Washington County Rural Water System and Blair Water System Evaluation

Water System Expansion Evaluation

Papio-Missouri River Natural Resources District and City of Blair, NE

April 5, 2024

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1 Purpose

The Papio Missouri River Natural Resources District (PMRNRD) and the City of Blair (CITY) are proceeding with a joint project to expand and improve both the Washington County Rural Water System (WCRWS) operated by the PMRNRD and the CITY's water distribution system.

Both systems are challenged by operating conditions that limit their ability to meet current water demands.

This report is a supplement to the City of Blair Water Master Plan completed in 2016.

2 Background

2.1 Rural Water System No. 1

The PMRNRD operates two rural water systems in Washington County. The first system was constructed in 1980 with water supplied by the Metropolitan Utilities District (MUD) from a connection located at North 60th Street and is referred to WCRWS No. 1. Pressure is maintained in the system by means of a pump station located at the point of connection on 60th Street, approximately 0.75 miles south of Northern Hills Drive. A 12 IN ductile iron water main provides water to the City of Fort Calhoun from the pump station. An agreement is in place between the City of Fort Calhoun and the PMRNRD for two service connections from this main. Fort Calhoun is a bulk user and still maintains their own distribution system. The rural water distribution system is fed from this 12 IN main and expansions have occurred over the years. The rural system currently serves approximately 670 customers and consists of small diameter PVC pipe ranging in size from 2 IN to 6 IN. See Figure 1 for the system layout and limits.

The PMRNRD upgraded the pump station in 2018 to replace the variable frequency drive controls and the telemetry to improve the system control. The pumps had been replaced in 2005 as part of the System No. 2 improvements to allow water to be supplied to the CITY, as discussed in greater detail below.

Figure 1

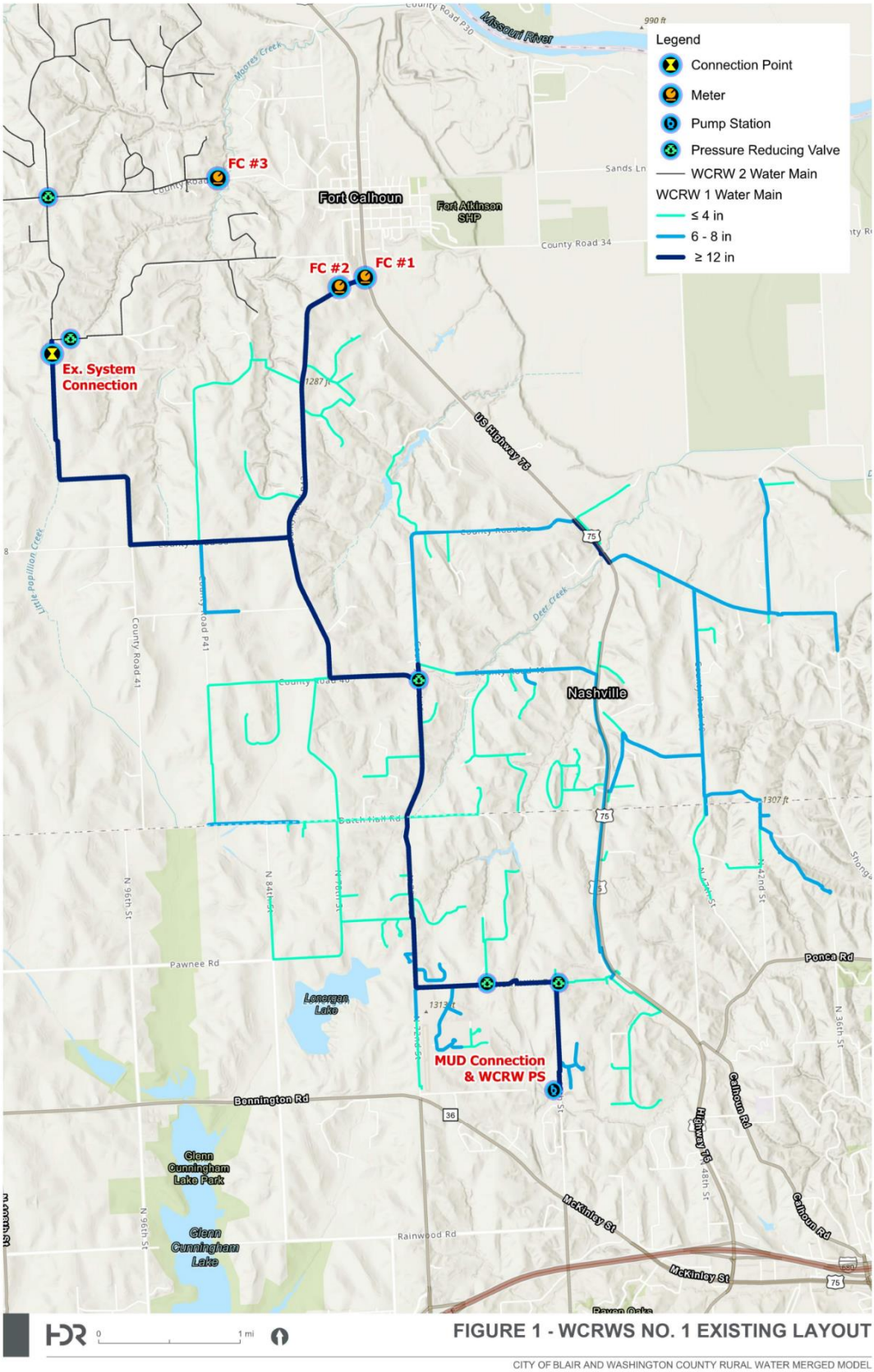


FIGURE 1 - WCRWS NO. 1 EXISTING LAYOUT

CITY OF BLAIR AND WASHINGTON COUNTY RURAL WATER MERGED MODEL

2.2 Rural Water System No. 2

WCRWS No. 2 was constructed in 2005 with water supplied by the City of Blair. The No. 2 System was developed as a joint project between the CITY and the PMRNRD. A new pump station was constructed in the CITY near the south ground storage reservoir and an elevated water tower constructed south of the City adjacent to Highway 133, immediately south of County Road P26. The Highway 133 Elevated Tower has a capacity of one million gallons and the tank maintains the pressure in the rural system and the southern portion of the CITY. System No. 2 serves approximately 446 customers with PVC pipes ranging in size from 2 IN to 12 IN. See Figure 2 for the system layout and limits.

The CITY paid for the construction of an interconnection between System No. 1 and No. 2 including the oversizing of some of the planned mains and additional mains to allow for the interconnection to the existing system. The interconnection was designed to allow water to be conveyed from System No. 1 to the Highway 133 Elevated Storage Tower in the event the CITY lost the ability to provide water to the tower. The CITY also paid for the replacement of the System No. 1 pumps to increase their capacity and operating head to enable the pumps to convey water to the Highway 133 Elevated Storage Tower. The interconnection has been used multiple times to provide water to the CITY as well as to provide water from System No. 2 to System No. 1.

System No. 2 was expanded in 2016 to provide a second connection to the City of Fort Calhoun. Fort Calhoun does not have a water tower and the west portion of the city is on higher ground resulting in low system pressures. The connection addressed the pressure concerns. The connection was not designed to provide fire flow for the area due to existing System No. 2 pressure limitations. The connection is noted as FC3 on Figure No. 2.

System No. 2 was expanded in 2016 to provide service to the Lakeland Subdivisions on Highway 133. The five subdivisions were served by the Lakeland Estates Water Company, a private system with water provided by wells located throughout the system. The previous privately provided water was not treated and had high levels of iron and manganese. Home treatment units including water softeners were utilized by the residents. The connection to the CITY system through the WCRWS No. 2 allowed the existing wells to be removed from service. Lakeland Water System is a bulk user and still maintains their distribution system.

