plan because of the high degree of uncertainty in predicting what will occur over such a long period of time. After 3 or 4 years, a new condition survey should be performed to see how the roads have deteriorated throughout the plan to produce an updated five-year treatment plan.

The first year of the program, 2020, focuses on major collector and residential roads. The main treatments suggested for this part of the program are crack sealing and chip seal. The estimated cost of road maintenance work for 2020 is $222,882. First year funding will only be for routine and preventative treatments as shown in Table 8.

Table 8. Paved Road Funding Distribution for 2020

Treatment Category	Funding
Routine/Preventative	$ 222,882.72
Rehabilitation	
Reconstruction	
TOTAL	$ 222,882.72

The second year of the program, 2021, focuses on residential, major collector, and major arterial roads. The main treatments suggested for this part of the program are crack sealing and base

repair. The estimated cost of road maintenance work for 2021 is $348,980. The recommended funding distribution for the two pavement preservation strategies is given in Table 9.

Table 9. Paved Road Funding Distribution for 2021

Treatment Category	Funding
Routine/Preventative	$ 59,964.53
Rehabilitation	$
Reconstruction	$ 289,016.25
TOTAL	$ 348,980.78

The third year of the program, 2022, focuses on major collector and residential roads. The main treatments suggested for this part of the program are rotomilling with a 3 inch overlay and chip seal. The estimated cost of road maintenance work for 2022 is $294,778. The recommended funding distribution for the two pavement preservation strategies is given in Table 10.

Table 10. Paved Road Funding Distribution for 2022

Treatment Category	Funding
Routine/Preventative	$ 99,816.41
Rehabilitation	$
Reconstruction	$ 194,962.50
TOTAL	$ 294,778.91

The fourth year of the program, 2023, focuses on residential roads. The main treatment suggested for this part of the program is chip seal. The estimated cost of road maintenance work for 2023 is $212,882. The recommended funding for year three is given in Table 11.

Table 11. Paved Road Funding Distribution for 2023

Treatment Category	Funding
Routine/Preventative	$ 222,882.27
Rehabilitation	$
Reconstruction	$
TOTAL	$ 222,882.27

The fifth and final year of the program, 2024, focuses on residential and major collector roads. The main treatments suggested for this part of the program are chip seal and rotomilling with a 3 inch overlay. The estimated cost of road maintenance work for 2023 is $419,805. The recommended funding distribution for the two pavement preservation strategies is given in Table 12.

Table 12. Paved Road Funding Distribution for 2024

Treatment Category	Funding
Routine/Preventative	$ 153,573.20
Rehabilitation	$ -
Reconstruction	$ 266,232.50
TOTAL	$ 419,805.70

The list of streets within the road network that are recommended to be treated each year of the five-year maintenance plan can be found in Appendix G. The resulting RSL values for the road network in 2024 after the treatment plan has been completed can be found in Figure 13.

Implementation of Pavement Management System

A fully implemented pavement management system can be a useful tool to a city, town, or county in cost effectively maintaining their street or road networks at a high service level.

A majority of the work necessary to implement a pavement management system has been done by the Utah LTAP Center. As described in this report, a full inventory and condition survey of Roosevelt's street network has been made. This provided the basis for the analysis of the street network's current conditions. In addition, a pavement preservation program and recommendations have been made that will enable Roosevelt to maintain and enhance the service life of its street network.

The following steps are suggested to facilitate the implementation of the pavement management system and assure its beneficial use:

1. Conduct briefings with appropriate personnel to explain the details and procedures of the pavement management system.
2. Train the appropriate personnel on how to implement the recommended pavement preservation program.
3. Develop a pavement structure history database including dates of initial construction and subsequent maintenance and rehabilitation actions.
4. Develop a traffic database and incorporate traffic counts, classifications, and axle load data.
5. In cooperation with the personnel responsible for the maintenance of the street network, conduct site reviews of street segments recommended for treatment.

The Utah LTAP Center is available and can assist in this implementation effort. Further fieldwork and support is available on an as needed actual cost basis. This can be arranged and scheduled by contacting Nick Jones at the Utah LTAP Center.

Importance of Feedback

The pavement management system set forth in this report is systematic in nature. Therefore, special steps and efforts should be taken to assure that everyone involved has an opportunity and a means to provide both input and feedback in the pavement management process. As shown in Figure 1 of the introduction to this report, feedback among all elements of the pavement management process is essential for the system to be dynamic and useful to the city. Effective feedback has been accomplished by several agencies by establishing a pavement management team or group. This team is comprised of representatives from each operating element involved in the process within the organization. Typically, this team is led by someone from the Public Works Department who assigns specific duties to each team member commensurate with their role in the pavement management process.

The pavement preservation program requires accurate and timely feedback on all decisions and actions taken with respect to preservation (routine maintenance, preventative maintenance, rehabilitation maintenance, and reconstruction) of each street segment. This feedback should include such information as type of work performed, unit costs of work items, amount and quality of work performed, date of completed work, additional pavement structure added, and any other design related information. In addition, periodic condition surveys should be made to keep track of the condition of each street and the network as a whole. These periodic condition surveys should be conducted every two to three years.

Summary of Findings and Recommendations

Findings

Currently the streets network classifications in Roosevelt are: 79.58% of the street network is classified as residential, 18.3% as major collector, and 2.6% as major arterial.

Analyses of the distress information of the paved street network showed that there were six distress types prevalent in the asphalt paved streets network. Of these distress types, fatigue cracking occurred most frequently in the asphalt streets network. The percent areas of the asphalt street network affected by these distress types were previously shown in Figure 6.

Currently, the average remaining service life (RSL) for Roosevelt's entire asphalt paved street network is estimated to be 11.77 years. The current percent of street network surface area with no service life left (terminal serviceability or RSL = 0) is 4.07%.

Recommendations

Using the pavement preservation program presented in this report, the percent of street network surface area at the terminal serviceability level will be approximately 7.5%. Roosevelt's street network is currently in a "good" condition, but it is recommended that the average annual funding for the street maintenance be increased to $1,913,676.

A five-year maintenance plan is recommended for preserving the asphalt street networks at a high level of service. Costs of expanding the network are not included in the given recommended budget. Future funding needs will likely increase due to inflation, increased pavement surface areas, increased traffic volumes, and increased material costs. For the allocated road funds, prioritize preventative treatments with a lesser emphasis on reconstructive. Additional funds required for personnel, capital improvements, and capacity improvements should come from other funding sources such as impact fees and mill levies. The details of this recommended pavement preservation program are given in Appendix G.

It has been a pleasure working with Roosevelt City to provide the information included in this report. Roosevelt's Public Works and Engineering Department have been extremely supportive of the work that has been done in preparing the pavement preservation program. The pavement management program can be used to maintain and improve the streets network for several years to come.

Table 13. Summary of Findings and Recommendations

2018 Average RSL	11.77
2018 Terminal Serviceability	4.07%
2024 Estimated Average RSL	10.71
2024 Estimated Terminal Serviceability	7.5%
2018-2024 Average Recommended Annual Funding	$1,913,676

Appendix A

Inventory of Street Network

Appendix A - Asphalt

ID	Road Name	From	To	Width	Length	RSL	Area (Sq. Yards)	Area %
Functional Class: Major Arterial								
71	200 N	1000 W	900 W	54	456	12	2,736.00	0.32%
70	200 N	1100 W	1000 W	54	897	16	5,382.00	0.63%
134	200 N	SKYLINE DR	GATES DR	57	952	16	6,029.33	0.70%
361	SOUTH COVE RD	500 W	HWY 121	40	413	16	1,835.56	0.21%
374	200 N	GATES DR	500 W	57	548	16	3,470.67	0.41%
72	200 N	900 W	SKYLINE DR	54	462	14	2,772.00	0.32%
					Total	15.00	22,225.56	2.60%
Functional Class: Major Collector								
26	LAGOON ST	500 E	600 E	46	573	20	2,928.67	0.34%
44	STATE ST	975 S	800 S	30	925	20	3,083.33	0.36%
74	STATE ST	1080 S	975 S	30	544	20	1,813.33	0.21%
113	LAGOON ST	300 E	400 E	80	422	20	3,751.11	0.44%
212	LAGOON ST	200 W	100 W	80	498	20	4,426.67	0.52%
257	LAGOON ST	100 W	STATE ST	80	415	20	3,688.89	0.43%
317	STATE ST	1200 S	1080 S	24	558	20	1,488.00	0.17%
262	STATE ST	300 N	HWY 121	55	475	8	2,902.78	0.34%
313	STATE ST	1700 S	1200 S	24	2079	12	5,544.00	0.65%
360	2000 S	STATE ST	500 E	25	2206	12	6,127.78	0.72%
362	500 E	600 S	700 S	43	567	6	2,709.00	0.32%
365	500 E	LESLIE ST	400 S	39	417	6	1,807.00	0.21%
366	500 E	SHELLY ST	LESLIE ST	39	300	6	1,300.00	0.15%
367	500 E	150 S	SHELLY ST	39	321	6	1,391.00	0.16%
372	500 E	100 S	150 S	39	301	6	1,304.33	0.15%
76	STATE ST	SUNSET DR	700 S	27	216	6	648.00	0.08%
91	STATE ST	300 S	SUNSET DR	27	481	6	1,443.00	0.17%
116	600 E	400 N	500 N	36	470	6	1,880.00	0.22%
125	STATE ST	700 S	800 S	27	690	8	2,070.00	0.24%
229	STATE ST	300 N	500 N	55	1174	8	7,174.44	0.84%
35	LAGOON ST	100 E	US 40	72	423	10	3,384.00	0.40%
93	STATE ST	US 40	425 S	54	417	10	2,502.00	0.29%
230	500 W	100 N	200 N	44	461	10	2,253.78	0.26%
231	500 W	LAGOON ST	100 N	44	510	10	2,493.33	0.29%
7	STATE ST	425 S	300 S	54	565	10	3,390.00	0.40%
13	LAGOON ST	400 E	500 E	80	396	10	3,520.00	0.41%
117	LAGOON ST	US 40	300 E	72	418	10	3,344.00	0.39%
239	LAGOON ST	300 W	200 W	47	542	16	2,830.44	0.33%
387	HAYFIELD RD	STATE ST	DEAD ENG	48	1334	16	7,114.67	0.83%
370	STATE ST	600 S	US 40	65	458	10	3,307.78	0.39%
222	600 E	HARMSTON AVE	100 N	50	267	12	1,483.33	0.17%
268	600 E	100 N	LAGOON ST	50	500	12	2,777.78	0.32%
449	5200 W	US-191	City Boundary	40	1495	14	6,644.44	0.78%
109	600 E	300 N	400 N	36	470	14	1,880.00	0.22%
112	LAGOON ST	STATE ST	100 E	55	421	14	2,572.78	0.30%
359	STATE ST	2000 E	1870 S	40	523	2	2,324.44	0.27%
42	600 E	550 N	600 N	36	280	6	1,120.00	0.13%
47	600 E	500 N	550 N	36	287	6	1,148.00	0.13%
67	500 E	600 S	500 S	43	589	8	2,814.11	0.33%
237	STATE ST	100 N	HWY 121	55	468	8	2,860.00	0.33%
364	500 E	500 S	400 S	43	626	8	2,990.89	0.35%
2	600 E	300 N	US 40	36	477	10	1,908.00	0.22%
27	LAGOON ST	600 E	700 E	58	327	10	2,107.33	0.25%
28	STATE ST	100 S	LAGOON ST	55	488	10	2,982.22	0.35%
31	STATE ST	200 S	100 S	55	499	10	3,049.44	0.36%

ID	Road Name	From	To	Width	Length	RSL	Area (Sq. Yards)	Area %
Functional Class: Major Collector								
223	600 E	HARMSTON AVE	HWY 121	50	202	10	1,122.22	0.13%
236	STATE ST	LAGOON ST	100 N	55	501	10	3,061.67	0.36%
371	500 E	100 S	LAGOON ST	61	491	10	3,327.89	0.39%
292	STATE ST	1800 S	1700 S	40	387	10	1,720.00	0.20%
3	600 E	600 N	650 N	36	264	12	1,056.00	0.12%
38	LAGOON ST	700 E	800 E	44	313	12	1,530.22	0.18%
153	LAGOON ST	500 W	400 W	47	522	12	2,726.00	0.32%
189	LAGOON ST	400 W	300 W	47	469	12	2,449.22	0.29%
350	STATE ST	1870 S	1800 S	40	278	12	1,235.56	0.14%
120	STATE ST	300 S	200 S	55	482	16	2,945.56	0.34%
369	600 E	650 N	700 N	36	263	16	1,052.00	0.12%
					Total	11.14	152,510.44	17.83%
Functional Class: Residential								
0	200 S	500 W	NYE ST	44	258	20	1,261.33	0.15%
19	400 E	400 N	500 N	37	470	20	1,932.22	0.23%
34	400 E	500 N	550 N	37	281	20	1,155.22	0.14%
52	300 N	300 E	200 E	36	310	20	1,240.00	0.14%
58	300 S	300 E	US 40	34	452	20	1,707.56	0.20%
61	200 W	300 N	400N	46	463	20	2,366.44	0.28%
66	CLUB HOUSE DR	AREVA RD	CANYON VIEW DR	44	1206	20	5,896.00	0.69%
78	RODEO DR	800 S	US 40	34	1109	20	4,189.56	0.49%
82	SKYLINE DR	200 S	LAGOON ST	44	620	20	3,031.11	0.35%
85	975 S	200 W	STATE ST	30	890	20	2,966.67	0.35%
89	600 S	350 E	450 E	43	263	20	1,256.56	0.15%
123	300 E	300 N	400 N	37	474	20	1,948.67	0.23%
127	300 N	200 E	100 E	36	423	20	1,692.00	0.20%
141	600 S	200 E	300 E	43	514	20	2,455.78	0.29%
143	200 S	N/A	SKYLINE DR	44	395	20	1,931.11	0.23%
159	400 N	300 E	400 E	37	521	20	2,141.89	0.25%
166	LAGOON ST	1000 WEST	900 WEST	46	444	20	2,269.33	0.27%
176	100 W	200 S	100 S	55	494	20	3,018.89	0.35%
204	400 E	300 N	US 40	35	475	20	1,847.22	0.22%
224	ROOSEVELT CIR	350 E	300 E	32	281	20	999.11	0.12%
245	300 N	100 W	200 W	43	483	20	2,307.67	0.27%
253	800 S	RODEO DR	200 W	34	374	20	1,412.89	0.17%
256	MEMORY LN	DEAD END	AREVA RD	44	593	20	2,899.11	0.34%
263	300 N	200 W	300 W	43	538	20	2,570.44	0.30%
270	800 S	200 W	150 W	24	218	20	581.33	0.07%
274	AREVA	200 N	SUNSET CIRCLE	44	1210	20	5,915.56	0.69%
286	400 N	200 E	300 E	37	370	20	1,521.11	0.18%
291	HARRISON AVE	SOUTH POCO DR	700 S	34	464	20	1,752.89	0.20%
293	500 E	1080 S	1040 S	44	256	20	1,251.56	0.15%
294	500 E	1040 S	975 S	44	318	20	1,554.67	0.18%
296	500 E	1870 S	1140 S	44	3019	20	14,759.56	1.73%
302	350 N	950 W	850 W	30	470	20	1,566.67	0.18%
304	ALEXIA LN	HAYDON DR	AREVA RD	36	242	20	968.00	0.11%
308	SOUTH POCO DR	500 E	HARRISON AVE	34	262	20	989.78	0.12%
319	500 E	970 S	920 S	44	313	20	1,530.22	0.18%
320	500 E	920 S	850 S	44	342	20	1,672.00	0.20%
324	ASPEN LN	WILLOW CIR	END OF PAVEMENT	34	199	20	751.78	0.09%
326	1140 S	500 E	DEAD END	34	51	20	192.67	0.02%
327	500 E	1140 S	1080 S	44	270	20	1,320.00	0.15%
334	1875 S	340 E	400 E	34	266	20	1,004.89	0.12%
335	500 E	2000 S	1870 S	44	516	20	2,522.67	0.29%
342	850 W	350 N	GATES DR	30	235	20	783.33	0.09%

ID	Road Name	From	To	Width	Length	RSL	Area (Sq. Yards)	Area %
Functional Class: Residential								
346	SOUTH POCO DR	END OF PAVEMENT	HARRISON AVE	34	143	20	540.22	0.06%
377	UNION ST	300 N	385 N	60	201	20	1,340.00	0.16%
388	300 E	700 S	DEAD END	35	92	20	357.78	0.04%
389	GILBERT AVE	700 S	DEAD END	35	99	20	385.00	0.05%
390	500 W	200 S	DEAD END	30	236	20	786.67	0.09%
393	100 N	900 W	1000 W	20	455	20	1,011.11	0.12%
394	800 S	200 E	1000 W	20	349	20	775.56	0.09%
444	LESLIE ST	END OF PAVEMENT	500 E	30	220	20	733.33	0.09%
450	STONEGATE DR	COVE RD	550 S	24	2887	20	7,698.67	0.90%
451	200 S	STONEGATE DR	DEAD END	22	582	20	1,422.67	0.17%
452	280 S	STONEGATE DR	DEAD END	22	810	20	1,980.00	0.23%
453	350 S	STONEGATE DR	DEAD END	22	833	20	2,036.22	0.24%
454	440 S	STONEGATE DR	DEAD END	22	1043	20	2,549.56	0.30%
455	550 S	STONEGATE DR	DEAD END	22	835	20	2,041.11	0.24%
242	100 N	400 E	300 E	28	403	8	1,253.78	0.15%
258	100 N	STATE ST	100 E	55	421	8	2,572.78	0.30%
69	300 E	550 S	600 S	24	327	12	872.00	0.10%
142	550 S	200 E	300 E	24	514	12	1,370.67	0.16%
68	300 E	550 S	ROOSEVELT CIR	24	293	12	781.33	0.09%
184	800 S	150 W	STATE ST	24	686	12	1,829.33	0.21%
300	CONSTITUTION DR	PARK RIDGE DR	100 S	35	679	12	2,640.56	0.31%
386	200 N	SUMMERALL LN	AREVA RD	22	1291	12	3,155.78	0.37%
37	100 S	200 W	100 W	54	492	0	2,952.00	0.35%
48	600 N	DEAD END	400 E	40	325	0	1,444.44	0.17%
102	1000 W	BONNIE DR	BONNIE DR	34	760	0	2,871.11	0.34%
106	GATES DR	HWY 121	NELSON AVE	44	997	0	4,874.22	0.57%
144	GEORGIA CIR	DEAD END	LAGOON ST	32	200	0	711.11	0.08%
156	100 N	700 E	800 E	35	329	0	1,279.44	0.15%
160	700 N	DEAD END	400 E	44	331	0	1,618.22	0.19%
161	500 E	650 N	700 N	38	257	0	1,085.11	0.13%
162	100 E	800 S	700 S	42	690	0	3,220.00	0.38%
175	550 N	DEAD END	400 E	44	316	0	1,544.89	0.18%
181	650 N	DEAD END	400 E	43	308	0	1,471.56	0.17%
187	400 E	100 S	LAGOON ST	56	487	0	3,030.22	0.35%
198	500 E	600 E	650 E	38	265	0	1,118.89	0.13%
201	400 N	800 E	900 E	37	419	0	1,722.56	0.20%
287	400 N	900 E	UNION ST	37	324	0	1,332.00	0.16%
289	100 S	NYE RD	DEAD END	44	340	0	1,662.22	0.19%
1	800 E	250 N	US 40	44	274	2	1,339.56	0.16%
25	600 N	400 E	450 E	40	277	2	1,231.11	0.14%
110	800 E	300 N	400 N	45	482	2	2,410.00	0.28%
111	600 N	450 E	500 E	40	178	2	791.11	0.09%
118	200 W	200 S	100 S	44	491	2	2,400.44	0.28%
121	100 E	300 S	200 S	70	478	2	3,717.78	0.43%
140	SUNSET DR	STATE ST	DEAD END	34	441	2	1,666.00	0.19%
157	400 N	700 E	800 E	37	546	2	2,244.67	0.26%
165	100 S	400 E	500 E	65	403	2	2,910.56	0.34%
203	100 E	700 S	600 S	42	697	2	3,252.67	0.38%
228	800 S	US 40	400 W	34	984	2	3,717.33	0.43%
235	BONNIE	1000 W	DEAD END	46	116	2	592.89	0.07%
421	500 N	S 500 N	200 E	36	579	2	2,316.00	0.27%
182	650 N	400 E	500 E	43	457	4	2,183.44	0.26%
214	200 E	300 N	US 40	55	471	4	2,878.33	0.34%
234	BONNIE	1000 W	1000 W	35	707	4	2,749.44	0.32%
272	100 S	500 W	NYE RD	44	235	4	1,148.89	0.13%
277	350 E	600 S	ROOSEVELT CIR	24	789	4	2,104.00	0.25%

ID	Road Name	From	To	Width	Length	RSL	Area (Sq. Yards)	Area %
Functional Class: Residential								
373	650 N	500 E	600 E	43	517	4	2,470.11	0.29%
375	75 N	WENDALL LN	END OF PAVEMENT	34	643	4	2,429.11	0.28%
408	300 W	300 N ST	300 W	40	579	4	2,573.33	0.30%
199	700 N	400 E	500 E	44	460	4	2,248.89	0.26%
122	600 N	500 E	600 E	40	520	4	2,311.11	0.27%
11	300 N	CARMA AVE	700 E	40	239	6	1,062.22	0.12%
145	300 N	JOYCE AVE	800 E	40	358	6	1,591.11	0.19%
249	500 E	LAGOON ST	DEAD END	61	342	6	2,318.00	0.27%
49	800 S	100 E	200 E	30	418	6	1,393.33	0.16%
126	700 S	100 E	200 E	43	413	6	1,973.22	0.23%
207	GATES DR	DEAD END	GATES DR	45	1385	6	6,925.00	0.81%
216	100 W	100 N	HWY 121	54	470	6	2,820.00	0.33%
259	200 W	LAGOON ST	100 N	44	501	6	2,449.33	0.29%
281	200 W	100 N	HWY 121	44	471	6	2,302.67	0.27%
288	300 N	UNION ST	900 E	51	319	6	1,807.67	0.21%
318	1200 S	END OF PAVEMENT	STATE ST	44	898	6	4,390.22	0.51%
12	300 N	800 E	CARMA AVE	40	233	6	1,035.56	0.12%
18	800 E	300 N	250 N	44	206	6	1,007.11	0.12%
46	100 E	200 S	100 S	55	497	6	3,037.22	0.36%
75	3RD E	DEAD END	700 S	34	107	6	404.22	0.05%
94	VIOLA CIR	DEAD END	LAGOON ST	30	196	6	653.33	0.08%
115	100 N	100 W	STATE ST	64	420	6	2,986.67	0.35%
124	400 E	550 N	600 N	37	288	6	1,184.00	0.14%
129	400 E	650 N	700 N	37	257	6	1,056.56	0.12%
130	400 E	LAGOON ST	100 N	59	464	6	3,041.78	0.36%
170	400 N	400 E	500 E	37	458	6	1,882.89	0.22%
200	700 N	500 E	600 E	44	510	6	2,493.33	0.29%
215	100 E	100 N	HWY 121	55	469	6	2,866.11	0.34%
241	100 N	100 E	US 40	55	417	6	2,548.33	0.30%
243	100 E	300 N	US 40	55	473	6	2,890.56	0.34%
6	600 S	200 E	100 E	34	406	8	1,533.78	0.18%
195	400 N	600 E	700 E	37	326	8	1,340.22	0.16%
43	400 E	600 N	650 N	37	267	8	1,097.67	0.13%
138	700 S	SOUTH POCO DR	300 E	44	254	8	1,241.78	0.15%
219	200 W	100 S	LAGOON ST	44	491	8	2,400.44	0.28%
9	300 N	600 E	500 E	36	523	8	2,092.00	0.24%
10	300 N	700 E	600 E	40	321	8	1,426.67	0.17%
30	100 N	200 W	100 W	64	493	8	3,505.78	0.41%
53	300 N	500 E	400 E	37	459	8	1,887.00	0.22%
87	700 S	HARRISON AVE	500 E	44	259	8	1,266.22	0.15%
100	SKYLINE DR	LAGOON ST	100 N	34	538	8	2,032.44	0.24%
119	100 S	100 W	STATE ST	54	424	8	2,544.00	0.30%
197	500 N	500 E	600 E	44	526	8	2,571.56	0.30%
213	300 E	100 N	200 N	55	472	8	2,884.44	0.34%
232	500 W	100 S	LAGOON ST	45	517	8	2,585.00	0.30%
267	300 E	LAGOON ST	100 N	55	503	8	3,073.89	0.36%
275	150 W	800 S	US 40	30	1445	8	4,816.67	0.56%
290	ALTA ST	200 S	100 S	32	469	8	1,667.56	0.19%
351	ELM CIR	1200 S	DEAD END	24	279	8	744.00	0.09%
101	300 N	900 E	JOYCE AVE	51	143	8	810.33	0.09%
8	300 S	STATE ST	100 E	54	422	10	2,532.00	0.30%
20	500 N	400 E	450 E	44	266	10	1,300.44	0.15%
29	100 E	100 S	LAGOON ST	55	490	10	2,994.44	0.35%
83	SKYLINE DR	200 S	LAGOON ST	34	1062	10	4,012.00	0.47%
86	700 S	GILBERT AVE	NORTH POCO DR	44	279	10	1,364.00	0.16%
98	180 S	DEAD END	1000 W	34	229	10	865.11	0.10%

ID	Road Name	From	To	Width	Length	RSL	Area (Sq. Yards)	Area %
Functional Class: Residential								
131	240 S	DEAD END	1000 W	34	227	10	857.56	0.10%
137	700 S	200 E	SOUTH POCO DR	44	298	10	1,456.89	0.17%
139	700 S	300 E	GILBERT AVE	44	285	10	1,393.33	0.16%
164	300 E	200 S	100 S	44	500	10	2,444.44	0.29%
186	300 E	400 S	300 S	44	359	10	1,755.11	0.21%
191	300 E	ROOSEVELT CIR	400 S	43	622	10	2,971.78	0.35%
202	HARMSTON AVE	510 E	600 E	34	412	10	1,556.44	0.18%
252	200 E	ROOSEVELT CIR	US 40	51	485	10	2,748.33	0.32%
260	300 E	100 S	LAGOON ST	44	485	10	2,371.11	0.28%
348	SPRUCE DR	DEAD END	1200 S	34	530	10	2,002.22	0.23%
399	STATE ST		600 N	23	331	10	845.89	0.10%
424	250 N	900 E	UNION ST	20	323	10	717.78	0.08%
445	LESLIE ST	500 E	END OF PAVEMENT	30	168	10	560.00	0.07%
409	S 500 N	E 500 N	END OF PAVEMENT	36	312	10	1,248.00	0.15%
172	400 N	500 E	600 E	37	521	8	2,141.89	0.25%
39	200 S	STATE ST	100 E	54	416	10	2,496.00	0.29%
56	200 S	100 E	US 40	54	423	10	2,538.00	0.30%
151	600 N	600 E	DEAD END	40	685	10	3,044.44	0.36%
5	NYE RD	200 S	100 S	32	473	12	1,681.78	0.20%
36	500 W	200 S	100 S	44	470	12	2,297.78	0.27%
40	GATES DR	NELSON DR	GATES DR	45	380	12	1,900.00	0.22%
99	100 N	900 W	SKYLINE DR	40	527	12	2,342.22	0.27%
135	50 E	DEAD END	1150 S	34	150	12	566.67	0.07%
136	50 E	1150 S	1080 S	34	295	12	1,114.44	0.13%
179	100 E	DEAD END	300 S	100	466	12	5,177.78	0.61%
264	300 W	300 N	END OF PAVEMENT	43	267	12	1,275.67	0.15%
357	45 E	1800 S	DEAD END	34	173	12	653.56	0.08%
368	550 N	450 E	600 E	35	712	12	2,768.89	0.32%
4	400 E	300 N	400 N	37	470	16	1,932.22	0.23%
21	1000 W	100 N	200 N	30	500	16	1,666.67	0.19%
57	300 S	100 E	US 40	46	416	16	2,126.22	0.25%
62	290 S	1000 W	MEMORY LANE	40	868	16	3,857.78	0.45%
63	AREVA RD	CLUB HOUSE DR	PARK PALACE DR.	44	564	16	2,757.33	0.32%
88	600 S	300 E	350 E	43	245	16	1,170.56	0.14%
90	600 S	450 E	500 E	43	365	16	1,743.89	0.20%
132	CLUB HOUSE DR	CANYON VIEW DR	HWY 121	44	1583	16	7,739.11	0.90%
148	HILLCREST DR	MILLER DR	DEAD END	35	162	16	630.00	0.07%
150	MASON CIR	AREVA RD	AREVA RD	44	1505	16	7,357.78	0.86%
152	CANYON VIEW DR	CLUB HOUSE DR	DEAD END	35	1282	16	4,985.56	0.58%
208	NELSON RD	DEAD END	GATES DR	45	619	16	3,095.00	0.36%
209	100 S	100 E	US 40	54	419	16	2,514.00	0.29%
210	100 S	300 E	US 40	56	422	16	2,625.78	0.31%
211	100 S	300 E	400 E	63	412	16	2,884.00	0.34%
225	ROOSEVELT CIR	300 E	300 E	32	196	16	696.89	0.08%
226	ROOSEVELT CIR	300 E	200 E	39	317	16	1,373.67	0.16%
238	100 S	STATE ST	100 E	54	421	16	2,526.00	0.30%
240	300 W	100 N	HWY 121	42	467	16	2,179.33	0.25%
250	700 E	LAGOON ST	100 N	42	498	16	2,324.00	0.27%
271	800 S	400 W	RODEO DR	34	701	16	2,648.22	0.31%
297	1875 S	280 E	340 E	34	280	16	1,057.78	0.12%
303	300 N	950 W	850 W	30	451	16	1,503.33	0.18%
305	850 W	300 N	350 N	30	273	16	910.00	0.11%
306	MOUNTAIN GREEN CIR	300 W	DEAD END	20	206	16	457.78	0.05%
328	1875 S	STATE ST	100 E	34	442	16	1,669.78	0.20%
336	1875 S	480 E	500 E	34	165	16	623.33	0.07%
343	950 W	300 N	350 N	30	284	16	946.67	0.11%

