HELENA MONTANA

QUEEN CITY OF THE ROCKIES

Helena Water Facilities Plan

CHAPTER 1 – EXECUTIVE SUMMARY

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Introduction

The City of Helena currently provides water to City rate payers. In the future the water service is expected to expand to include portions of the Central Valley, North Valley, and the West Side. In order to continue to accommodate growth in the Helena area, and to best use water resources and funds available to the City, the City needs to plan for the future of its water system. This Water Facilities Plan defines the condition of the existing infrastructure and describes improvements necessary to provide water efficiently for the future. This chapter presents an executive summary of the Helena Water Facilities Plan. It briefly describes the chapter contents of this document.

Overview of the Recommended Plan

In the recommended plan, City supply will be treated at the City's two main treatment facilities, Missouri River Water Treatment Plant (MRTP) and Tenmile Water Treatment Plant (TTP). The Hale Zone supply will ultimately be abandoned. Groundwater was deemed not viable as a long-term source of supply based on unsuccessful efforts to develop municipal wells in 1998, the impact a large municipal well may have on surrounding wells, the potential costs involved in treating for arsenic and radon, and the potential negative impacts of mixing groundwater with surface water in the distribution system.

It is recommended that the MRTP be improved to more reliably treat flows year round and provide the larger portion of the City's water supply. The plan includes phased improvements to MRTP to allow use of grants and matching funds as they become available. In addition, the plan includes the addition of two storage reservoirs (one on the west end and one in the low zone) two new pump stations (one to the north and one at the low zone reservoir), extension of service to serve growth to the north and east, and improvements to the existing system to improve fire flows.

Treatment Plant Recommendations

The City will maintain its two existing water treatment plants. To meet future regulations and growth needs, a program of sequential improvement sized to match anticipated grant funds was created.

- **New transfer pumps station, high zone station and clearwell.** Currently the MRTP capacity is limited by disinfection capacity. In there future the City rely more heavily on the MRTP, more so by reversing the roles of the treatment plants. This project is critical to the City's ability to meet current and future demands. Constructing this project increases the plant pumping capacity to 13 MGD, to meet the 2025 maximum day demand.

- **New Pretreatment with DAF.** The current pretreatment is ineffective. Even with large alum doses, turbidities onto the filters are the same or exceed raw water turbidities. New pretreatment would improve filter operation, save chemical costs by significantly reducing alum dose, and provide an additional pathogen barrier.

- **Raw Water Pump Station and Intake.** The gravity capacity of the existing MRTP raw water transmission main is 12 MGD at full pool, 9 MGD at low pool. The 2025

design flow for MRTP is 13 MGD. If Helena Valley Irrigation District adjusts its management of the reservoir such that full pool is not maintained during the summer months, or the demand at MRTP exceeds 12 MGD, this project will move forward.

Distribution System Recommendations

The goal for water distribution is to provide adequate fire flows and to serve growth, through storage reservoirs, pump stations and the addition or replacement of water lines. Fire flow analyses were based on criteria established and approved by the City. Future flows were based on 20 year and buildout flow projections.

Storage

The recommended plan includes construction of two new storage reservoirs out in the distribution system (in additional to clearwell construction at MRTP), one in the Low Zone, one on the West Side.

Pump Stations

The recommended plan includes improvements to Dahlhausen (in addition to a new high service station at MRTP).

Fire Flow Improvements

Numerous projects, totaling 28 miles of water line, are identified to improve fire flows around the City. The projects are described by service area and include the area around the airport, the area around Carroll College, the Hale Zone, West Side, Central Helena and the Area in the vicinity of the railroad.

Estimated Costs

The recommended plan has an estimated capital cost of $16 million in treatment plant improvements, $36 million in existing distribution system improvements, and $25 million in water system extension projects.

Funding Sources

A number of funding sources will be used to pay for the recommended plan, including federal and state grant funds, and water system rates. Projects have been identified that would position the City to maximize the use of grant funds and minimize impacts to City rate payers.