Figure 2

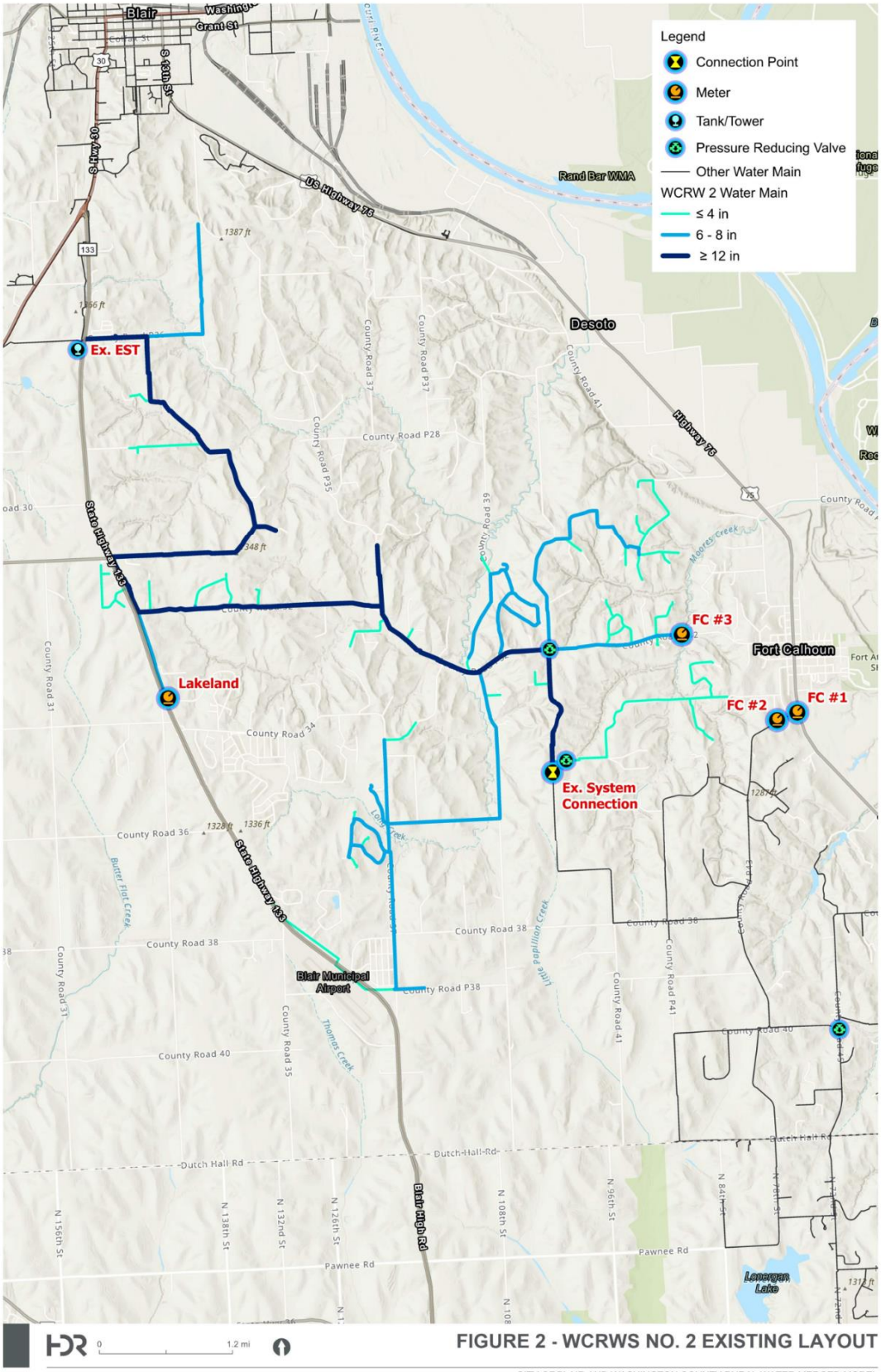


FIGURE 2 - WCRWS NO. 2 EXISTING LAYOUT

CITY OF BLAIR AND WASHINGTON COUNTY RURAL WATER MERGED MODEL

2.3 Blair Water Distribution System

HDR completed a Water Facilities Master Plan (2016 Master Plan) for the City in 2016. The 2016 Master Plan was undertaken to address the near-term, short-term, and long-term planning for the water system. The plan evaluated and identified existing system deficiencies, growth projections, and system reliability. The plan did take into consideration the planned construction of the Lakeland Subdivisions connection and the Fort Calhoun west connection.

The 2016 Master Plan identified a water storage deficit for the CITY that would have to be addressed in the near-term (i.e., 5 to 10 years) of the study. The existing Highway 133 Elevated Storage Tower is served by South Pump Station that pulls water from the south ground storage reservoir. Unfortunately, the ability of the existing system to convey water to the South Ground Storage Reservoir is limited, which is limiting the amount of water that can be conveyed to the Highway 133 Elevated Storage Tower. The 2016 Master Plan recommended the implementation of an intermediate pressure zone, construction of a one-million-gallon elevated storage reservoir, and the construction of a new pump station to serve the new reservoir. Figure 3 illustrates the current CITY pressure zones. Figure 4 illustrates the CITY pressure zones as proposed in the 2016 Master Plan with the addition of the intermediate pressure zone.