ID	Road Name	From	To	Width	Length	RSL	Area (Sq. Yards)	Area %
Functional Class: Residential								
344	300 W	LAGOON ST	100 N	42	501	16	2,338.00	0.27%
376	150 N	WENDALL LN	END OF PAVEMENT	35	693	16	2,695.00	0.32%
418	LAGOON ST	1000 W	CONSTITIUTION DR	30	551	16	1,836.67	0.21%
45	800 S	STATE ST	100 E	30	424	6	1,413.33	0.17%
33	500 N	450 E	500 E	44	188	12	919.11	0.11%
77	SOUTH POCO DR	700 S	NORTH POCO DR	34	288	12	1,088.00	0.13%
246	300 W	300 N	HWY 121	43	474	12	2,264.67	0.26%
298	100 S	PARK RIDGE DR	CONSTITUTION DR	34	697	12	2,633.11	0.31%
314	FIR AVE	DEAD END	1200 S	34	438	12	1,654.67	0.19%
322	320 E	1080 S	DEAD END	34	130	12	491.11	0.06%
180	1000 W	DEAD END	290 S	47	244	12	1,274.22	0.15%
333	1800 S	190 EAST CIR	END OF PAVEMENT	34	179	14	676.22	0.08%
103	AREVA	SUNSET CIRCLE	AREVA	44	306	14	1,496.00	0.17%
104	HILLCREST DR	HWY 121	MILLER DR	35	659	14	2,562.78	0.30%
107	AREVA	AREVA	RIVIERA DR	44	402	14	1,965.33	0.23%
149	AREVA RD	MASON CIRCLE	MASON CIRLCE	44	311	14	1,520.44	0.18%
167	LAGOON ST	900 W	GUINEVERE CIRCLE	50	275	14	1,527.78	0.18%
171	500 E	300 N	400 N	37	471	14	1,936.33	0.23%
220	100 W	100 S	LAGOON ST	55	490	14	2,994.44	0.35%
261	100 N	300 E	US 40	55	424	14	2,591.11	0.30%
282	PARKVIEW LN	DEAD END	1000 W	32	325	14	1,155.56	0.14%
284	GUENEVIERRE CIR	DEAD END	LAGOON ST	36	243	14	972.00	0.11%
316	ASPEN LN	1200 S	WILLOW CIR	34	489	14	1,847.33	0.22%
323	1875 S	400 E	480 E	34	264	14	997.33	0.12%
16	100 N	500 W	400 W	44	511	2	2,498.22	0.29%
79	200 E	800 S	600 S	51	594	2	3,366.00	0.39%
173	450 E	500 N	500 N	32	301	2	1,070.22	0.13%
221	800 E	HWY 121	100 N	42	472	2	2,202.67	0.26%
233	100 E	LAGOON ST	100 N	55	500	2	3,055.56	0.36%
17	100 N	400 W	300 W	44	488	6	2,385.78	0.28%
80	200 E	600 S	550 S	51	223	6	1,263.67	0.15%
92	200 E	600 S	600 S	42	107	6	499.33	0.06%
114	100 N	300 W	200 W	44	533	6	2,605.78	0.30%
133	200 E	550 S	ROOSEVELT CIR	51	266	6	1,507.33	0.18%
196	450 E	550 N	600 N	32	273	6	970.67	0.11%
218	800 E	100 N	LAGOON ST	31	497	6	1,711.89	0.20%
280	200 W	300 N	HWY 121	44	475	6	2,322.22	0.27%
50	200 E	800 S	700 S	50	685	8	3,805.56	0.44%
84	IVIE MANOR	DEAD END	LAGOON ST	43	327	8	1,562.33	0.18%
95	NORTH POCO DR	SOUTH POCO DR	HARRISON AVE	34	826	8	3,120.44	0.36%
269	700 E	300 N	400 N	50	468	8	2,600.00	0.30%
283	PARK RIDGE DR	PARK RIDGE DR	100 S	34	214	8	808.44	0.09%
285	KING ARTHURS CT	DEAD END	LAGOON ST	34	256	8	967.11	0.11%
295	1875 S	500 E	DEAD END	34	316	8	1,193.78	0.14%
310	930 S	525 E	DEAD END	24	168	8	448.00	0.05%
339	290 S	PARK RIDGE DR	1000 W	34	415	8	1,567.78	0.18%
340	PARK RIDGE DR	CONSTITUTION DR	290 S	34	481	8	1,817.11	0.21%
341	PARK RIDGE DR	100 S	PARK RIDGE DR	34	748	8	2,825.78	0.33%
23	SKYLINE DR	100 N	200 N	34	496	10	1,873.78	0.22%
32	700 S	STATE ST	100 E	30	420	10	1,400.00	0.16%
41	600 S	100 E	STATE ST	34	421	10	1,590.44	0.19%
155	LAGOON ST	IVIE MANOR	500 W	50	326	10	1,811.11	0.21%
168	LAGOON ST	GUINEVERE CIRCLE	SKYLINE DR	50	428	10	2,377.78	0.28%
185	400 S	450 E	350 E	32	164	10	583.11	0.07%
190	1000 W	290 S	240 S	45	233	10	1,165.00	0.14%
194	100 N	600 E	700 E	35	320	10	1,244.44	0.15%

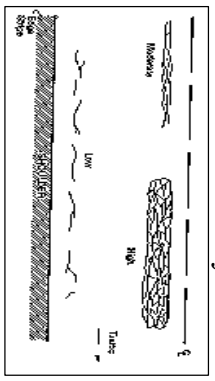
ID	Road Name	From	To	Width	Length	RSL	Area (Sq. Yards)	Area %
Functional Class: Residential								
217	100 W	300 N	HWY 121	53	473	10	2,785.44	0.33%
227	1000 W	240 S	180 S	45	247	10	1,235.00	0.14%
247	400 N	200 W	100 W	32	477	10	1,696.00	0.20%
251	HARMSTON AVE	HWY 121	150 N	34	202	10	763.11	0.09%
254	WENDALL LN	LAGOON ST	75 N	44	281	10	1,373.78	0.16%
265	100 W	300 N	400 N	34	456	10	1,722.67	0.20%
266	400 W	LAGOON ST	100 N	44	502	10	2,454.22	0.29%
273	WENDALL LN	75 N	150 N	35	358	10	1,392.22	0.16%
279	HARRISON AVE	700 S	NORTH POCO DR	34	289	10	1,091.78	0.13%
299	1000 W	180 S	LAGOON ST	45	889	10	4,445.00	0.52%
331	1800 S	45 E CIR	115 E CIR	34	325	10	1,227.78	0.14%
349	1080 S	STATE ST	320 S	34	1345	10	5,081.11	0.59%
353	920 S	500 E	525 E	34	140	10	528.89	0.06%
354	1080 S	320 S	500 E	44	747	10	3,652.00	0.43%
358	190 E	1800 S	DEAD END	34	183	10	691.33	0.08%
363	400 S	500 E	450 E	41	225	10	1,025.00	0.12%
448	Riviera Dr	Fairway Cir	Dead End	40	268	10	1,191.11	0.14%
96	1000 W	200 N	BONNIE DR	40	218	10	968.89	0.11%
14	1000 W	LAGOON ST	100 N	30	493	12	1,643.33	0.19%
51	300 N	100 E	STATE ST	36	419	12	1,676.00	0.20%
73	1150 S	50 E	END OF PAVEMENT	34	800	12	3,022.22	0.35%
147	MILLER DR	HWY 121	HILLCRST DR	34	592	12	2,236.44	0.26%
154	LAGOON ST	VIOLA CIR	GEORGIA CIR	51	256	12	1,450.67	0.17%
163	400 S	300 E	ROOSEVELT CIR	41	396	12	1,804.00	0.21%
174	700 E	300 N	250 N	50	202	12	1,122.22	0.13%
183	700 E	250 N	US 40	50	276	12	1,533.33	0.18%
192	LAGOON ST	WENDALL LN	VIOLA CIR	51	126	12	714.00	0.08%
193	LAGOON ST	GEOGRIA CIR	IVIE MANOR	51	240	12	1,360.00	0.16%
248	400 W	100 N	DEAD END	44	389	12	1,901.78	0.22%
309	525 E	DEAD END	920 S	24	147	12	392.00	0.05%
311	BIRCH AVE	DEAD END	1200 S	34	533	12	2,013.56	0.24%
312	1700 S	STATE ST	DEAD END	34	812	12	3,067.56	0.36%
315	PINE CIR	1200 S	DEAD END	34	332	12	1,254.22	0.15%
330	1800 S	STATE ST	45 E CIR	34	189	12	714.00	0.08%
332	1800 S	115 EAST CIR	190 EAST CIR	34	317	12	1,197.56	0.14%
337	115 E	1800 S	DEAD END	34	188	12	710.22	0.08%
338	425 S	PRIVATE	STATE ST	32	664	12	2,360.89	0.28%
383	300 S	300 E	END OF PAVEMENT	30	240	12	800.00	0.09%
398	STATE ST	600 N	SMITH LN	23	706	12	1,804.22	0.21%
276	400 W	800 S	US 40	20	692	12	1,537.78	0.18%
15	900 W	LAGOON ST	100 N	40	489	16	2,173.33	0.25%
22	900 W	100 N	200 N	40	498	16	2,213.33	0.26%
24	CARMA AVE	300 N	DEAD END	34	196	16	740.44	0.09%
54	JOYCE AVE	300 N	DEAD END	34	184	16	695.11	0.08%
55	200 S	300 E	US 40	55	434	16	2,652.22	0.31%
59	200 S	NYE ST	ALTA ST	44	224	16	1,095.11	0.13%
60	200 S	ALTA ST	200 W	44	1123	16	5,490.22	0.64%
64	200 W	975 S	800 S	30	925	16	3,083.33	0.36%
81	ROOSEVELT CIR	400 S	350 S	39	437	16	1,893.67	0.22%
97	200 S	SKYLINE DR	500 W	44	919	16	4,492.89	0.53%
105	AREVA RD	RIVIERA DR	MASON CIRCLE	44	396	16	1,936.00	0.23%
108	AREVA RD	MASON DR	CLUB HOUSE DR	44	618	16	3,021.33	0.35%
128	300 N	400 E	300 E	36	522	16	2,088.00	0.24%
146	SUNSET CIRCLE	DEAD END	AREVA RD	34	180	16	680.00	0.08%
158	500 E	400 N	500 N	37	466	16	1,915.78	0.22%
169	LAGOON ST	SKYLINE DR	WENDALL LN	51	315	16	1,785.00	0.21%

ID	Road Name	From	To	Width	Length	RSL	Area (Sq. Yards)	Area %
Functional Class: Residential								
177	200 S	200 W	100 W	54	486	16	2,916.00	0.34%
178	200 S	100 W	STATE ST	54	416	16	2,496.00	0.29%
188	300 E	300 S	200 S	44	479	16	2,341.78	0.27%
205	500 E	300 N	US 40	37	482	16	1,981.56	0.23%
206	500 N	350 E	400 E	44	520	16	2,542.22	0.30%
244	300 N	STATE ST	100 W	43	425	16	2,030.56	0.24%
255	150 N	DEAD END	WENDALL LN	35	118	16	458.89	0.05%
278	OLPIN AVE	800 S	US 40	20	499	16	1,108.89	0.13%
301	350 N	1000 W	950 W	30	498	16	1,660.00	0.19%
307	ALEXIA LN	DEAD END	HAYDON DR	36	298	16	1,192.00	0.14%
321	320 E	DEAD END	1080 S	34	165	16	623.33	0.07%
325	500 E	850 S	800 S	44	247	16	1,207.56	0.14%
329	1875 S	100 E	160 E	34	266	16	1,004.89	0.12%
345	HAYDON DR	DEAD END	ALEXIA LN	35	234	16	910.00	0.11%
347	500 E	800 S	700 S	44	714	16	3,490.67	0.41%
352	WILLOW CIR	ASPEN LN	DEAD END	40	147	16	653.33	0.08%
355	1875 S	160 E	220 E	34	264	16	997.33	0.12%
356	1875 S	220 E	280 E	34	260	16	982.22	0.11%
378	UNION ST	300 N	350 N	45	233	16	1,165.00	0.14%
441	JANE ST	500 E	END OF PAVEMENT	35	136	16	528.89	0.06%
442	SHELLY ST	END OF PAVEMENT	500 E	50	236	16	1,311.11	0.15%
					Total	11.58	680,806.11	79.58%

Appendix B

Condition Survey Evaluation Sheet

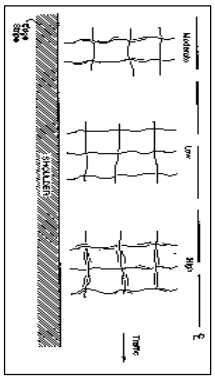
FATIGUE CRACKING



Severity

	Extent		
	Low	**Medium**	**High**
0 None	1 Crack WP or 1' off C&G Length	2 Crack WP or 1'-2' off C&G Length	>30% of Surface Area or Length
Low Cracks < 1/4"	1	2	3
Mediu m Cracks 1/4"to 3/4"	4	5	6
High Cracks > 3/4"	7	8	9

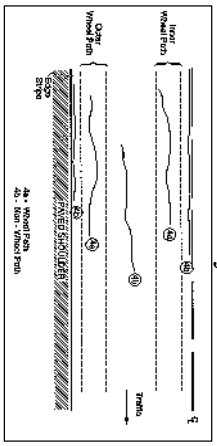
BLOCK CRACKING



Severity

	Extent		
	Low	**Medium**	**High**
0 None	> 15'x15' Squares	15'-10'x Squares	< 10'x10' Squares
Low Cracks < 1/4"	1	2	3
Mediu m Cracks 1/4"to 3/4"	4	5	6
High Cracks > 3/4"	7	8	9

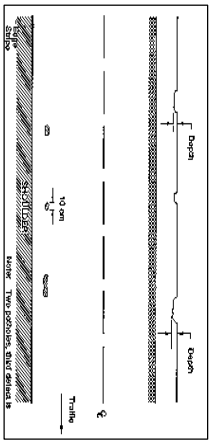
LONGITUDINAL CRACKING



Severity

	Extent		
	Low	**Medium**	**High**
0 None	1 Crack Full Length	2 Cracks Full Length	> 2 Cracks Full Length
Low Cracks < 1/4"	1	2	3
Mediu m Cracks 1/4"to 3/4"	4	5	6
High Cracks > 3/4"	7	8	9

UTILITY CUTS

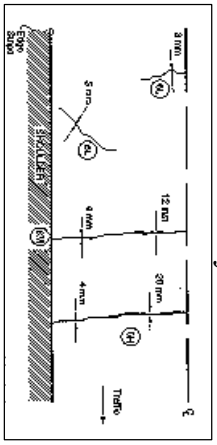


Severity

	Extent		
	Low	**Medium**	**High**
0 None	0-10% of Length	10-30% of Length	>30% of Length
Low Cracks < 1/4"	1	2	3
Mediu m Cracks 1/4"to 3/4"	4	5	6
High Cracks > 3/4"	7	8	9

Note: to rate potholes use the same form with the following changes to the severity: **Low** is <1" deep, **Med** is 1"-2" deep and **High** is >2"

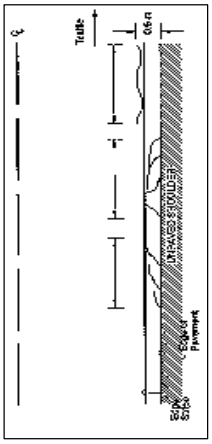
TRANSVERSE CRACKING



Severity

	Extent		
	Low	**Medium**	**High**
0 None	> 100' between Cracks	100'-20' between Cracks	< 20' between Cracks
Low Cracks < 1/4"	1	2	3
Mediu m Cracks 1/4"to 3/4"	4	5	6
High Cracks > 3/4"	7	8	9

EDGE CRACKING



Severity

	Extent		
	Low	**Medium**	**High**
0 None	0-10% of Length	10-30% of Length	> 30% of Length
Low 0-6" from Curb	1	2	3
Mediu m 6-18" from Curb	4	5	6
High 18" from Curb	7	8	9

Rutting

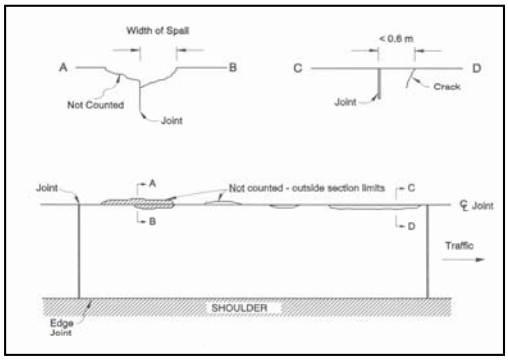
Excellent	Low	Med	High
0	<1/2"	1/2"-3/4"	>3/4"

Drainage

RATINGS	DRAINAGE RATING CRITERIA
Excellent	**Newly constructed, cross-slope > 2%, drainage provisions provided**
Good	**Cross-slope > 2%, drainage provisions provided**
Fair	**Cross-slope < 2%, no drainage provisions provided**
Poor	**Flat or concave cross-slope, ponding surface water evident, no drainage provisions provided**

CONCRETE RATING SHEET

SPALLING OF JOINTS

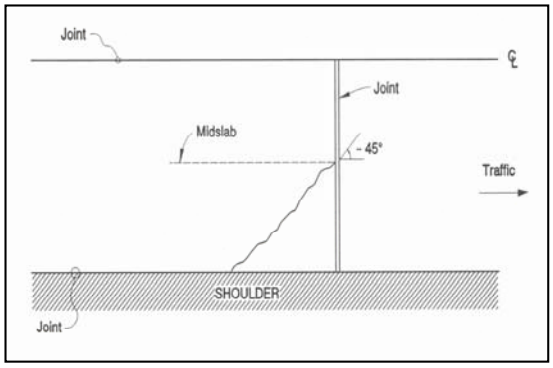


Severity	Extent (Number of joints) Low	Medium	High
0 None	0-10%	10-22%	>22%
Low spalls < 3" wide	1	2	3
Medium spalls 3" to 6" wide	4	5	6
High spalls > 6" wide	7	8	9

JOINT SEAL DAMAGE

Severity	Extent (Number of joints) Low	Medium	High
0 None	0-10%	10-22%	>22%
Low damage <10% of joint length	1	2	3
Medium damage 10% to 50% of joint length	4	5	6
High damage >50% of joint length	7	8	9

CORNER BREAKS

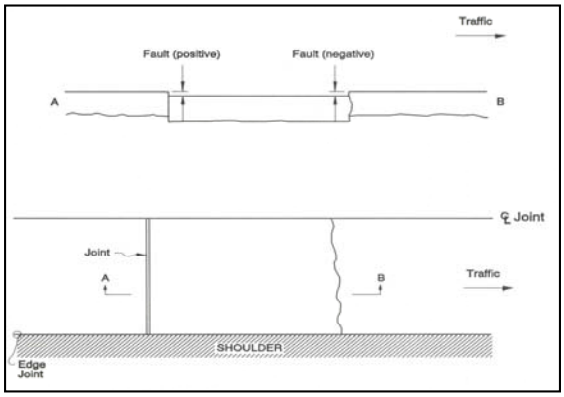


Severity	Extent (Percent of slabs with corner breaks) Low	Medium	High
0 None	<10%	10-20%	>20%
Low Diagonal corner craacks in slab, no spalling/faultin	1	2	3
Medium Corner Crack is slightly spalled & faulted <1/4"	4	5	6
High Corner Breaks is highly spalled and faulted >1/4"	7	8	9

BROKEN SLABS

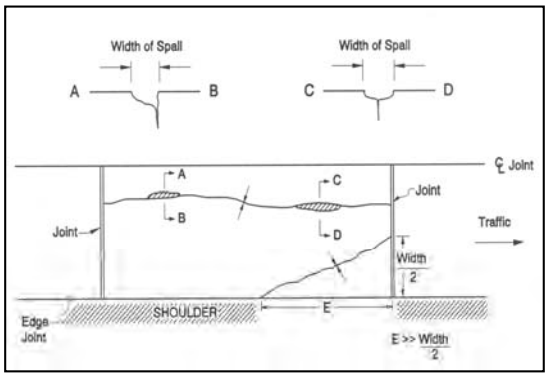
Severity	Extent (Number of slabs) Low	Medium	High
0 None	<6%	6-15%	>15%
Low Slab cracked into more than 3 pieces, no spalling/faulting	1	2	3
Medium Slab cracked into more than 3 pieces, some spalling, faulting <1/4"	4	5	6
High Slab broken into 4 or more pieces, spalling/faulting >1/4"	7	8	9

FAULTING



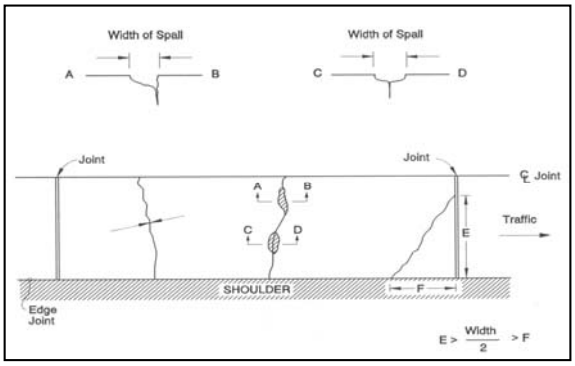
Severity	Extent (Percent length of roadway) Low	Medium	High
0 None	<10%	10-30%	>30%
Low <1/2"	1	2	3
Medium 1/2" to 1"	4	5	6
High >1"	7	8	9

LONGITUDINAL



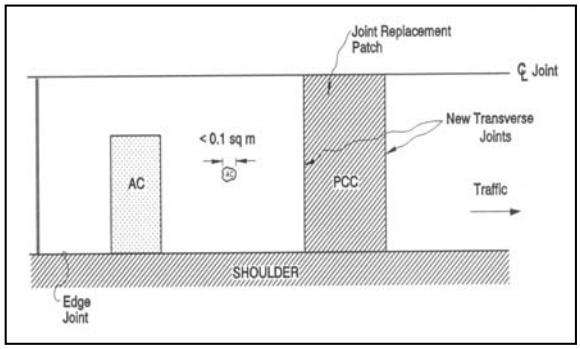
Severity	Extent (Percent of slabs with longitudinal cracks) Low	Medium	High
0 None	<10%	10-20%	>20%
Low crack width <1/8", no spalling/faulting	1	2	3
Medium crack width 1/8" to 1/2", spalling <3", faulting >1/2"	4	5	6
High crack width >1/2", spalling >3", faulting >1/2"	7	8	9

TRANSVERSE



Severity	Extent (Percent of slabs with transverse cracks) Low	Medium	High
0 None	<10%	10-20%	>20%
Low crack width <1/8", no spalling/faulting	1	2	3
Medium crack width 1/8" to 1/2", spall <3", fault >1/4"	4	5	6
High crack width >1/2", spall >3", fault >1/4"	7	8	9

PATCH DETERIORATION



Severity	Extent (Percent of surface area) Low	Medium	High
0 None	<10%	10-30%	>30%
Low no faul, no settle at perimeter	1	2	3
Medium fault & settle <1/4" at perimeter	4	5	6
High fault & settle >1/4" at perimeter, cracked/broken patch	7	8	9

MAP CRACKING

Severity	Extent (Pecent of surface area) Low	Medium	High
0 None	<10%	10-20%	>20%
Low small connected cracks, no spalling	1	2	3
Medium connected cracks, no spalling	4	5	6
High large connected cracks with surface spalling	7	8	9

STREETS: _____

SECTION NO: _____

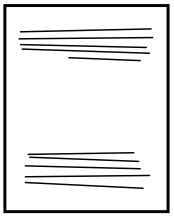
START: _____

END: _____

START MILEAGE: _____

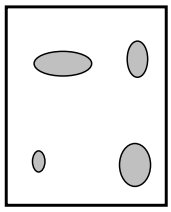
END MILEAGE: _____

CORRUGATIONS



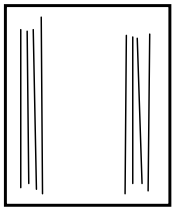
SEVERITY	NO Defects	EXTENT: Low	EXTENT: Med	EXTENT: High
Low		1	2	3
Med		4	5	6
High		7	8	9

POTHOLES



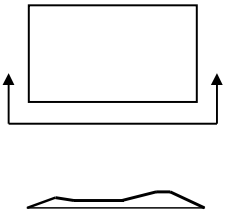
SEVERITY	NO Defects	EXTENT: Low	EXTENT: Med	EXTENT: High
Low		1	2	3
Med		4	5	6
High		7	8	9

RUTTING



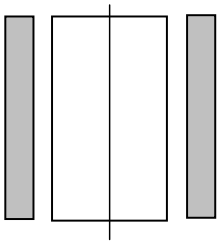
SEVERITY	NO Defects	EXTENT: Low	EXTENT: Med	EXTENT: High
Low (<1 in.)		1	2	3
Med (1 - 3 in.)		4	5	6
High (>3 in.)		7	8	9

IMPROPER X-SECTION



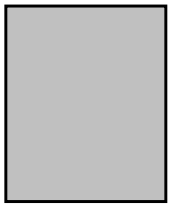
SEVERITY	CONDITION
	GOOD
	FAIR
	POOR

ROADSIDE DRAINAGE



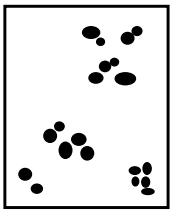
SEVERITY	CONDITION
	GOOD
	FAIR
	POOR

DUST



SEVERITY	CONDITION
	LIGHT
	MEDIUM
	HEAVY

LOOSE AGGREGATE



SEVERITY	NO Defects	EXTENT: Low	EXTENT: Med	EXTENT: High
Low		1	2	3
Med		4	5	6
High		7	8	9

Appendix C

Condition Survey of Street Network

Appendix C - Asphalt

ID	Road Name	From Address	To Address	Fatigue	Long	Trans	Patches	Edge	Potholes	Block	RSL
0	200 S	500 W	NYE ST	0	0	0	0	0	0	0	20
19	400 E	400 N	500 N	0	0	0	0	0	0	0	20
34	400 E	500 N	550 N	0	0	0	0	0	0	0	20
52	300 N	300 E	200 E	0	0	0	0	0	0	0	20
58	300 S	300 E	US 40	0	0	0	0	0	0	0	20
61	200 W	300 N	400N	0	0	0	0	0	0	0	20
66	CLUB HOUSE DR	AREVA RD	CANYON VIEW DR	0	0	0	0	0	0	0	20
78	RODEO DR	800 S	US 40	0	0	0	0	0	0	0	20
82	SKYLINE DR	200 S	LAGOON ST	0	0	0	0	0	0	0	20
85	975 S	200 W	STATE ST	0	0	0	0	0	0	0	20
89	600 S	350 E	450 E	0	0	0	0	0	0	0	20
123	300 E	300 N	400 N	0	0	0	0	0	0	0	20
127	300 N	200 E	100 E	0	0	0	0	0	0	0	20
141	600 S	200 E	300 E	0	0	0	0	0	0	0	20
143	200 S	N/A	SKYLINE DR	0	0	0	0	0	0	0	20
159	400 N	300 E	400 E	0	0	0	0	0	0	0	20
166	LAGOON ST	1000 WEST	900 WEST	0	0	0	0	0	0	0	20
176	100 W	200 S	100 S	0	0	0	0	0	0	0	20
204	400 E	300 N	US 40	0	0	0	0	0	0	0	20
224	ROOSEVELT CIR	350 E	300 E	0	0	0	0	0	0	0	20
245	300 N	100 W	200 W	0	0	0	0	0	0	0	20
253	800 S	RODEO DR	200 W	0	0	0	0	0	0	0	20
256	MEMORY LN	DEAD END	AREVA RD	0	0	0	0	0	0	0	20
263	300 N	200 W	300 W	0	0	0	0	0	0	0	20
270	800 S	200 W	150 W	0	0	0	0	0	0	0	20
274	AREVA	200 N	SUNSET CIRCLE	0	0	0	0	0	0	0	20
286	400 N	200 E	300 E	0	0	0	0	0	0	0	20
291	HARRISON AVE	SOUTH POCO DR	700 S	0	0	0	0	0	0	0	20
293	500 E	1080 S	1040 S	0	0	0	0	0	0	0	20
294	500 E	1040 S	975 S	0	0	0	0	0	0	0	20
296	500 E	1870 S	1140 S	0	0	0	0	0	0	0	20
302	350 N	950 W	850 W	0	0	0	0	0	0	0	20
304	ALEXIA LN	HAYDON DR	AREVA RD	0	0	0	0	0	0	0	20
308	SOUTH POCO DR	500 E	HARRISON AVE	0	0	0	0	0	0	0	20
319	500 E	970 S	920 S	0	0	0	0	0	0	0	20
320	500 E	920 S	850 S	0	0	0	0	0	0	0	20
324	ASPEN LN	WILLOW CIR	END OF PAVEMENT	0	0	0	0	0	0	0	20
326	1140 S	500 E	DEAD END	0	0	0	0	0	0	0	20
327	500 E	1140 S	1080 S	0	0	0	0	0	0	0	20
334	1875 S	340 E	400 E	0	0	0	0	0	0	0	20
335	500 E	2000 S	1870 S	0	0	0	0	0	0	0	20
342	850 W	350 N	GATES DR	0	0	0	0	0	0	0	20
346	SOUTH POCO DR	END OF PAVEMENT	HARRISON AVE	0	0	0	0	0	0	0	20
377	UNION ST	300 N	385 N	0	0	0	0	0	0	0	20
388	300 E	700 S	DEAD END	0	0	0	0	0	0	0	20
389	GILBERT AVE	700 S	DEAD END	0	0	0	0	0	0	0	20
390	500 W	200 S	DEAD END	0	0	0	0	0	0	0	20
393	100 N	900 W	1000 W	0	0	0	0	0	0	0	20
394	800 S	200 E	1000 W	0	0	0	0	0	0	0	20
444	LESLIE ST	END OF PAVEMENT	500 E	0	0	0	0	0	0	0	20
450	STONEGATE DR	COVE RD	550 S	0	0	0	0	0	0	0	20
451	200 S	STONEGATE DR	DEAD END	0	0	0	0	0	0	0	20
452	280 S	STONEGATE DR	DEAD END	0	0	0	0	0	0	0	20
453	350 S	STONEGATE DR	DEAD END	0	0	0	0	0	0	0	20
454	440 S	STONEGATE DR	DEAD END	0	0	0	0	0	0	0	20
455	550 S	STONEGATE DR	DEAD END	0	0	0	0	0	0	0	20
26	LAGOON ST	500 E	600 E	0	0	0	0	0	0	0	20
44	STATE ST	975 S	800 S	0	0	0	0	0	0	0	20
74	STATE ST	1080 S	975 S	0	0	0	0	0	0	0	20
113	LAGOON ST	300 E	400 E	0	0	0	0	0	0	0	20
212	LAGOON ST	200 W	100 W	0	0	0	0	0	0	0	20
257	LAGOON ST	100 W	STATE ST	0	0	0	0	0	0	0	20
317	STATE ST	1200 S	1080 S	0	0	0	0	0	0	0	20
242	100 N	400 E	300 E	0	5	4	5	7	0	0	8
258	100 N	STATE ST	100 E	0	4	7	4	7	0	0	8
262	STATE ST	300 N	HWY 121	0	0	0	2	7	0	0	8
69	300 E	550 S	600 S	0	0	4	0	1	0	0	12