Existing System Description (Chapter 3)

The City of Helena is served by two surface water treatment plants, a spring and a well. The distribution system includes a pipe distribution networks, eight storage tanks, and seven pumping stations.

Treatment Facilities/Supplies

The City of Helena operates two surface water treatment plants, the Tenmile Water Treatment Plant (TTP) and the Missouri Water Treatment Plant (MRTP). The TTP was constructed in 1990. The TTP uses contact adsorption clarifiers and conventional filtration

for turbidity removal and gas chlorination for disinfection. The TTP is on the west end of the City. Finished water is delivered by gravity.

The MRTP was originally constructed in 1952. The MRTP uses sedimentation and conventional filtration for turbidity removal and gas chlorination for disinfection. The plant includes two pump stations (high zone and low zone) to deliver finished water.

The Hale Supply consists of two sources, Orofino and Eureka. The Orofino collector system obtains its water from a spring and shallow groundwater supplies captured by an infiltration system. The Eureka collector and well sump lifts shallow groundwater captured from a historic mine shaft.

Distribution System

The City's distribution system consists of two large pressure zones and five smaller zones. The system is served by eight reservoirs and pump stations located on the south end of the City. The large zones are the Upper and Lower Malben-Woolston Zone. The five smaller zones are the Winne Zone, the Hale Zone, the Upper Hale Zone, Reeder's Village, and Forrest Estates.

Water Quality and Regulatory Review (Chapter 4)

There are numerous current and future regulations the City's water system must comply with. The regulation having the most immediate impact will be the passage of the groundwater rule, which will impact that area served directly from the Eureka well.

The Stage 2 Disinfection By-Products Rule will also require the City to increase the number of samples taken throughout the distribution system for TTHMs and HAA5s. The results of this sampling could impact future disinfection options for the City.

Water Demand Forecast (Chapter 5)

The City of Helena water service planning area includes the existing City limits, the Fort Harrison area, the Central Valley, North Valley, and the West Side. Figure 1-1 shows the existing and future service areas.