Figure 3

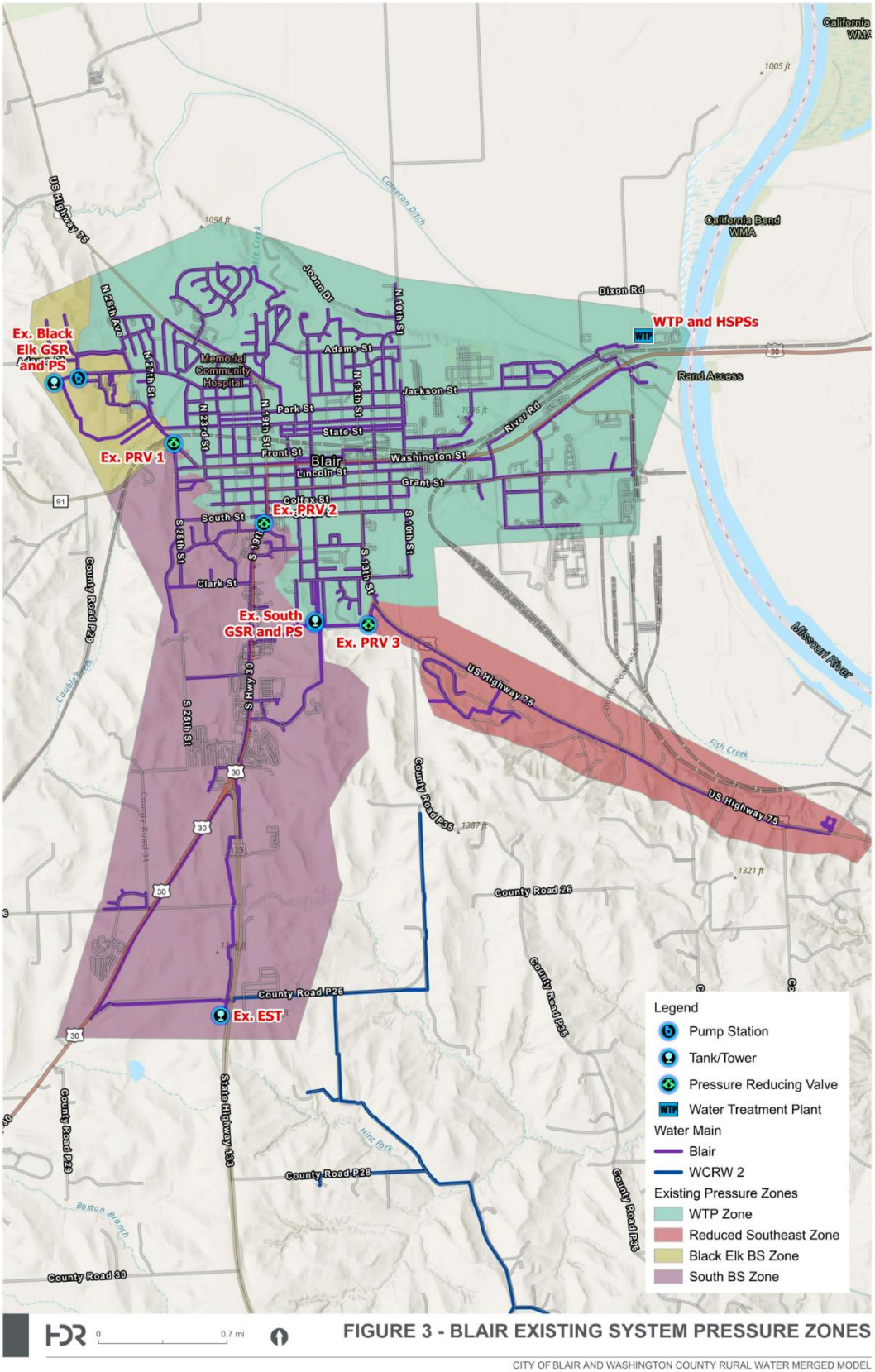


FIGURE 3 - BLAIR EXISTING SYSTEM PRESSURE ZONES

CITY OF BLAIR AND WASHINGTON COUNTY RURAL WATER MERGED MODEL

Figure 4

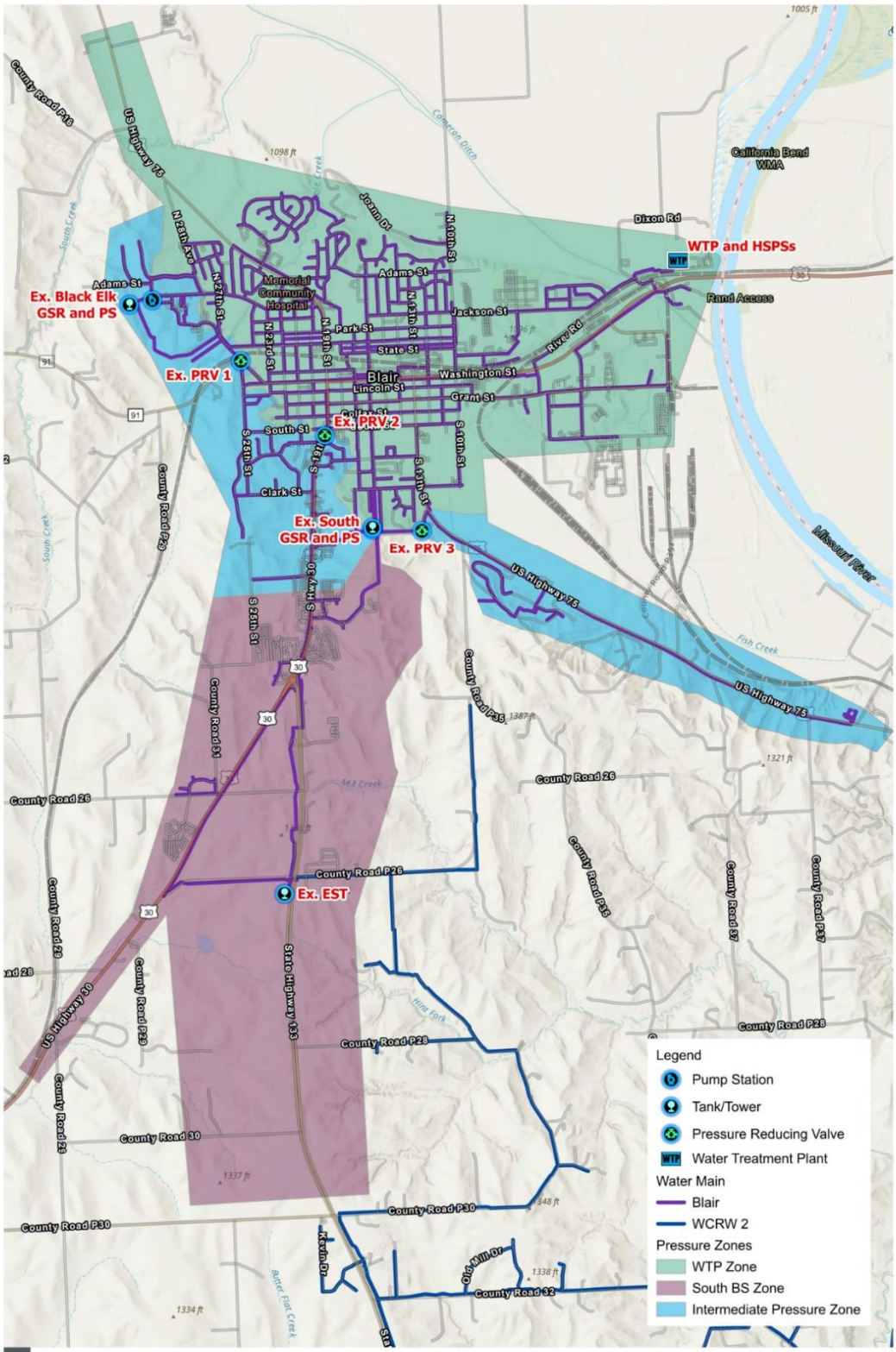


FIGURE 4 - 2035 RECOMMENDED PRESSURE ZONE BOUNDARIES FROM 2016 BLAIR WMP

CITY OF BLAIR AND WASHINGTON COUNTY RURAL WATER MERGED MODEL

3 Current Conditions

Both the PMRNRD and the CITY have experienced significant demand increases in recent years. Part of demand increases is due to the system expansions and partly due to the increased use of home sprinkler systems. Both rural water systems have had steady increases in the number of customers and the system demands have reflected the additional flows. The pump station that serves System No. 1 was operated near the operational limit for a substantial portion of the 2023 summer due to the ongoing drought conditions. Likewise, the CITY experienced significant demand challenges and were constrained in their ability to provide water to the Highway 133 Elevated Storage Tower. The problem was exacerbated by the construction of the south bypass and the removal of a 12 IN main from service that provides water to the Highway 133 Elevated Tower.

The PMRNRD continues to receive requests for new services connections for both rural systems.

Omaha Public Power District (OPPD) ceased operations of their power generating facility located on US Highway 75 east of Blair. The facility was served by a 12 IN water main constructed in 2007. The main is largely unused except for the minor domestic flow at the OPPD facility and the residential services connected to the main. The main to the OPPD facility falls within the proposed intermediate pressure zone. The under-utilized 12 IN main provides an opportunity for the expansion of the rural water system.

3.1 Proposed Rural Water System Expansion

Washington County is in the process of updating their comprehensive plan. The area east of Highway 133 has been designated for continued residential, acreage development. This area is primarily served by System No. 2. The PMRNRD has been approached by several landowners about providing water service to the area north of the current System No. 2 service area.

A preliminary design was completed of the unserved rural area north of the current System No. 2 service area, south of Highway 75. The locations of existing homes were identified from available aerial photography and confirmed by visual observations by HDR personnel. A distribution system was developed to serve all the existing homes and businesses. The distribution system was sized based on the existing homes. Figure 5 shows the proposed rural water system expansion.

3.2 System Analysis

The 2016 Master Plan evaluated the existing distribution system including the pump stations and storage for the current conditions and the projected 2035 design year. The evaluation considered the land use planning, population projections, and anticipated developments. The plan did not consider the expansion of the rural water system. The water usage for the CITY is based on recently provided actual meter readings and projected for the anticipated system expansion. The water distribution model was developed using the current GIS information provided by the CITY. The assumptions for the demand loads including fire flow are included in the 2016 Master Plan.

The water usage for the rural water system is based on current meter data provided by the PMRNRD including flow data for the City of Fort Calhoun. The typical water usage for the

existing water system was applied to the potential users of the proposed system expansion. Rural water systems are not designed for fire flow. The current water usage data does reflect the use of lawn irrigation systems by some of the current customers. The water distribution model was developed using the plan information for the rural systems. HDR had recently updated the hydraulic analysis of the rural water system.