ID	Road Name	From Address	To Address	Fatigue	Long	Trans	Patches	Edge	Pot/Patch	Block	RSL
142	550 S	200 E	300 E	0	0	0	0	1	4	0	12
68	300 E	550 S	ROOSEVELT CIR	0	0	1	0	1	0	0	12
184	800 S	150 W	STATE ST	0	0	0	0	1	0	0	12
300	CONSTITUTION DR	PARK RIDGE DR	100 S	0	1	4	0	1	0	0	12
386	200 N	SUMMERALL LN	AREVA RD	0	0	0	0	1	0	0	12
313	STATE ST	1700 S	1200 S	0	0	1	1	1	0	0	12
360	2000 S	STATE ST	500 E	0	0	1	0	1	0	0	12
37	100 S	200 W	100 W	9	0	0	1	9	1	0	0
48	600 N	DEAD END	400 E	9	0	0	0	0	0	0	0
102	1000 W	BONNIE DR	BONNIE DR	9	0	0	0	0	0	0	0
106	GATES DR	HWY 121	NELSON AVE	9	0	0	0	9	0	0	0
144	GEORGIA CIR	DEAD END	LAGOON ST	9	0	9	0	4	1	0	0
156	100 N	700 E	800 E	9	0	0	0	0	9	0	0
160	700 N	DEAD END	400 E	9	0	0	0	0	4	0	0
161	500 E	650 N	700 N	9	0	0	0	0	0	0	0
162	100 E	800 S	700 S	9	0	0	7	0	7	0	0
175	550 N	DEAD END	400 E	9	0	0	0	0	7	0	0
181	650 N	DEAD END	400 E	9	0	0	0	0	5	0	0
187	400 E	100 S	LAGOON ST	9	0	0	1	0	7	0	0
198	500 E	600 E	650 E	9	0	0	0	0	0	0	0
201	400 N	800 E	900 E	9	1	0	0	0	0	0	0
287	400 N	900 E	UNION ST	9	1	0	0	0	0	0	0
289	100 S	NYE RD	DEAD END	9	0	0	4	0	1	0	0
1	800 E	250 N	US 40	8	0	6	0	0	5	0	2
25	600 N	400 E	450 E	8	0	0	0	0	0	0	2
110	800 E	300 N	400 N	8	0	0	0	0	5	0	2
111	600 N	450 E	500 E	8	0	0	0	0	0	0	2
118	200 W	200 S	100 S	8	0	0	4	4	0	0	2
121	100 E	300 S	200 S	8	0	0	4	0	1	0	2
140	SUNSET DR	STATE ST	DEAD END	8	1	0	1	0	0	0	2
157	400 N	700 E	800 E	8	0	0	4	0	0	0	2
165	100 S	400 E	500 E	8	0	0	0	9	2	0	2
203	100 E	700 S	600 S	8	0	0	5	0	9	0	2
228	800 S	US 40	400 W	8	0	0	6	1	1	0	2
235	BONNIE	1000 W	DEAD END	8	0	0	0	0	0	0	2
421	500 N	S 500 N	200 E	8	0	0	4	0	0	0	2
182	650 N	400 E	500 E	6	0	0	0	0	0	0	4
214	200 E	300 N	US 40	6	8	8	0	0	1	0	4
234	BONNIE	1000 W	1000 W	6	0	8	0	0	0	0	4
272	100 S	500 W	NYE RD	6	2	6	0	0	1	0	4
277	350 E	600 S	ROOSEVELT CIR	6	0	0	1	5	6	0	4
373	650 N	500 E	600 E	6	0	0	0	0	0	0	4
375	75 N	WENDALL LN	END OF PAVEMENT	6	1	4	0	0	1	0	4
408	300 W	300 N ST	300 W	6	0	5	0	0	0	0	4
199	700 N	400 E	500 E	6	4	5	1	0	0	0	4
122	600 N	500 E	600 E	6	0	0	0	0	0	0	4
11	300 N	CARMA AVE	700 E	5	0	0	0	0	0	0	6
145	300 N	JOYCE AVE	800 E	5	0	0	4	0	0	0	6
249	500 E	LAGOON ST	DEAD END	5	0	0	0	0	1	0	6
49	800 S	100 E	200 E	7	0	8	0	4	1	0	6
126	700 S	100 E	200 E	7	3	8	0	0	2	0	6
207	GATES DR	DEAD END	GATES DR	7	7	7	4	0	1	0	6
216	100 W	100 N	HWY 121	7	0	7	0	0	9	0	6
259	200 W	LAGOON ST	100 N	7	7	0	0	4	0	0	6
281	200 W	100 N	HWY 121	7	0	8	4	0	0	0	6
288	300 N	UNION ST	900 E	7	1	4	0	0	0	0	6
318	1200 S	END OF PAVEMENT	STATE ST	7	0	4	1	0	0	0	6
362	500 E	600 S	700 S	7	5	6	1	0	0	0	6
365	500 E	LESLIE ST	400 S	7	0	6	0	0	0	0	6
366	500 E	SHELLY ST	LESLIE ST	7	1	6	0	0	0	0	6
367	500 E	150 S	SHELLY ST	7	1	6	0	0	0	0	6
372	500 E	100 S	150 S	7	1	3	0	0	0	0	6
12	300 N	800 E	CARMA AVE	7	0	8	0	0	0	0	6
18	800 E	300 N	250 N	5	0	0	0	7	7	0	6
46	100 E	200 S	100 S	5	0	0	4	0	0	0	6
75	3RD E	DEAD END	700 S	5	0	0	0	1	0	0	6
94	VIOLA CIR	DEAD END	LAGOON ST	5	0	4	4	0	1	0	6
115	100 N	100 W	STATE ST	7	8	7	0	0	0	0	6
124	400 E	550 N	600 N	5	7	8	0	0	0	0	6
129	400 E	650 N	700 N	5	0	0	0	0	1	0	6

ID	Road Name	From Address	To Address	Fatigue	Long	Trans	Patches	Edge	Pot/Patch	Block	RSL
130	400 E	LAGOON ST	100 N	5	0	5	0	0	0	0	6
170	400 N	400 E	500 E	5	0	0	1	0	0	0	6
200	700 N	500 E	600 E	5	0	0	4	0	0	0	6
215	100 E	100 N	HWY 121	5	0	0	0	0	0	1	6
241	100 N	100 E	US 40	5	4	0	2	7	0	0	6
243	100 E	300 N	US 40	5	5	6	4	4	1	0	6
76	STATE ST	SUNSET DR	700 S	5	0	0	4	0	0	0	6
91	STATE ST	300 S	SUNSET DR	5	0	8	0	0	1	0	6
116	600 E	400 N	500 N	5	0	0	1	0	0	0	6
6	600 S	200 E	100 E	4	2	6	1	0	0	0	8
195	400 N	600 E	700 E	2	0	2	0	0	0	0	8
43	400 E	600 N	650 N	2	1	5	0	0	0	0	8
138	700 S	SOUTH POCO DR	300 E	2	0	2	1	0	0	0	8
219	200 W	100 S	LAGOON ST	2	5	0	2	0	0	0	8
9	300 N	600 E	500 E	4	0	4	0	0	0	0	8
10	300 N	700 E	600 E	4	0	0	4	0	0	0	8
30	100 N	200 W	100 W	4	0	7	0	0	0	0	8
53	300 N	500 E	400 E	4	0	0	4	0	0	0	8
87	700 S	HARRISON AVE	500 E	4	0	2	0	0	0	0	8
100	SKYLINE DR	LAGOON ST	100 N	4	0	0	1	7	0	0	8
119	100 S	100 W	STATE ST	4	6	6	0	0	0	0	8
197	500 N	500 E	600 E	4	0	0	0	0	1	0	8
213	300 E	100 N	200 N	4	4	0	0	0	4	0	8
232	500 W	100 S	LAGOON ST	4	1	6	0	0	0	0	8
267	300 E	LAGOON ST	100 N	4	4	5	4	0	0	0	8
275	150 W	800 S	US 40	4	0	0	7	1	9	0	8
290	ALTA ST	200 S	100 S	4	1	0	0	0	0	0	8
351	ELM CIR	1200 S	DEAD END	4	0	0	1	0	0	0	8
125	STATE ST	700 S	800 S	4	5	6	0	1	0	0	8
229	STATE ST	300 N	500 N	4	0	4	0	4	0	0	8
101	300 N	900 E	JOYCE AVE	4	0	2	4	0	0	0	8
8	300 S	STATE ST	100 E	1	1	0	0	0	0	0	10
20	500 N	400 E	450 E	1	0	1	0	0	0	0	10
29	100 E	100 S	LAGOON ST	1	0	0	4	0	0	1	10
83	SKYLINE DR	200 S	LAGOON ST	1	1	0	1	0	1	0	10
86	700 S	GILBERT AVE	NORTH POCO DR	1	2	5	0	0	0	0	10
98	180 S	DEAD END	1000 W	1	0	7	0	0	0	0	10
131	240 S	DEAD END	1000 W	1	0	4	0	0	0	0	10
137	700 S	200 E	SOUTH POCO DR	1	5	5	0	0	1	0	10
139	700 S	300 E	GILBERT AVE	1	1	4	0	0	1	0	10
164	300 E	200 S	100 S	1	4	5	0	0	0	0	10
186	300 E	400 S	300 S	1	1	5	4	0	0	0	10
191	300 E	ROOSEVELT CIR	400 S	1	1	5	0	0	1	0	10
202	HARMSTON AVE	510 E	600 E	1	0	4	1	0	0	0	10
252	200 E	ROOSEVELT CIR	US 40	1	4	5	0	0	0	0	10
260	300 E	100 S	LAGOON ST	1	4	4	0	0	0	0	10
348	SPRUCE DR	DEAD END	1200 S	1	0	2	1	0	0	0	10
399	STATE ST		600 N	1	0	4	0	0	0	0	10
424	250 N	900 E	UNION ST	1	1	1	0	0	0	0	10
445	LESLIE ST	500 E	END OF PAVEMENT	1	1	1	0	0	0	0	10
35	LAGOON ST	100 E	US 40	1	0	0	0	0	0	0	10
93	STATE ST	US 40	425 S	1	1	0	0	0	0	0	10
230	500 W	100 N	200 N	1	1	3	0	0	0	0	10
231	500 W	LAGOON ST	100 N	1	1	3	0	0	0	0	10
409	S 500 N	E 500 N	END OF PAVEMENT	1	1	1	0	0	0	0	10
7	STATE ST	425 S	300 S	1	1	1	0	0	0	0	10
13	LAGOON ST	400 E	500 E	1	0	0	0	0	0	0	10
117	LAGOON ST	US 40	300 E	1	0	0	0	0	0	0	10
172	400 N	500 E	600 E	1	6	4	2	0	0	0	8
39	200 S	STATE ST	100 E	0	5	5	0	0	0	0	10
56	200 S	100 E	US 40	0	5	5	0	0	0	0	10
151	600 N	600 E	DEAD END	0	5	4	0	0	0	0	10
5	NYE RD	200 S	100 S	0	4	4	1	0	0	0	12
36	500 W	200 S	100 S	0	2	1	1	0	0	0	12
40	GATES DR	NELSON DR	GATES DR	0	4	4	0	0	0	0	12
99	100 N	900 W	SKYLINE DR	0	4	1	4	0	0	0	12
135	50 E	DEAD END	1150 S	0	4	1	0	0	0	0	12
136	50 E	1150 S	1080 S	0	4	1	0	0	0	0	12
179	100 E	DEAD END	300 S	0	4	4	0	0	0	0	12
264	300 W	300 N	END OF PAVEMENT	0	4	1	0	0	0	0	12

ID	Road Name	From Address	To Address	Fatigue	Long	Trans	Patches	Edge	Pot/Patch	Block	RSL
357	45 E	1800 S	DEAD END	0	4	4	0	0	0	0	12
368	550 N	450 E	600 E	0	2	2	0	0	0	0	12
71	200 N	1000 W	900 W	0	4	1	0	0	0	0	12
4	400 E	300 N	400 N	0	1	0	0	0	0	0	16
21	1000 W	100 N	200 N	0	1	1	0	0	0	0	16
57	300 S	100 E	US 40	0	1	0	0	0	0	0	16
62	290 S	1000 W	MEMORY LANE	0	1	1	0	0	0	0	16
63	AREVA RD	CLUB HOUSE DR	PARK PALACE DR.	0	1	1	0	0	0	0	16
88	600 S	300 E	350 E	0	1	0	0	0	0	0	16
90	600 S	450 E	500 E	0	1	0	0	0	0	0	16
132	CLUB HOUSE DR	CANYON VIEW DR	HWY 121	0	1	0	0	0	0	0	16
148	HILLCREST DR	MILLER DR	DEAD END	0	1	0	0	0	0	0	16
150	MASON CIR	AREVA RD	AREVA RD	0	1	0	0	0	0	0	16
152	CANYON VIEW DR	CLUB HOUSE DR	DEAD END	0	1	1	0	0	0	0	16
208	NELSON RD	DEAD END	GATES DR	0	1	0	0	0	0	0	16
209	100 S	100 E	US 40	0	1	1	0	0	0	0	16
210	100 S	300 E	US 40	0	1	1	0	0	0	0	16
211	100 S	300 E	400 E	0	1	0	0	0	0	0	16
225	ROOSEVELT CIR	300 E	300 E	0	1	0	0	0	0	0	16
226	ROOSEVELT CIR	300 E	200 E	0	1	0	0	0	0	0	16
238	100 S	STATE ST	100 E	0	1	0	0	0	0	0	16
240	300 W	100 N	HWY 121	0	1	0	0	0	0	0	16
250	700 E	LAGOON ST	100 N	0	1	0	0	0	0	0	16
271	800 S	400 W	RODEO DR	0	1	0	0	0	0	0	16
297	1875 S	280 E	340 E	0	1	0	0	0	0	0	16
303	300 N	950 W	850 W	0	1	0	0	0	0	0	16
305	850 W	300 N	350 N	0	1	0	0	0	0	0	16
306	MOUNTAIN GREEN CIR	300 W	DEAD END	0	1	0	0	0	0	0	16
328	1875 S	STATE ST	100 E	0	1	0	0	0	0	0	16
336	1875 S	480 E	500 E	0	1	0	0	0	0	0	16
343	950 W	300 N	350 N	0	1	0	0	0	0	0	16
344	300 W	LAGOON ST	100 N	0	1	0	0	0	0	0	16
376	150 N	WENDALL LN	END OF PAVEMENT	0	1	0	0	0	0	0	16
418	LAGOON ST	1000 W	CONSTITIUTION DR	0	1	1	0	0	0	0	16
239	LAGOON ST	300 W	200 W	0	1	0	0	0	0	0	16
387	HAYFIELD RD	STATE ST	DEAD ENG	0	1	0	0	0	0	0	16
70	200 N	1100 W	1000 W	0	1	0	0	0	0	0	16
134	200 N	SKYLINE DR	GATES DR	0	1	1	0	0	0	0	16
361	SOUTH COVE RD	500 W	HWY 121	0	1	1	0	0	0	0	16
374	200 N	GATES DR	500 W	0	1	1	0	0	0	0	16
45	800 S	STATE ST	100 E	0	0	8	8	1	1	0	6
370	STATE ST	600 S	US 40	0	1	1	5	0	0	0	10
33	500 N	450 E	500 E	0	0	0	2	0	0	0	12
77	SOUTH POCO DR	700 S	NORTH POCO DR	0	1	2	4	0	0	0	12
246	300 W	300 N	HWY 121	0	0	0	4	0	0	0	12
298	100 S	PARK RIDGE DR	CONSTITUTION DR	0	1	0	4	0	1	0	12
314	FIR AVE	DEAD END	1200 S	0	0	2	4	0	0	0	12
322	320 E	1080 S	DEAD END	0	0	0	4	0	0	0	12
222	600 E	HARMSTON AVE	100 N	0	0	4	4	0	0	0	12
268	600 E	100 N	LAGOON ST	0	1	0	4	0	2	0	12
180	1000 W	DEAD END	290 S	0	0	1	2	0	0	0	12
333	1800 S	190 EAST CIR	END OF PAVEMENT	0	0	1	1	0	0	0	14
449	5200 W	US-191	City Boundary	0	1	1	1	0	0	0	14
103	AREVA	SUNSET CIRCLE	AREVA	0	0	0	1	0	0	0	14
104	HILLCREST DR	HWY 121	MILLER DR	0	1	1	1	0	0	0	14
107	AREVA	AREVA	RIVIERA DR	0	0	0	1	0	0	0	14
149	AREVA RD	MASON CIRCLE	MASON CIRLCE	0	1	0	1	0	0	0	14
167	LAGOON ST	900 W	GUINEVERE CIRCLE	0	0	0	1	0	0	0	14
171	500 E	300 N	400 N	0	0	0	1	0	0	0	14
220	100 W	100 S	LAGOON ST	0	0	0	1	0	0	0	14
261	100 N	300 E	US 40	0	0	0	1	0	0	0	14
282	PARKVIEW LN	DEAD END	1000 W	0	1	1	1	0	0	0	14
284	GUENEVIERRE CIR	DEAD END	LAGOON ST	0	0	1	1	0	0	0	14
316	ASPEN LN	1200 S	WILLOW CIR	0	0	1	1	0	0	0	14
323	1875 S	400 E	480 E	0	0	0	1	0	0	0	14
109	600 E	300 N	400 N	0	1	0	1	0	0	0	14
112	LAGOON ST	STATE ST	100 E	0	0	0	1	0	0	0	14
72	200 N	900 W	SKYLINE DR	0	1	1	1	0	0	0	14
16	100 N	500 W	400 W	0	7	9	4	0	0	0	2
79	200 E	800 S	600 S	0	4	9	0	0	0	0	2

ID	Road Name	From Address	To Address	Fatigue	Long	Trans	Patches	Edge	Pot/Patch	Block	RSL
173	450 E	500 N	500 N	4	0	9	1	0	0	0	2
221	800 E	HWY 121	100 N	5	7	9	4	0	0	0	2
233	100 E	LAGOON ST	100 N	0	4	9	7	0	0	0	2
359	STATE ST	2000 E	1870 S	0	7	9	4	0	0	0	2
42	600 E	550 N	600 N	1	0	8	0	0	1	0	6
47	600 E	500 N	550 N	4	5	8	0	0	0	0	6
17	100 N	400 W	300 W	4	7	8	4	0	0	0	6
80	200 E	600 S	550 S	0	0	8	0	0	1	0	6
92	200 E	600 S	600 S	0	0	8	0	0	1	0	6
114	100 N	300 W	200 W	4	7	8	0	0	0	0	6
133	200 E	550 S	ROOSEVELT CIR	1	5	8	0	0	0	0	6
196	450 E	550 N	600 N	4	0	8	0	5	0	0	6
218	800 E	100 N	LAGOON ST	4	4	8	0	0	1	0	6
280	200 W	300 N	HWY 121	4	0	8	4	0	0	0	6
50	200 E	800 S	700 S	1	0	6	0	0	1	0	8
84	IVIE MANOR	DEAD END	LAGOON ST	1	0	6	0	0	0	0	8
95	NORTH POCO DR	SOUTH POCO DR	HARRISON AVE	1	1	6	0	0	0	0	8
269	700 E	300 N	400 N	0	1	6	0	0	0	0	8
283	PARK RIDGE DR	PARK RIDGE DR	100 S	0	1	6	0	0	0	0	8
285	KING ARTHURS CT	DEAD END	LAGOON ST	0	0	6	0	0	0	0	8
295	1875 S	500 E	DEAD END	0	2	6	0	0	0	0	8
310	930 S	525 E	DEAD END	0	0	6	0	0	1	0	8
339	290 S	PARK RIDGE DR	1000 W	0	1	6	0	0	0	0	8
340	PARK RIDGE DR	CONSTITUTION DR	290 S	0	1	6	0	0	0	0	8
341	PARK RIDGE DR	100 S	PARK RIDGE DR	0	1	6	0	0	0	0	8
67	500 E	600 S	500 S	0	5	6	4	0	0	0	8
237	STATE ST	100 N	HWY 121	0	0	6	1	0	0	0	8
364	500 E	500 S	400 S	0	7	6	0	0	0	0	8
23	SKYLINE DR	100 N	200 N	0	1	3	0	0	1	0	10
32	700 S	STATE ST	100 E	0	4	5	0	0	0	0	10
41	600 S	100 E	STATE ST	0	0	5	0	0	0	0	10
155	LAGOON ST	IVIE MANOR	500 W	0	0	3	0	0	7	0	10
168	LAGOON ST	GUINEVERE CIRCLE	SKYLINE DR	0	0	3	0	0	0	0	10
185	400 S	450 E	350 E	0	0	5	0	0	0	0	10
190	1000 W	290 S	240 S	0	4	5	0	0	0	0	10
194	100 N	600 E	700 E	0	4	5	4	0	1	0	10
217	100 W	300 N	HWY 121	0	1	3	0	0	0	0	10
227	1000 W	240 S	180 S	0	4	5	0	0	0	0	10
247	400 N	200 W	100 W	0	1	3	0	0	0	0	10
251	HARMSTON AVE	HWY 121	150 N	0	0	3	1	0	0	0	10
254	WENDALL LN	LAGOON ST	75 N	0	1	5	0	0	0	0	10
265	100 W	300 N	400 N	0	1	3	0	0	0	0	10
266	400 W	LAGOON ST	100 N	0	4	5	0	0	0	0	10
273	WENDALL LN	75 N	150 N	0	1	5	0	0	0	0	10
279	HARRISON AVE	700 S	NORTH POCO DR	0	1	3	0	0	0	0	10
299	1000 W	180 S	LAGOON ST	0	2	3	0	0	0	0	10
331	1800 S	45 E CIR	115 E CIR	0	1	5	0	0	0	0	10
349	1080 S	STATE ST	320 S	0	1	5	1	0	0	0	10
353	920 S	500 E	525 E	0	0	5	1	0	0	0	10
354	1080 S	320 S	500 E	0	4	5	0	0	0	0	10
358	190 E	1800 S	DEAD END	0	0	5	0	0	0	0	10
363	400 S	500 E	450 E	0	0	5	0	0	0	0	10
448	Riviera Dr	Fairway Cir	Dead End	0	1	5	0	0	0	0	10
2	600 E	300 N	US 40	0	0	5	4	0	0	0	10
27	LAGOON ST	600 E	700 E	0	0	5	0	0	0	0	10
28	STATE ST	100 S	LAGOON ST	0	0	3	0	0	0	0	10
31	STATE ST	200 S	100 S	0	1	3	1	0	0	0	10
223	600 E	HARMSTON AVE	HWY 121	0	4	5	4	0	0	0	10
236	STATE ST	LAGOON ST	100 N	0	1	3	0	0	0	0	10
371	500 E	100 S	LAGOON ST	0	1	3	4	0	0	0	10
96	1000 W	200 N	BONNIE DR	0	4	7	0	0	0	0	10
292	STATE ST	1800 S	1700 S	0	0	7	0	0	0	0	10
14	1000 W	LAGOON ST	100 N	0	0	4	0	0	0	0	12
51	300 N	100 E	STATE ST	0	1	2	1	0	0	0	12
73	1150 S	50 E	END OF PAVEMENT	0	1	4	0	0	0	0	12
147	MILLER DR	HWY 121	HILLCRST DR	0	1	4	0	0	0	0	12
154	LAGOON ST	VIOLA CIR	GEORGIA CIR	0	0	4	0	0	0	0	12
163	400 S	300 E	ROOSEVELT CIR	0	0	2	1	0	0	0	12
174	700 E	300 N	250 N	0	1	4	0	0	0	0	12
183	700 E	250 N	US 40	0	1	4	0	0	0	0	12

ID	Road Name	From Address	To Address	Fatigue	Long	Trans	Patches	Edge	Pot/Patch	Block	RSL
192	LAGOON ST	WENDALL LN	VIOLA CIR	0	0	4	0	0	0	0	12
193	LAGOON ST	GEOGRIA CIR	IVIE MANOR	0	0	4	0	0	0	0	12
248	400 W	100 N	DEAD END	0	1	4	0	0	0	0	12
309	525 E	DEAD END	920 S	0	0	4	0	0	0	0	12
311	BIRCH AVE	DEAD END	1200 S	0	1	2	1	0	1	0	12
312	1700 S	STATE ST	DEAD END	0	0	2	1	0	0	0	12
315	PINE CIR	1200 S	DEAD END	0	0	2	1	0	0	0	12
330	1800 S	STATE ST	45 E CIR	0	1	2	0	0	0	0	12
332	1800 S	115 EAST CIR	190 EAST CIR	0	1	2	0	0	0	0	12
337	115 E	1800 S	DEAD END	0	0	2	0	0	0	0	12
338	425 S	PRIVATE	STATE ST	0	1	4	0	0	0	0	12
383	300 S	300 E	END OF PAVEMENT	0	0	4	0	0	0	0	12
398	STATE ST	600 N	SMITH LN	0	0	4	0	0	0	0	12
3	600 E	600 N	650 N	0	0	2	0	0	0	0	12
38	LAGOON ST	700 E	800 E	0	0	4	1	0	0	0	12
153	LAGOON ST	500 W	400 W	0	1	4	0	0	0	0	12
189	LAGOON ST	400 W	300 W	0	1	4	0	0	0	0	12
350	STATE ST	1870 S	1800 S	0	0	4	0	0	0	0	12
276	400 W	800 S	US 40	0	1	2	0	0	0	0	12
15	900 W	LAGOON ST	100 N	0	0	1	0	0	0	0	16
22	900 W	100 N	200 N	0	0	1	0	0	0	0	16
24	CARMA AVE	300 N	DEAD END	0	0	1	0	0	0	0	16
54	JOYCE AVE	300 N	DEAD END	0	0	1	0	0	0	0	16
55	200 S	300 E	US 40	0	0	1	0	0	0	0	16
59	200 S	NYE ST	ALTA ST	0	0	1	0	0	0	0	16
60	200 S	ALTA ST	200 W	0	0	1	0	0	0	0	16
64	200 W	975 S	800 S	0	0	1	0	0	0	0	16
81	ROOSEVELT CIR	400 S	350 S	0	0	1	0	0	0	0	16
97	200 S	SKYLINE DR	500 W	0	0	1	0	0	0	0	16
105	AREVA RD	RIVIERA DR	MASON CIRCLE	0	0	1	0	0	0	0	16
108	AREVA RD	MASON DR	CLUB HOUSE DR	0	0	1	0	0	0	0	16
128	300 N	400 E	300 E	0	0	1	0	0	0	0	16
146	SUNSET CIRCLE	DEAD END	AREVA RD	0	0	1	0	0	0	0	16
158	500 E	400 N	500 N	0	0	1	0	0	0	0	16
169	LAGOON ST	SKYLINE DR	WENDALL LN	0	0	1	0	0	0	0	16
177	200 S	200 W	100 W	0	0	1	0	0	0	0	16
178	200 S	100 W	STATE ST	0	0	1	0	0	0	0	16
188	300 E	300 S	200 S	0	0	1	0	0	0	0	16
205	500 E	300 N	US 40	0	0	1	0	0	0	0	16
206	500 N	350 E	400 E	0	0	1	0	0	0	0	16
244	300 N	STATE ST	100 W	0	0	1	0	0	0	0	16
255	150 N	DEAD END	WENDALL LN	0	0	1	0	0	0	0	16
278	OLPIN AVE	800 S	US 40	0	0	1	0	0	0	0	16
301	350 N	1000 W	950 W	0	0	1	0	0	0	0	16
307	ALEXIA LN	DEAD END	HAYDON DR	0	0	1	0	0	0	0	16
321	320 E	DEAD END	1080 S	0	0	1	0	0	0	0	16
325	500 E	850 S	800 S	0	0	1	0	0	0	0	16
329	1875 S	100 E	160 E	0	0	1	0	0	0	0	16
345	HAYDON DR	DEAD END	ALEXIA LN	0	0	1	0	0	0	0	16
347	500 E	800 S	700 S	0	0	1	0	0	0	0	16
352	WILLOW CIR	ASPEN LN	DEAD END	0	0	1	0	0	0	0	16
355	1875 S	160 E	220 E	0	0	1	0	0	0	0	16
356	1875 S	220 E	280 E	0	0	1	0	0	0	0	16
378	UNION ST	300 N	350 N	0	0	1	0	0	0	0	16
441	JANE ST	500 E	END OF PAVEMENT	0	0	1	0	0	0	0	16
442	SHELLY ST	END OF PAVEMENT	500 E	0	0	1	0	0	0	0	16
120	STATE ST	300 S	200 S	0	0	1	0	0	0	0	16
369	600 E	650 N	700 N	0	0	1	0	0	0	0	16

Appendix D

Distress Deterioration Table and Recommended Preservation Strategies

Asphalt

Fatigue_id	Severity & Extent	RSL_Fatigue	Strategy
0	No Fatigue Cracking	20	Routine
1	Low,Low	10	Routine
2	Low, Medium	8	Preventative
3	Low, High	6	Rehabilitation
4	Medium, Low	8	Preventative
5	Medium, Medium	6	Preventative
6	Medium, High	4	Rehabilitation
7	High, Low	6	Preventative
8	High, Medium	2	Rehabilitation
9	High, High	0	Reconstruct

Transverse_id	Severity & Extent	RSL_Transverse	Strategy
0	No Cracking	20	Routine
1	Low,Low	14	Routine
2	Low, Medium	12	Routine
3	Low, High	10	Preventative
4	Medium, Low	12	Preventative
5	Medium, Medium	10	Preventative
6	Medium, High	8	Preventative
7	High, Low	10	Preventative
8	High, Medium	6	Rehabilitation
9	High, High	2	Reconstruct

Longitudinal_id	Severity & Extent	RSL_Longitudinal	Strategy
0	No Cracking	20	Routine
1	Low,Low	14	Routine
2	Low, Medium	12	Preventative
3	Low, High	10	Preventative
4	Medium, Low	12	Preventative
5	Medium, Medium	10	Preventative
6	Medium, High	8	Preventative
7	High, Low	10	Preventative
8	High, Medium	8	Preventative
9	High, High	6	Rehabilitation

Patch_id	Severity & Extent	RSL_Patch	Strategy
0	No Cracking	20	Routine
1	Low,Low	14	Routine
2	Low, Medium	12	Preventative
3	Low, High	10	Preventative
4	Medium, Low	12	Preventative
5	Medium, Medium	10	Preventative
6	Medium, High	8	Preventative
7	High, Low	10	Preventative
8	High, Medium	6	Preventative
9	High, High	2	Rehabilitation

Asphalt

Edge_id	Severity & Extent	RSL_Edge	Strategy
0	No Cracking	20	Routine
1	Low,Low	12	No Maintenance
2	Low, Medium	10	Preventative
3	Low, High	8	Preventative
4	Medium, Low	10	Preventative
5	Medium, Medium	8	Preventative
6	Medium, High	6	Rehabilitation
7	High, Low	8	Preventative
8	High, Medium	6	Rehabilitation
9	High, High	4	Rehabilitation

Block_id	Severity & Extent	RSL_Block	Strategy
0	No Cracking	20	Routine
1	Low,Low	12	Routine
2	Low, Medium	10	Preventative
3	Low, High	8	Preventative
4	Medium, Low	10	Preventative
5	Medium, Medium	8	Preventative
6	Medium, High	6	Rehabilitation
7	High, Low	8	Preventative
8	High, Medium	6	Rehabilitation
9	High, High	2	Reconstruct

Appendix E

Recommended Preservation Strategies for Each Street Segment

Treatment Recommendations - Asphalt

ID	Road Name	From Address	To Address	Functional Class	Recommended Treatment	Area
156	100 N	700 E	800 E	Residential	Base Repair/Pavement Replacement	1,062.22
115	100 N	100 W	STATE ST	Residential	Base Repair/Pavement Replacement	1,035.56
261	100 N	300 E	US 40	Residential	Base Repair/Pavement Replacement	2,498.22
16	100 N	500 W	400 W	Residential	Base Repair/Pavement Replacement	2,385.78
17	100 N	400 W	300 W	Residential	Base Repair/Pavement Replacement	1,007.11
96	1000 W	200 N	BONNIE DR	Residential	Base Repair/Pavement Replacement	1,120.00
354	1080 S	320 S	500 E	Residential	Base Repair/Pavement Replacement	1,413.33
326	1140 S	500 E	DEAD END	Residential	Base Repair/Pavement Replacement	3,037.22
337	115 E	1800 S	DEAD END	Residential	Base Repair/Pavement Replacement	1,148.00
133	200 E	550 S	ROOSEVELT CIR	Residential	Base Repair/Pavement Replacement	404.22
50	200 E	800 S	700 S	Residential	Base Repair/Pavement Replacement	648.00
134	200 N	SKYLINE DR	GATES DR	Major Arterial	Base Repair/Pavement Replacement	3,366.00
374	200 N	GATES DR	500 W	Major Arterial	Base Repair/Pavement Replacement	1,263.67
177	200 S	200 W	100 W	Residential	Base Repair/Pavement Replacement	1,443.00
178	200 S	100 W	STATE ST	Residential	Base Repair/Pavement Replacement	499.33
118	200 W	200 S	100 S	Residential	Base Repair/Pavement Replacement	653.33
131	240 S	DEAD END	1000 W	Residential	Base Repair/Pavement Replacement	810.33
52	300 N	300 E	200 E	Residential	Base Repair/Pavement Replacement	2,605.78
127	300 N	200 E	100 E	Residential	Base Repair/Pavement Replacement	2,986.67
245	300 N	100 W	200 W	Residential	Base Repair/Pavement Replacement	1,880.00
9	300 N	600 E	500 E	Residential	Base Repair/Pavement Replacement	2,311.11
53	300 N	500 E	400 E	Residential	Base Repair/Pavement Replacement	1,184.00
244	300 N	STATE ST	100 W	Residential	Base Repair/Pavement Replacement	1,056.56
58	300 S	300 E	US 40	Residential	Base Repair/Pavement Replacement	3,041.78
264	300 W	300 N	END OF PAVEMENT	Residential	Base Repair/Pavement Replacement	1,507.33
34	400 E	500 N	550 N	Residential	Base Repair/Pavement Replacement	1,591.11
357	45 E	1800 S	DEAD END	Residential	Base Repair/Pavement Replacement	1,882.89
135	50 E	DEAD END	1150 S	Residential	Base Repair/Pavement Replacement	1,070.22
161	500 E	650 N	700 N	Residential	Base Repair/Pavement Replacement	2,183.44
325	500 E	850 S	800 S	Residential	Base Repair/Pavement Replacement	970.67
20	500 N	400 E	450 E	Residential	Base Repair/Pavement Replacement	2,248.89
33	500 N	450 E	500 E	Residential	Base Repair/Pavement Replacement	2,493.33
268	600 E	100 N	LAGOON ST	Major Collector	Base Repair/Pavement Replacement	2,878.33
109	600 E	300 N	400 N	Major Collector	Base Repair/Pavement Replacement	2,866.11
2	600 E	300 N	US 40	Major Collector	Base Repair/Pavement Replacement	1,711.89
369	600 E	650 N	700 N	Major Collector	Base Repair/Pavement Replacement	2,202.67
181	650 N	DEAD END	400 E	Residential	Base Repair/Pavement Replacement	3,055.56
182	650 N	400 E	500 E	Residential	Base Repair/Pavement Replacement	2,749.44
199	700 N	400 E	500 E	Residential	Base Repair/Pavement Replacement	2,548.33
126	700 S	100 E	200 E	Residential	Base Repair/Pavement Replacement	2,890.56
32	700 S	STATE ST	100 E	Residential	Base Repair/Pavement Replacement	2,318.00
307	ALEXIA LN	DEAD END	HAYDON DR	Residential	Base Repair/Pavement Replacement	1,148.89
63	AREVA RD	CLUB HOUSE DR	PARK PALACE DR.	Residential	Base Repair/Pavement Replacement	2,104.00
108	AREVA RD	MASON DR	CLUB HOUSE DR	Residential	Base Repair/Pavement Replacement	2,322.22
317	STATE ST	1200 S	1080 S	Major Collector	Base Repair/Pavement Replacement	2,324.44
236	STATE ST	LAGOON ST	100 N	Major Collector	Base Repair/Pavement Replacement	2,470.11
350	STATE ST	1870 S	1800 S	Major Collector	Base Repair/Pavement Replacement	2,429.11
383	300 S	300 E	END OF PAVEMENT	Residential	Base Repair/Pavement Replacement	2,573.33
203	100 E	700 S	600 S	Residential	Chip Seal	1,908.00
46	100 E	200 S	100 S	Residential	Chip Seal	1,056.00
243	100 E	300 N	US 40	Residential	Chip Seal	1,681.78
29	100 E	100 S	LAGOON ST	Residential	Chip Seal	1,533.78
179	100 E	DEAD END	300 S	Residential	Chip Seal	3,390.00
233	100 E	LAGOON ST	100 N	Residential	Chip Seal	2,532.00
242	100 N	400 E	300 E	Residential	Chip Seal	2,092.00
258	100 N	STATE ST	100 E	Residential	Chip Seal	1,426.67
241	100 N	100 E	US 40	Residential	Chip Seal	3,520.00
30	100 N	200 W	100 W	Residential	Chip Seal	1,643.33
194	100 N	600 E	700 E	Residential	Chip Seal	1,300.44
165	100 S	400 E	500 E	Residential	Chip Seal	1,873.78
210	100 S	300 E	US 40	Residential	Chip Seal	2,107.33
211	100 S	300 E	400 E	Residential	Chip Seal	2,982.22
238	100 S	STATE ST	100 E	Residential	Chip Seal	2,994.44