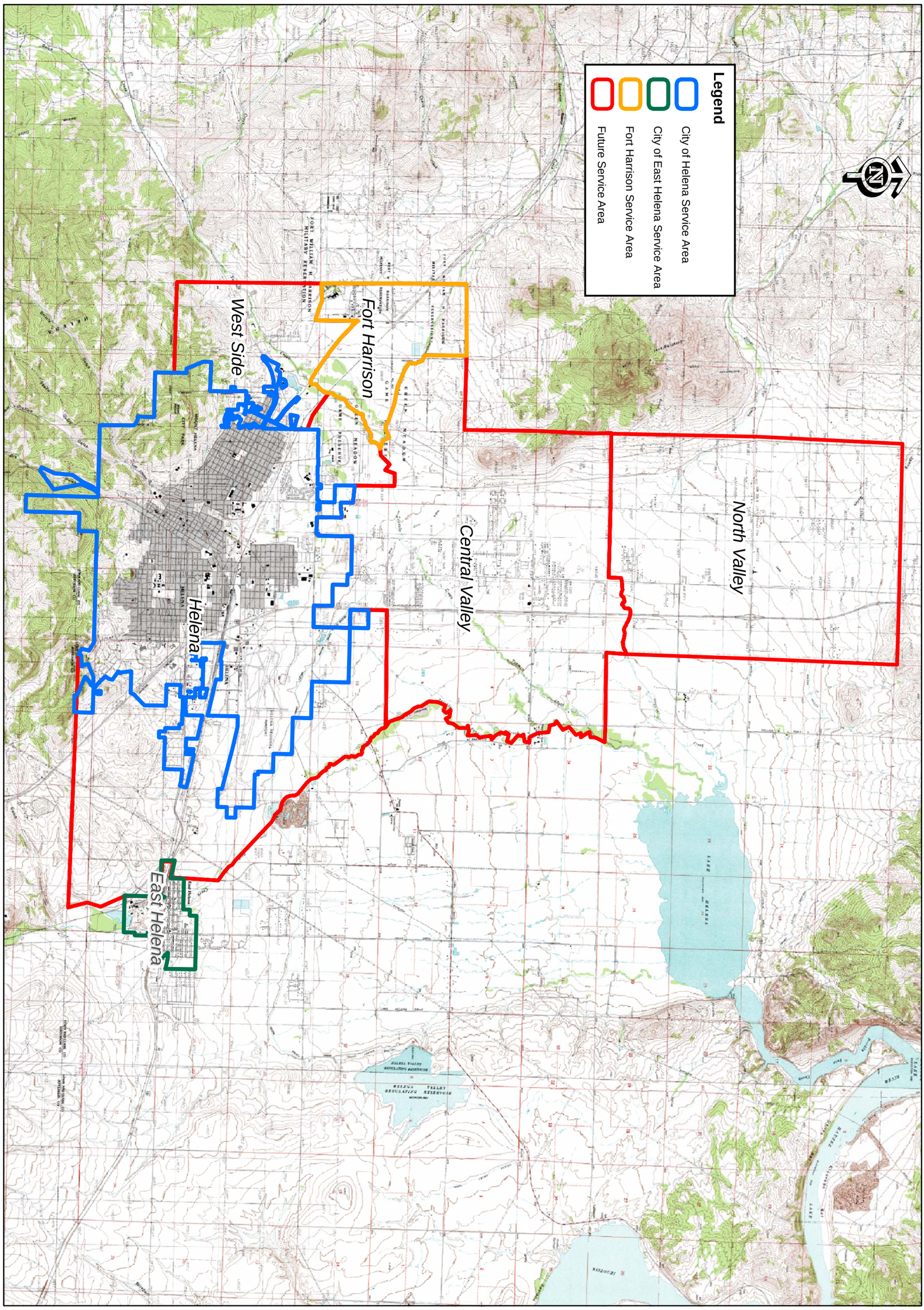

Figure 1-1
Current and Future Water Service Area

City of Helena
Water Facilities Plan

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Table 1-1 presents the projected populations for these areas in 2025, and in 2045.

Table 1-1 Population Projections [1]

	2005	2025[1]	Buildout
City of Helena	31,005	35,986	40,493
Central Valley	330	9,670	15,166
North Valley	0	853	4,588
West Side	540	3,300	4,060
Fort Harrison	162	212	258
Service Area Population	32,037	50,021	64,565

[1] Population projections based on 1998 Helena Area Wastewater Treatment Plan.

Projected water demands were developed based population and service area projections. Table 1-2 shows these demands. The recommended upgrades to the system would provide adequate flow to meet demands in 2025.

Table 1-2 2025 Water Demands for City of Helena Service Area

	2025 Population	Average Annual (MGD)	Maximum Day (MGD)
City of Helena	35,986	6.3	15.1
Central Valley	9,670	1.7	4.1
North Valley	853	0.1	0.2
West Side	3,300	0.6	1.4
Fort Harrison	212	0.04	0.1
Total	**50,021**	**8.7**	**20.9**

Treatment Plant Analysis (Chapter 6)

This chapter of the plan evaluated the ability of the City's two treatment plants to meet 2025 and long term needs. Table 1-3 shows the percent of supply that would come from each source now, in 2025 and in 2045. Given that the Tenmile is supply is essentially maximized today, a larger and larger percentage of water comes from MRTP into the future; 40% in 2025 and 55% in 2045.

Table 1-3 Existing Capacities and Projected Use

Water Source	Estimated Capacity (MG/yr)			Projected Annual Use in 2025 (MG/yr)			Projected Annual Use in 2045 (MG/yr)		
	Raw	Finished	Percent	Raw	Finished	Percent	Raw	Finished	Percent
Tenmile Supply	1,960[1]	1,867	33.5%	1,960	1,867	59.5%	1,960	1,867	45.3%
MR Supply	3,676[2]	3,501	62.9 %	1,335	1,272	40.5%	2,370	2,257	54.7%
Hale Zone Supply	200	200	3.5%	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]
Total	5,810	5,568	100%	3,295	3,139	100%	4,330	4,124	100%

A review of each TTP process was conducted with minor improvements recommended. Alternatives reviewed for process improvements at MRTP are shown in Table 1-4. Options evaluated for the Hale (Orofino) source are in Table 1-5.