Figure 5

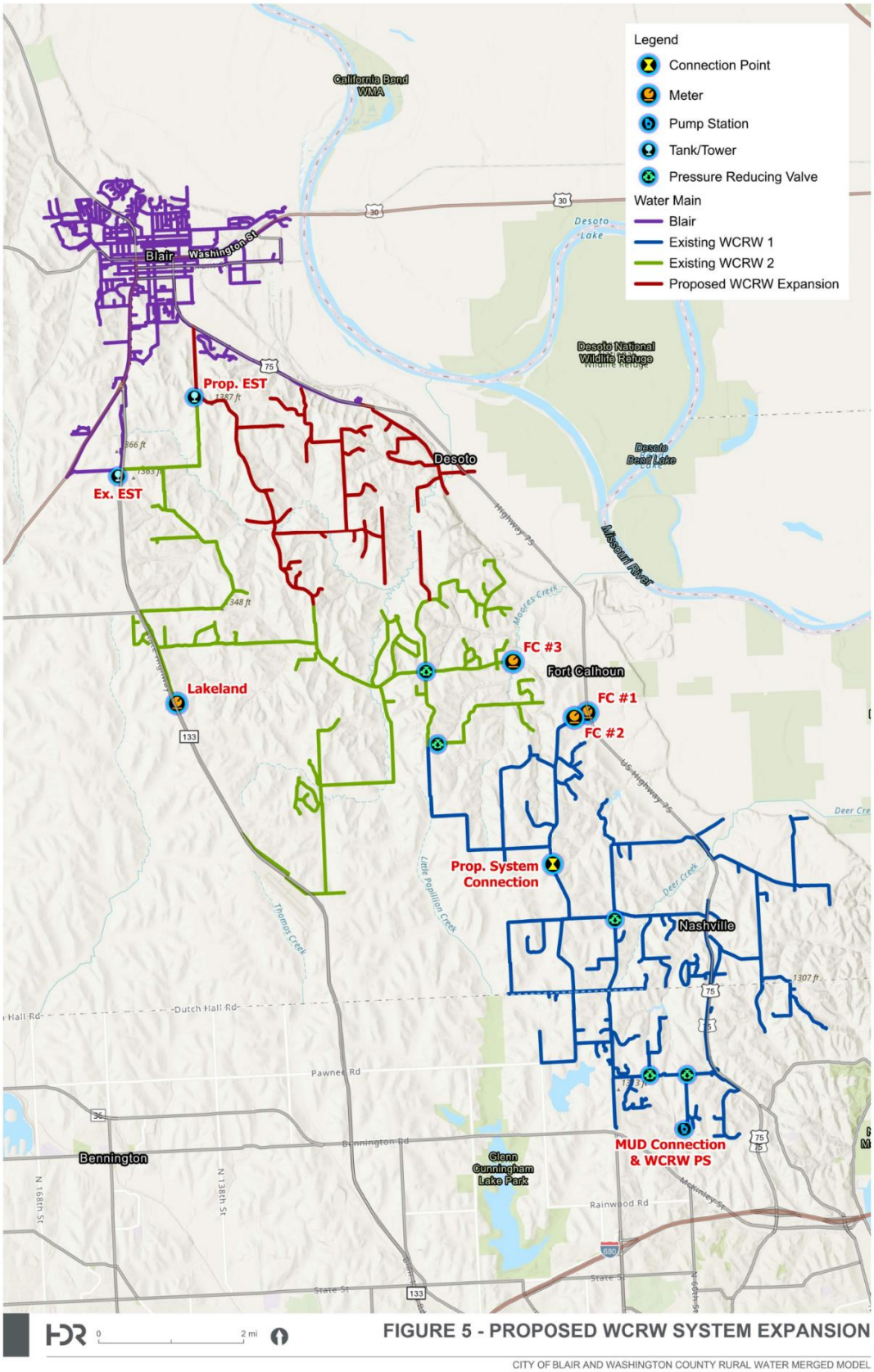


FIGURE 5 - PROPOSED WCRW SYSTEM EXPANSION

CITY OF BLAIR AND WASHINGTON COUNTY RURAL WATER MERGED MODEL

4 Recommended Improvements

The PMRNRD considered the construction of an elevated water tower to meet the growing System No. 1 demands. The existing MUD connection is operating at maximum capacity and the pump station that is serving System No. 1 is at capacity. The largest system demand occurs in the morning when the sprinkler systems are operating and then drops off during the day. The proposed elevated tower would be filled during the non-peak times to address the peak demands. An elevated tower for System No. 1 would allow for minimal system expansion due to the limited supply from MUD.

Likewise, the CITY planned to proceed with the recommendations of the master plan to implement the intermediate pressure zone improvements to address their system demands which included a new pump station and elevated water tower.

The CITY and the PMRNRD have decided to jointly pursue a solution to address their water system challenges.

The following are the recommended system improvements:

1. Construct a new pump station for the City of Blair. The new pump station would be located on Highway 75 south of Wilber Street.
2. Construct a new elevated water tower for the City of Blair. The new elevated water tower would be located south of Highway 75 on County Road P35.
3. Relocate PRV No. 3 to the east of the intersection of Highway 75 and Bridgeview Drive.
4. Close the isolation valve south of the intersection of Highway 30 and Ridgeview Road, north of the 8 IN tee for the main from the South Pump Station.
5. Remove PRV No. 1 from service and open the valve.
6. Install a third pump with a variable frequency drive (VFD) in the Black Elk Pump Station that matches the existing pumps.
7. Construct a new 12 IN water main from Highway 75 along County Road P35 to the new elevated water tower. The new main would connect to the City's Highway 75 12 IN main. The main would extend from the elevated water tower south adjacent to County Road P35 and connect to the PMRNRD 12 IN main located adjacent to County Road P32 at the intersection of County Road P35.
8. Open the 12 IN interconnection between System Nos. 1 and 2 at the intersection of County Roads P39 and P34.
9. Close the isolation valve south of where the interconnection main connects to the 12 IN main on County Road P43 that serves Fort Calhoun at the intersection of County Road 38.
10. Complete the property owner survey for the unserved rural area north of System No. 2. Proceed with the preliminary design of the rural water system expansion once sufficient interest indicates that the system expansion is viable.

The proposed changes are significantly different than what was envisioned in the 2016 Master Plan. The proposed approach in the 2016 Master Plan was to construct an elevated water tower adjacent to the existing ground storage reservoir and create an intermediate pressure zone that would serve Highway 75 and the north portion of Highway 30. Unfortunately, the elevation of the proposed tower location would not address the rural water

service supply challenges and would not allow for the expansion of the rural system. The ground elevation at the ground storage reservoir is 50 FT lower in elevation than the Highway 133 Elevated Tower site.

The intermediate pressure zone as proposed in the 2016 Master Plan would have resulted in the removal of the Black Elk Pump Station and Ground Storage Reservoir from service. The Ground Storage Reservoir is filled by the high service pumps located at the water treatment plant. Pressure in the Black Elk pressure zone is maintained by the pump station with water pulled from the Ground Storage Reservoir. The area would have been served by the new elevated tower and proposed Highway 75 Pump Station. The one-million-gallon ground reservoir was constructed in 1978 is reported by City personnel to be in good condition.

The revised approach results in the proposed elevated water tower being constructed at a location with approximately the same ground elevation as the existing Highway 133 Elevated Storage Tower. The high-water level for the proposed tower would match the existing tower and the two towers would operate in common, serving the same service area including the north portion of the rural water system. The proposed Highway 75 Pump Station and the existing South Pump Station would operate in common. The pump stations would be operated in a lead-lag scenario. One station would operate initially to maintain the water level in both elevated water towers and then shut down once the water level reaches the preset elevation. The second station would begin operation if the first pump station is not able to keep up with the system demands. The stations would alternate on which station would start first to meet the initial demand.

The proposed changes revise the boundaries of the two rural water systems with a portion of System No. 1 being transferred to System No. 2 including Fort Calhoun.

Figure 6 illustrates the proposed rural water distribution systems boundaries.

Figure 7 illustrates the proposed CITY pressure zones.

The proposed approach provides the following benefits:

1. The CITY addresses the system supply shortfall to the Highway 133 Elevated Storage Tower. The Highway 133 Elevated Storage Tower can be served by the proposed Highway 75 Pump Station as well as by the existing South Pump Station.
2. Operating the two elevated towers and associated pump stations in common results in a robust, flexible system. The change decreases the demand on the South Pump Station thereby increasing its service life and allows flexibility for maintenance and outages.
3. The Fort Calhoun demand and a portion of the rural users would be moved from the System No. 1 Pump Station. The Fort Calhoun demand is a significant amount of the demand on System No. 1. The proposed change reduces the demand on the System No. 1 pump station and allows for continued development within the System No. 1 service area. The removal of the Fort Calhoun demand decreases the demand on the System No. 1 Pump Station thereby increasing the service life of the pumps.
4. Fort Calhoun fire demand would be addressed by the two elevated towers.
5. The Black Elk Ground Storage Reservoir would remain in service.
6. The Black Elk Service area would be increased. Moving a portion of the demand from the Highway 133 Elevated Storage Tower to the Black Elk Service Area would

increase the water turn over within the Black Elk Ground Storage Reservoir and decrease the demand on the South Pump Station and Highway 133 Elevated Storage Reservoir. The expansion of the Black Elk Service Area would reduce the system pressure for the north Highway 30 area, which were extremely high.

7. The proposed pump addition at the Black Elk Pump Station would result in greater firefighting reliability for the service area.
8. The City's 12 IN Highway 75 water main that used to serve the OPPD power plant would have increased use.
9. The PMRNRD can begin planning for the expansion north of System No. 2.
10. The PMRNRD would be purchasing more water from the CITY.