ID	Road Name	From Address	To Address	Functional Class	Recommended Treatment	Area
298	100 S	PARK RIDGE DR	CONSTITUTION DR	Residential	Chip Seal	3,505.78
176	100 W	200 S	100 S	Residential	Chip Seal	3,049.44
216	100 W	100 N	HWY 121	Residential	Chip Seal	1,400.00
220	100 W	100 S	LAGOON ST	Residential	Chip Seal	919.11
265	100 W	300 N	400 N	Residential	Chip Seal	3,384.00
102	1000 W	BONNIE DR	BONNIE DR	Residential	Chip Seal	2,297.78
180	1000 W	DEAD END	290 S	Residential	Chip Seal	1,530.22
190	1000 W	290 S	240 S	Residential	Chip Seal	2,496.00
227	1000 W	240 S	180 S	Residential	Chip Seal	1,900.00
299	1000 W	180 S	LAGOON ST	Residential	Chip Seal	1,590.44
255	150 N	DEAD END	WENDALL LN	Residential	Chip Seal	1,676.00
312	1700 S	STATE ST	DEAD END	Residential	Chip Seal	1,887.00
331	1800 S	45 E CIR	115 E CIR	Residential	Chip Seal	2,538.00
358	190 E	1800 S	DEAD END	Residential	Chip Seal	872.00
252	200 E	ROOSEVELT CIR	US 40	Residential	Chip Seal	2,736.00
80	200 E	600 S	550 S	Residential	Chip Seal	3,022.22
71	200 N	1000 W	900 W	Major Arterial	Chip Seal	1,088.00
143	200 S	N/A	SKYLINE DR	Residential	Chip Seal	4,012.00
56	200 S	100 E	US 40	Residential	Chip Seal	1,364.00
55	200 S	300 E	US 40	Residential	Chip Seal	1,266.22
61	200 W	300 N	400N	Residential	Chip Seal	2,502.00
281	200 W	100 N	HWY 121	Residential	Chip Seal	968.89
280	200 W	300 N	HWY 121	Residential	Chip Seal	865.11
64	200 W	975 S	800 S	Residential	Chip Seal	2,342.22
360	2000 S	STATE ST	500 E	Major Collector	Chip Seal	2,032.44
263	300 N	200 W	300 W	Residential	Chip Seal	3,344.00
145	300 N	JOYCE AVE	800 E	Residential	Chip Seal	2,544.00
101	300 N	900 E	JOYCE AVE	Residential	Chip Seal	2,070.00
8	300 S	STATE ST	100 E	Residential	Chip Seal	857.56
344	300 W	LAGOON ST	100 N	Residential	Chip Seal	566.67
246	300 W	300 N	HWY 121	Residential	Chip Seal	1,114.44
322	320 E	1080 S	DEAD END	Residential	Chip Seal	1,456.89
277	350 E	600 S	ROOSEVELT CIR	Residential	Chip Seal	1,393.33
453	350 S	STONEGATE DR	DEAD END	Residential	Chip Seal	1,370.67
187	400 E	100 S	LAGOON ST	Residential	Chip Seal	2,236.44
43	400 E	600 N	650 N	Residential	Chip Seal	3,044.44
159	400 N	300 E	400 E	Residential	Chip Seal	2,726.00
286	400 N	200 E	300 E	Residential	Chip Seal	1,450.67
201	400 N	800 E	900 E	Residential	Chip Seal	1,811.11
363	400 S	500 E	450 E	Residential	Chip Seal	1,804.00
163	400 S	300 E	ROOSEVELT CIR	Residential	Chip Seal	2,444.44
338	425 S	PRIVATE	STATE ST	Residential	Chip Seal	2,377.78
196	450 E	550 N	600 N	Residential	Chip Seal	2,141.89
136	50 E	1150 S	1080 S	Residential	Chip Seal	1,122.22
320	500 E	920 S	850 S	Residential	Chip Seal	5,177.78
198	500 E	600 E	650 E	Residential	Chip Seal	1,533.33
362	500 E	600 S	700 S	Major Collector	Chip Seal	583.11
365	500 E	LESLIE ST	400 S	Major Collector	Chip Seal	1,755.11
372	500 E	100 S	150 S	Major Collector	Chip Seal	2,449.22
171	500 E	300 N	400 N	Residential	Chip Seal	1,165.00
67	500 E	600 S	500 S	Major Collector	Chip Seal	2,971.78
364	500 E	500 S	400 S	Major Collector	Chip Seal	714.00
371	500 E	100 S	LAGOON ST	Major Collector	Chip Seal	1,360.00
158	500 E	400 N	500 N	Residential	Chip Seal	1,244.44
205	500 E	300 N	US 40	Residential	Chip Seal	1,340.22
347	500 E	800 S	700 S	Residential	Chip Seal	2,571.56
232	500 W	100 S	LAGOON ST	Residential	Chip Seal	1,556.44
222	600 E	HARMSTON AVE	100 N	Major Collector	Chip Seal	2,884.44
47	600 E	500 N	550 N	Major Collector	Chip Seal	2,785.44
48	600 N	DEAD END	400 E	Residential	Chip Seal	1,483.33
25	600 N	400 E	450 E	Residential	Chip Seal	1,122.22
89	600 S	350 E	450 E	Residential	Chip Seal	1,235.00
6	600 S	200 E	100 E	Residential	Chip Seal	7,174.44
88	600 S	300 E	350 E	Residential	Chip Seal	2,253.78
90	600 S	450 E	500 E	Residential	Chip Seal	2,493.33

ID	Road Name	From Address	To Address	Functional Class	Recommended Treatment	Area
41	600 S	100 E	STATE ST	Residential	Chip Seal	2,585.00
250	700 E	LAGOON ST	100 N	Residential	Chip Seal	3,061.67
200	700 N	500 E	600 E	Residential	Chip Seal	1,253.78
86	700 S	GILBERT AVE	NORTH POCO DR	Residential	Chip Seal	2,264.67
137	700 S	200 E	SOUTH POCO DR	Residential	Chip Seal	1,696.00
139	700 S	300 E	GILBERT AVE	Residential	Chip Seal	1,901.78
1	800 E	250 N	US 40	Residential	Chip Seal	763.11
110	800 E	300 N	400 N	Residential	Chip Seal	2,748.33
221	800 E	HWY 121	100 N	Residential	Chip Seal	1,373.78
184	800 S	150 W	STATE ST	Residential	Chip Seal	2,572.78
49	800 S	100 E	200 E	Residential	Chip Seal	2,371.11
45	800 S	STATE ST	100 E	Residential	Chip Seal	2,902.78
305	850 W	300 N	350 N	Residential	Chip Seal	1,275.67
15	900 W	LAGOON ST	100 N	Residential	Chip Seal	1,722.67
22	900 W	100 N	200 N	Residential	Chip Seal	2,454.22
353	920 S	500 E	525 E	Residential	Chip Seal	3,073.89
310	930 S	525 E	DEAD END	Residential	Chip Seal	2,777.78
290	ALTA ST	200 S	100 S	Residential	Chip Seal	1,392.22
103	AREVA	SUNSET CIRCLE	AREVA	Residential	Chip Seal	4,816.67
105	AREVA RD	RIVIERA DR	MASON CIRCLE	Residential	Chip Seal	1,091.78
300	CONSTITUTION DR	PARK RIDGE DR	100 S	Residential	Chip Seal	1,667.56
314	FIR AVE	DEAD END	1200 S	Residential	Chip Seal	1,720.00
202	HARMSTON AVE	510 E	600 E	Residential	Chip Seal	2,633.11
251	HARMSTON AVE	HWY 121	150 N	Residential	Chip Seal	4,445.00
26	LAGOON ST	500 E	600 E	Major Collector	Chip Seal	392.00
212	LAGOON ST	200 W	100 W	Major Collector	Chip Seal	2,013.56
257	LAGOON ST	100 W	STATE ST	Major Collector	Chip Seal	3,067.56
13	LAGOON ST	400 E	500 E	Major Collector	Chip Seal	1,654.67
117	LAGOON ST	US 40	300 E	Major Collector	Chip Seal	1,254.22
154	LAGOON ST	VIOLA CIR	GEORGIA CIR	Residential	Chip Seal	491.11
256	MEMORY LN	DEAD END	AREVA RD	Residential	Chip Seal	714.00
147	MILLER DR	HWY 121	HILLCRST DR	Residential	Chip Seal	1,227.78
306	MOUNTAIN GREEN CIR	300 W	DEAD END	Residential	Chip Seal	1,197.56
208	NELSON RD	DEAD END	GATES DR	Residential	Chip Seal	676.22
283	PARK RIDGE DR	PARK RIDGE DR	100 S	Residential	Chip Seal	710.22
340	PARK RIDGE DR	CONSTITUTION DR	290 S	Residential	Chip Seal	2,360.89
82	SKYLINE DR	200 S	LAGOON ST	Residential	Chip Seal	2,002.22
100	SKYLINE DR	LAGOON ST	100 N	Residential	Chip Seal	5,081.11
83	SKYLINE DR	200 S	LAGOON ST	Residential	Chip Seal	1,235.56
23	SKYLINE DR	100 N	200 N	Residential	Chip Seal	744.00
308	SOUTH POCO DR	500 E	HARRISON AVE	Residential	Chip Seal	528.89
346	SOUTH POCO DR	END OF PAVEMENT	HARRISON AVE	Residential	Chip Seal	3,652.00
44	STATE ST	975 S	800 S	Major Collector	Chip Seal	653.56
74	STATE ST	1080 S	975 S	Major Collector	Chip Seal	691.33
91	STATE ST	300 S	SUNSET DR	Major Collector	Chip Seal	1,025.00
370	STATE ST	600 S	US 40	Major Collector	Chip Seal	2,768.89
237	STATE ST	100 N	HWY 121	Major Collector	Chip Seal	3,307.78
28	STATE ST	100 S	LAGOON ST	Major Collector	Chip Seal	3,327.89
140	SUNSET DR	STATE ST	DEAD END	Residential	Chip Seal	800.00
62	290 S	1000 W	MEMORY LANE	Residential	Chip Seal	1,804.22
388	300 E	700 S	DEAD END	Residential	Chip Seal	845.89
408	300 W	300 N ST	300 W	Residential	Chip Seal	1,248.00
394	800 S	200 E	1000 W	Residential	Chip Seal	717.78
418	LAGOON ST	1000 W	CONSTITIUTION DR	Residential	Chip Seal	560.00
444	LESLIE ST	END OF PAVEMENT	500 E	Residential	Chip Seal	1,191.11
445	LESLIE ST	500 E	END OF PAVEMENT	Residential	Chip Seal	6,644.44
215	100 E	100 N	HWY 121	Residential	Crack Seal	1,932.22
99	100 N	900 W	SKYLINE DR	Residential	Crack Seal	2,173.33
37	100 S	200 W	100 W	Residential	Crack Seal	1,666.67
289	100 S	NYE RD	DEAD END	Residential	Crack Seal	2,213.33
272	100 S	500 W	NYE RD	Residential	Crack Seal	740.44
98	180 S	DEAD END	1000 W	Residential	Crack Seal	695.11
333	1800 S	190 EAST CIR	END OF PAVEMENT	Residential	Crack Seal	2,652.22
330	1800 S	STATE ST	45 E CIR	Residential	Crack Seal	2,126.22
356	1875 S	220 E	280 E	Residential	Crack Seal	781.33

ID	Road Name	From Address	To Address	Functional Class	Recommended Treatment	Area
334	1875 S	340 E	400 E	Residential	Crack Seal	1,095.11
297	1875 S	280 E	340 E	Residential	Crack Seal	5,490.22
336	1875 S	480 E	500 E	Residential	Crack Seal	3,857.78
323	1875 S	400 E	480 E	Residential	Crack Seal	2,757.33
295	1875 S	500 E	DEAD END	Residential	Crack Seal	3,083.33
214	200 E	300 N	US 40	Residential	Crack Seal	5,382.00
79	200 E	800 S	600 S	Residential	Crack Seal	2,772.00
72	200 N	900 W	SKYLINE DR	Major Arterial	Crack Seal	1,893.67
59	200 S	NYE ST	ALTA ST	Residential	Crack Seal	1,170.56
97	200 S	SKYLINE DR	500 W	Residential	Crack Seal	1,743.89
219	200 W	100 S	LAGOON ST	Residential	Crack Seal	4,492.89
339	290 S	PARK RIDGE DR	1000 W	Residential	Crack Seal	1,496.00
123	300 E	300 N	400 N	Residential	Crack Seal	2,562.78
69	300 E	550 S	600 S	Residential	Crack Seal	1,936.00
213	300 E	100 N	200 N	Residential	Crack Seal	1,965.33
267	300 E	LAGOON ST	100 N	Residential	Crack Seal	3,021.33
164	300 E	200 S	100 S	Residential	Crack Seal	1,880.00
260	300 E	100 S	LAGOON ST	Residential	Crack Seal	2,572.78
288	300 N	UNION ST	900 E	Residential	Crack Seal	2,945.56
128	300 N	400 E	300 E	Residential	Crack Seal	2,088.00
57	300 S	100 E	US 40	Residential	Crack Seal	7,739.11
240	300 W	100 N	HWY 121	Residential	Crack Seal	6,029.33
204	400 E	300 N	US 40	Residential	Crack Seal	680.00
124	400 E	550 N	600 N	Residential	Crack Seal	630.00
129	400 E	650 N	700 N	Residential	Crack Seal	1,520.44
130	400 E	LAGOON ST	100 N	Residential	Crack Seal	7,357.78
4	400 E	300 N	400 N	Residential	Crack Seal	4,985.56
170	400 N	400 E	500 E	Residential	Crack Seal	1,915.78
276	400 W	800 S	US 40	Residential	Crack Seal	1,527.78
454	440 S	STONEGATE DR	DEAD END	Residential	Crack Seal	1,785.00
173	450 E	500 N	500 N	Residential	Crack Seal	1,936.33
327	500 E	1140 S	1080 S	Residential	Crack Seal	1,274.22
249	500 E	LAGOON ST	DEAD END	Residential	Crack Seal	1,829.33
296	500 E	1870 S	1140 S	Residential	Crack Seal	2,916.00
319	500 E	970 S	920 S	Residential	Crack Seal	2,496.00
367	500 E	150 S	SHELLY ST	Major Collector	Crack Seal	2,341.78
36	500 W	200 S	100 S	Residential	Crack Seal	1,981.56
449	5200 W	US-191	City Boundary	Major Collector	Crack Seal	2,542.22
175	550 N	DEAD END	400 E	Residential	Crack Seal	3,095.00
368	550 N	450 E	600 E	Residential	Crack Seal	2,514.00
455	550 S	STONEGATE DR	DEAD END	Residential	Crack Seal	2,625.78
142	550 S	200 E	300 E	Residential	Crack Seal	2,884.00
3	600 E	600 N	650 N	Major Collector	Crack Seal	2,994.44
122	600 N	500 E	600 E	Residential	Crack Seal	696.89
151	600 N	600 E	DEAD END	Residential	Crack Seal	1,373.67
174	700 E	300 N	250 N	Residential	Crack Seal	2,526.00
183	700 E	250 N	US 40	Residential	Crack Seal	2,830.44
160	700 N	DEAD END	400 E	Residential	Crack Seal	2,179.33
138	700 S	SOUTH POCO DR	300 E	Residential	Crack Seal	2,030.56
375	75 N	WENDALL LN	END OF PAVEMENT	Residential	Crack Seal	2,324.00
218	800 E	100 N	LAGOON ST	Residential	Crack Seal	458.89
271	800 S	400 W	RODEO DR	Residential	Crack Seal	2,591.11
304	ALEXIA LN	HAYDON DR	AREVA RD	Residential	Crack Seal	2,648.22
107	AREVA	AREVA	RIVIERA DR	Residential	Crack Seal	1,537.78
149	AREVA RD	MASON CIRCLE	MASON CIRLCE	Residential	Crack Seal	1,108.89
316	ASPEN LN	1200 S	WILLOW CIR	Residential	Crack Seal	1,155.56
235	BONNIE	1000 W	DEAD END	Residential	Crack Seal	972.00
284	GUENEVIERRE CIR	DEAD END	LAGOON ST	Residential	Crack Seal	1,057.78
291	HARRISON AVE	SOUTH POCO DR	700 S	Residential	Crack Seal	2,640.56
279	HARRISON AVE	700 S	NORTH POCO DR	Residential	Crack Seal	1,660.00
148	HILLCREST DR	MILLER DR	DEAD END	Residential	Crack Seal	1,503.33
84	IVIE MANOR	DEAD END	LAGOON ST	Residential	Crack Seal	910.00
54	JOYCE AVE	300 N	DEAD END	Residential	Crack Seal	457.78
285	KING ARTHURS CT	DEAD END	LAGOON ST	Residential	Crack Seal	1,192.00
35	LAGOON ST	100 E	US 40	Major Collector	Crack Seal	5,544.00

ID	Road Name	From Address	To Address	Functional Class	Recommended Treatment	Area
239	LAGOON ST	300 W	200 W	Major Collector	Crack Seal	1,847.33
27	LAGOON ST	600 E	700 E	Major Collector	Crack Seal	623.33
192	LAGOON ST	WENDALL LN	VIOLA CIR	Residential	Crack Seal	997.33
38	LAGOON ST	700 E	800 E	Major Collector	Crack Seal	1,207.56
169	LAGOON ST	SKYLINE DR	WENDALL LN	Residential	Crack Seal	1,669.78
150	MASON CIR	AREVA RD	AREVA RD	Residential	Crack Seal	1,004.89
278	OLPIN AVE	800 S	US 40	Residential	Crack Seal	623.33
78	RODEO DR	800 S	US 40	Residential	Crack Seal	946.67
224	ROOSEVELT CIR	350 E	300 E	Residential	Crack Seal	2,338.00
225	ROOSEVELT CIR	300 E	300 E	Residential	Crack Seal	910.00
81	ROOSEVELT CIR	400 S	350 S	Residential	Crack Seal	3,490.67
361	SOUTH COVE RD	500 W	HWY 121	Major Arterial	Crack Seal	653.33
77	SOUTH POCO DR	700 S	NORTH POCO DR	Residential	Crack Seal	997.33
348	SPRUCE DR	DEAD END	1200 S	Residential	Crack Seal	982.22
262	STATE ST	300 N	HWY 121	Major Collector	Crack Seal	6,127.78
313	STATE ST	1700 S	1200 S	Major Collector	Crack Seal	1,835.56
359	STATE ST	2000 E	1870 S	Major Collector	Crack Seal	1,052.00
292	STATE ST	1800 S	1700 S	Major Collector	Crack Seal	3,470.67
120	STATE ST	300 S	200 S	Major Collector	Crack Seal	2,695.00
146	SUNSET CIRCLE	DEAD END	AREVA RD	Residential	Crack Seal	1,165.00
94	VIOLA CIR	DEAD END	LAGOON ST	Residential	Crack Seal	3,155.78
254	WENDALL LN	LAGOON ST	75 N	Residential	Crack Seal	7,114.67
421	500 N	S 500 N	200 E	Residential	Crack Seal	1,836.67
389	GILBERT AVE	700 S	DEAD END	Residential	Crack Seal	528.89
387	HAYFIELD RD	STATE ST	DEAD ENG	Major Collector	Crack Seal	1,311.11
121	100 E	300 S	200 S	Residential	Full Depth Reclamation	1,339.56
119	100 S	100 W	STATE ST	Residential	Full Depth Reclamation	1,231.11
21	1000 W	100 N	200 N	Residential	Full Depth Reclamation	2,952.00
73	1150 S	50 E	END OF PAVEMENT	Residential	Full Depth Reclamation	1,444.44
452	280 S	STONEGATE DR	DEAD END	Residential	Full Depth Reclamation	2,871.11
68	300 E	550 S	ROOSEVELT CIR	Residential	Full Depth Reclamation	4,874.22
186	300 E	400 S	300 S	Residential	Full Depth Reclamation	2,410.00
191	300 E	ROOSEVELT CIR	400 S	Residential	Full Depth Reclamation	791.11
11	300 N	CARMA AVE	700 E	Residential	Full Depth Reclamation	2,400.44
12	300 N	800 E	CARMA AVE	Residential	Full Depth Reclamation	3,717.78
302	350 N	950 W	850 W	Residential	Full Depth Reclamation	1,666.00
19	400 E	400 N	500 N	Residential	Full Depth Reclamation	711.11
287	400 N	900 E	UNION ST	Residential	Full Depth Reclamation	1,279.44
157	400 N	700 E	800 E	Residential	Full Depth Reclamation	2,244.67
172	400 N	500 E	600 E	Residential	Full Depth Reclamation	1,618.22
247	400 N	200 W	100 W	Residential	Full Depth Reclamation	1,085.11
185	400 S	450 E	350 E	Residential	Full Depth Reclamation	3,220.00
266	400 W	LAGOON ST	100 N	Residential	Full Depth Reclamation	2,910.56
293	500 E	1080 S	1040 S	Residential	Full Depth Reclamation	1,544.89
335	500 E	2000 S	1870 S	Residential	Full Depth Reclamation	1,471.56
366	500 E	SHELLY ST	LESLIE ST	Major Collector	Full Depth Reclamation	3,030.22
197	500 N	500 E	600 E	Residential	Full Depth Reclamation	1,118.89
206	500 N	350 E	400 E	Residential	Full Depth Reclamation	1,722.56
230	500 W	100 N	200 N	Major Collector	Full Depth Reclamation	3,252.67
141	600 S	200 E	300 E	Residential	Full Depth Reclamation	3,717.33
373	650 N	500 E	600 E	Residential	Full Depth Reclamation	592.89
24	CARMA AVE	300 N	DEAD END	Residential	Full Depth Reclamation	1,332.00
132	CLUB HOUSE DR	CANYON VIEW DR	HWY 121	Residential	Full Depth Reclamation	1,662.22
390	500 W	200 S	DEAD END	Residential	Full Depth Reclamation	2,316.00
162	100 E	800 S	700 S	Residential	No Treatment	1,261.33
114	100 N	300 W	200 W	Residential	No Treatment	1,932.22
209	100 S	100 E	US 40	Residential	No Treatment	2,928.67
217	100 W	300 N	HWY 121	Residential	No Treatment	1,155.22
349	1080 S	STATE ST	320 S	Residential	No Treatment	3,083.33
275	150 W	800 S	US 40	Residential	No Treatment	1,240.00
332	1800 S	115 EAST CIR	190 EAST CIR	Residential	No Treatment	1,707.56
328	1875 S	STATE ST	100 E	Residential	No Treatment	2,366.44
329	1875 S	100 E	160 E	Residential	No Treatment	5,896.00
92	200 E	600 S	600 S	Residential	No Treatment	1,813.33
70	200 N	1100 W	1000 W	Major Arterial	No Treatment	4,189.56

ID	Road Name	From Address	To Address	Functional Class	Recommended Treatment	Area
0	200 S	500 W	NYE ST	Residential	No Treatment	3,031.11
39	200 S	STATE ST	100 E	Residential	No Treatment	2,966.67
60	200 S	ALTA ST	200 W	Residential	No Treatment	1,256.56
188	300 E	300 S	200 S	Residential	No Treatment	3,751.11
10	300 N	700 E	600 E	Residential	No Treatment	1,948.67
51	300 N	100 E	STATE ST	Residential	No Treatment	1,692.00
301	350 N	1000 W	950 W	Residential	No Treatment	2,455.78
75	3RD E	DEAD END	700 S	Residential	No Treatment	1,931.11
195	400 N	600 E	700 E	Residential	No Treatment	2,141.89
248	400 W	100 N	DEAD END	Residential	No Treatment	2,269.33
294	500 E	1040 S	975 S	Residential	No Treatment	3,018.89
231	500 W	LAGOON ST	100 N	Major Collector	No Treatment	1,847.22
116	600 E	400 N	500 N	Major Collector	No Treatment	4,426.67
111	600 N	450 E	500 E	Residential	No Treatment	999.11
87	700 S	HARRISON AVE	500 E	Residential	No Treatment	2,307.67
18	800 E	300 N	250 N	Residential	No Treatment	1,412.89
253	800 S	RODEO DR	200 W	Residential	No Treatment	2,899.11
270	800 S	200 W	150 W	Residential	No Treatment	3,688.89
342	850 W	350 N	GATES DR	Residential	No Treatment	2,570.44
85	975 S	200 W	STATE ST	Residential	No Treatment	581.33
274	AREVA	200 N	SUNSET CIRCLE	Residential	No Treatment	5,915.56
152	CANYON VIEW DR	CLUB HOUSE DR	DEAD END	Residential	No Treatment	1,521.11
351	ELM CIR	1200 S	DEAD END	Residential	No Treatment	1,752.89
106	GATES DR	HWY 121	NELSON AVE	Residential	No Treatment	1,251.56
207	GATES DR	DEAD END	GATES DR	Residential	No Treatment	1,554.67
144	GEORGIA CIR	DEAD END	LAGOON ST	Residential	No Treatment	14,759.56
345	HAYDON DR	DEAD END	ALEXIA LN	Residential	No Treatment	1,566.67
104	HILLCREST DR	HWY 121	MILLER DR	Residential	No Treatment	968.00
166	LAGOON ST	1000 WEST	900 WEST	Residential	No Treatment	989.78
167	LAGOON ST	900 W	GUINEVERE CIRCLE	Residential	No Treatment	1,488.00
155	LAGOON ST	IVIE MANOR	500 W	Residential	No Treatment	1,530.22
168	LAGOON ST	GUINEVERE CIRCLE	SKYLINE DR	Residential	No Treatment	1,672.00
193	LAGOON ST	GEOGRIA CIR	IVIE MANOR	Residential	No Treatment	751.78
153	LAGOON ST	500 W	400 W	Major Collector	No Treatment	192.67
189	LAGOON ST	400 W	300 W	Major Collector	No Treatment	1,320.00
95	NORTH POCO DR	SOUTH POCO DR	HARRISON AVE	Residential	No Treatment	1,004.89
5	NYE RD	200 S	100 S	Residential	No Treatment	2,522.67
448	Riviera Dr	Fairway Cir	Dead End	Residential	No Treatment	783.33
226	ROOSEVELT CIR	300 E	200 E	Residential	No Treatment	540.22
450	STONEGATE DR	COVE RD	550 S	Residential	No Treatment	1,340.00
273	WENDALL LN	75 N	150 N	Residential	No Treatment	357.78
352	WILLOW CIR	ASPEN LN	DEAD END	Residential	No Treatment	385.00
393	100 N	900 W	1000 W	Residential	No Treatment	786.67
386	200 N	SUMMERALL LN	AREVA RD	Residential	No Treatment	1,011.11
424	250 N	900 E	UNION ST	Residential	No Treatment	775.56
441	JANE ST	500 E	END OF PAVEMENT	Residential	No Treatment	733.33
409	S 500 N	E 500 N	END OF PAVEMENT	Residential	No Treatment	7,698.67
442	SHELLY ST	END OF PAVEMENT	500 E	Residential	No Treatment	1,422.67
399	STATE ST		600 N	Residential	No Treatment	1,980.00
398	STATE ST	600 N	SMITH LN	Residential	No Treatment	2,036.22
377	UNION ST	300 N	385 N	Residential	No Treatment	2,549.56
378	UNION ST	300 N	350 N	Residential	No Treatment	2,041.11
14	1000 W	LAGOON ST	100 N	Residential	Rotomill & Thick Overlay (3 in.)	1,097.67
318	1200 S	END OF PAVEMENT	STATE ST	Residential	Rotomill & Thick Overlay (3 in.)	1,393.33
376	150 N	WENDALL LN	END OF PAVEMENT	Residential	Rotomill & Thick Overlay (3 in.)	3,805.56
355	1875 S	160 E	220 E	Residential	Rotomill & Thick Overlay (3 in.)	2,814.11
451	200 S	STONEGATE DR	DEAD END	Residential	Rotomill & Thick Overlay (3 in.)	1,562.33
259	200 W	LAGOON ST	100 N	Residential	Rotomill & Thick Overlay (3 in.)	3,120.44
303	300 N	950 W	850 W	Residential	Rotomill & Thick Overlay (3 in.)	1,973.22
321	320 E	DEAD END	1080 S	Residential	Rotomill & Thick Overlay (3 in.)	1,241.78
309	525 E	DEAD END	920 S	Residential	Rotomill & Thick Overlay (3 in.)	6,925.00
42	600 E	550 N	600 N	Major Collector	Rotomill & Thick Overlay (3 in.)	2,820.00
223	600 E	HARMSTON AVE	HWY 121	Major Collector	Rotomill & Thick Overlay (3 in.)	2,400.44
269	700 E	300 N	400 N	Residential	Rotomill & Thick Overlay (3 in.)	2,860.00
228	800 S	US 40	400 W	Residential	Rotomill & Thick Overlay (3 in.)	2,449.33