Table 1-4 MRTP Alternative Processes Reviewed

Process Step	Alternatives Analyzed
Raw Water Delivery – Increasing Capacity	Parallel pipeline
	Increasing operating level of Regulating Reservoir
	Construction of booster pumping station
Pretreatment	Plate Settling
	Dissolved Air Flotation (DAF)
	Ballasted Sedimentation
Taste and Odor Control	Chlorine dioxide and powder activated carbon (PAC)
	Ozone and peroxide
	UV and peroxide
Disinfection	Upgrade Existing Chlorine Gas
	Liquid Chlorination
	On site generation
	UV

Table 1-5 Hale Alternatives

Process Step	Alternatives Analyzed
Orofino	Provide filtration
	Meet criteria to avoid filtration
	Permanently disconnect source
	Seek new source to replace

Distribution System Analysis (Chapter 7)

The distribution system was analyzed for fire flows, storage needs, the ability to serve growth and to provide system redundancy. Fire flow needs were analyzed by building type, in each pressure zone. Storage was analyzed to determine needs for equalization and emergency storage needs. Pump stations were reviewed for their ability to meet demands under normal system operation and operating during a power failure. Alternative ways to feed the Hale Zone were reviewed. Each zone was analyzed for storage requirements, pump station, and piping needs under both existing conditions and future conditions.

Role Reversal Analysis (Chapter 8)

This chapter reviewed the impacts of revering the roles of the two treatment plants; making MRTP the year-round facility and operating TTP in the summer (rather than the reverse).

The long-term benefits of reversing the supply and treatment roles for the ratepayers, the public and the watersheds are significant. The reversal of roles of the TTP and MRTP has several distinct advantages:

1. Increases summer in-stream flows in Tenmile Creek, which is good for the impaired watershed, meets the goals of local watershed groups, and improves the trout fishery.
2. Reduces the City's water supply vulnerability to drought and forest fire effects, taking advantage of the more plentiful supply from the Missouri River source.
3. Provides in-stream flows to Tenmile Creek to dilute heavy metals from historical mine discharges below City intakes.
4. Builds upon the City's recent successes in pursuing federal funding for much needed improvements to the MRTP to facilitate the role reversal.

Table 1-6 summarizes the evaluation of the two water source management alternatives, current plant roles and reversed plant role, their costs, their weight, and their score for each evaluation criteria. Each criterion was given a weight and a benefit score was calculated. Public health was given a "2" weight and environmental quality, drought risk and fire risk were given a "1" weight. Then each alternative was evaluated relative to the criteria.

Both alternatives received a "2" on public health, as they both equally meet public health requirements. For drought and fire risk, the reversing roles alternative scored a "2" because it has a lower risk. The current roles alternative received a "1" because it has a higher vulnerability. In terms of environmental quality, the reversed roles alternative has a more

positive impact and was therefore assigned a "2." Maintaining the current roles alternative is less environmentally friendly and received a "1." Each score was then multiplied by its weight and a total benefit score was given. The benefit score for the current plant roles alternative is "5." The benefit score for reversed roles alternative is "8." The total cost for the current roles alternative is $16,000,000. The total cost for the reversed roles alternative is $19,500,000. Distribution system costs have not been included. The benefit to cost ratio for the current plant role is 2.2. For reversed roles, the benefit to cost ratio is 3.1.

Table 1-6 Alternative Evaluation

	Cost	Drought Risk	Fire Risk	Environmental Impact	Public Health	Total Score	Benefit to Cost Ratio
Weight		1	1	1	2		
Current Roles	$16,000,000	1	1	1	2	5	3.1
Reversed Roles	$19,500,000	2	2	2	2	8	4.1

While maintaining the current plant roles has the lowest present worth cost, it has lower environmental and risk benefits. Reversing the plant roles performs better in terms of drought and fire risk and environmental impacts, although at a higher cost.