Figure 6

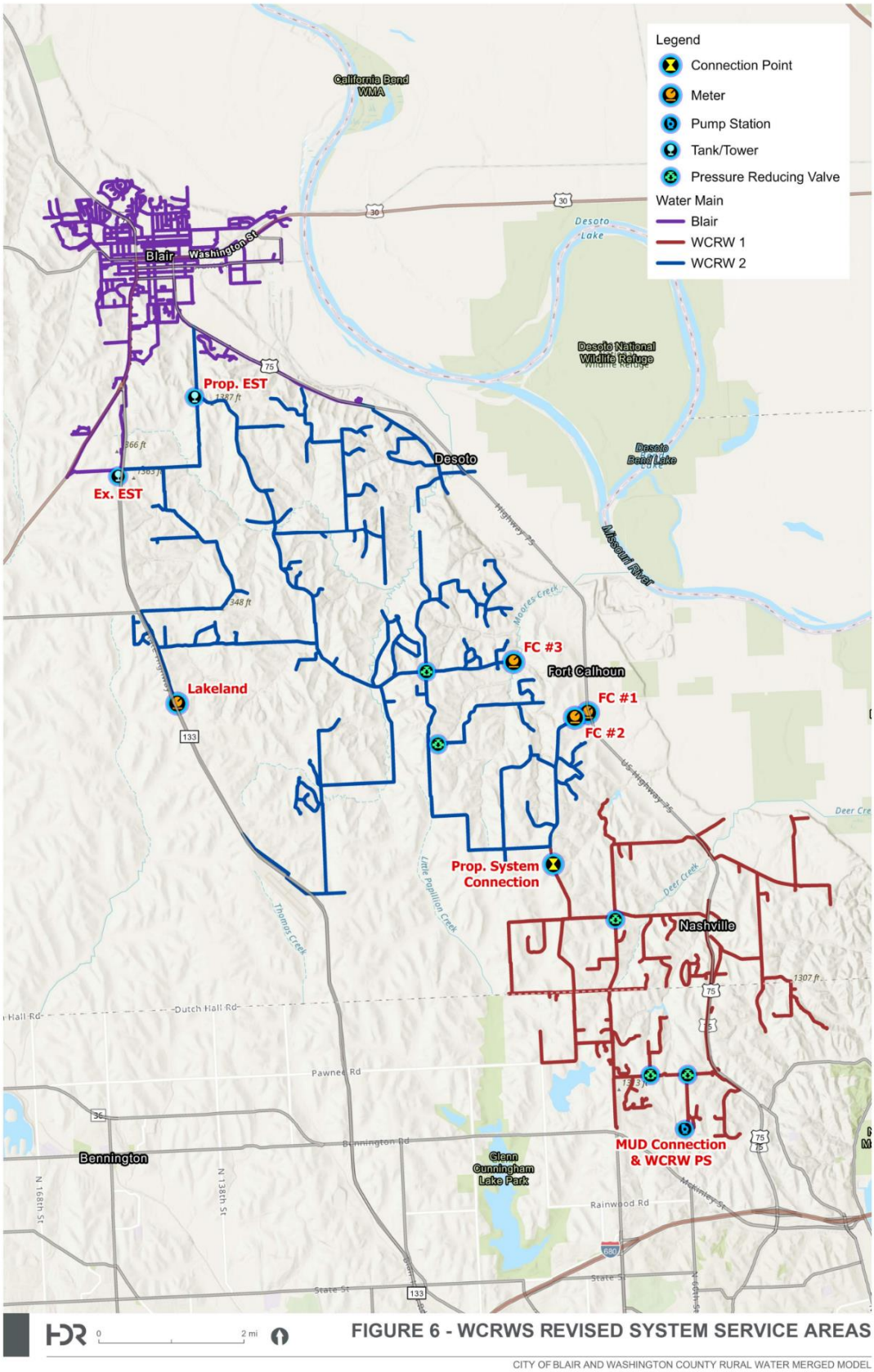


FIGURE 6 - WCRWS REVISED SYSTEM SERVICE AREAS

CITY OF BLAIR AND WASHINGTON COUNTY RURAL WATER MERGED MODEL

Figure 7

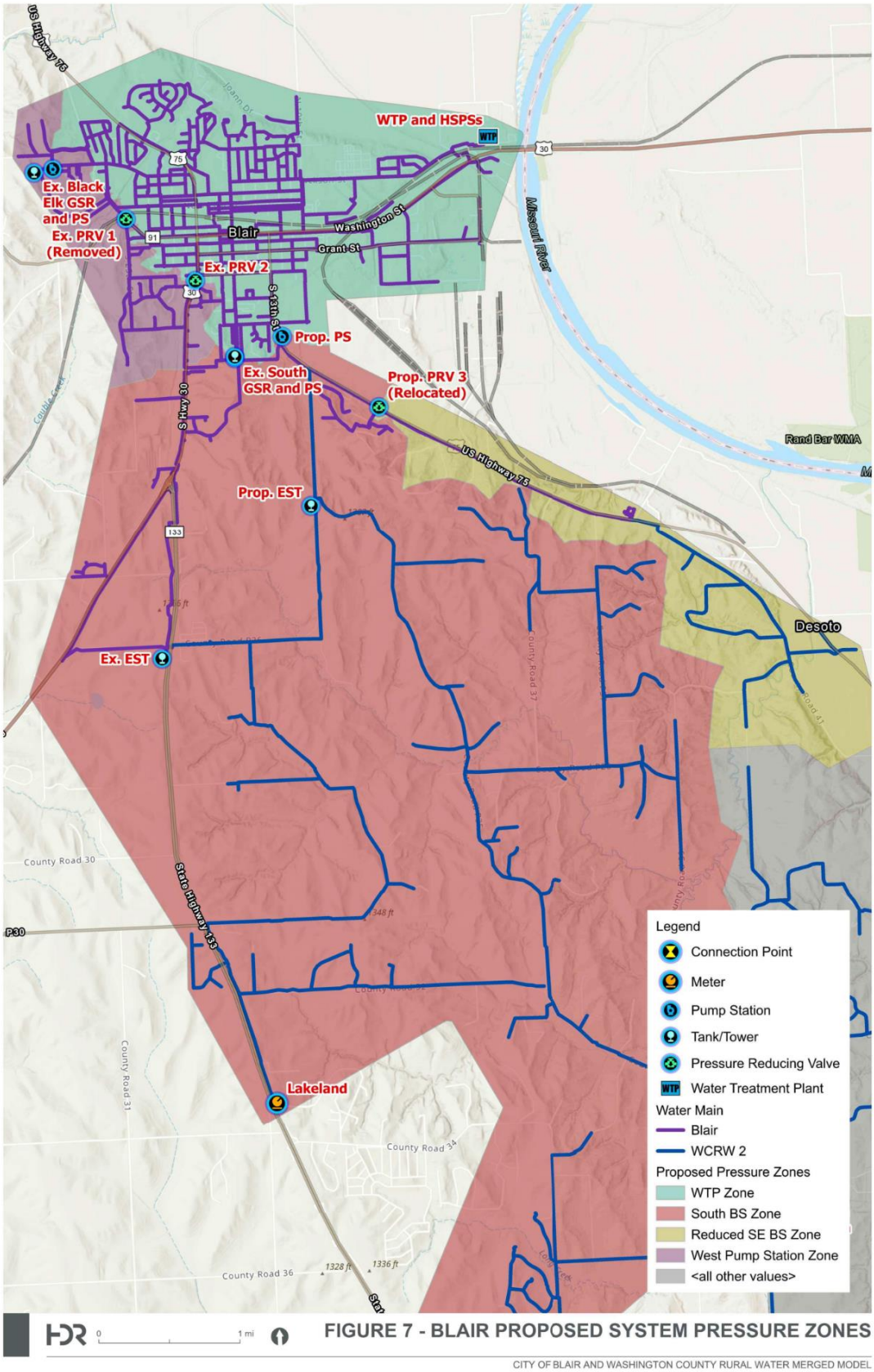


FIGURE 7 - BLAIR PROPOSED SYSTEM PRESSURE ZONES

CITY OF BLAIR AND WASHINGTON COUNTY RURAL WATER MERGED MODEL

4.1 Detailed Breakdown – City of Blair

4.1.1 Highway 75 Pump Station

The new pump station would be constructed on the east side of US Highway 75, south of Wilber Street, north of Maple Drive. Figure 8 for the proposed Highway 75 Pump Station site layout.

The proposed station would be an above ground package station, like the pump station recently installed at the south reservoir site. The station exterior can be provided with a residential looking exterior. An isolation valve would be installed in the existing 12 IN main to allow flow to be directed to the pump station. Connections to the existing main would be accomplished by wet taps. The current firm capacity of the South Pump Station is approximately 1,100 gpm.

Scenario	ADD, gpm	MDD*, gpm	Additional Firm Capacity Required
Current	550	1100	0
Future w/ Black Elk Expansion	630	1300	200
Future w/o Black Elk Expansion	750	1500	400

**Note: Assumes a maximum day peaking factor of 2.0. This factor should be confirmed.*

The pump station is recommended to be equipped with pumps that provide a firm capacity of 1 MGD or 700 gpm.