ID	Road Name	From Address	To Address	Functional Class	Recommended Treatment	Area
343	950 W	300 N	350 N	Residential	Rotomill & Thick Overlay (3 in.)	2,600.00
324	ASPEN LN	WILLOW CIR	END OF PAVEMENT	Residential	Rotomill & Thick Overlay (3 in.)	2,302.67
311	BIRCH AVE	DEAD END	1200 S	Residential	Rotomill & Thick Overlay (3 in.)	808.44
234	BONNIE	1000 W	1000 W	Residential	Rotomill & Thick Overlay (3 in.)	967.11
66	CLUB HOUSE DR	AREVA RD	CANYON VIEW DR	Residential	Rotomill & Thick Overlay (3 in.)	1,807.67
40	GATES DR	NELSON DR	GATES DR	Residential	Rotomill & Thick Overlay (3 in.)	1,193.78
113	LAGOON ST	300 E	400 E	Major Collector	Rotomill & Thick Overlay (3 in.)	448.00
112	LAGOON ST	STATE ST	100 E	Major Collector	Rotomill & Thick Overlay (3 in.)	4,390.22
341	PARK RIDGE DR	100 S	PARK RIDGE DR	Residential	Rotomill & Thick Overlay (3 in.)	1,567.78
282	PARKVIEW LN	DEAD END	1000 W	Residential	Rotomill & Thick Overlay (3 in.)	1,817.11
315	PINE CIR	1200 S	DEAD END	Residential	Rotomill & Thick Overlay (3 in.)	2,825.78
76	STATE ST	SUNSET DR	700 S	Major Collector	Rotomill & Thick Overlay (3 in.)	2,709.00
125	STATE ST	700 S	800 S	Major Collector	Rotomill & Thick Overlay (3 in.)	2,990.89
229	STATE ST	300 N	500 N	Major Collector	Rotomill & Thick Overlay (3 in.)	1,807.00
93	STATE ST	US 40	425 S	Major Collector	Rotomill & Thick Overlay (3 in.)	1,300.00
7	STATE ST	425 S	300 S	Major Collector	Rotomill & Thick Overlay (3 in.)	1,391.00
31	STATE ST	200 S	100 S	Major Collector	Rotomill & Thick Overlay (3 in.)	1,304.33

Appendix F

Preservation Strategies, Treatments, and Associated Costs

Treatment Type	Maint. Category	Cost	0	1-3	4-6	7-9	10-12	13-15	16-18	19-21
Crack Seal	Routine	**$0.45**	0	0	0	0	1	2	3	2
Cold Patch	Routine	$0.45	0	0	0	0	0	0	0	0
Digout and Hot Patch	Routine	**$0.68**	0	0	0	0	0	0	0	0
High Perf. Cold Patch	Routine	$0.90	0	0	0	0	0	0	0	0
Fog Coat	Routine	**$0.68**	0	0	0	1	1	2	2	2
High Mineral Asphalt Emulsion	Preventative	**$1.80**	0	0	0	1	2	3	5	5
Sand Seal	Preventative	**$0.98**	0	0	0	1	2	2	2	2
Scrub Seal	Preventative	**$1.50**	0	1	3	5	5	5	5	5
Single Chip Seal	Preventative	**$1.95**	0	1	3	5	5	5	5	5
Slurry Seal	Preventative	**$2.63**	0	1	3	5	5	5	5	5
Microsurfacing	Preventative	**$3.60**	0	2	3	5	7	7	7	7
Plant Mix Seal	Rehabilitation	**$8.40**	0	3	4	5	7	7	7	7
Cold In-place Recycling (2 in with chip seal)	Rehabilitation	**$7.50**	0	3	4	5	6	7	7	7
Thin Hot Mix Overlay (<2 in)	Rehabilitation	**$10.13**	0	4	6	7	7	7	7	7
HMA (leveling) & Overlay (<2 in.)	Rehabilitation	**$11.25**	0	4	6	8	8	8	8	8
Hot Surface Recycling	Rehabilitation	**$7.50**	0	3	5	7	8	8	8	8
Rotomill & Overlay (<2 in)	Rehabilitation	**$12.60**	0	4	7	8	8	8	8	8
Cold In-place Recycling (2/2 in.)	Reconstruction	**$15.45**	15	15	15	15	15	15	15	15
Thick Overlay (3 in.)	Reconstruction	**$15.00**	12	12	12	12	12	12	12	12
Rotomill & Thick Overlay (3 in.)	Reconstruction	**$16.50**	12	12	12	12	12	12	12	12
Base Repair\Pavement Replacement	Reconstruction	**$18.00**	16	16	16	16	16	16	16	16
Cold Recycling & Overlay (3/3 in.)	Reconstruction	**$16.73**	14	14	14	14	14	14	14	14
Full Depth Reclamation& Overlay (3/3 in.)	Reconstruction	**$19.88**	20	20	20	20	20	20	20	20
Base/Pavement Replacement (3/3/6 in.)	Reconstruction	**$28.50**	20	20	20	20	20	20	20	20

***Fit the current RSL into a category along the top row and then move downward to the applied treatment to find the additional RSL that will be achieved from the selected treatment.**

(2/2 in.) Means 2" overlay with 2" recycle

(3/3/6) Means 3" HMA over 3" Road Base over 6" Base

Appendix G

Recommended Pavement Preservation Program and Proposed Funding Allocation

Year 1

Crack Seal (Bad Roads)

ID	Road Name	From Address	To Address	Area	Functional Class	Main Distress	RSL
313	STATE ST	1700 S	1200 S	5,544.00	Major Collector	Edge Cracks	12
360	2000 S	STATE ST	500 E	6,127.78	Major Collector	Edge Cracks	12
276	400 W	800 S	US 40	1,537.78	Residential	Transverse	12
180	1000 W	DEAD END	290 S	1,274.22	Residential	Patches	12
68	300 E	550 S	ROOSEVELT CIR	781.33	Residential	Edge Cracks	12
184	800 S	150 W	STATE ST	1,829.33	Residential	Edge Cracks	12
300	CONSTITUTION DR	PARK RIDGE DR	100 S	2,640.56	Residential	Edge Cracks	12
386	200 N	SUMMERALL LN	AREVA RD	3,155.78	Residential	Edge Cracks	12

Chip Seal

71	200 N	1000 W	900 W	2,736.00	Major Arterial	Longitudinal	12
449	5200 W	US-191	City Boundary	6,644.44	Major Collector	Patches	14
3	600 E	600 N	650 N	1,056.00	Major Collector	Transverse	12
38	LAGOON ST	700 E	800 E	1,530.22	Major Collector	Transverse	12
153	LAGOON ST	500 W	400 W	2,726.00	Major Collector	Transverse	12
189	LAGOON ST	400 W	300 W	2,449.22	Major Collector	Transverse	12
350	STATE ST	1870 S	1800 S	1,235.56	Major Collector	Transverse	12
222	600 E	HARMSTON AVE	100 N	1,483.33	Major Collector	Patches	12
268	600 E	100 N	LAGOON ST	2,777.78	Major Collector	Patches	12
2	600 E	300 N	US 40	1,908.00	Major Collector	Transverse	10
27	LAGOON ST	600 E	700 E	2,107.33	Major Collector	Transverse	10
28	STATE ST	100 S	LAGOON ST	2,982.22	Major Collector	Transverse	10
31	STATE ST	200 S	100 S	3,049.44	Major Collector	Transverse	10
223	600 E	HARMSTON AVE	HWY 121	1,122.22	Major Collector	Transverse	10
236	STATE ST	LAGOON ST	100 N	3,061.67	Major Collector	Transverse	10
371	500 E	100 S	LAGOON ST	3,327.89	Major Collector	Transverse	10
292	STATE ST	1800 S	1700 S	1,720.00	Major Collector	Transverse	10
370	STATE ST	600 S	US 40	3,307.78	Major Collector	Patches	10
35	LAGOON ST	100 E	US 40	3,384.00	Major Collector	Fatigue	10
93	STATE ST	US 40	425 S	2,502.00	Major Collector	Fatigue	10
230	500 W	100 N	200 N	2,253.78	Major Collector	Fatigue	10
231	500 W	LAGOON ST	100 N	2,493.33	Major Collector	Fatigue	10
7	STATE ST	425 S	300 S	3,390.00	Major Collector	Fatigue	10
13	LAGOON ST	400 E	500 E	3,520.00	Major Collector	Fatigue	10
117	LAGOON ST	US 40	300 E	3,344.00	Major Collector	Fatigue	10
125	STATE ST	700 S	800 S	2,070.00	Major Collector	Fatigue	8
229	STATE ST	300 N	500 N	7,174.44	Major Collector	Fatigue	8
262	STATE ST	300 N	HWY 121	2,902.78	Major Collector	Edge Cracks	8

Year 1 Cost Table

Major Arterial	Major Collector	Minor Collector	Residential	Total
Crack Seal (Bad Roads)				
	$ 18,674.84		$ 17,950.40	$ 36,625.24
Chip Seal				
$ 6,511.68	$ 179,745.80			$ 186,257.48

Total:	$ 222,882.72

Year 2

Base Repair

ID	Road Name	From Address	To Address	Area	Functional Class	Main Distress	RSL
42	600 E	550 N	600 N	1,120.00	Major Collector	Transverse	6
47	600 E	500 N	550 N	1,148.00	Major Collector	Transverse	6
76	STATE ST	SUNSET DR	700 S	648.00	Major Collector	Fatigue	6
91	STATE ST	300 S	SUNSET DR	1,443.00	Major Collector	Fatigue	6
116	600 E	400 N	500 N	1,880.00	Major Collector	Fatigue	6
359	STATE ST	2000 E	1870 S	2,324.44	Major Collector	Transverse	2

Crack Seal (Good Roads)

ID	Road Name	From Address	To Address	Area	Functional Class	Main Distress	RSL
70	200 N	1100 W	1000 W	5,382.00	Major Arterial	Longitudinal	16
134	200 N	SKYLINE DR	GATES DR	6,029.33	Major Arterial	Longitudinal	16
361	SOUTH COVE RD	500 W	HWY 121	1,835.56	Major Arterial	Longitudinal	16
374	200 N	GATES DR	500 W	3,470.67	Major Arterial	Longitudinal	16
72	200 N	900 W	SKYLINE DR	2,772.00	Major Arterial	Patches	14
120	STATE ST	300 S	200 S	2,945.56	Major Collector	Transverse	16
369	600 E	650 N	700 N	1,052.00	Major Collector	Transverse	16
239	LAGOON ST	300 W	200 W	2,830.44	Major Collector	Longitudinal	16
387	HAYFIELD RD	STATE ST	DEAD ENG	7,114.67	Major Collector	Longitudinal	16
109	600 E	300 N	400 N	1,880.00	Major Collector	Patches	14
112	LAGOON ST	STATE ST	100 E	2,572.78	Major Collector	Patches	14
15	900 W	LAGOON ST	100 N	2,173.33	Residential	Transverse	16
22	900 W	100 N	200 N	2,213.33	Residential	Transverse	16
24	CARMA AVE	300 N	DEAD END	740.44	Residential	Transverse	16
54	JOYCE AVE	300 N	DEAD END	695.11	Residential	Transverse	16
55	200 S	300 E	US 40	2,652.22	Residential	Transverse	16
59	200 S	NYE ST	ALTA ST	1,095.11	Residential	Transverse	16
60	200 S	ALTA ST	200 W	5,490.22	Residential	Transverse	16
64	200 W	975 S	800 S	3,083.33	Residential	Transverse	16
81	ROOSEVELT CIR	400 S	350 S	1,893.67	Residential	Transverse	16
97	200 S	SKYLINE DR	500 W	4,492.89	Residential	Transverse	16
105	AREVA RD	RIVIERA DR	MASON CIRCLE	1,936.00	Residential	Transverse	16
108	AREVA RD	MASON DR	CLUB HOUSE DR	3,021.33	Residential	Transverse	16
128	300 N	400 E	300 E	2,088.00	Residential	Transverse	16
146	SUNSET CIRCLE	DEAD END	AREVA RD	680.00	Residential	Transverse	16
158	500 E	400 N	500 N	1,915.78	Residential	Transverse	16
169	LAGOON ST	SKYLINE DR	WENDALL LN	1,785.00	Residential	Transverse	16
177	200 S	200 W	100 W	2,916.00	Residential	Transverse	16
178	200 S	100 W	STATE ST	2,496.00	Residential	Transverse	16
188	300 E	300 S	200 S	2,341.78	Residential	Transverse	16
205	500 E	300 N	US 40	1,981.56	Residential	Transverse	16
206	500 N	350 E	400 E	2,542.22	Residential	Transverse	16
244	300 N	STATE ST	100 W	2,030.56	Residential	Transverse	16
255	150 N	DEAD END	WENDALL LN	458.89	Residential	Transverse	16
278	OLPIN AVE	800 S	US 40	1,108.89	Residential	Transverse	16
301	350 N	1000 W	950 W	1,660.00	Residential	Transverse	16
307	ALEXIA LN	DEAD END	HAYDON DR	1,192.00	Residential	Transverse	16
321	320 E	DEAD END	1080 S	623.33	Residential	Transverse	16
325	500 E	850 S	800 S	1,207.56	Residential	Transverse	16
329	1875 S	100 E	160 E	1,004.89	Residential	Transverse	16

ID	Road Name	From Address	To Address	Area	Functional Class	Main Distress	RSL
345	HAYDON DR	DEAD END	ALEXIA LN	910.00	Residential	Transverse	16
347	500 E	800 S	700 S	3,490.67	Residential	Transverse	16
352	WILLOW CIR	ASPEN LN	DEAD END	653.33	Residential	Transverse	16
355	1875 S	160 E	220 E	997.33	Residential	Transverse	16
356	1875 S	220 E	280 E	982.22	Residential	Transverse	16
378	UNION ST	300 N	350 N	1,165.00	Residential	Transverse	16
441	JANE ST	500 E	END OF PAVEMENT	528.89	Residential	Transverse	16
442	SHELLY ST	END OF PAVEMENT	500 E	1,311.11	Residential	Transverse	16
4	400 E	300 N	400 N	1,932.22	Residential	Longitudinal	16
21	1000 W	100 N	200 N	1,666.67	Residential	Longitudinal	16
57	300 S	100 E	US 40	2,126.22	Residential	Longitudinal	16
62	290 S	1000 W	MEMORY LANE	3,857.78	Residential	Longitudinal	16
63	AREVA RD	CLUB HOUSE DR	PARK PALACE DR.	2,757.33	Residential	Longitudinal	16
88	600 S	300 E	350 E	1,170.56	Residential	Longitudinal	16
90	600 S	450 E	500 E	1,743.89	Residential	Longitudinal	16
132	CLUB HOUSE DR	CANYON VIEW DR	HWY 121	7,739.11	Residential	Longitudinal	16
148	HILLCREST DR	MILLER DR	DEAD END	630.00	Residential	Longitudinal	16
150	MASON CIR	AREVA RD	AREVA RD	7,357.78	Residential	Longitudinal	16
152	CANYON VIEW DR	CLUB HOUSE DR	DEAD END	4,985.56	Residential	Longitudinal	16
208	NELSON RD	DEAD END	GATES DR	3,095.00	Residential	Longitudinal	16
209	100 S	100 E	US 40	2,514.00	Residential	Longitudinal	16
210	100 S	300 E	US 40	2,625.78	Residential	Longitudinal	16
211	100 S	300 E	400 E	2,884.00	Residential	Longitudinal	16
225	ROOSEVELT CIR	300 E	300 E	696.89	Residential	Longitudinal	16
226	ROOSEVELT CIR	300 E	200 E	1,373.67	Residential	Longitudinal	16
238	100 S	STATE ST	100 E	2,526.00	Residential	Longitudinal	16
240	300 W	100 N	HWY 121	2,179.33	Residential	Longitudinal	16
250	700 E	LAGOON ST	100 N	2,324.00	Residential	Longitudinal	16
271	800 S	400 W	RODEO DR	2,648.22	Residential	Longitudinal	16
297	1875 S	280 E	340 E	1,057.78	Residential	Longitudinal	16
303	300 N	950 W	850 W	1,503.33	Residential	Longitudinal	16
305	850 W	300 N	350 N	910.00	Residential	Longitudinal	16
306	MOUNTAIN GREEN C	300 W	DEAD END	457.78	Residential	Longitudinal	16
328	1875 S	STATE ST	100 E	1,669.78	Residential	Longitudinal	16
336	1875 S	480 E	500 E	623.33	Residential	Longitudinal	16
343	950 W	300 N	350 N	946.67	Residential	Longitudinal	16
344	300 W	LAGOON ST	100 N	2,338.00	Residential	Longitudinal	16
376	150 N	WENDALL LN	END OF PAVEMENT	2,695.00	Residential	Longitudinal	16
418	LAGOON ST	1000 W	CONSTITIUTION DR	1,836.67	Residential	Longitudinal	16
103	AREVA	SUNSET CIRCLE	AREVA	1,496.00	Residential	Patches	14
104	HILLCREST DR	HWY 121	MILLER DR	2,562.78	Residential	Patches	14
107	AREVA	AREVA	RIVIERA DR	1,965.33	Residential	Patches	14
149	AREVA RD	MASON CIRCLE	MASON CIRLCE	1,520.44	Residential	Patches	14
167	LAGOON ST	900 W	GUINEVERE CIRCLE	1,527.78	Residential	Patches	14
171	500 E	300 N	400 N	1,936.33	Residential	Patches	14
220	100 W	100 S	LAGOON ST	2,994.44	Residential	Patches	14
261	100 N	300 E	US 40	2,591.11	Residential	Patches	14
282	PARKVIEW LN	DEAD END	1000 W	1,155.56	Residential	Patches	14
284	GUENEVIERRE CIR	DEAD END	LAGOON ST	972.00	Residential	Patches	14
316	ASPEN LN	1200 S	WILLOW CIR	1,847.33	Residential	Patches	14
323	1875 S	400 E	480 E	997.33	Residential	Patches	14

Year 2 Cost Table

Major Arterial	Major Collector	Minor Collector	Residential	Total
Base Repair				
	$ 289,016.25			$ 289,016.25
Crack Seal (Good Roads)				
$ 5,846.87	$ 5,518.63		$ 48,599.03	$ 59,964.53

Total:	$ 348,980.78

Year 3

Rotomill & Thick Overlay (3in.)

ID	Road Name	From Address	To Address	Area	Functional Class	Main Distress	RSL
67	500 E	600 S	500 S	2,814.11	Major Collector	Transverse	8
237	STATE ST	100 N	HWY 121	2,860.00	Major Collector	Transverse	8
364	500 E	500 S	400 S	2,990.89	Major Collector	Transverse	8

Chip Seal

172	400 N	500 E	600 E	2,141.89	Residential	Longitudinal	8
6	600 S	200 E	100 E	1,533.78	Residential	Fatigue	8
195	400 N	600 E	700 E	1,340.22	Residential	Fatigue	8
9	300 N	600 E	500 E	2,092.00	Residential	Fatigue	8
10	300 N	700 E	600 E	1,426.67	Residential	Fatigue	8
30	100 N	200 W	100 W	3,505.78	Residential	Fatigue	8
53	300 N	500 E	400 E	1,887.00	Residential	Fatigue	8
87	700 S	HARRISON AVE	500 E	1,266.22	Residential	Fatigue	8
100	SKYLINE DR	LAGOON ST	100 N	2,032.44	Residential	Fatigue	8
119	100 S	100 W	STATE ST	2,544.00	Residential	Fatigue	8
197	500 N	500 E	600 E	2,571.56	Residential	Fatigue	8
213	300 E	100 N	200 N	2,884.44	Residential	Fatigue	8
232	500 W	100 S	LAGOON ST	2,585.00	Residential	Fatigue	8
267	300 E	LAGOON ST	100 N	3,073.89	Residential	Fatigue	8
275	150 W	800 S	US 40	4,816.67	Residential	Fatigue	8
290	ALTA ST	200 S	100 S	1,667.56	Residential	Fatigue	8
351	ELM CIR	1200 S	DEAD END	744.00	Residential	Fatigue	8
242	100 N	400 E	300 E	1,253.78	Residential	Edge Cracks	8
258	100 N	STATE ST	100 E	2,572.78	Residential	Edge Cracks	8

Year 3 Cost Table

Major Arterial	Major Collector	Minor Collector	Residential	Total
Rotomill & Thick Overlay (3 in.)				
	$ 194,962.50			$ 194,962.50
Chip Seal				
			$ 99,816.41	$ 99,816.41

Total:	$ 294,778.91

Year 4

Chip Seal

ID	Road Name	From Address	To Address	Area	Functional Class	Main Distress	RSL
23	SKYLINE DR	100 N	200 N	1,873.78	Residential	Transverse	10
32	700 S	STATE ST	100 E	1,400.00	Residential	Transverse	10
41	600 S	100 E	STATE ST	1,590.44	Residential	Transverse	10
155	LAGOON ST	IVIE MANOR	500 W	1,811.11	Residential	Transverse	10
168	LAGOON ST	GUINEVERE CIRCLE	SKYLINE DR	2,377.78	Residential	Transverse	10
185	400 S	450 E	350 E	583.11	Residential	Transverse	10
190	1000 W	290 S	240 S	1,165.00	Residential	Transverse	10
194	100 N	600 E	700 E	1,244.44	Residential	Transverse	10
217	100 W	300 N	HWY 121	2,785.44	Residential	Transverse	10
227	1000 W	240 S	180 S	1,235.00	Residential	Transverse	10
247	400 N	200 W	100 W	1,696.00	Residential	Transverse	10
251	HARMSTON AVE	HWY 121	150 N	763.11	Residential	Transverse	10
254	WENDALL LN	LAGOON ST	75 N	1,373.78	Residential	Transverse	10
265	100 W	300 N	400 N	1,722.67	Residential	Transverse	10
266	400 W	LAGOON ST	100 N	2,454.22	Residential	Transverse	10
273	WENDALL LN	75 N	150 N	1,392.22	Residential	Transverse	10
279	HARRISON AVE	700 S	NORTH POCO DR	1,091.78	Residential	Transverse	10
299	1000 W	180 S	LAGOON ST	4,445.00	Residential	Transverse	10
331	1800 S	45 E CIR	115 E CIR	1,227.78	Residential	Transverse	10
349	1080 S	STATE ST	320 S	5,081.11	Residential	Transverse	10
353	920 S	500 E	525 E	528.89	Residential	Transverse	10
354	1080 S	320 S	500 E	3,652.00	Residential	Transverse	10
358	190 E	1800 S	DEAD END	691.33	Residential	Transverse	10
363	400 S	500 E	450 E	1,025.00	Residential	Transverse	10
448	Riviera Dr	Fairway Cir	Dead End	1,191.11	Residential	Transverse	10
96	1000 W	200 N	BONNIE DR	968.89	Residential	Transverse	10
39	200 S	STATE ST	100 E	2,496.00	Residential	Longitudinal	10
56	200 S	100 E	US 40	2,538.00	Residential	Longitudinal	10
151	600 N	600 E	DEAD END	3,044.44	Residential	Longitudinal	10
8	300 S	STATE ST	100 E	2,532.00	Residential	Fatigue	10
20	500 N	400 E	450 E	1,300.44	Residential	Fatigue	10
29	100 E	100 S	LAGOON ST	2,994.44	Residential	Fatigue	10
83	SKYLINE DR	200 S	LAGOON ST	4,012.00	Residential	Fatigue	10
86	700 S	GILBERT AVE	NORTH POCO DR	1,364.00	Residential	Fatigue	10
98	180 S	DEAD END	1000 W	865.11	Residential	Fatigue	10
131	240 S	DEAD END	1000 W	857.56	Residential	Fatigue	10
137	700 S	200 E	SOUTH POCO DR	1,456.89	Residential	Fatigue	10
139	700 S	300 E	GILBERT AVE	1,393.33	Residential	Fatigue	10
164	300 E	200 S	100 S	2,444.44	Residential	Fatigue	10
186	300 E	400 S	300 S	1,755.11	Residential	Fatigue	10
191	300 E	ROOSEVELT CIR	400 S	2,971.78	Residential	Fatigue	10
202	HARMSTON AVE	510 E	600 E	1,556.44	Residential	Fatigue	10
252	200 E	ROOSEVELT CIR	US 40	2,748.33	Residential	Fatigue	10
260	300 E	100 S	LAGOON ST	2,371.11	Residential	Fatigue	10
348	SPRUCE DR	DEAD END	1200 S	2,002.22	Residential	Fatigue	10
399	STATE ST	550 N	600 N	845.89	Residential	Fatigue	10
424	250 N	900 E	UNION ST	717.78	Residential	Fatigue	10
445	LESLIE ST	500 E	END OF PAVEMENT	560.00	Residential	Fatigue	10

ID	Road Name	From Address	To Address	Area	Functional Class	Main Distress	RSL
409	S 500 N	E 500 N	END OF PAVEMENT	1,248.00	Residential	Fatigue	10

Year 4 Cost Table

Minor Arterial	Major Collector	Minor Collector	Residential	Total
		Chip Seal		
			$ 212,882.27	$ 212,882.27

Total:	$ 212,882.27

Year 5

Rotomill & Thick Overlay (3 in.)

ID	Road Name	From Address	To Address	Area	Functional Class	Main Distress	RSL
362	500 E	600 S	700 S	2,709.00	Major Collector	Fatigue	6
365	500 E	LESLIE ST	400 S	1,807.00	Major Collector	Fatigue	6
366	500 E	SHELLY ST	LESLIE ST	1,300.00	Major Collector	Fatigue	6
367	500 E	150 S	SHELLY ST	1,391.00	Major Collector	Fatigue	6
372	500 E	100 S	150 S	1,304.33	Major Collector	Fatigue	6
50	930 S	525 E	DEAD END	448.00	Residential	Transverse	8
84	PARK RIDGE DR	PARK RIDGE DR	100 S	808.44	Residential	Transverse	8
95	KING ARTHURS CT	DEAD END	LAGOON ST	967.11	Residential	Transverse	8
269	400 E	600 N	650 N	1,097.67	Residential	Fatigue	8

Chip Seal

333	1800 S	190 EAST CIR	END OF PAVEMENT	676.22	Residential	Patches	14
14	1000 W	LAGOON ST	100 N	1,643.33	Residential	Transverse	12
51	300 N	100 E	STATE ST	1,676.00	Residential	Transverse	12
73	1150 S	50 E	END OF PAVEMENT	3,022.22	Residential	Transverse	12
147	MILLER DR	HWY 121	HILLCRST DR	2,236.44	Residential	Transverse	12
154	LAGOON ST	VIOLA CIR	GEORGIA CIR	1,450.67	Residential	Transverse	12
163	400 S	300 E	ROOSEVELT CIR	1,804.00	Residential	Transverse	12
174	700 E	300 N	250 N	1,122.22	Residential	Transverse	12
183	700 E	250 N	US 40	1,533.33	Residential	Transverse	12
192	LAGOON ST	WENDALL LN	VIOLA CIR	714.00	Residential	Transverse	12
193	LAGOON ST	GEOGRIA CIR	IVIE MANOR	1,360.00	Residential	Transverse	12
248	400 W	100 N	DEAD END	1,901.78	Residential	Transverse	12
309	525 E	DEAD END	920 S	392.00	Residential	Transverse	12
311	BIRCH AVE	DEAD END	1200 S	2,013.56	Residential	Transverse	12
312	1700 S	STATE ST	DEAD END	3,067.56	Residential	Transverse	12
315	PINE CIR	1200 S	DEAD END	1,254.22	Residential	Transverse	12
330	1800 S	STATE ST	45 E CIR	714.00	Residential	Transverse	12
332	1800 S	115 EAST CIR	190 EAST CIR	1,197.56	Residential	Transverse	12
337	115 E	1800 S	DEAD END	710.22	Residential	Transverse	12
338	425 S	PRIVATE	STATE ST	2,360.89	Residential	Transverse	12
383	300 S	300 E	END OF PAVEMENT	800.00	Residential	Transverse	12
398	STATE ST	600 N	SMITH LN	1,804.22	Residential	Transverse	12
33	500 N	450 E	500 E	919.11	Residential	Patches	12
77	SOUTH POCO DR	700 S	NORTH POCO DR	1,088.00	Residential	Patches	12
246	300 W	300 N	HWY 121	2,264.67	Residential	Patches	12
298	100 S	PARK RIDGE DR	CONSTITUTION DR	2,633.11	Residential	Patches	12
314	FIR AVE	DEAD END	1200 S	1,654.67	Residential	Patches	12
322	320 E	1080 S	DEAD END	491.11	Residential	Patches	12
5	NYE RD	200 S	100 S	1,681.78	Residential	Longitudinal	12
36	500 W	200 S	100 S	2,297.78	Residential	Longitudinal	12
40	GATES DR	NELSON DR	GATES DR	1,900.00	Residential	Longitudinal	12
99	100 N	900 W	SKYLINE DR	2,342.22	Residential	Longitudinal	12
135	50 E	DEAD END	1150 S	566.67	Residential	Longitudinal	12
136	50 E	1150 S	1080 S	1,114.44	Residential	Longitudinal	12
179	100 E	DEAD END	300 S	5,177.78	Residential	Longitudinal	12
264	300 W	300 N	END OF PAVEMENT	1,275.67	Residential	Longitudinal	12
357	45 E	1800 S	DEAD END	653.56	Residential	Longitudinal	12

ID	Road Name	From Address	To Address	Area	Functional Class	Main Distress	RSL
368	550 N	450 E	600 E	2,768.89	Residential	Longitudinal	12
69	300 E	550 S	600 S	872.00	Residential	Edge Cracks	12
142	550 S	200 E	300 E	1,370.67	Residential	Edge Cracks	12

Year 5 Cost Table

Minor Arterial	Major Collector	Minor Collector	Residential	Total
Rotomill & Thick Overlay (3 in.)				
	$ 191,505.00		$ 74,727.50	$ 266,232.50
Chip Seal				
			$ 153,573.20	$ 153,573.20

Total:	$ 419,805.70

Additional Roads

Base Repair

ID	Road Name	From Address	To Address	Area	Functional Class	Main Distress	RSL
101	300 N	900 E	JOYCE AVE	810.33	Residential	Fatigue	8
17	100 N	400 W	300 W	2,385.78	Residential	Transverse	6
80	200 E	600 S	550 S	1,263.67	Residential	Transverse	6
92	200 E	600 S	600 S	499.33	Residential	Transverse	6
114	100 N	300 W	200 W	2,605.78	Residential	Transverse	6
133	200 E	550 S	ROOSEVELT CIR	1,507.33	Residential	Transverse	6
196	450 E	550 N	600 N	970.67	Residential	Transverse	6
218	800 E	100 N	LAGOON ST	1,711.89	Residential	Transverse	6
280	200 W	300 N	HWY 121	2,322.22	Residential	Transverse	6
45	800 S	STATE ST	100 E	1,413.33	Residential	Patches	6
12	300 N	800 E	CARMA AVE	1,035.56	Residential	Fatigue	6
18	800 E	300 N	250 N	1,007.11	Residential	Fatigue	6
46	100 E	200 S	100 S	3,037.22	Residential	Fatigue	6
75	3RD E	DEAD END	700 S	404.22	Residential	Fatigue	6
94	VIOLA CIR	DEAD END	LAGOON ST	653.33	Residential	Fatigue	6
115	100 N	100 W	STATE ST	2,986.67	Residential	Fatigue	6
124	400 E	550 N	600 N	1,184.00	Residential	Fatigue	6
129	400 E	650 N	700 N	1,056.56	Residential	Fatigue	6
130	400 E	LAGOON ST	100 N	3,041.78	Residential	Fatigue	6
170	400 N	400 E	500 E	1,882.89	Residential	Fatigue	6
200	700 N	500 E	600 E	2,493.33	Residential	Fatigue	6
215	100 E	100 N	HWY 121	2,866.11	Residential	Fatigue	6
241	100 N	100 E	US 40	2,548.33	Residential	Fatigue	6
243	100 E	300 N	US 40	2,890.56	Residential	Fatigue	6
182	650 N	400 E	500 E	2,183.44	Residential	Fatigue	4
214	200 E	300 N	US 40	2,878.33	Residential	Fatigue	4
234	BONNIE	1000 W	1000 W	2,749.44	Residential	Fatigue	4
272	100 S	500 W	NYE RD	1,148.89	Residential	Fatigue	4
277	350 E	600 S	ROOSEVELT CIR	2,104.00	Residential	Fatigue	4
373	650 N	500 E	600 E	2,470.11	Residential	Fatigue	4
375	75 N	WENDALL LN	END OF PAVEMENT	2,429.11	Residential	Fatigue	4
408	300 W	300 N ST	300 W	2,573.33	Residential	Fatigue	4
199	700 N	400 E	500 E	2,248.89	Residential	Fatigue	4
11	300 N	CARMA AVE	700 E	1,062.22	Residential	Fatigue	6
145	300 N	JOYCE AVE	800 E	1,591.11	Residential	Fatigue	6
249	500 E	LAGOON ST	DEAD END	2,318.00	Residential	Fatigue	6
16	100 N	500 W	400 W	2,498.22	Residential	Transverse	2
79	200 E	800 S	600 S	3,366.00	Residential	Transverse	2
173	450 E	500 N	500 N	1,070.22	Residential	Transverse	2
221	800 E	HWY 121	100 N	2,202.67	Residential	Transverse	2
233	100 E	LAGOON ST	100 N	3,055.56	Residential	Transverse	2
122	600 N	500 E	600 E	2,311.11	Residential	Fatigue	4

Full Depth Reclamation

1	800 E	250 N	US 40	1,339.56	Residential	Fatigue	2
25	600 N	400 E	450 E	1,231.11	Residential	Fatigue	2
110	800 E	300 N	400 N	2,410.00	Residential	Fatigue	2
111	600 N	450 E	500 E	791.11	Residential	Fatigue	2

ID	Road Name	From Address	To Address	Area	Functional Class	Main Distress	RSL
118	200 W	200 S	100 S	2,400.44	Residential	Fatigue	2
121	100 E	300 S	200 S	3,717.78	Residential	Fatigue	2
140	SUNSET DR	STATE ST	DEAD END	1,666.00	Residential	Fatigue	2
157	400 N	700 E	800 E	2,244.67	Residential	Fatigue	2
165	100 S	400 E	500 E	2,910.56	Residential	Fatigue	2
203	100 E	700 S	600 S	3,252.67	Residential	Fatigue	2
228	800 S	US 40	400 W	3,717.33	Residential	Fatigue	2
235	BONNIE	1000 W	DEAD END	592.89	Residential	Fatigue	2
421	500 N	S 500 N	200 E	2,316.00	Residential	Fatigue	2
37	100 S	200 W	100 W	2,952.00	Residential	Fatigue	0
48	600 N	DEAD END	400 E	1,444.44	Residential	Fatigue	0
102	1000 W	BONNIE DR	BONNIE DR	2,871.11	Residential	Fatigue	0
106	GATES DR	HWY 121	NELSON AVE	4,874.22	Residential	Fatigue	0
144	GEORGIA CIR	DEAD END	LAGOON ST	711.11	Residential	Fatigue	0
156	100 N	700 E	800 E	1,279.44	Residential	Fatigue	0
160	700 N	DEAD END	400 E	1,618.22	Residential	Fatigue	0
161	500 E	650 N	700 N	1,085.11	Residential	Fatigue	0
162	100 E	800 S	700 S	3,220.00	Residential	Fatigue	0
175	550 N	DEAD END	400 E	1,544.89	Residential	Fatigue	0
181	650 N	DEAD END	400 E	1,471.56	Residential	Fatigue	0
187	400 E	100 S	LAGOON ST	3,030.22	Residential	Fatigue	0
198	500 E	600 E	650 E	1,118.89	Residential	Fatigue	0
201	400 N	800 E	900 E	1,722.56	Residential	Fatigue	0
287	400 N	900 E	UNION ST	1,332.00	Residential	Fatigue	0
289	100 S	NYE RD	DEAD END	1,662.22	Residential	Fatigue	0

Rotomill

288	1200 S	END OF PAVEMENT	STATE ST	4,390.22	Residential	Fatigue	6
318	GATES DR	DEAD END	GATES DR	6,925.00	Residential	Fatigue	6

Additional Roads Cost Table

Minor Arterial	Major Collector	Minor Collector	Residential	Total
Base Repair				
			$ 2,799,805.00	$ 2,799,805.00
Full Depth Reclamation				
			$ 4,019,066.58	$ 4,019,066.58
Rotomill and 3 Inch Overlay				
			$ 254,592.50	$ 254,592.50

Total:	$ 7,073,464.08





Drinking Water Source Contingency Plan and Updated Drinking Water Source Protection Plans Appendix I



HORROCKS ENGINEERS

EXECUTIVE SUMMARY

Roosevelt City commissioned Horrocks Engineers to assist Roosevelt City in the preparation of Drinking Water Source Protection Plans for each of their drinking water sources in accordance with the Drinking Water Source Protection (DWSP) Rule (R309-605). The Revised DWSP Rule became effective on August 01, 2019, and applies to all Public Water Suppliers (PWS) with ground-water sources of drinking water. The information contained within the Contingency Plan is an update to the Roosevelt City Drinking Water Source Contingency Plan submitted in 2003 and is supplemental to previous work performed by the City in accordance with the DWSP Rule. Information regarding these related components of the DWSP Plan may be obtained by contacting the City or Horrocks Engineers.

This contingency plan develops the set of actions to be considered if remedial action is required for Roosevelt City's culinary water supplies. It contains Emergency Response, Rationing, Water Supply Decontamination, and Source Development Plans. Each of these plans are discussed in the following sections.

I.1 EMERGENCY RESPONSE PLAN

I.1.1 INTRODUCTION

The purpose of this Emergency Response Plan is to establish the responsibilities, priorities, and actions required by the City in conjunction with other improvement districts, cities, and County and Federal agencies in protecting the lives and health of the populace, public and private property, and the living and natural resources from the natural disaster, industrial accidents, terrorists, or civil disturbances.

Each year communities are struck, without warning, by natural disaster and/or industrial accidents which may result in loss of service or even loss of life and destruction of property. These losses can be greatly reduced if the City had the resources capability for immediate action to meet such emergencies and disaster. The City has a responsibility to take such pre-emergency measures to ensure the ability to operate under emergency conditions, and to put such abilities into action in the event of any kind of disaster. While the intent of this plan is to ensure the City's ability to respond and recover from any contingency with the least impact on the community, this plan places maximum practical emphasis on mitigation and preparedness phases of emergency management.

It is the intent of this Plan that all emergencies be controlled and handled by the City. If assistance is needed outside the resources of the City, inter-local agreements, resources and coordination will be utilized as needed from private entities and County, State, and Federal Governments. The overall responsibility for management and control will be retained by the City and its Council.

I.1.2 MITIGATION

Included in this section is information identifying ways to reduce the vulnerability of the water supply system to disruption and to improve the Community's response capabilities. The following are some appropriate actions that could help mitigate potential hazards and/or emergencies impacted the City's culinary water supply, system, and infrastructure:

1. Infrastructure maintenance/upgrades/maps.
2. Regular inspection of air release stations; particularly on transmission lines.
3. Staff emergency training.
4. System security analysis.
5. Site new backup well.
6. Regular inspection of tanks, towers, wells, booster pump stations.
7. Sanitation procedures for construction/repairs.

I.1.3 CONSERVATION

It is important that the community be aware of conservation measures, not only during emergency situations when water may be scarce for an extended period of time, but always in an effort to extend its water supply which is located in a semi-arid climate. The following are efforts to reduce the amount of water used by it residents, business and industry.

1. Water Meters
2. Public Education
3. Rate Structure.

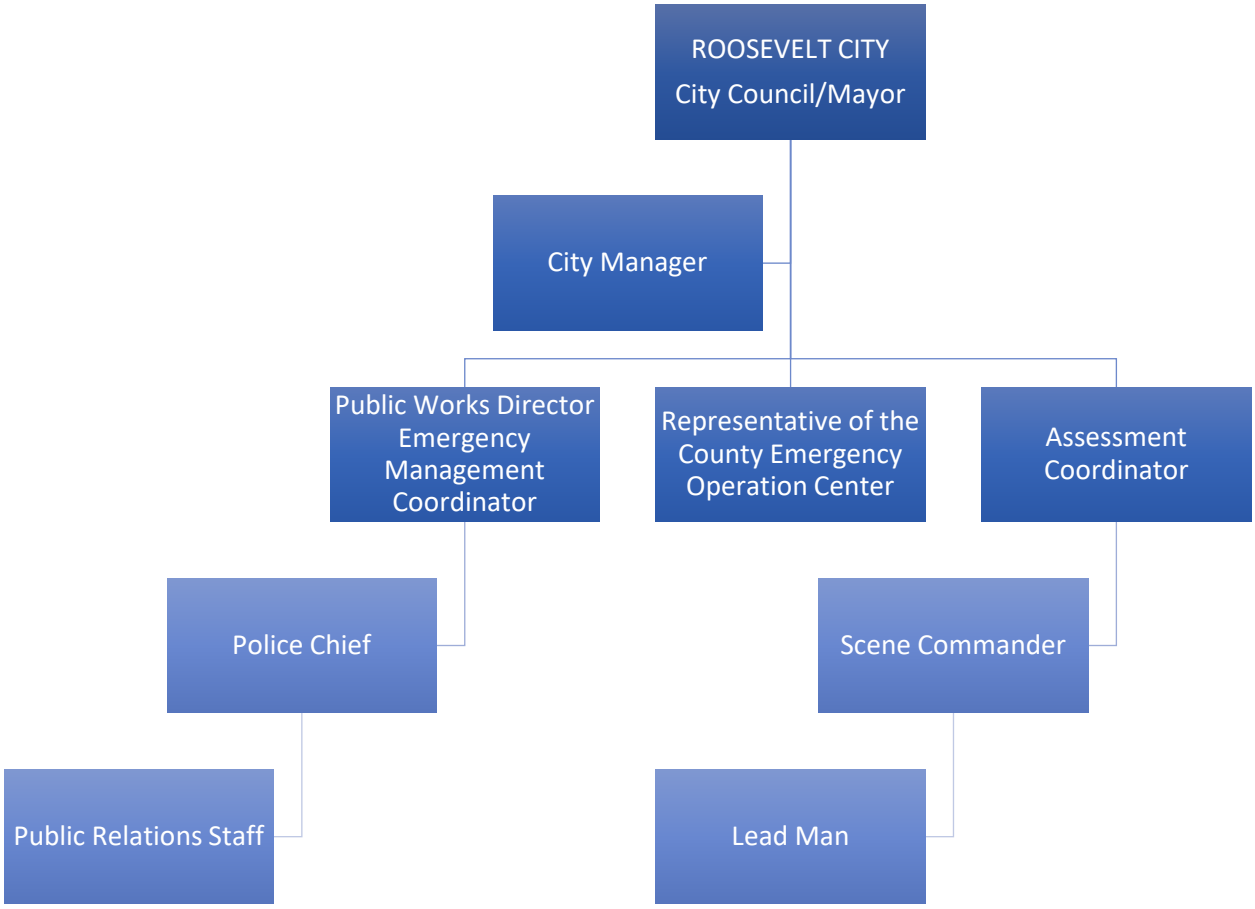
I.1.4 ORGANIZATION

Lines of Authority and Responsibilities

The lines of authority for implementation of the Emergency Response Plan are as shown in Figure I-1. The following sections describe the duties and responsibilities of staff members.

The **Manager** is the Chief Appointed Officer of the City and as such shall be the "Chief Emergency Response Administrator." In the absence of the Manager, the City Council has designated the Public Works Director as the "Acting" Chief Emergency Response Administrator. The "Acting Chief Emergency Response Administrator" shall be construed to mean "Chief Emergency Response Administrator" in the absence or unavailability of the Manager.

Figure I-1 Lines of Authority



In the temporary absence or unavailability of the Manager, the Manager may designate the City Recorder, the City Engineer and/or a Department Head with jurisdiction over the emergency to act in his behalf and to carry out the necessary action to oversee the emergency. The duties of the Manager in time of emergency or disaster include the following:

1. Declare emergency
2. Determine emergency category.
3. Determine readiness condition.
4. Determine department status.
5. Authorize and direct establishment of an emergency management center. Give

general supervision throughout emergency.

6. Keep the Mayor and the City Council informed.

7. Designate border of emergency area.

The **Emergency Management Coordinator (EMC)** shall be the Public Works Director or as appointed by the Manager, and shall oversee all activities at the Emergency Operation Center, under the direction of the Chief Emergency Response Administrator. The (EMC) has been designated to standardize and coordinate emergency operations plans and procedures in the City and with other entities. The EMC will coordinate with the City's Department Heads, County Fire Emergency Services Director, and the State Emergency Management Office. This coordination ensures that all plans are coordinated and complement each other.

The **Representative to the County Emergency Operating Center** shall be appointed by the Manager or Public Works Director to work with the designated Emergency Operating Center - Duchesne County Desk ("County EOC"), when emergency status is declared by the county Commission or by the Governor of the State of Utah.

The **Assessment Coordinator** shall coordinate the inspection of all drinking water system physical facilities to determine the degree of damage to the facility and in coordination with the EMC, prioritize the repair, replacement or abandonment of any system physical facilities.

The **Scene Commander** shall be the First Level of Control at the emergency site, and shall set up a command post at the scene of the incident.

The **Lead Man** shall be the first arriving employee at the incident scene. The Lead Man is to evaluate, assess damage, and report findings to the Scene Commander; secure the area to protect life and property, and mitigate the loss of water. All work performed by the Lead Man shall be under the direct supervision of the Scene Commander.

The City's **Public Information Officer (PIO)** is to be designated by the Chief Emergency Response Administrator. In a disaster, the PIO will designate a Public Information Area. The area may be near the disaster scene in a small incident or in a central location in a large disaster. Scene Commanders and the EMC will relay information concerning the situation to the PIO so the public can be informed through the media of issues relating to public health and safety.

The **City Attorney** shall advise the City on the legality and/or legal implications of contemplated emergency actions; interpret laws, rules and regulations for acquisition and/or control of critical resources, evacuations and population control; and assist in drafting emergency resolutions and ordinances, as required.

The **City Finance Office and Office Department** shall maintain and correlate fiscal and accounting records of all expenditures related to the disaster. Additional responsibilities of the City Finance Office shall include:

1. Advise the Chief Emergency Response Administrator how all departments can
2. maintain strict accountability and proper supporting records and documentation to support subsequent claims in emergency conditions.

3. Assist departments concerned in the preparations and processing of Federal and State financial claims.

4. Assist in the establishment of "one-step center" where all Federal and State loan assistance agencies are collected. Assistance will include providing space, communications and administrative support at the direction of the Federal Emergency Management Administration personnel. The Grants Officer will assist the Finance Department in this activity.

5. Ensure the security of financial documents.

6. Be office of record for all official matters.

7. Prepare such "after actions" reports as needed.

8. Assist appropriate City representatives in official actions.

9. Assist Personnel Officer.

10. Facilitate City communication using two-way radio, smartphones, social media, etc.

The **Water and Sewer Departments** shall ensure that all wells, reservoirs, water supply systems and sewage lift stations are operating. They shall also be responsible for maintenance of safe quality water for domestic use.

The **City Engineering Department** shall be responsible to survey affected structures for safety and stability. The Engineering Department may also provide needed data on business, land uses, etc., provide needed data on transportation routes such as roadway problems, provide the needed maps for the EOC and other emergency operations, and assist the Scene Commander and the City EOC.

The **Public Works Department** will be responsible to provide heavy equipment, emergency generators, lighting equipment, barricades and other traffic control equipment as needed. Additional responsibilities of the Public Works Department include the following:

1. Make emergency repairs.

2. Provide sand and/or other emergency diking materials as needed (sandbags, timbers, rocks, etc.)

3. Provide pumps.

4. Provide operators of heavy equipment as needed.
5. Coordinate heavy equipment use with private providers.
6. Restore supply lines to operating condition.

The **Public Works Department** will also coordinate emergency repairs to vehicles and other City equipment, assist in the emergency repair to district structures, and assist, when requested, in the repair of pipes and other water and sewer systems.

The **City Staff** shall work under the direction of the Chief Emergency Response Administrator, and will coordinate City support to employee families and serve as an information conduit between employees and their families. This department shall also coordinate efforts between the City and the public and respond to miscellaneous City EOC directives.

Classification of the Emergency or Disaster

An emergency or disaster is any operation that is above and beyond the normal operating activities of the City or any City Department. Emergencies and/or disasters will be classified using one of the following four **Phase** designations:

A **Phase** I **Emergency** shall be any emergency that is above and beyond the normal daily activities of the department concerned, but can be handled adequately with the department personnel on duty at the time of emergency. The City EOC is not activated or manned at this level of emergency. A Phase I Emergency can be declared by the Department Head.

A **Phase** II **Emergency** shall be an emergency that can still be handled within the resources of the concerned department but it is of such magnitude to necessitate the calling in of the departmental off-duty personnel, assigned volunteers, and auxiliary agencies. The City EOC is activated and manned at this level of emergency. A Phase II Emergency can only be declared by the Public Works Director.

A **Phase** III **Emergency** shall be any emergency of such magnitude that will require cooperation between one or more City Departments. Such emergency can still be handled within the resources of the City, County, and/or other entities through mutual aid and sharing of resources. Once a Phase III Emergency has been declared, any request for assistance or resources shall be requested by the Scene Commander and shall take precedence over any daily activities. City departments will open emergency support operations as specified by the Chief Emergency Response Administrator. The City EOC is activated and manned at this level of emergency. A Phase III Emergency can only be declared by the Acting Chief Emergency Response Administrator.

A **Phase IV Emergency** is an emergency of the greatest magnitude such as earthquake, flood, attack, etc., that would require the resources of the entire City, and both governmental and private auxiliary agencies. Outside assistance would also be required for recovery from this type of disaster. It is anticipated that the recovery time for this level of emergency will exceed one week.

The City EOC is activated and manned at this level of emergency. A Phase IV Emergency can only be declared by the Acting Chief Emergency Response Administrator

The above emergency stages and accompanying definitions are consistent with those of local, county and state government agencies, and will therefore provide a uniform system for coordination with other agencies within the State. In addition, it will provide a uniform system for transition from a normal daily operating posture to full alert and readiness to respond to any emergency situation.

As indicated earlier, it is the intent of this Plan that all emergencies be controlled and handled by the City. If assistance is needed outside the resources of the City, inter-local agreements, resources and coordination will be utilized as needed from private entities, County, State, and Federal Governments. The overall responsibility for management and control will be retained by the City and its Council.

Facility Damage Assessment

The Assessment Coordinator will be responsible to determine the preliminary damage assessment priorities based upon an evaluation of the physical status of all facilities at the time of emergency. In performance of the facility damage assessment, the following key points should be kept in mind:

1. Damage assessment is first priority, however, crews and equipment can be brought into the active repair phase while the damage assessments may still be underway.

2. Employee skills shall be first in mind as repair assignments are made. Ideally, an employee's normal or usual type of work assignments should be the same in an emergency. Use other City employees and/or volunteers as fill-ins to work with skilled workers.

3. The Scene Commander shall assign work areas for all workers while keeping in mind the employee skills.

4. All workers, including volunteers, must first be issued identification cards (see forms and checklists in appendix) by the City EOC before they can be assigned.

5. After each report is finalized, the Scene Commander will assign maintenance and repair duties.

6. Employees not specifically assigned to damage assessment shall report to their Department Head.

7. Department Heads must become familiar with the emergency response prioritized listing page.

Copies of the forms which should be used for the physical assessment of facilities are contained in the Appendix of this document. The overall status of a facility will be represented by a color coding system as described below:

1. **Status Green:** All systems operational. No assistance anticipated.
2. **Status Yellow:** Some systems depleted, but response capability still maintained. Response capability will be lost at current rate of resources expenditure.
3. **Status Red:** Response capability non-existent or severely limited. Need assistance immediately.

Upon completion of the preliminary damage assessment, the Assessment Coordinator and the EMC will then decide which damaged drinking water facility receives priority repair or replacement. The determination of priorities shall be based upon the following criteria:

1. The drinking water system's unique design.

2. Medical/emergency care requirements.

3. Drinking water and sanitation needs of the public.

4. Fire fighting requirements.

5. How much safe drinking water is remaining in the system reservoirs.

6. How to transport that water to where it is needed the most.

I.1.5 IMPLEMENTATION

General Information

The announcement by the Chief Emergency Response Administrator of the enactment of the City's Emergency Plan may be done several ways, such as orally, person to person, by pager, two way radio, smart phones, or by commercial radio and/or television, e-mail, internet, social media, smartphone text alerts. For authorized City officials, all alerts can and should be integrated into the City's Supervisory Control and Data Acquisition (SCADA) system. Alerts may be received on computers, tablets, and/or smart phones via the SCADA system.

This announcement will include phase number of the emergency. The description of the emergency and the staging area may also be given. Vehicles will report to their previously assigned areas unless specifically changed by the Chief Emergency Response Administrator's emergency announcement or by the Scene Commander.

The City understands that in the event of an emergency, an employee will want to take care of his/her immediate family needs and would want to secure their well-being before reporting to work. The City will, however, attempt to impress upon its employees the importance of their responsibility to the City's customer needs. Customer needs can only be met by the City-trained employees who most likely would be the only persons who stand to prevent the escalation of damage to property, and the occurrence of personal injury to the public.

In an emergency, there will be two levels of control, both of which are directly responsible to the Chief Emergency Response Administrator. The first level of control shall be the Scene Commander who will set up the Command Post at the scene of the incident. The Scene Commander will be responsible for coordination of the following:

1. Coordinate response agencies.
2. Keep the site open.
3. Establish communications with the City EOC, and other agencies.
4. Coordinate transportation.
5. Keep the PIO updated about the on scene information.

The second level of control shall be the EMC and will be at the City EOC, where overall coordination will be exercised. The EMC will be responsible for coordinating the following:

1. Phones and communications.
2. Meals for displaced persons and service providers.
3. Purchasing.
4. Identification Badges.
5. Coordinate information for press release with the PIO.
6. Building security.
7. Sheltering of displaced persons.
8. Coordinate with County, State Federal, and other outside agencies.
9. Coordinate with the County Fire/Emergency Services and other agencies such as the Red Cross, local churches, clubs, and other private providers for the above items.

A brief description of the Scene Command Post and the City EOC is presented in following sections of

this plan.

Response Conditions

Since response actions of one department may be dependent upon the response and status of another department, it is imperative that all departments progress from normal daily operations to full alert readiness in a uniform manner. In emergency response actions, the principle of centralized control and decentralized execution of emergency actions must be maintained. Through this principle all response actions will be in harmony and well-orchestrated by legal authority from the City EOC. As the departments move from normal operations to emergency posture, they will do so by going through a series of response conditions. The conditions and the actions to be taken are as follows:

1. Response Condition I - Daily Operations

a. Review plans and update as necessary.

b. Perform City EOC housekeeping duties as necessary, such as testing the radio console, testing SCADA alarms, etc.

c. Train personnel on a routine basis.

d. Perform other routine emergency preparedness functions, as necessary.

2. Response Condition II - Increased Intelligence Watch (Phase I Emergency)

a. Monitor the situation on a 24 hour basis.

b. Review applicable plans and Standard Operating Procedures.

c. Notify Manager, Public Works Administrator and key personnel.

d. Review status of all equipment and supplies.

e. EMC will brief Mayor and key personnel, as necessary.

3. Response Condition Ill (Phase II Emergency)

a. Chief Emergency Response Administrator places key personnel on standby status.

b. Operate City EOC on a 24 hour basis with minimum crew.

c. Accelerate repair or procurement of equipment or supplies of emergency response actions, using normal procurement procedures and maintenance procedures.

d. Chief Emergency Response Administrator briefs elected City Council and key personnel on a 24 hour basis.

4. Response Condition IV (Phase III Emergency)

a. Place City EOC on medium manning status.

b. Accelerate repair or procurement of equipment or supplies needed for emergency response. Actions should now be done on emergency basis, such as maintenance being done on a 24 hour basis and emergency procedures for procurement implemented.

c. Place all personnel on standby status.

d. Pertinent departments open emergency support operations centers, as specified by the Chief Emergency Response Administrator.

e. Cancel all vacations and other time off.

5. Response Condition V (Phase IV Emergency)

a. Place City EOC on full manning.

b. Pertinent departments open emergency support operations center, as specified by the Chief Emergency Response Administrator.

c. Bring all equipment and supplies to full operational status.

d. Recall all personnel, as necessary.

e. Freeze all supplies and resources for emergency use only.

f. Respond to the emergency, as necessary.

These procedures outlining definitions of emergencies and emergency response conditions are provided to assist the command and control of the emergency response function. They will not be used to constrain or limit the emergency response actions of any department involved in direct response actions. Such department will respond with the necessary response action to control the situation. They will then notify the Chief Emergency Response Administrator of the magnitude of the emergency by using one of the definitions of emergencies and the necessary verbal clarification to inform the Chief Emergency Response Administrator of the gravity of the situation. The Chief Emergency Response Administrator will then declare an official response condition, and if the situation should warrant it, cause the EOC to become functional. Such response condition will then be communicated to all departments to prepare them for the necessary response.

Scene Command Post

The Scene Command Post will provide field support to the re-establishing of normal operations of the City. The Scene Command Post is key to successful response and recovery operations. The Scene Command Post will establish repair priorities and submit them to the City EOC who, after confirming these priorities, shall arrange support necessary to bring about the recovery period of the emergency operations. In order to provide the most efficient response in an emergency all response and recover activities must be coordinated through the City EOC. Because emergency events have the potential for causing other property and personal harm, action must be swift and well-coordinated by the Scene Command Post.

Organization and Assignment of Responsibilities

1. The Scene Commander is designated the authority for emergency operations by the Chief Emergency Response Administrator to oversee the operation of the Scene Command Post.

2. The Scene Commander oversees all field operations during the emergency and the recovery operations after the emergency.

3. The Scene Command Post roster shall be assembled from the Maintenance and Construction Department and such other employees and volunteers as may be designated.

4. The response employee arriving first at a site will function as the Lead Man until such time as the Scene Commander arrives on site.

5. Responsibilities of the Scene Commander include:

    a. Assess the impact of the emergency and report damage assessments to City EOC.

    b. Coordinate all field activities and rotate workers to rest areas.

    c. Save City resources of water supply and comply as able to County, and State emergency organizations.

    d. Restore and maintain safe potable water supplies which may be rationed for domestic use, mass care, and fire needs.

    e. Repair and maintain sewage pumping systems.

    f. Oversee potable water distribution sites.

Restoration Responsibilities

1. Coordinate all restoration work.

2. Prioritize and submit repair needs to the EOC.

3. Return emergency operations to status normal in an expeditious manner.

4. Maintain records of repairs, supplies, and contracts with private and public companies. Submit the complete information, along with costs and invoices, to the EOC for further handling.

City Emergency Operations Center (EOC)

The primary location of the City EOC is at the Roosevelt City office which is located at 255 South State Street in Roosevelt City, Utah. An alternate location, if necessary, will be announced by the EOC, with the assistance of the PIO by telephone, pager, two-way radio, commercial broadcasting stations KXRQ, KIFX, and KNEU. It should also be announced if necessary by local TV stations, social media outlets, smartphone text alerts, and/or notice posted at primary City EOC location. The City EOC is the key to successful response and recovery operations. With decision makers located together, personnel and other resources can be used more efficiently. Coordination of activities will ensure that all tasks are accomplished with little or no duplication of effort.

During emergency operations, the City EOC shall be organized into four groups.

1. **Executive Group:** This group consists of the City Manager, Public Works Administrator, City Recorder and City Engineer or Engineer's representative.

2. **Operations Group:** The operations assignees and their normal operations staff comprise this group and are responsible for carrying out City EOC activities.

3. **Communications Group:** The communications officer, appointed by the Chief Emergency Response Administrator, and/or City PIO directs the activities of the City communications and public information releases to the news media, social media, smartphones, etc.

4. **Operations Support Group:** This group consists of the customer relations department and will be assisted by other staff as assigned by the EOC Manager under the direction of the Chief Emergency Response Administrator.

The central point of coordination for all emergency response actions will be in the City EOC. This is to ensure coherent response actions when the emergency involved more than one department and several response agencies. During an emergency each department will coordinate all response actions with the City EOC. The City's EMC will coordinate emergency planning with local and County Fire/Emergency Services Department.

The City EOC shall direct the use of all City two-way radios, and smartphone communications, by establishing and announcing priority of calls with life threatening situations being of highest priority. Field units shall instigate their calls by stating their unit number and briefly stating the emergency including damage reports, if any. The City's EMC will decide the priority of the calls and may choose to not act beyond the acknowledgment of the call. Unless otherwise provided, radio contact with outside agencies will be through the City EOC.

Emergency Fire/Medical Facilities

Basic life support will be provided by the Fire Department. All Fire Departments personnel are Utah State Emergency Medical Technicians. Advanced life support will be provided by Uintah Basin Medical Center. Ground ambulance transportation is provided by Uintah Basin Medical Center and air ambulance transportation is provided by Air Med.

Medical personnel shall be dispatched through normal dispatch centers. The Scene Commander will make necessary decisions on resources which are needed. Medical treatment shall be governed by State medical procedures and Department Standard Operating Procedures. The triage, treatment, and transportation sections will be under the Scene Commander.

Standard emergency phone number 911 should only be used by City radio-phones systems in life or death situations. The following emergency numbers are designated as the first response for emergency assistance.

Roosevelt City Police:	435-722-2330/	dispatch: 435-722-4558
Duchesne County Sheriff:	435-738-2015/	dispatch 1: 435-738-2424 dispatch 2: 435-722-4558
Roosevelt Fire and Rescue:	435-722-5001/	dispatch: 435-722-4558
Uintah Basin Medical Center:	435-722-6163	

I.1.6 PRIORITIZE WORK/REPAIR NEEDED

Prioritization of the work/repair necessary to restore facilities is essential, and will enhance the ability of the City to fully restore services within a minimal time period and at a minimal cost. In general, restoration of services should proceed on a case by case basis. Under no circumstances (particularly in larger disaster/emergency events) should the City attempt to repair the entire system at the same time. Attempts to repair all system failures at the same time often results in insufficient work forces and equipment to repair specific failures.

Consideration should be made as to identifying those areas which are most critical to operation of the system. Prioritization may also take into consideration the identification of those areas which can be served within a minimum amount of repair required. Under all scenarios, the conservation of water is essential. Prioritization of work/repair should also take into

consideration the following factors:

1. Medical/emergency care requirements.
2. Drinking water and sanitation needs of the public.
3. Fire fighting requirements.
4. How much safe drinking water is remaining in the system reservoirs.
5. How to transport safe water to where it is needed the most.

I.1.7 DISPATCHING PERSONNEL AND EQUIPMENT

General Information

Some pickups and cars have been assigned to be driven home so as to be widely dispersed in the case of an emergency. This disbursement should enable quicker response to assigned areas without the employee having to report to a centralized place before reporting to work, and receiving directions. Designated areas of response are made with the employee's place of residence in mind. When possible an employee is assigned an area near the employee's place of residence.

After a damage assessment has been made, reports will be delivered to the Scene Commander who may assign a new area to the employee.

Vehicle Assignment

Vehicles and cars are to be maintained by its assigned operator so that at all times it will have its designated tools, working equipment, supplies and the emergency manual with its maps kept in order, and above half-full gas tank.

Agency Notification

Table I-1 contains the names and telephone numbers for contacts at various agencies that may be notified in the event of a public water supply system emergency. Based on the nature of the emergency and the information available, various representatives from this listing will be selected by the response coordinator to be part of the coordination which will then meet throughout the duration of the emergency to aid in decision-making and positive outcomes.