The existing 12 IN water main is located within Highway 75 ROW. The proposed pump station would be located on private property. Property acquisition would be required. A concrete drive would be constructed next to the station for Public Works employee access. The site would be fenced.

A pressure reducing vault (PRV) is located at the south end of Maple Drive on the west side of the turnaround. The PRV is located on a 12 IN main that connects the Highway 133 Elevated Storage Tower to the Highway 75 water main and was designed to reduce the pressure in the main that served OPPD. PRV's allow flow in one direction. The PRV would be removed and reinstalled on the 12 IN main on the south side of Highway 75, east of the Bridgeview Road intersection. The isolation valve in the 12 IN main would be opened to allow the Highway 75 Pump Station and South Pump Station to operate in common through the 12 IN main. The pipe connections where the PRV is removed would be capped.

A new 12 IN water main would be constructed adjacent to County Road P35 from Highway 75 south to the new elevated tower location near the intersection of County Road P33. A casing was installed under the new bypass paving in anticipation of this main.

4.1.2 County Road P33 Elevated Storage Tank

The proposed elevated tower would be located near the intersection of County Roads P33 and P35. The tower would likely be a composite tank, similar to the Highway 133 Elevated Storage Tower. The new tower would have a capacity of one million gallons. The high-water level would be El. 1490, which matches the high-water level of the Highway 133 Storage Elevated Tower. The tank would be approximately 125 FT tall. Property acquisition would be required. The tank site would include an access drive and security fencing. Figure 9 for the County Road P33 Elevated Storage Tower site layout.

Water system storage volume is comprised of five separate components which are illustrated in Figure 4-1:

- Operating Volume
- Equalizing Volume
- Fire Flow Volume
- Standby Volume
- Dead Volume

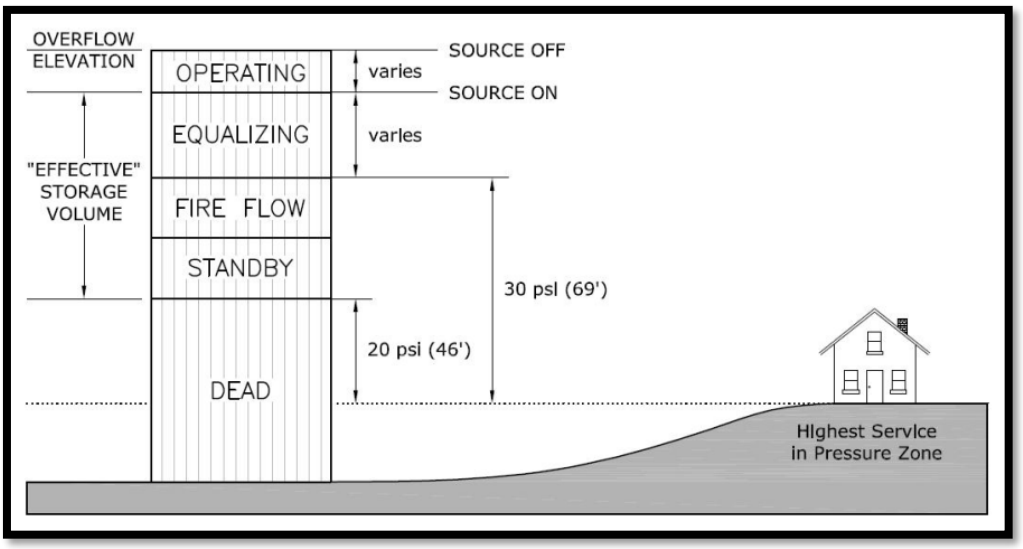


FIGURE 4-1 STORAGE COMPONENTS

The dead storage volume is not applicable for the proposed elevated tower discussion. The dead storage volume relates to standpipe reservoirs. The proposed low water elevation for the tower addresses the minimum pressure requirement.

Operational Storage Volume
Operational volume is the water above the high-water storage elevations set by City operations staff. Operational volumes are subtracted from total storage to determine the effective storage available for equalizing, emergency, and fire flow.

Equalization Volume
Equalization volume is the total volume needed to moderate daily fluctuations in diurnal demands during periods when the demand exceeds the capacity of the supply system. The equalizing volume is calculated as the difference between the peak hour demand and the maximum hour demand for 6 hours. Equalizing volume requirements are greatest on the day of maximum demand. Operation of a properly balanced system results in replenishment of storage facilities during times of day when the demand curve is below the capacity of the supply system and depletion of storage facilities when the demand exceeds the supply capacity.

Projected demands taken from Section 3 with the projected City 2035 demand projections, rural water system expansion, and proposed Black Elk pressure zone modifications.

Fire Suppression Volume

The required fire suppression volume is typically designated by zoning type. The maximum fire suppression demand of 1,000 gpm was given as a requirement by the City of Blair for the 2016 Master Plan and was used as the fire flow demand for the combined zone (including Fort Calhoun). For the purpose of this study, it was assumed that this volume is required for 4 hours.

Standby or Emergency Volume

Emergency volume is required to supply reasonable system demands during a foreseeable system emergency or outage. A key concept is that establishing standby volume involves planning for reasonable system outages; those that can be expected to occur under normal operating conditions, such as a pipeline failure, power outage, valve failure or issue with the river intake. Major system emergencies, such as those created by an earthquake, tornado, flood, or other very significant natural event, are intended to be covered by emergency system operations planning, since construction of sufficient reserve volume to accommodate sustained system demands under emergency conditions is not economically feasible. The recommended emergency storage volume for normal operating conditions is equal to the average day demand for 12 hours (at a minimum.

Table 4-1 Storage Capacity Analysis for South Pressure Zone

Required Storage Calculations		
	Operational Storage (MG)	0.10
	Equalizing Storage (MG)	0.81
	Fire Flow Storage (MG)	0.24
	Standy or Emergency Storage (MG)	0.54
	Total Required Storage (MG)	**1.69**
Existing Elevated Storage (MG)		
	Total Existing Storage (MG)	**1.00**
Storage Surplus/(Deficiency) (MG)		**-0.69**

The minimum recommended capacity of the proposed elevated tower is 0.69 MG. A 1.0 MG tower was used for the cost estimate. The capacity of the tower will be set during the final design. It is recommended to monitor the actual peak hour and maximum day demands for the combined zone to refine the peaking factors in this analysis before committing to a final storage size.

4.1.3 Black Elk Service Area Modifications

The Black Elk Service Area modifications consist of closing the isolation valve on the 12 IN main on the east side of Highway 30, south of Ridgeview Road. An 8 IN main conveys water from the South Pump Station to the 12 IN main on Highway 30 that serves the

Highway 133 Elevated Storage Tower. The area north of the isolation valve would become part of the Black Elk Service Area.

PRV 1 would be removed from service by closing the connecting valves and opening the main isolation valve to allow water to flow to the south and serve the expanded Black Elk Service Area.

The expansion of the Black Elk Service Area can be implemented at any time to improve the water turnover within the ground storage reservoir, reduce the system pressure on the north portion of Highway 30, and remove a portion of the demand from the South Pump Station. The proposed change does not have a cost component.

The Black Elk Pump Station was constructed in 1978 consists of two pumps with piping connections and space provided for a third pump. One pump normally operates to maintain pressure in the system. Both pumps are necessary for fire flow conditions. Ten State Standards recommends pump stations be designed to meet the maximum pumping requirements with one pump out of service which is defined as firm capacity. The Black Elk Pump Station does not meet this requirement. The station cannot provide the required fire flow demand with one pump out of service. The addition of the third pump would allow the station to meet the firm capacity requirement and provide redundancy for maintenance of the existing pumps. VFDs were installed for the existing pumps in 2002. The new pump would also be equipped with a VFD.

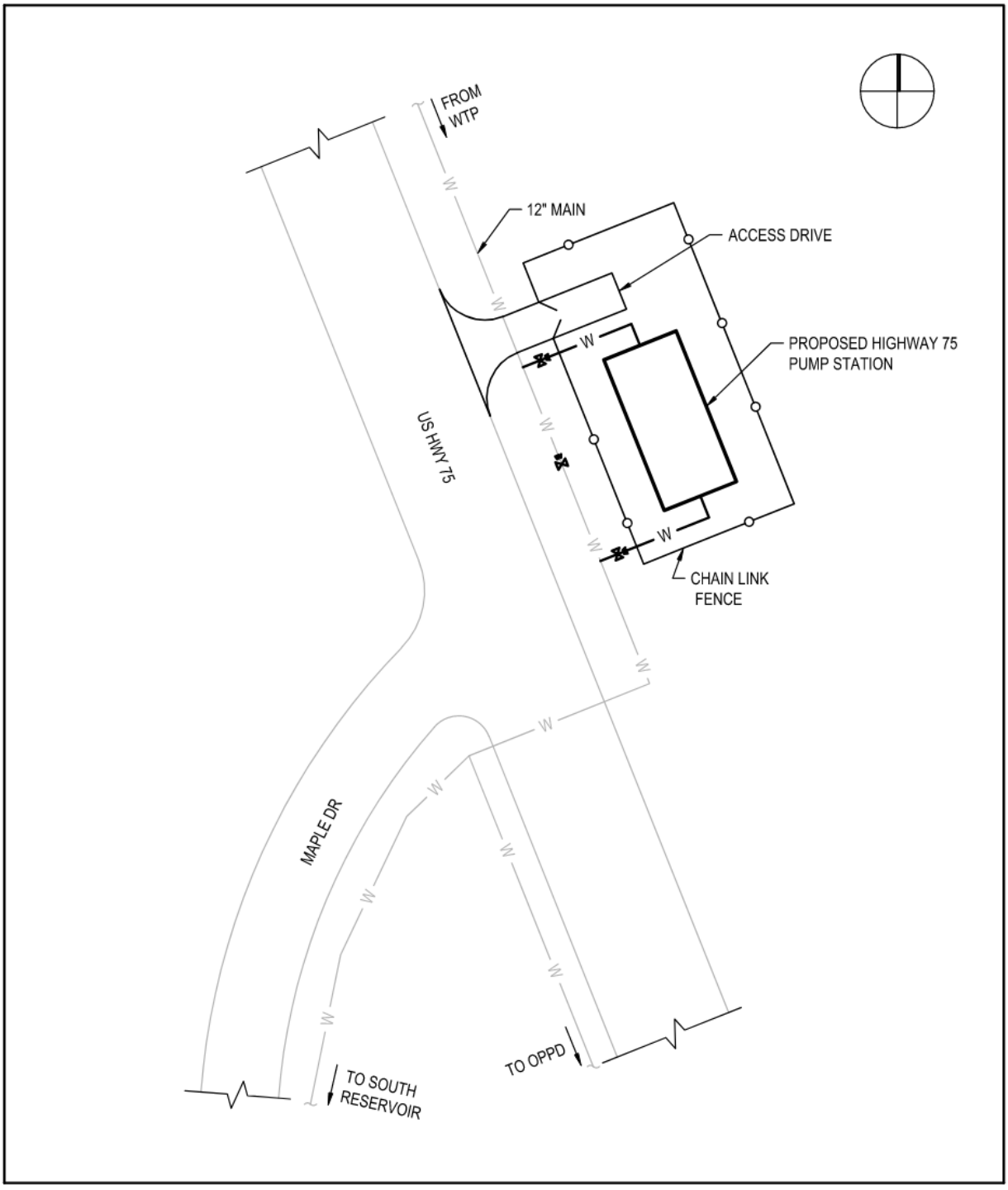
4.1.4 Summary of City of Blair Improvements

The following is a summary of anticipated project costs for the CITY improvements:

County Road P33 Elevated Storage Tower and Site Piping:	$4,226,634
Highway 75 Pump Station and PRV Relocation:	1,968,464
Black Elk Pump Station Modification:	469,700
Land, Fees:	67,600
Total:	$6,672,398

The preliminary opinion of probable cost for the proposed CITY improvements are included in Appendix A.

Figure 8



WASHINGTON COUNTY RURAL WATER SYSTEMS AND BLAIR WATER SYSTEM EVALUATION

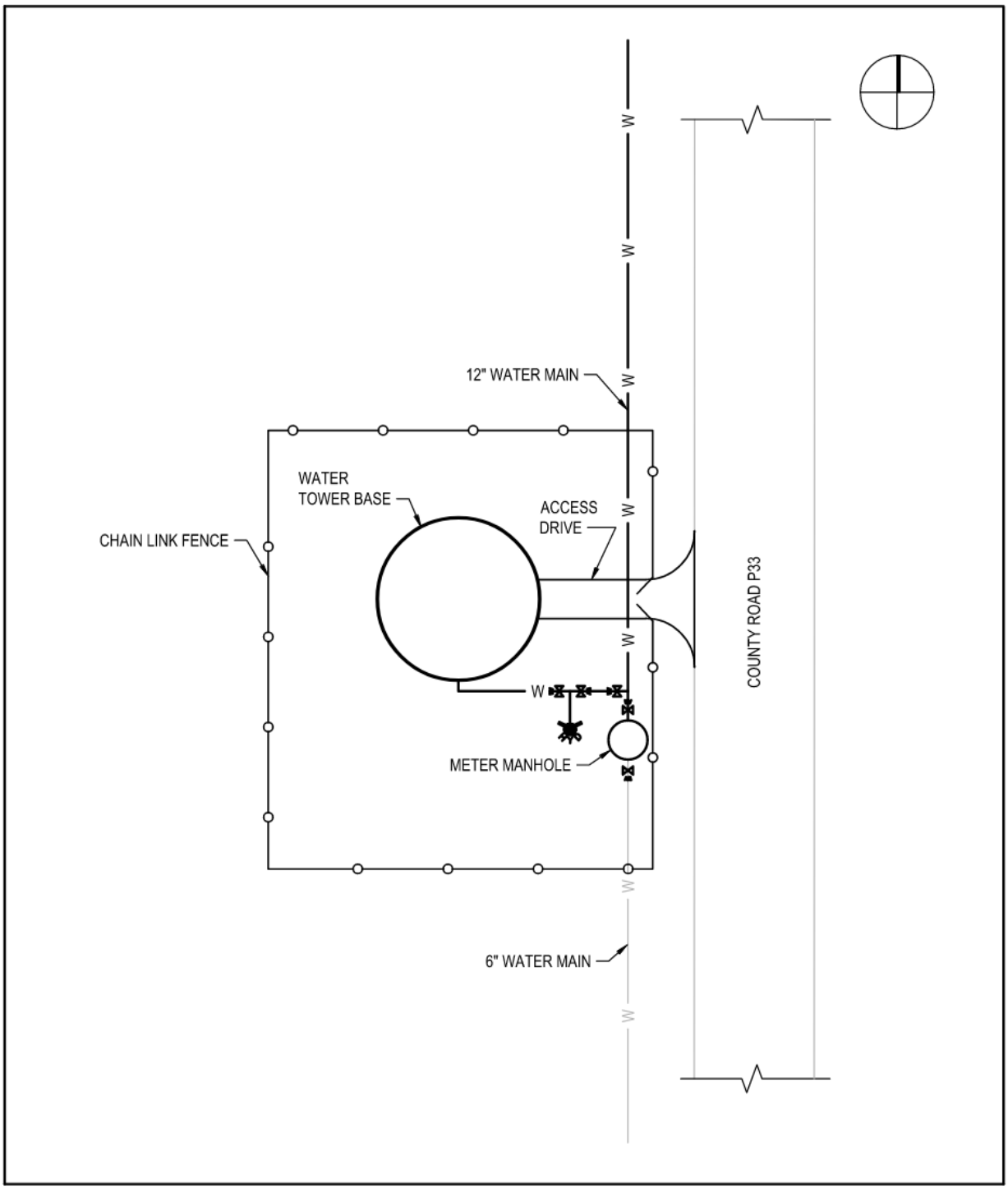
HIGHWAY 75 PUMP STATION SITE PLAN

DATE JAN. 2024

FIGURE 8

1917 S 67th Street, Omaha, NE 68106-2973
(402) 399-1000
hdrinc.com

Figure 9



WASHINGTON COUNTY RURAL WATER SYSTEMS AND BLAIR WATER SYSTEM EVALUATION

COUNTY ROAD P33 ELEVATED TOWER SITE PLAN

DATE JAN. 2024

FIGURE 9

4.2 Detailed Breakdown – PMRNRD

The unserved rural area north of System No. 2 is roughly bounded on the west by County Road P35, on the northeast by US Highway 75, and on the south by County Road 30 extended. The area is populated by farms, acreages, and a few small businesses. The proposed expansion would serve approximately 258 users if everyone connected. There are new subdivisions and acreages under construction in this area.

A preliminary rural water system layout has been developed for the proposed rural water system expansion to serve the unserved area identified above. Figure 6 illustrates the preliminary system layout and identifies potential customers in the area that was used in the development of the water system planning. A detailed schematic plan is included in Appendix C.

The proposed system expansion consists of water mains ranging in size from 2 IN to 12 IN.