Table I-1 Emergency Personnel Roster

EMPLOYEE NAME	HOME PHONE #	WORK PHONE #	EMERGENCY PHONE #	MOBILE #
POLICE DEPARTMENT				
Roosevelt Dispatch		(435) 722-4558		
Vernal Dispatch		(435) 789-4222		
Rick Harrison (Police Chief)		(435) 722-2330		(435) 823-1079
J.C. Hansen		(435) 722-2330		
Allan Tucker		(435) 722-2330		
T.J. Bird		(435) 722-2330		
Clint Robinson		(435) 722-2330		
Brett Green		(435) 722-2330		
CITY MANAGER				
Ryan Snow		(435) 725-7201		(435) 823-1120
CITY COUNCIL				
Mayor JR Bird				(435) 722-7988
David Baird				(435) 330-4360
Dustin White				(385) 404-0082
Aaron Weight	(435) 722-4450	(435) 722-6901		(435) 823-1535
Joe Burdick	(435) 722-0151			(435) 722-8277
David Labrum	(435) 722-3262	(435) 722-2233		(435) 823-2232
PUBLIC WORKS				
Kirby Wolfinjer	(435) 722-0414	(435) 722-9993		(435) 823-7228
CONSULTING ENGINEERS				
Horrocks Engineers	(435) 503-2042	(435) 654-2226	(435) 503-2042	(435) 503-2042
Jones and DeMille Engineering	(435) 760-5844	(435) 722-8267	(435) 760-5844	(435) 760-5844
ROOSEVELT FIRE AND RESCUE				
Lee Rockwood		(435)-722-5001		(435) 722-8230
ATTORNEY				
Stephen Foote				(435) 823-5551

I.1.8 REQUEST/RESPONSE FOR EMERGENCY AID

Commercial Suppliers of Equipment/Materials

Plumbing Contractors

Name: Long's Plumbing
Address: 115 W 1130 N, Roosevelt, UT 84066
Telephone: (435) 722-2038

Name: Aspen Plumbing Inno
Address: 740 N 2550 E, Ballard, UT 84066
Telephone: (435) 467-3495

Name: Downs Plumbing
Address: Roosevelt, UT 84066
Telephone: (435) 725-3575

Name: D & K Plumbing Co.
Address: 1971 W Riverside Rd., Myton, UT 84052
Telephone: (435) 646-3330

Name: Basin Drain and Sewer
Address: 12401 W 3000 N, Bluebell, UT 84007
Telephone: (435) 790-4070

Name: PDM Professionals and Consultants, LLC
Address: 8325 E 11000 N, Tridell, UT 84076
Telephone: (435) 621-2539

Name: Lynn V. Christensen Plumbing & Heating
Address: 270 N Bonnie Drive, Roosevelt, UT 84066
Telephone: (435) 722-4445

Name: Dick Bess Plumbing
Address: 153 South 13500 West, Altamont, UT 84001
Telephone: (435) 454-3409

Name: Campbell Plumbing, Inc.
Address: 27 S 100 W Vernal, UT 84078
Telephone: (435) 789-6980

Name: RRC Plumbing & Heating
Address: 2122 S. Vernal Ave, Vernal, UT 84078

Telephone: (435) 781-9812

Replacement Supplies-Purchase

Name: Mountainland Supply Company
Address: 1810 West Highway 40, Roosevelt, UT 84066
Telephone: (435) 725-0019

Name: Marta-Co Supply Inc.
Address: 1820 South 2000 West, Roosevelt, UT 84066
Telephone: (435) 722-8372

Replacement Supplies-Rental

Name: Elite Equipment Rental
Address: 244 W Highway 40, Roosevelt, UT 84066
Telephone: (435) 722-1574

Name: Route 40 Rental and Repair
Address: 133 S 300 E, Roosevelt, UT 84066
Telephone: (435) 722-6045

Name: AG Equipment Inc.
Address: 1845 W Highway 40, Roosevelt, UT 84066
Telephone: (435) 722-4488

Name: Sunbelt Rentals, Inc.
Address: 2100 W Highway 40, Roosevelt, UT 84066
Telephone: (435) 722-2881

Heavy Equipment and Pumps

Name: KW Robinson Construction, Inc.
Address: P.O. Box 920/6207 S. Hwy 87, Duchesne, UT 84021
Telephone: (435) 738-0200

Name: Rasmussen Concrete Construction, Inc.
Address: W. Highway 40, Roosevelt, UT 84066
Telephone: (435) 353-4477

Name: R. Chapman Construction
Address: 140 W 425 S Ste 330-16, Roosevelt, UT 84066
Telephone: (435) 738-3800

Name: Burdick Materials/Neilson Construction
Address: 1870 N. North Crescent Rd., Roosevelt, UT 84066
Telephone: (435) 722-5013

Name: Hube's Construction
Address: P.O. Box 293, Vernal, UT 84020
Telephone: (435) 650-1448

Neighboring Agencies and Agreements

The following section identifies those neighboring agencies which may be contacted in time of emergency or disaster. Contact with all neighboring agencies shall be performed through the City EOC.

Name of Agency: Uintah Basin Association of Governments
Address: 330 E 100 S, Roosevelt, UT 84066
Telephone: (435) 722-4518

Name of Agency: Vernal City Corporation
Address: 374 East Main Street, Vernal, UT 84078
Telephone: (435) 789-2255
Contact: Quinn Bennion

Name of Agency: Duchesne County
Address: 734 North Center Street, P.O. Box 228, Duchesne, UT 84021
Telephone: (435) 738-1226
Contact: Mike Lefler

Name of Agency: Uintah County Office of Emergency Management
Address: 641 East 300 South #375, Vernal, UT 84078
Telephone: (435) 781-5466

Name of Agency: Duchesne City Fire Department
Address: 500 E. Main St., Duchesne, UT 84021
Telephone: (435) 630-4113
Contact: Russ Young

Name of Agency: Duchesne County Water Conservancy District (DCWCD)
Address: 275 West 800 South, Roosevelt, UT 84066
Telephone: (435) 722-4977
Contact: Clyde Watkins

I.1.9 PUBLIC NOTIFICATION/PRESS RELEASES

General Information

The release of information should be made through the City's Public Information Officer (PIO). The type of information given will vary with the type of emergency. Keeping this in mind, the following list provides some key points which should be utilized for successful public

notification/press releases.

1. Public notification and press releases are important phases of the emergency plan.
2. Coordinate with PIO at EOC.
3. Centralize news releases and statements to avoid confusing the public.
4. When responding to inquiries, make only factual responses. Avoid speculation.
5. Inform public of probable contamination of water supply if breaks are found in the lines.
6. Notify public of availability of water and precautions to be taken (boil order, etc.).
7. Request residents to restrict flow of sewage into the system in areas with breaks.
8. Where breaks are found in the sewage system, warn the public of dangers of sewage in the streets and channels.
9. Arrange for escorting media representatives who have proper identification through work areas or facilities; only if conditions are safe and if they make a request.

News Media Contacts

The following is a partial listing of radio, television, and newspaper which may be contacted in time of emergency or disaster to assist the City in notifying the public of health and safety concerns, service outages, rationing, etc.

Radio

Name: KNEU Radio
Address: Ballard, UT 84066
Contact: Jennifer Rock
Telephone: (435) 722-5011

Name: KIFX
Address: 2425 North Vernal Ave., Vernal, UT 84078
Telephone: (435) 789-0920

Name: KSL NewsRadio
Address: 55 North 3rd West, Salt Lake City, UT 84180-1109
Telephone: (801) 575-5555

Television

Name: KUTV Channel 2 (CBS affiliate)
Address: 299 South Main Street, Suite 150, Salt Lake City, UT 84111
Telephone: (801) 839-1222 (news tip line)

Name: KTVX Channel 4 (ABC affiliate)
Address: 2175 West 1700 South, Salt Lake City, UT 84104
Telephone: (801) 975-4526 (Hotline)

Name: KSL Channel 5 (NBC affiliate)
Address: KSL Broadcast House 55 North 300 West, Salt Lake City, UT 84180-1109
Telephone: (801) 575-5600

Name: KSTU-FOX 13 Channel 13
Address: 5020 Amelia Earhart Drive, Salt Lake City, UT 84116
Telephone: (801) 536-1313 (news tip line)

Newspaper

Name: Uintah Basin Standard
Address: 268 S. Main St., Roosevelt, UT 84066
Telephone: (435) 722-5131

Name: Vernal Express
Address: 60 E 100 N, Vernal UT 84078
Telephone: (435) 789-3511

Name: The Salt Lake Tribune
Address: 90 S 400 W, Ste 700, Salt Lake City, UT 84101
Telephone: (801) 257-8742

Name: Deseret News
Address: 55 North 300 West, Ste 500, Salt Lake City, UT 84101
Telephone: (801) 575-5600 (news tip line)

Name: Daily Herald
Address: 86 N. University Ave. #300, Provo, UT 84601
Telephone: (801) 373-5050 or (800) 880-8075

Name: Standard Examiner
Address: 332 Standard Way, Ogden, UT 84404
Telephone: (801) 625-4225

I.1.10 RECOVERY

General Information

Recovery is an important phase of the Emergency Response Plan, yet an area which is often not fully completed and/or followed through with. The following checklist summarizes those items which

should be included during recovery.

1. Designate a local Disaster Recovery Coordinator to document emergency work performed and to submit appropriate documents for reimbursement under existing legislation, and for City records.

2. Make a detailed damage inspection of system safety following repair/replacement.

3. Notify key personnel (including regulatory and health agencies).

4. Complete emergency repairs and schedule permanent repairs.

5. Un-tag repaired facilities and equipment.

6. Replace used materials and supplies.

7. Complete permanent repairs and replacements.

Documentation

In addition to the above items, the Scene Commander will be responsible for documenting the response actions to any emergency incident. This information is needed for accounting, any possible legal actions, isolating problem areas, improving response actions, City history, training, etc. The Documentation should include a discussion of the following areas:

1. Identify problem areas.

2. Have all agencies learn from the experiences.

3. Obtain input from all agencies on solving problem areas.

Accounting

In the event of an emergency, proper accounting for response costs and losses from damages are very important. These costs are needed for insurance reimbursements or Federal Disaster Assistance reimbursements. Care should be taken to include all costs, direct and indirect. The City's EOC office shall oversee the compilation of these costs. Any dispensing of disaster costs, as a result of an emergency to County, State, or Federal agencies, shall be done through the Office of the Mayor.

I.1.11 TRAINING

The Basic Plan effectiveness will be evaluated periodically by:

1. Testing the validity of the Plan.

2. Training of personnel in its execution.

3. Identifying areas to be improved.

4. Participating in any County-wide exercise to test the response plans of agencies within the County, both governmental and non-governmental. This exercise, when held by the County, will be known by the title of "Exercise Broad scope" and will test actual field operations.

5. Participating in any quarterly Desk Top Exercise held by the County EOC to test and train the command and control function between the County, State, and City's EOCs.

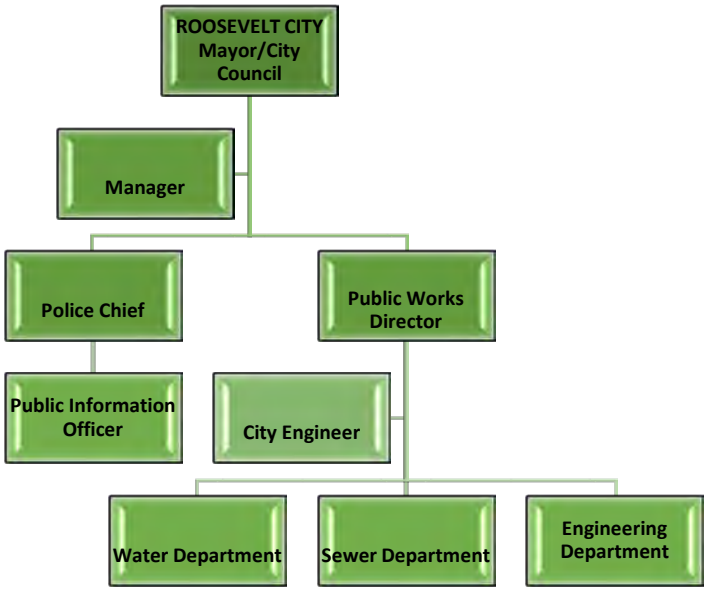
6. Periodic review and update of the basic plan by the Manager and Public Works Administrator.

I.2 RATIONING PLAN

I.2.1 LINES OF AUTHORITY AND RESPONSIBILITIES

The lines of authority for implementation of the Rationing Plan are as shown in Figure I-2 below. The following sections describe the duties and responsibilities of staff members.

Figure I-2 – Rationing Plan Lines of Authority



The **Manager** is the Chief Executive Officer of the City. In the absence of the **Manager** the City Council has designated the **Public Works Director** as the "Acting" Chief Executive Officer. The "Acting Chief Executive Officer" shall be construed to mean "Chief Executive Officer" in the

absence or unavailability of the **Manager**.

In the temporary absence or unavailability of the Manager or Public Works Director, the City Engineer will be authorized to act in his behalf and to carry out the necessary actions to oversee implementation of the Rationing Plan. The duties of the Chief Emergency Response Administrator in implementation of the Rationing Plan include the following:

1. Declare the need for Implementation of the Rationing Plan.
2. Determine Rationing category.
3. Determine readiness condition.
4. Determine department status.
5. Give general supervision throughout the rationing effort.
6. Keep the City Council informed.

The **Engineering Department** and the **Water Department** shall be responsible to support the City Engineer. Upon implementation of the Rationing Plan, these Departments will provide assistance in meeting the needs of the City, monitor the drinking water system physical facilities for inefficiencies and/or water loss, and prioritize water delivery.

The City's **Public Information Officer (PIO)** will be designated by the Chief Emergency Response Administrator, and will be responsible for notifying the public through mailings the news media, social media, and smart phone text alerts of issues relating to rationing.

I.2.2 RESPONSE CONDITIONS

Rationing will become necessary when demands upon the system exceed the supply of available water. As the departments move from normal operations to full rationing efforts they will do so by going through a series of response conditions. The prime indicator of a reduction in water supply will be based upon reductions in main line water pressures and/or reservoir levels. The conditions and actions to be taken are as follows:

1. **Response Condition** I - Daily Operations

   This condition reflects normal daily operations, wherein no additional rationing efforts are required. Under normal operating conditions, and given a system as large as Roosevelt City's, it is anticipated that water line breaks may occur periodically. The current normal operating pressure of the water system averages 30 to 80 pounds per square inch (psi). Normal fluctuations in water system pressure which range from 20 to 100 psi are expected due to seasonal and peak summer use periods. It is not anticipated that regular line maintenance and repair will necessitate implementation of

the Rationing Plan.

2. Response Condition II

Response Condition II will be implemented when the sustained level in the water storage tank falls below a level of 30% for a time period exceeding 24-hours. The Engineering Department will investigate the probable cause in pressure reduction and report to the Chief Emergency Response Administrator. If repairs and/or replacements are identified, the Chief Executive Officer should be notified immediately in accordance with the Emergency Response Plan (refer to Section I.1). The City may obtain additional water from the Duchesne County Water Conservancy District (DCWCD) Victory Pipeline to augment existing supplies. Rationing is not required under Response Condition II.

3. Response Condition III

Response Condition III will be implemented when the sustained pressure in the main line system falls below a pressure of 20 psi for a time period exceeding 24-hours. The Engineering Department will investigate the probable cause in pressure reduction. If repairs and/or replacements are identified, the Chief Executive Officer should be notified immediately in accordance with the Emergency Response Plan (refer to Section I.1). The City shall contact DCWCD to augment existing supplies.

The Public Information Office will be responsible to notify the public of diminished water supply, and request **voluntary** rationing of water. The public will be encouraged to limit outdoor water consumption (i.e. watering lawns, gardens, washing automobiles, etc.). The City may choose to use radio, television, newspaper, door-to-door contact, social media, smartphone text alerts, or mail rationing notices to be included within billing statements. Although the City does not have legal authority to enforce voluntary rationing of water, they can encourage water rationing through public education, increased rates, providing conservation tips, etc.

The City Parks and Recreation Department should also be informed and watering by use of the culinary water system should be limited or prohibited.

4. Response Condition IV

Response Condition IV will be implemented when the sustained pressure in the main line system falls below a pressure of 10 psi. The Engineering Department will investigate the probable cause in pressure reduction and report to the Chief Executive Officer. If repairs and/or replacements are identified, the Chief Executive Officer should be notified immediately in accordance with the Emergency Response Plan (refer to Section I.1). The City shall contact DCWCD to augment existing supplies.

Under a response condition IV, the City Emergency Operations Center (EOC) shall be activated as outlined in Section I.1. As noted previously, the City EOC staff is organized into four groups consisting of the executive group, the operations group, the communications group, and the

operations support group. (See Section I.1)

1. **Executive Group:** This group consists of the Manager, Public Works Administrator, and City Engineer.

2. **Operations Group: T**he operations assignees and their normal operations staff comprise this group and are responsible for carrying out EOC activities.

3. **Communications Group:** The communications officer appointed by the Chief Emergency Response Administrator (who is the PIO), and/or PIO directs the activities or the City communications and public information releases to the news media.

4. **Operations Support Group:** This group consists of the customer relations department and will be assisted by other staff as assigned by the EOC Manager under the direction of the Chief Emergency Response Administrator.

The Public Information Officer will be responsible to notify the public that **mandatory** rationing of all water supplies is in effect. The City may choose to use radio, television, newspaper, door- to-door contact, social media, smartphone text alerts, and mail rationing notices to be included within billing statements. Rationing efforts may include the following:

1. Even/Odd restrictions on outdoor use of water. Under this method, homes with an even numbered address would alternate water usage days with homes having odd numbered addresses.

2. Total restrictions on outdoor water usage.

3. Limitations on water usage based on highest priority need (i.e. culinary over agricultural).

I.2.3 IMPLEMENTATION

Implementation of the City's rationing plan will be by the Chief Emergency Response Administrator. Announcement of the enactment of the City's rationing plan may be done several ways, such as orally, person to person by pager, two-way radio, telephone, radio, television, newspaper, social media, text alerts, etc. This announcement will include the response condition number of the rationing plan.

1.2.4 PUBLIC INFORMATION AND CONTINUING EDUCATION

The release of information regarding rationing should be made through the Public Information Officer. The type of information given will vary with the level of rationing implemented. With this in mind, the following list provides some key points which should be utilized for successful public notification/press releases.

1. Public notification and press releases are important phases of the rationing plan.
2. Centralize new releases and statements to avoid confusing the public.
3. When responding to inquiries, make only factual responses; avoidspeculation.
4. Notify public of availability of water and precautions to be taken, if applicable.
5. Inform public of restriction in water use.
6. Inform public of consequences of misuse of the water supply. (i.e. higher water rates, diminished water supply, potential for termination of services, etc.).
7. Arrange for escorting media representatives who have proper identification through work areas or facilities, if they make a request.
8. Continue public education on a periodic basis through the duration of the rationing effort, and beyond. Public education efforts may consist of public announcement using radio, television, newspaper, notices included with billing statements, separate mailers, public meetings, and social media.

The above response conditions are not intended to limit or restrict the ability of the City to meet the demands of their customers. Rather, it provides a guideline from which management decisions can be made. The City reserves the right to select the appropriate response condition based upon the specific circumstances, the anticipated duration of rationing, existing supply reserves, and the availability of alternate water sources.

I.3 WATER SUPPLY DECONTAMINATION (REMEDIATION) PLAN

I.3.1 GENERAL

The City will address their water supply decontamination plan by using a two-step approach. The first step addresses decontamination as a generalized approach targeting a wide range of potential contaminants. The second step addresses decontamination of a narrow group of known potential contaminants. These steps are discussed in detail as follows:

I.3.2 POTENTIAL CONTAMINANTS - UNKNOWN

Generalized information regarding decontamination of water was obtained from the following sources:

1. "Ground Water Pollution Control", by L.W. Canter and R.C. Knox, Lewis Publishers, Inc., Chelsea, Michigan. 1985.

2. "Contaminant Hydrogeology", by C. W. Fetter, Department of Geology, University of Wisconsin – Oshkosh, Macmillan Publishing Company, a division of Macmillan, Inc., printed in the United States of America, New York, New York, 1993.

3. Industrial Environmental Contracting (IEC), 50 Hampton Street, P.O. Box 271, Metuchen, NJ 08840.

The Safe Drinking Water Act (SDWA) is a federal law that protects public drinking water supplies throughout the nation. Under the SDWA, the Environmental Protection Agency (EPA) sets standards for drinking water quality and with its partners implements various technical and financial programs to ensure drinking water safety.

SDWA defines a contaminant as any physical, chemical, biological or radiological substance or matter in water. Fetter (1993) indicates that different types of treatment are needed for water contaminated with heavy metals versus that contaminated by dissolved organic compounds. The type of treatment required for a particular drinking water source is dependent upon identification of the contaminants which are to be removed. Where a single contaminant is identified, the treatment system may consist of simple filtration and/or chlorination. On the other hand, cases involving multiple contaminants may require the use of multiple decontamination phases.
In the past, the accepted methods of water supply decontamination for public water suppliers were limited to chlorination, filtration, blending (dilution), and/or air and stream stripping. However, recent technological advances have provided additional decontamination methods. A partial listing of additional methods which are presently commercially available include multi-media filters, reverse osmosis, deionization, electrodialysis, softeners, pH adjustment (precipitation), dealkylizers, neutralization, ultraviolet, distillation, bioremediation, and ozone treatment.

As mentioned pollutants and contaminants can be removed from groundwater by applying various remediation techniques. This is commonly referred to as groundwater remediation and is process that is used to treat groundwater by removing the pollutants.

There are many different groundwater remediation methods, but they all have the same objective to clean polluted water (IEC).

The three most common methods of treatment of groundwater are (IEC):

1. **Physical:** The most basic type of groundwater remediation, uses air to strip water clean (air sparging). Another method physically removes the water from the ground and chemically treats it (IEC).

2. **Biological:** Biological means of remediation uses organic matter, microorganisms and plants to clean contaminated water. Bioaugmentation, bioventing, and biosparging are a few ways to use biological material to break down certain chemicals and compounds industrial waste in groundwater, often allowing treatment to be performed without the removal of the water from the supply (IEC).

3. **Chemical:** Chemical means of remediation take time and can be costly, but in certain circumstances, may be the only option. Carbon absorption, ion exchange, chemical precipitation, and oxidation are all ways to achieve clean groundwater by way of chemical remediation (IEC).

Organic contaminants are generally classified as either volatile or non-volatile. Fetter (1993) indicates that most of the organic contaminants in ground water are volatile. A characteristic of volatile organics is their relatively high vapor pressure, which is a measure of the tendency of a substance to pass from a solid or liquid phase to a gas phase. The higher the vapor pressure, the more volatile the substance, and the more readily the contaminant would move from a solid to a liquid and gas phase. Volatile organics includes 1,1,2-Trichloroethylene, 1,1,1,-Trichloroethane, 1,1-Dichloroethane, 1,2-Dichloropropane, Chloroform and Diisopropyl ether, etc. With present technology, one of the most effective means for the removal of volatile organics is through air stripping or steam stripping, also commonly referred to as air sparging.

Organic contaminants with a low vapor pressure are not readily removed using air stripping or steam stripping, and may require carbon filtration. Using this technology, the contaminated ground water is passed through an activated carbon filter, wherein the organic contaminants may be absorbed onto the activated carbon. Fetter (1993) notes that some organics "such as 1,4- dioxane, are resistant to air stripping, carbon absorption, or biological treatment. A summary of their work is as shown in Table I-2 (source: "Ground Water Pollution Control", by L.W. Canter and R.C. Knox, Lewis Publishers, Inc., Chelsea Michigan, 1985).

Table I-2 – Removal Mechanisms of Toxic Organics

	Percent Treatment Achieved		
	Stripping	**Sorption**	**Biological**
Compound			
Nitrogen Compounds			
Acrylonitrile			99.9
Phenos			
Phenol			99.9
2,4-DNP			99.3
2,4-DCP			95.2
PCP		0.58	97.3
Aromatics			
1,2-DCB	21.7		78.2
1,3-DCB			
Nitrobenzene			97.8
Benzene	2.0		97.9
Toluene	5.1	0.02	94.9
Ethylbenzene	5.2	0.19	94.6
Halogenated Hydrocarbons			

Methylene Chloride	8.0		91.7
1,2-DCE	99.5	0.50	
1,1,1-TCE	100.0		
1,1,2,2-TCE	93.5		
1,2-DCP	99.9		
TCE	65.1	0.83	33.8
Chloroform	19.0	1.19	78.7
Carbon Tetrachloride	33.0	1.38	64.9
Oxygenated Compounds			
Acrolein			99.9
Polynuclear Aromatics			
Phenanthrene			98.2
Naphthalene			98.6
Phthalates			
Bis(2-Ethyfhexyl)			76.9
Other			
Ethyl Acetate	1.0		98.8
Source: "Ground Water Pollution Control", by L.W. Canter and R.C. Knox, Lewis Publishers, Inc., Chelsea, Michigan, 1985			

A partial listing of treatment alternatives for inorganic contaminants, as prepared by Carter and Knox (1985) is as shown on Table I-3 (source: "Ground Water Pollution Control", by L.W. Canter and R.C. Knox, Lewis Publishers, Inc., Chelsea Michigan, 1985).

Table I-3 Treatment Alternatives for Inorganics

Inorganic	Treatment Method
Arsenic	Charcoal Filtration
	Lime Softening
	Precipitation with lime + iron
	Precipitation with alum
	Precipitation with ferric sulfate
	Precipitation with ferric chloride
	Precipitation with ferric hydroxide
	Precipitation with sulfide
	Ferric Sulfide Filter Bed
	Iron or Lime Coagulation + settling + dual media filtration + carbon adsorption
Barium	Iron or Lime Coagulation + settling + dual media filtration + carbon adsorption
	Precipitation as sulfate
	Precipitation as carbonate
	Precipitation as hydroxide

	Ion Exchange
Boron	Evaporation
	Reverse Osmosis
	Ion Exchange
Cadmium	Precipitation as hydroxide
	Precipitation as hydroxide + filtration
	Precipitation as sulfide
	Co-precipitation with ferrous hydroxide
	Reverse Osmosis
	Freeze Concentration
Chloride	Ion Exchange
	Electrodialysis
	Reverse Osmosis
	Other (holding basins, evaporative ponds, deep well injection)
Chromium (hexavalent)	Ion Exchange
	Freeze Concentration
	Activated Carbon
	Cementation
	Reduction (Reduce CR^{+6} to CR^{+3} and precipitation of hydroxide)
	Reduction with sulfur dioxide
	Reduction with bisulfite
	Reduction with bisulfite + hydrazine
	Reduction with metabisulfite
	Reduction with ferrous sulfate
Chromium (trivalent)	Precipitation (see above)
	Ion Exchange
Copper	Precipitation with lime
	Ion Exchange
	Evaporative Recovery
	Electrolytic Recovery
	Cementation
	Reverse Osmosis
Cyanide	Alkaline Chlorination
	Electrolysis
	Ozonation
	Evaporation
Fluoride	Precipitation by lime addition
	Precipitation by magnesium addition
	Precipitation by alum addition
	Adsorption on hydroxlapatite beds

	Adsorption on alumina contact beds
Iron	Oxidation - Precipitation by aeration, sand filtration
	Oxidation - Precipitation by aeration, lime, sand filtration
	Oxidation - Precipitation by aeration, coke bed filtration, sedimentation, sand filtration
	Oxidation - Precipitation by lime, aeration, diatomite filtration
	Oxidation - Precipitation by chlorination, alum-lime-sodium silicate precipitation, sand filtration
	(deep well disposal)
Lead	Ion Exchange
	Precipitation by lime + sedimentation
	Precipitation by caustic + sedimentation
	Precipitation by ammonium hydroxide
	Precipitation by dolomite + sedimentation
	Precipitation by sodium carbonate + filtration
	Precipitation by sodium phosphate + filtration
	Precipitation by ferric sulfate + sedimentation
	Precipitation by ferrous sulfate + sedimentation
Manganese	Aeration
	Ion Exchange
	Catalysis
	Oxidation - Precipitation by chlorine dioxide addition
	Oxidation - Precipitation by manganese dioxide addition
	Oxidation - Precipitation by potassium permanganate addition
Mercury	Precipitation by sodium sulfide addition
	Precipitation by sodium hydrosulfide addition
	Precipitation by magnesium sulfide addition
	Precipitation by sulfide addition
	Ion Exchange
	Coagulation with alum
	Coagulation with iron
	Activated Carbon
	Reduction to Metallic Form by zinc
	Reduction to Metallic Form by stannous chloride
	Reduction to Metallic Form by sodium borohydride
Nickel	Precipitation by lime
	Precipitation by sulfide
	Precipitation by alum
	Ion Exchange
	Reverse Osmosis
	Evaporative Recovery
Selenium	Coagulation with lime
	Coagulation with ferric sulfate

	Coagulation with alum
	Activate Carbon + Cation Exchange + Anion Exchange
Silver	Precipitation with ferric chloride
	Ion Exchange
	Reductive Exchange with zinc or iron
	Electrolytic Recovery
Total Dissolved Solids	Reverse Osmosis
	Electrodialysis
	Distillation
	Ion Exchange
Zinc	Precipitation by lime addition
	Precipitation by caustic addition
	Ion Exchange
	Evaporation

Source: "Ground Water Pollution Control", by L.W. Canter and R.C. Knox, Lewis Publishers, Inc., Chelsea, Michigan, 1985

As shown on Table I-3, most inorganic metals can be removed by precipitation, followed by filtration where necessary. Fetter (1993) notes the following:

> "Ferrous iron can be removed by aeration to create ferric iron, which will precipitate at a slightly alkaline pH. Hexavalent chromium may be removed by reducing the contaminant to the trivalent state by reducing the pH to 3 and then adding a reducing agent such as sulfur dioxide. The trivalent chromium can be co-precipitated with iron by adding dissolved iron at pH of 5 to 6 and then raising the pH with lime to between 8 and 9."

Nitrates cannot effectively be removed using precipitation, but may be handled using ion exchange (Fetter, 1993). Alternate decontamination methods for inorganics may also include reverse osmosis and electrodialysis.

Table I-4 below, summarizes the suitability of differing decontamination methods for given contaminant types. Due to the variation and number of potential contamination sources which exist within the Drinking Water Protection zones for the City's drinking water sources, and given continued advances that are being made to water supply decontamination technology, it is not possible, nor practical to identify a specific decontamination plan for each potential contaminant source. Effective treatment plans for ground water decontamination can be developed only after treatability studies have been conducted with representative samples to determine the appropriate treatment components.

Table I-4 – Summary of Suitability of Treatment Processes

	Volatile Organics	Non-Volatile Organics	Inorganics
Air Stripping	Suitable for most cases	Not Suitable	Not Suitable
Steam Stripping	Effective Concentrated Technique	Not Suitable	Not Suitable
Carbon Adsorption	Inadequate Removal	Effective Removal Technique	Not Suitable
Biological	Effective Removal Technique	Effective Removal Technique	Not Suitable Metals Toxic
pH Adjustment Precipitation	Not Applicable	Not Applicable	Effective Removal Technology
Electrodialysis	Not Applicable	Not Applicable	Inefficient Operation/ Inadequate Removal
Ion Exchange	Not Applicable	Not Applicable	Inappropriate Technology - Difficult Operation

Source: "Ground Water Pollution Control", by L.W. Canter and R.C. Knox, Lewis Publishers, Inc., Chelsea, Michigan, 1985

The City will continue to monitor all drinking water sources in accordance with State regulations. If water quality samples demonstrate that the City is unable to meet the minimum adopted drinking water standards at a particular water source, the City will temporarily abandon use of the offending water supply. With the assistance of the Consulting Engineer, the City will then perform treatability studies using representative samples of the contaminated ground water to determine appropriate treatment components. Factors which will be considered by the City in evaluating treatment options will include availability of appropriate decontamination technology, effectiveness, cost, etc. The City will evaluate the cost/benefits of installing the decontamination equipment versus the cost/benefits of replacing the supply with an alternate source (if available).

If an acceptable decontamination methodology is not available, or is not accepted by the City and/or the State of Utah, the drinking water source will continue in an abandoned status until such time as an acceptable decontamination technology is identified, or the drinking water source is permanently abandoned by the City, and another acceptable source is identified.

I.4 SOURCE DEVELOPMENT PLAN

Roosevelt City currently derives most of its water supply wells which include Hayden Wellfield and Durigan Well. The wells are owned and operated by the City. The City also has entered into a contract with DCWCD to obtain some water from the Victory Pipeline. As detailed in Appendix B of the 2019 Roosevelt City Masterplan Update, the City has adequate water to meet its demands over the next 25 years. The City should always explore more water sources for emergency purposes. It is difficult to determine which water sources may be deemed inactive due to contamination or other reasons. The City should always explore and develop additional water sources to supplement its water supply if needed in emergencies.

The City has been proactive in the development a secondary water system, to use water from Big Sand Wash Reservoir, to ease the burden on culinary water supplies for outdoor watering. The 2019 Roosevelt City Masterplan Update will expand the current secondary system, and further extend the life of existing culinary water supply.