A new 12 IN main would be constructed from the proposed County Road P33 Elevated Storage Tower beginning at the intersection of County Road P33 and P35. A meter would be set with a connection to the existing 6 IN main located on County Road P33 to provide system operational flexibility. The new 12 IN main would be located adjacent to County Road P35 and extend to County Road P32 and connect to the existing 12 IN main located on the north side of P32. The 6 IN and smaller pipes would be fed from this main.

A connection to the existing CITY Highway 75 12 IN main would occur at the termination of the 12 IN main near the OPPD plant entrance. A new 6 IN main would be constructed along Highway 75 and County Road 41 to serve the De Soto area. A meter pit would be installed at the point of connection to the existing main.

The expansion would include connections to the existing rural system including to the 6 IN main on County Road 39, north of County Road P32 and to the 8 IN main at the intersection of County Road P39 and Paradise Hill Lane. The existing mains were sized to allow for the eventual expansion of the rural water system.

The following is a summary of anticipated project costs for the WCRWS improvements:

Rural Water System, Full Build Out: $6,401,524

The preliminary opinion of probable cost for the proposed CITY improvements are included in Appendix B.

5 Implementation Plan

The demands on the CITY and PMRNRD water systems are pressing. The PMRNRD System No. 1 Pump Station were operating at near capacity a substantial portion of last summer and the CITY was challenged to maintain the water level in the Highway 133 Elevated Storage Tower.

We recommend the following steps to address the challenges faced by the water systems:

1. Implement the modifications to the Black Elk Service Area.
2. Begin preliminary design for the proposed Blair water system improvements as outlined above.

3. Begin rural system interest survey.
4. Pursue funding.
5. Begin coordinating with Fort Calhoun and Washington County.

5.1 Black Elk Service Area Modification

The proposed expansion of the Black Elk Service Area can be accomplished immediately and without cost. The proposed expansion of the Black Elk Service Area would remove a portion of the demand from the Highway 133 Elevated Storage Tower and transfer it to the Black Elk Service Area resulting in increased turnover of the water in the Black Elk Ground Storage Reservoir, reduced demand on the South Pump Station, and reduction in the system pressures on the north portion of Highway 30.

We recommend monitoring the pressures on Skyline Drive after the service area change is made to confirm the accuracy of the hydraulic modeling. Skyline Drive would be the new high point in the service area and confirmation of the system pressure at this location would determine whether the change is detrimental to the residents.

5.2 Preliminary Design

The preliminary design will address the final sizing and timing of the proposed elevated storage tower and Highway 75 pump station. We recommend implementing the proposed rural water service area changes that results in Fort Calhoun being served entirely the City of Blair. This test would be completed after the 12 IN main from the South Pump Station has been returned to service and the system is operating as it was before the start of the south bypass project. The confirmation test would include hydrant flow testing and pressure monitoring in Fort Calhoun to confirm fire flow conditions are being met. The SCADA information will confirm the assumed performance of the Blair distribution system.

The confirmation testing will also inform the schedule for the proposed pump station and elevated storage tower improvements. The existing water tower in conjunction with the proposed County Road P35 water main may provide the required infrastructure to allow removal of Fort Calhoun from the WCRWS No. 1 Service Area, thereby reducing demand on the 60th Street Pump Station. The construction of the proposed elevated storage tower and pump station possibly could be delayed, depending on the results of the confirmation testing.

Funding agencies typically require development of the design through 30 percent to allow the cost estimates to be further advanced. The preliminary design for the CITY improvements would include topographic survey of the proposed County Road Elevated Storage Tower site and Highway 75 Pump Station site; geotechnical investigation for the elevated storage tower; refinement of the system hydraulics; and finalization of the land acquisition requirements for the elevated storage tower and the pump station. Tract descriptions would be developed for the property acquisitions.

The preliminary design for the PMRNRD improvements would begin after the potential user survey is complete. This report assumes all existing residents would connect to the rural system which is not likely for a variety of reasons with primary issue being cost. The survey would be conducted by PMRNRD personnel, and the results provided to HDR to inform the design. A new system layout would be completed after the survey is complete and decisions made on the extents of the initial system. It may not be financially viable to serve some residents at this time due to a limited amount of customer interest and financial viability. The

preliminary design would include the finalization of the water main alignments including the sides of the road, hydraulic model update to confirm the pipe sizes, and hydrant locations.

The following is the anticipated design and construction schedule assuming all of the proposed improvements are implemented immediately:

CITY Improvements:

Preliminary Design	Jun. 2024 – Oct. 2024
Final Design	Nov. 2024 – Jul. 2025
Construction	Jan. 2026 – May 2027

PMRNRD Improvements

Potential User Survey	May 2024 – Oct. 2024
Preliminary Design	Nov. 2024 – Mar. 2025
Final Design	Apr. 2025 – Aug. 2026
Construction	Oct. 2026 – Sep. 2027

The schedule for the CITY improvements is driven by the lead times for pumps and equipment.

5.3 Funding

The proposed improvements represent a substantial capital expense for both the CITY and the PMRNRD.

We recommend that the CITY and PMRNRD explore available state and federal programs for funding and financing opportunities. The Bipartisan Infrastructure Law (BIL) increased the amount of funding to state revolving fund (SRF) programs. Some of these programs can include grants or loan forgiveness. Additional funding through BIL is available through 2027 and projects eligible for federal assistance could be prioritized while BIL funding is available. In Nebraska, NDEE administers the SRF and should be consulted about funding and project eligibility. Other programs such as EPA's Water Infrastructure Finance and Innovation Act (WIFIA) can allow the CITY and PMRNRD to borrow at U.S. Treasury rates and defer repayment until after substantial completion of a project. It is recommended to develop a funding and financing strategy to align available funding opportunities to specific projects or project types. At a minimum, this plan should evaluate and summarize the benefits and requirements for the following programs:

a. Nebraska Drinking Water State Revolving Fund (DWSRF) – A low interest water infrastructure loan program that is administered by NDEE with EPA oversight. Some loan forgiveness is available for disadvantaged communities. In Nebraska, this is defined as water systems serving populations less than 10,000. It is recommended to meet with NDEE to communicate the water system needs to determine if any of the recommended improvements could qualify for loan forgiveness.
b. America Rescue Plan Act (ARPA) – The American Rescue Plan (ARPA) provided funding for state and local governments for community improvements and infrastructure projects. ARPA funding must be allocated by December 31st, 2024, which is likely not possible unless the allocation dates are extended.

c. Economic Development Administration (EDA) Grants – The Public Works and Economic Adjustment Assistance Program through the EDA provides funding for utility projects that stimulate development in rural and disadvantaged areas.
d. EPA Grants – The EPA administers grant funding for water infrastructure projects through several grant programs. Most programs will have an emphasis on climate change and supporting rural and disadvantaged communities.

The proposed improvements address key priorities for funding agencies including consolidation of water systems, improved redundancy, resiliency, and serving unserved rural residents.

5.4 Fort Calhoun and Washington County Coordination

The proposed improvements would provide benefits for the City of Fort Calhoun and Washington County.

Fire protection for the City of Fort Calhoun is limited to the capacity of the System No. 1 Pump Station and the agreed upon maximum flow from System No. 1. The west portion of the City receives water from System No. 2 but the flow is not adequate for fire protection due to the size of the rural water mains, pressure reducing valves, and the requirement to maintain pressure for the upstream rural users. The proposed improvements would allow the City to draw from two elevated reservoirs to meet their fire flow demand and future system expansion.

We recommend meeting with City officials to discuss the proposed improvements including how the proposed improvements will benefit the City and ask for participation by the City in pursuing the funding applications. This report does not address improvements to the City's distribution system that may be necessary to accommodate the required flow.

Washington County would benefit from the proposed improvements through continued development in accordance with their comprehensive plan. Development in this portion of the County is limited by the lack of water and lack of quality water. The proposed improvements would make the expanded rural service area more desirable for development. In addition, the proposed improvements would allow for future expansion in the Cities of Blair and Fort Calhoun, thus improving the tax base.

We recommend meeting with County officials to discuss the proposed improvements and discuss County involvement in the funding application process. The County provided funding during the development of System No. 2 for the increased water main sizes to accommodate future development. County officials understood the potential expansion of the proposed rural system and the necessity of providing for that expansion. The County may want to provide funding for increased water main sizes to accommodate future development.

Coordination with the County during preliminary design would be necessary to understand the planned and potential developments within the proposed service area. As noted, new developments are under construction and likely more are planned. An understanding of the planned road improvements will also be critical to the water system design.

Appendix A - City of Blair Detailed Opinion of Probable Project Costs

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Appendix B - PMRNRD Detailed Opinion of Probable Project Costs

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Appendix C - Schematic Plans Proposed Rural Water System Expansion

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