ALTERNATIVE WATER SUPPLY OPTIONS

1. Surface water sources and treatment needs.

2. Bottled water supplies, delivery and distribution.

3. System interconnects with other water supplies.

4. New wells.

5. Emergency or backup wells.

6. Emergency treatment of water system.

I.5 REFERENCES

1. "Ground Water Pollution Control", by L.W. Canter and R.C. Knox, Lewis Publishers, Inc., Chelsea, Michigan. 1985.

2. "Contaminant Hydrogeology", by C. W. Fetter, Department of Geology, University of Wisconsin – Oshkosh, Macmillan Publishing Company, a division of Macmillan, Inc., printed in the United States of America, New York, New York, 1993.

3. Industrial Environmental Contracting (IEC), 50 Hampton Street, P.O. Box 271, Metuchen, NJ 08840.

APPENDIX

Forms and Checklists

INITIAL DISASTER REPORT

Date: _____ Name of Person Making Report: _____

1. What happened (e.g., flood, explosion, fire): _____
2. Date of incident: _____
3. Location of incident: _____
4. Extent of damage or loss: _____
5. Total injured, homeless, and fatalities: _____
6. Type and extent of assistance required if known: _____
7. Additional remarks: _____

FACILITY DAMAGE ASSESSMENT CHECKLIST - RESERVOIRS

Location: _____

Reservoir Capacity (MG): _____

Checked By: _____ Date: _____

Assessment of Damage Codes (Check appropriate code)

No damage	Green _____
Usable with caution	Yellow _____
Damage critical, shutdown necessary	Red _____

Code red or yellow: take necessary precautionary action and notify scene commander.

ALWAYS RED TAG SHUTDOWNS

Estimated cost to restore facility **$** _____

The following items should be checked:

1. Seepage, leaks, cracks in soil.
2. Embankment slump, landslide.
3. Inlet-outlet pipes.
4. Evidence of sub base and concrete wall damage.
5. Tank buckling.
6. Abnormal fluctuation in storage water level.
7. Telemetering and electric power sources.
8. SCADA system.
9. Backup batteries and generators.
10. Chlorine tanks and lines.
11. Structural damage.
12. Other observations (specify): _____
13. Water level: _____

FACILITY DAMAGE ASSESSMENT CHECKLIST – WELLS AND PUMP STATIONS

Location: _____

Checked By: _____ Date: _____

Assessment of Damage Codes (Check appropriate code)

No damage	Green _____
Usable with caution	Yellow _____
Damage critical, shutdown necessary	Red _____

Code red or yellow: take necessary precautionary action and notify scene commander.

ALWAYS RED TAG SHUTDOWNS

Estimated cost to restore facility **$** _____

Before trying to restore function of facility, the following should be checked:

1. Seepage, leaks, cracks in soil.
2. Embankment slump, landslide.
3. Inlet-outlet pipes.
4. Evidence of sub base and concrete wall damage.
5. Building buckling.
6. Electrical power, wires, motors, panels, breakers, transformers.
7. SCADA system.
8. Standby power generators.
9. Water lines and controls.
10. Chlorine tanks and lines.
11. Structural damage.
12. Flooding.
13. Drive shafts.
14. Other observations (specify): _____

FACILITY DAMAGE ASSESSMENT CHECKLIST – PIPES, UNDERGROUND

Location: _____

Checked By: _____ Date: _____

Assessment of Damage Codes (Check appropriate code)

No damage	Green _____
Usable with caution	Yellow _____
Damage critical, shutdown necessary	Red _____

Code red or yellow: take necessary precautionary action and notify scene commander.

ALWAYS RED TAG SHUTDOWNS

Estimated cost to restore facility **$** _____

The following should be checked:

1. Seepage, leaks, cracks in soil.
2. Embankment slump, landslide.
3. Main lines.
4. Pressure regulating control valves.
5. Irrigation canal pipe crossings.
6. Chemical spills.
7. Vacuum valves.
8. Hydrants.
9. Valves.
10. Air Release Stations.
11. Structural damage.
12. Flooding.
13. Manholes and sewer and water vaults.
14. Other observations (specify): _____

FACILITY DAMAGE ASSESSMENT CHECKLIST – BUILDINGS AND STRUCTURES

Location: _____

Checked By: _____ Date: _____

Assessment of Damage Codes (Check appropriate code)

No damage	Green _____
Usable with caution	Yellow _____
Damage critical, shutdown necessary	Red _____

Code red or yellow: take necessary precautionary action and notify scene commander.

ALWAYS RED TAG SHUTDOWNS

Estimated cost to restore facility **$** _____

The following items should be checked before entering:

1. Seepage, leaks, cracks in soil.
2. Soil conditions, landslides, embankment slump.
3. Alarms.
4. Foundation and sub base.
5. Building buckling.
6. Safety.
7. Doorway.
8. Electrical systems and downed wires.
9. Secure broken windows and doors.
10. Structural damage.
11. Vandalism.
12. Disconnect electrical, gas and water services if necessary, to assure safe entry and operation.
13. Other observations (specify): _____

Updated Drinking Water Source Protection Plan

Example Water Company
System Number 07004
Hayden Wellfield
Sources 09, 10, 11, 13 & 16 (formerly 14)

1. Introduction

System Information:

Roosevelt City
255 South State Street
Roosevelt, Utah 84066
(435) 722-5001
Community Water System



Source Information

Hayden Wellfield
Sources 09, 10, 11, 13, &16 (formerly 14)

Designated Person

Ryan Clayburn
255South State Street
Roosevelt, Utah 84066
(435) 722-5001

2. Delineation Report

No changes have been made to the well delineations. Corrections to the information contained in the previous update (Table II-1 Well Data Summary) are shown in bold print.

Hayden Well #5 (WS014) was replaced in 2009 (WS016). A description of how the new well characteristics affected the delineation zones is described below. Supporting documents and calculations are located in Appendix A.

The original "Drinking Water Source Protection Plan" for the Hayden Well Field was conducted in June 2004. The report was approved by the State of Utah, and in

that report, they hydraulic conductivity (K) was determined from the Cooper-Jacobs Equation solution for pumping tests in confined aquifers.

Cooper-Jacobs Equation for single point transmissivity:

$$T=\frac{264(Q)}{s}\log\frac{(0.3Tt)}{(r^2S)}$$

$$K=\frac{T\ (ft^2/day)}{H}$$

Where:

- s = drawdown (ft)
- Q = pumping rate (gpm)
- T = transmissivity (gpd/ft) → (ft^2/day)
- t = pumping time (day)
- r = well radius (ft)
- S = storage coefficient (0.005 - 0.00005)
- K= hydraulic conductivity (ft/day)
- H= aquifer thickness (ft)

The delineation zones were determined from the draw from the Hayden Well Field from the unconfined aquifer. Of the five wells in the well field, wells with the highest pumping rates were used in the analysis of K. Those pumping rates were 1,500 gpm and 1,800 gpm, and the aquifer thicknesses were 190 and 177. K values were calculated using the T (transmissivity) results from the Cooper Jacobs equation using the low and high end storage coefficient. Pump tests yielded a K value range between 43 and 64 ft/d. The width of the management area was determined using a K value of 43 ft/d. The length of the zone was determined using 64 ft/d to offer a conservative estimate of management zones. The saturated layer yielded T values between 7,688 and 12,182 ft^2/d

Based on storage coefficient values that range between 0.005 and 0.00005, K and T were calculated for the Hayden Replacement #5 WS016 (formerly WS014). For the purposes of this update, it will be referred to as WS016. Although the well drillers report indicates that the maximum pumping rate is 1,400 gpm, according to Roosevelt City officials and flow records obtained by Roosevelt City, the maximum flow that WS016 has been equipped to deliver is approximately 1,120 gpm. At an aquifer thickness of 143 ft, this yields K values ranging between 35 and 46 ft/d, and T values ranging between 5,007 and 6,590 ft^2/d.

Since the maximum K value is less than what was used to calculate the zone length, and the minimum K value is less than the K value determined to calculate the zone width, it was determined that there would be no impact to the original delineation zone by the current Hayden Well Field.

Table II-1 Well Data Summary

Source #	9	10	11	13	**16 (formerly 14)**
Well #	1	2	3	4	5
Casing Size	12-inch	12-inch	20-inch	**12-inch**	16-inch
Depth	190-feet	185-feet	215-feet	220-feet	206-feet
Perforation Interval	60' to 165'	85' to 142' 148' to 162' 170' to 180'	70' to 210'	90' to 220'	**100' to 121.6'; 121.6' to 154'; 154' to 186.6'**
Perforation of Screen	3/8" x 3-1/2" Mills	3/8" x 3-1/2" Mills	14-inch No. 50 SS screen	8-inch No. 50 SS screen	16-inch No. **50/100/50** SS screen
Type Method of Well Construction	Cable Tool	Cable Tool	Cable Tool	Cable Tool	Dual Rotary
Type and Location of Pump	Submersible set at 150 feet	**Vertical Turbine w. VFD set at 150 feet**	**Vertical Turbine w. VFD set at 170 feet**	Submersible set at 190 feet	Vertical Turbine w/ VFD set at 180 feet
Max. Project Pumping Rate	1,220 gpm	1,185 gpm	1,860 gp,	865 gpm	1,120 gpm

3. Inventory of Potential Contamination Sources (PCS) (incl. List, hazards, prioritization, location and map)

No changes.

4. Assessment of PCS Hazards

No changes.

5. Management of Existing Potential Contamination Sources

Roosevelt City management strategies are summarized below:

A. Inform PCS that they are within the DWSP zones.
B. Annually send mailer or information packet.
C. Request that all pits be properly lined to prevent leaching,
D. Request the business or resident to notify the City if a leak or spill occurs.
E. Request the Division of Oil, Gas and Mining to notify the City if the status of the well changes.
F. Get on mailing list from the State for copies of inspection reports or certificates of compliance.

6. Management of Future Potential Contamination Sources

If a new PCS (for example, a residence) is identified within the protection areas for the Hayden Wellfield, the system agrees to:

1. Contact each PCS as it moves into the protection areas
2. Determine whether it is actually a PCS
3. If it is, add it to your inventory
4. Identify and assess it's controls, and
5. Plan and implement land management strategies, if the PCS is not adequately controlled.

7. Implementation Schedule

The system agrees to take the following actions described in Section 5 by January 2018.

8. Resource Evaluation

The actions described in this plan will have a minimal effect on the water system's resources, and can be completed with the system's existing resources.

9. Recordkeeping Section

The system will keep records of the actions described in Section 5. These records will become the basis for providing updated Drinking Water Source Protection (DWSP) Plans to the Division of Drinking Water in the future, so it is important that actions related to source protection be recorded.

10. Contingency Plan

Previously approved by the Division, no changes

11. Public Notification

Previously approved by Division, no changes. .

12. Waivers

Currently Roosevelt City operates under reliable and consistent waivers for monitoring for VOCs and Pesticides. The City wished to continue under this reliable and consistent waiver.

Appendix A

- **Calculations**
- **24 hour drawdown**
- **Hayden #5 Replacement - Well Driller's Report**
- **Disinfection Test Results**

Appendix A
Calculations

Cooper-Jacobs Equation
Storage coefficient values range between 0.005 and 0.00005

Hayden #5 WS016 (formerly WS014)

Q(gpm)	1,120	flow
s(ft)	52.92	drawdown
T(gpd/ft)	37,454	Transmissivity
t(day)	1	Pumping Time
r(ft)	0.67	well radius
S	0.005	Storage Coefficient
H	142.85	Aquifer Thickness

K(ft/day)	35.05
T(gpd/ft)	37,454.24
T(ft^2/day)	5,006.88
Q/s	21.16

Q(gpm)	1,120	flow
s(ft)	52.92	drawdown
T(gpd/ft)	49,295	Transmissivity
t(day)	1	Pumping Time
r(ft)	0.67	well radius
S	0.00005	Storage Coefficient
H	142.85	Aquifer Thickness

K(ft/day)	46.13
T(gpd/ft)	49,294.71
T(ft^2/day)	6,589.72
Q/s	21.16

Initial Depth to Water= 72.152
Final Depth to Water= 125.075

Well Depth= 215

$$T = \frac{264(Q)}{s} \log \frac{(.3Tt)}{(r2S)}$$

Report Date: 8/28/2009 10:23:38 AM
Report User Name: Brandi
Report Computer Name: SHOP2-OFFICE

Log File Properties:

File Name: no. 2 step draw roosevelt 2009-08-21 09.59.34.wsl
Create Date: 8/21/2009 9:59:21 AM

Device Properties:

Device: Level TROLL® 700
Site: step draw down 2
Device Name:
Serial Number: 104798
Firmware Version: 2.07

24 hrs.

Log Configuration

Log Name: no. 2 step draw roosevelt
Created By: Unknown
Computer Name: Pocket PC
Application: WinSituMobile.exe
Application Version: 5.3.0.3
Create Date: 8/20/2009 9:52:54 AM
Notes Size(bytes): 4096
Type: Step Linear
Overwrite when full: Disabled
Scheduled Start Time: Manual Start
Scheduled Stop: No Stop Time
Steps: 7

Step: 1
Duration: Days: 0 Hours: 00 Mins: 02 Secs: 00
Interval: Days: 0 Hours: 00 Mins: 00 Secs: 10
Step: 2
Duration: Days: 0 Hours: 00 Mins: 03 Secs: 00
Interval: Days: 0 Hours: 00 Mins: 00 Secs: 30
Step: 3
Duration: Days: 0 Hours: 00 Mins: 10 Secs: 00
Interval: Days: 0 Hours: 00 Mins: 01 Secs: 00
Step: 4
Duration: Days: 0 Hours: 00 Mins: 45 Secs: 00
Interval: Days: 0 Hours: 00 Mins: 05 Secs: 00
Step: 5
Duration: Days: 0 Hours: 01 Mins: 00 Secs: 00
Interval: Days: 0 Hours: 00 Mins: 10 Secs: 00

Step: 6
Duration: Days: 0 Hours: 06 Mins: 00 Secs: 00
Interval: Days: 0 Hours: 00 Mins: 30 Secs: 00
Step: 7
Duration: Days: 0 Hours: 16 Mins: 00 Secs: 00
Interval: Days: 0 Hours: 01 Mins: 00 Secs: 00

Level Reference Settings At Log Creation
Level Measurement Mode: Level Depth To Water
Specific Gravity: 0.999
Level Reference Mode: Set new reference
Level Reference Value: 72.5 (ft)
Level Reference Head Pressure: 46.5851 (PSI)
Temperature: 53.8105 (F)
Depth of Probe: 107.596 (ft)

Log Notes:

Date and Time	Note
6/10/1971 7:18:00 PM	User Note: "Level reference initialized to: 72.5"
6/10/1971 7:19:02 PM	Manual Start Command

Log Data:
Record Count: 72

Sensor: Pres 500G 104798 Date and Time	Elapsed Time Seconds	Sensor: Pres 500G SN#: 104798 Pressure (PSI)	Sensor: Pres 500G SN#: 104798 Level Depth To Water (ft)	SN#: Temperature (F)
6/10/1971 7:19:02 PM	0.000	46.736	72.152	53.718
6/10/1971 7:19:12 PM	10.001	46.742	72.138	

53.722			
6/10/1971 7:19:22 PM	20.001	46.715	72.200
53.720			
6/10/1971 7:19:32 PM	30.002	46.723	72.192
53.715			
6/10/1971 7:19:42 PM	40.001	46.713	72.204
53.718			
6/10/1971 7:19:52 PM	50.001	46.709	72.214
53.713			
6/10/1971 7:20:02 PM	60.001	46.707	72.218
53.711			
6/10/1971 7:20:12 PM	70.001	46.735	72.154
53.715			
6/10/1971 7:20:22 PM	80.001	46.724	72.179
53.711			
6/10/1971 7:20:32 PM	90.001	46.721	72.186
53.707			
6/10/1971 7:20:42 PM	100.001	46.448	72.818
53.704			
6/10/1971 7:20:52 PM	110.001	44.137	78.151
53.708			
6/10/1971 7:21:02 PM	120.001	42.848	81.129
53.695			
6/10/1971 7:21:32 PM	150.001	42.654	81.576
53.696			
6/10/1971 7:22:02 PM	180.001	39.835	85.085
53.701			
6/10/1971 7:22:32 PM	210.001	38.486	91.199
53.707			
6/10/1971 7:23:02 PM	240.001	37.650	93.130
53.706			
6/10/1971 7:23:32 PM	270.001	37.073	94.463
53.712			
6/10/1971 7:24:02 PM	300.001	36.642	95.450
53.709			
6/10/1971 7:25:02 PM	360.001	35.935	97.091
53.712			
6/10/1971 7:26:02 PM	420.001	35.434	98.247
53.711			
6/10/1971 7:27:02 PM	480.001	34.990	99.273
53.710			
6/10/1971 7:28:02 PM	540.001	34.662	100.030
53.707			
6/10/1971 7:29:02 PM	600.001	34.399	100.636

53.708				
6/10/1971 7:30:02 PM	660.001	34.365	100.715	
53.706				
6/10/1971 7:31:02 PM	720.001	34.352	100.745	
53.705				
6/10/1971 7:32:02 PM	780.001	34.375	100.692	
53.704				
6/10/1971 7:33:02 PM	840.001	34.373	100.696	
53.702				
6/10/1971 7:34:02 PM	900.001	34.364	100.717	
53.701				
6/10/1971 7:39:02 PM	1200.001	34.342	100.768	
53.698				
6/10/1971 7:44:02 PM	1500.001	33.226	103.345	
53.699				
6/10/1971 7:49:02 PM	1800.001	32.251	105.596	
53.687				
6/10/1971 7:54:02 PM	2100.001	31.693	106.886	
53.678				
6/10/1971 7:59:02 PM	2400.001	31.291	107.813	
53.645				
6/10/1971 8:04:02 PM	2700.001	30.913	108.687	
53.631				
6/10/1971 8:09:02 PM	3000.036	30.634	109.331	
53.659				
6/10/1971 8:14:02 PM	3300.045	30.417	109.832	
53.661				
6/10/1971 8:19:02 PM	3600.056	30.193	110.349	
53.661				
6/10/1971 8:29:02 PM	4200.001	29.801	111.253	
53.657				
6/10/1971 8:39:02 PM	4800.111	29.524	111.894	
53.705				
6/10/1971 8:49:02 PM	5400.133	29.301	112.409	
53.702				
6/10/1971 8:59:02 PM	6000.001	29.146	112.766	
53.650				
6/10/1971 9:09:02 PM	6600.001	28.995	113.115	
53.650				
6/10/1971 9:19:02 PM	7200.021	28.803	113.558	
53.648				
6/10/1971 9:49:02 PM	9000.034	28.482	114.299	
53.653				
6/10/1971 10:19:02 PM	10800.109	28.238	114.864	

53.638			
6/10/1971 10:49:02 PM	12600.129	28.027	115.351
53.644			
6/10/1971 11:19:02 PM	14400.140	27.841	115.779
53.675			
6/10/1971 11:49:03 PM	16200.159	27.692	116.123
53.676			
6/11/1971 12:19:02 AM	18000.119	27.621	116.287
53.642			
6/11/1971 12:49:02 AM	19800.001	27.544	116.465
53.637			
6/11/1971 1:19:02 AM	21600.001	27.375	116.854
53.639			
6/11/1971 1:49:02 AM	23400.001	27.304	117.021
53.641			
6/11/1971 2:19:02 AM	25200.011	27.204	117.251
53.643			
6/11/1971 2:49:02 AM	27000.041	27.106	117.477
53.641			
6/11/1971 3:19:02 AM	28800.127	27.046	117.616
53.639			
6/11/1971 4:19:02 AM	32400.001	26.916	117.916
53.638			
6/11/1971 5:19:02 AM	36000.001	26.868	118.026
53.631			
6/11/1971 6:19:02 AM	39600.001	25.663	120.808
53.632			
6/11/1971 7:19:02 AM	43200.001	25.456	121.286
53.636			
6/11/1971 8:19:02 AM	46800.001	25.375	121.472
53.628			
6/11/1971 9:19:02 AM	50400.001	25.295	121.658
53.653			
6/11/1971 10:19:02 AM	54000.001	25.185	121.913
53.651			
6/11/1971 11:19:02 AM	57600.001	25.061	122.199
53.653			
6/11/1971 12:19:02 PM	61200.001	24.514	123.461
53.659			
6/11/1971 1:19:02 PM	64800.001	24.288	123.983
53.661			
6/11/1971 2:19:02 PM	68400.001	24.298	123.959
53.660			
6/11/1971 3:19:02 PM	72000.001	24.108	124.400

53.654			
6/11/1971 4:19:02 PM	75600.001	24.116	124.380
53.653			
6/11/1971 5:19:02 PM	79200.001	24.046	124.542
53.659			
6/11/1971 6:19:02 PM	82800.001	23.935	124.799
53.652			
6/11/1971 7:19:02 PM	86400.001	23.815	**125.075**
53.654			

24.0 hrs

WELL DRILLER'S REPORT
State of Utah
Division of Water Rights

For additional space, use "Additional Well Data Form" and attach

Well Identification

Water Right: 43-7253 WIN: 3361

Owner *Note any changes*

Roosevelt City Corporation
255 South State Street (36-8)
Roosevelt UT 84066

Contact Person/Engineer: Horrocks Engineer

Well Location *Note any changes*

S 1677 W 399 from the NE corner of section 27, Township 1N, Range 1W, US B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation, local well #)

Drillers Activity Start Date: 6-19-09 Completion Date: 8-30-09

Check all that apply: ☐ New ☐ Repair ☐ Deepen ☐ Clean ☒ Replace ☐ Public Nature of Use:

If a replacement well, provide location of new well. 75 feet north/south and 79 feet east/west of the existing well

DEPTH (feet) FROM	TO	BOREHOLE DIAMETER (in)	DRILLING METHOD	DRILLING FLUID
0	27	30"	Dual Rotary	None
27	106	24"	Dual Rotary	water/foam
106	215	20"	Dual Rotary	water/foam

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE Hard	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture, degree of weathering, hardness, water quality, etc.)
0	20		x				x	x		x				
20	21	x			x		x	x						
21	120						x	x		x				
120	140	x												some water
140	210	x												lots of water
210	215				x								blue/green	

Static Water Level

Date 8-20-09 Water Level 72.152 feet Flowing? ☐ Yes ☒ No

Method of Water Level Measurement probe If Flowing, Capped Pressure PSI

Point to Which Water Level Measurement was Referenced surface Elevation

Height of Water Level reference point above ground surface 0 feet Temperature 54 degrees ☐ C ☒ F

Well Log

Construction Information

DEPTH (feet) FROM	TO	CASING: CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM (in)	DEPTH (feet) FROM	TO	☐SCREEN ☐PERFORATIONS ☐OPEN BOTTOM: SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)
-2	100		.375	16	100	121.6	50		johnson
185	206		.375	16	121.6	154	100		johnson
					154	186.6	50		johnson

Well Head Configuration: welded cap — Access Port Provided? ☐Yes ☒No

Casing Joint Type: welded — Perforator Used:

Was a Surface Seal Installed? ☑Yes ☐No — Depth of Surface Seal: 100 feet — drill Shoe? ☐Yes ☒No

Surface Seal Material Placement Method: pumped

Was a temporary surface casing used? ☑Yes ☐No If yes, depth of casing: 100 feet diameter: 30"/24" inches/20"

DEPTH (feet) FROM	TO	SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION: SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	Quantity of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)
0	100	cement	25 yards	12-14 bags sand cement-8 bags concrete

Well Development and Well Yield Test Information

DATE	METHOD	YIELD	Units Check One GPM	Units Check One CFS	DRAWDOWN (ft)	TIME PUMPED (hrs & min)
	Air	800	x			70hr plus
	Pumped (submersible)	1300	x			90hr plus

Pump (Permanent)

Pump Description: 1300 — Horsepower: 125 — Pump Intake Depth: 200 feet

Approximate Maximum Pumping Rate: 1400 — Well Disinfected upon Completion? ☒Yes ☐No

Comments

Description of construction activity, additional materials used, problems encountered, extraordinary circumstances, abandonment procedures. *Use additional well data form for more space.*

Great well, lots more water down there- might pump 1600 GPM

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name: AQUA DESIGN INC. — License No.: 320

Signature: Richard Potter — Date: Sept. 2 2009

Chemtech-Ford Laboratories

Certificate of Analysis

Roosevelt City Corporation
Attn: Rick Stewart
255 South State 36-8
Roosevelt, UT 84066

Sample Type: Drinking Water
Sampler: Rick Stewart
Phone: (435) 722-5001
Fax: (435) 722-5000
Email:

Lab No	Date/Time Sampled	Analysis	Result	Units	Method	Test Initiated Date/Time	Test Finished Date/Time
Sample ID: Hayden Well #5						*Use:* Routine	
Comments:						*Repeat Sample:*	
System No.: UTAH07004						*Failure Date:*	
0905579-01	8/24/2009 11:00	Coliform, Total	Absent	Org/100 mL	9223B-PA	8/24/2009 16:00	8/25/2009 16:00
0905579-01	8/24/2009 11:00	E. Coli	Absent	Org/100 mL	9223B-PA	8/24/2009 16:00	8/25/2009 16:00
Sample ID: Hayden Well #5						*Use:* Routine	
Comments:						*Repeat Sample:*	
System No.: UTAH07004						*Failure Date:*	
0905579-02	8/24/2009 11:00	Coliform, Total	Absent	Org/100 mL	9223B-PA	8/24/2009 16:00	8/25/2009 16:00
0905579-02	8/24/2009 11:00	E. Coli	Absent	Org/100 mL	9223B-PA	8/24/2009 16:00	8/25/2009 16:00

Laboratory Director, David Gayer

Updated Drinking Water Source Protection Plan

Roosevelt City

System Number 07004

Sprouse (Durrigan) Well #1
Source #15

1. Introduction

System Information:

Roosevelt City
255 South State Street
Roosevelt, Utah 84066
(435) 722-5001
Community Water System

Source Information

Sprouce Wellfield
Sources #15

Designated Person

Ryan Clayburn
255South State Street
Roosevelt, Utah 84066
(435) 722-5001

2. Delineation Report

No changes have been made to the Sprouce/Durrigan Well delineation.

3. Inventory of Potential Contamination Sources (PCS) (incl. List, hazards, prioritization, location and map)

No changes.

4. Assessment of PCS Hazards

The septic systems, animal feed operations and other water wells within the Management Area have been abandoned or removed since the original PCS inventory.

The inactive gravel mining operation identified in the original PCS was developed by the Ute Tribe into a recreational pond. This pond is located in Zone 2 and on Indian Lands. Based upon observations during construction, it appears that a clay liner was installed to reduce the infiltration of the pond. See Figure 1, attached, for an aerial image of the pond.

5. Management of Existing Potential Contamination Sources

Roosevelt City management strategies are summarized below:

A. Inform PCS that they are within the DWSP zones.
B. Annually send mailer or information packet.
C. Request that all pits be properly lined to prevent leaching,
D. Request the business or resident to notify the City if a leak or spill occurs.
E. Request the Division of Oil, Gas and Mining to notify the City if the status of the well changes.
F. Get on mailing list from the State for copies of inspection reports or certificates of compliance.

6. Management of Future Potential Contamination Sources

If a new PCS (for example, a residence) is identified within the protection areas for the Hayden Wellfield, the system agrees to:

1. Contact each PCS as it moves into the protection areas
2. Determine whether it is actually a PCS
3. If it is, add it to your inventory
4. Identify and assess it's controls, and
5. Plan and implement land management strategies, if the PCS is not adequately controlled.

7. Implementation Schedule

The system agrees to take the following actions described in Section 5 by January 2018.

8. Resource Evaluation

The actions described in this plan will have a minimal effect on the water system's resources, and can be completed with the system's existing resources.

9. Recordkeeping Section

The system will keep records of the actions described in Section 5. These records will become the basis for providing updated Drinking Water Source Protection (DWSP) Plans to the Division of Drinking Water in the future, so it is important that actions related to source protection be recorded.

10. Contingency Plan

Previously approved by the Division, no changes

11. Public Notification

Previously approved by Division, no changes. .

12. Waivers

Currently Roosevelt City operates under reliable and consistent waivers for monitoring for VOCs and Pesticides. The City wishes to continue under this reliable and consistent use waiver.

Exhibit 1 – Ute Tribal Recreation Pond

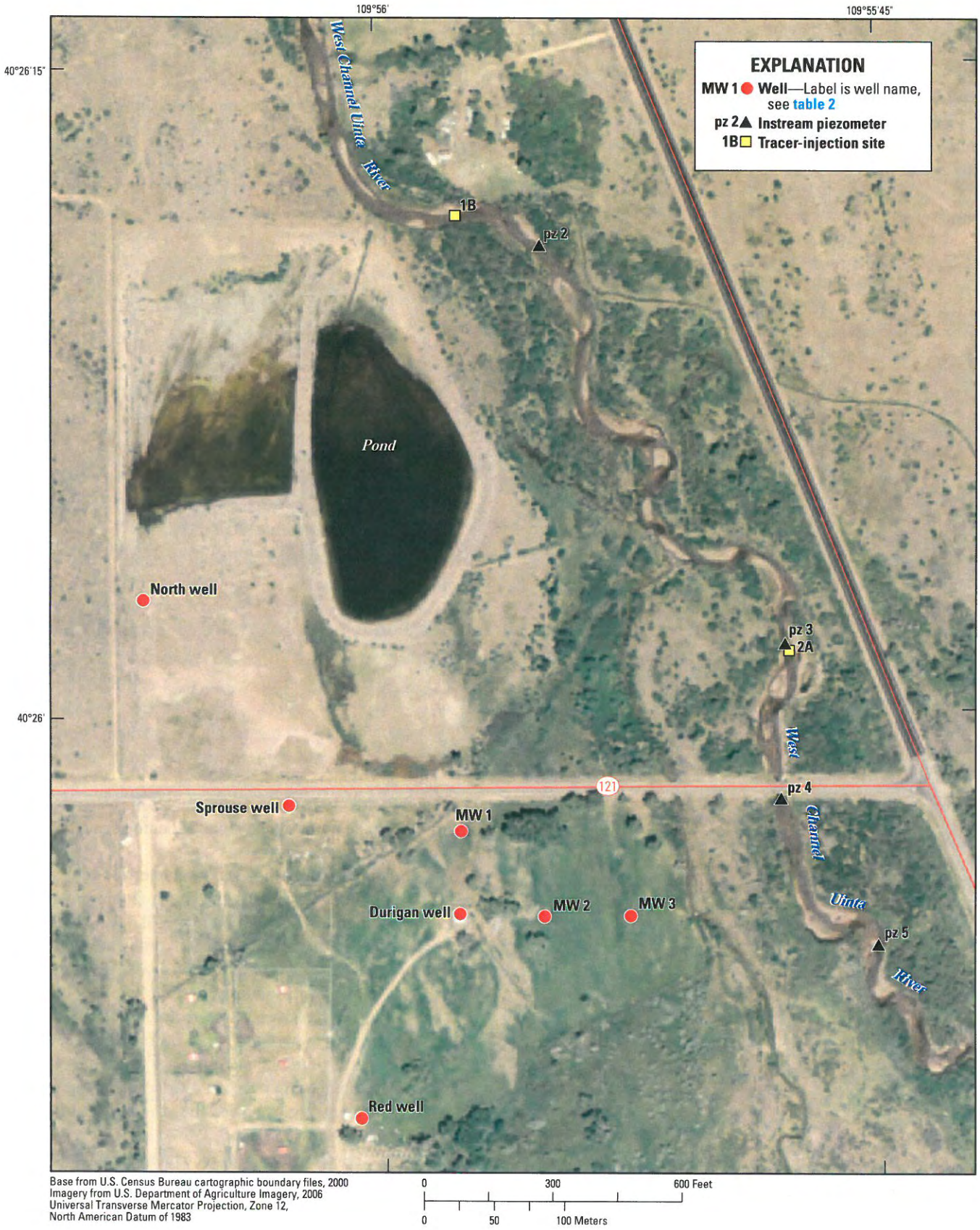


Figure 2. Location of the Sprouse well field adjacent to the West Channel of the Uinta River, Roosevelt Valley, Utah.