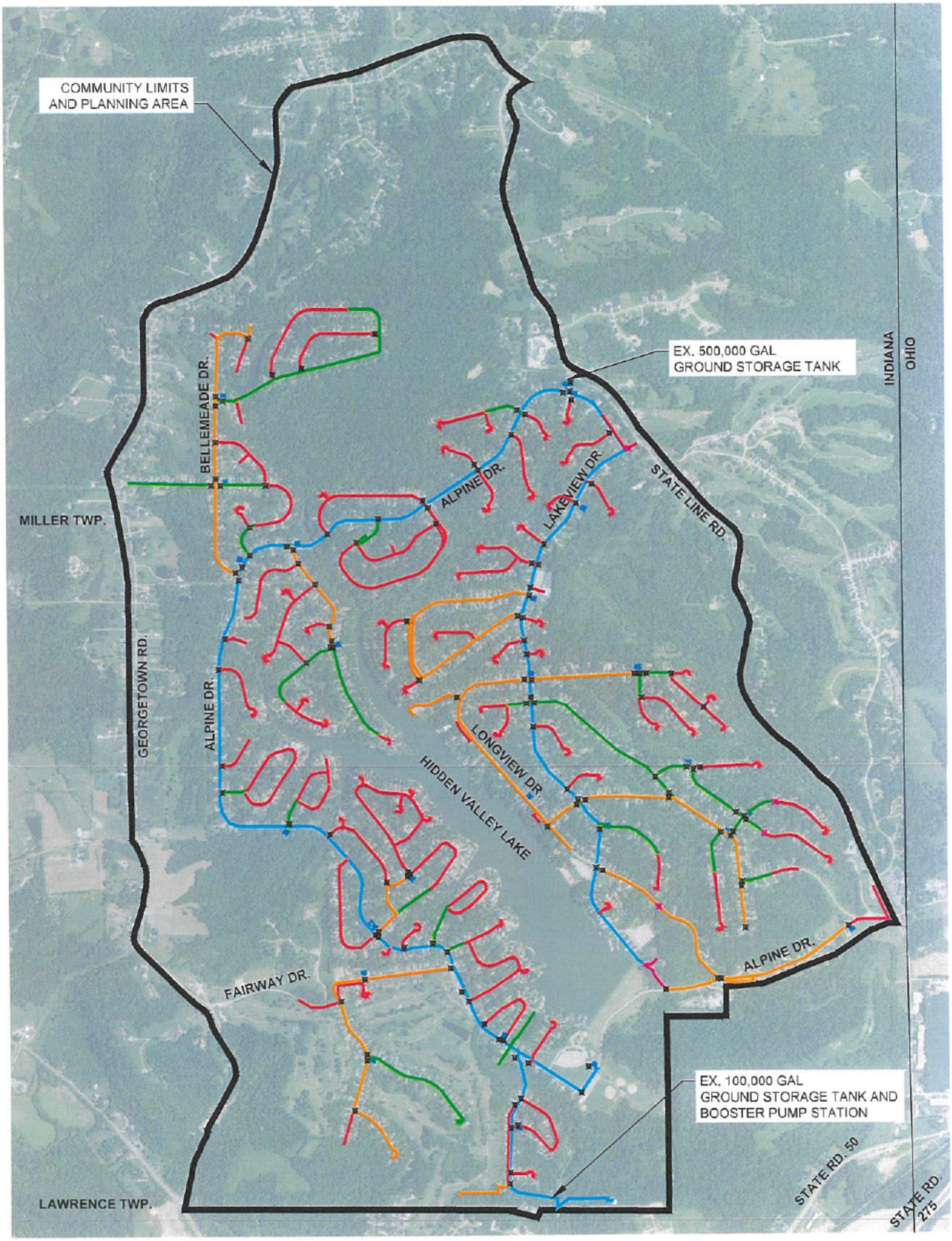

LEGEND:

- EX. WATER MAIN 1"
- EX. WATER MAIN 2"
- EX. WATER MAIN 4"
- EX. WATER MAIN 6"
- EX. WATER MAIN 8"
- EX. WATER HYDRANTS
- EX. GATE VALVES
- EX. PRV

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VALLEY RURAL UTILITY COMPANY DEARBORN COUNTY, INDIANA
PRELIMINARY ENGINEERING REPORT
EXISTING FACILITIES FIGURE ES-1

ES.3 Need for Project

Several specific health, sanitation, and security concerns are described herein. Additional items identified within this report as needing to be performed are also critical to provide safe drinking water to the community. A failure of any critical component could put the safety of the community's drinking water at risk or leave it without fire protection. Deficiencies have been identified with these critical components through a variety of sources, including the Asset Management Plan which is included in part in **Appendix C**. **It is imperative that the Utility address these items. These issues present a significant risk to human and environmental health and safety and must be addressed.**

These components are outlined below:

- The older manual and radio read meters are nearing the end of their expected useful life according to the Asset Management Plan (**Appendix C**) and are in need of replacement to improve potential water loss meter inaccuracies and to ensure accurate billing from the utility.
- The system's isolation valves are infrequent and unreliable, often leading to large portions of the system without water due to a lack of ability to isolate sections of the system. New isolation valves are necessary to allow for proper emergency operation. To properly maintain, flush, operate, and respond to emergency situations such as a water main break, valves should be provided at critical intersections. These system valves allow the distribution system to be segmented into smaller areas to limit the number of out of service customers affected by such an emergency. The ability to isolate portions of the system, in conjunction with line redundancy noted above, is critical for proper operation and emergency response.
- The Validated Water Loss Audit for 2021 (**Appendix D**) found that the utility is experiencing approximately 30% losses. There are many factors that contribute to these high losses including meter inaccuracies and leaks in the lines. Such high losses cost the utility thousands of dollars per year in both the cost of purchased water and lost revenues. Further, significant leaks in the water mains can cause a threat to water quality. It is imperative that these losses be addressed via meter and water main replacements.
- Many of the 2-inch diameter lines in the system consist of Schedule 40 PVC. While this material is sufficient during typical operations, it is not rated to withstand spikes in pressure. Due to the area's topography and the utility's operations, pressure spikes are not uncommon in the system. Additionally, as the lines age, the materials deteriorate over time, increasing their vulnerability to leaks.
- Redundant lines should be provided to ensure all areas of the system have available water should a water main break occur, or a line need to be taken out of service. There is currently only one line connecting the east and west sides of the community. If this line were to break or require isolation, it would greatly impact the water supply to half of the community. A redundant line should be installed to ensure a consistent, safe water supply to the entire community.

- The high service pumps and all associated components are at the end of their expected useful life according to the Asset Management Plan (**Appendix C**). The pumps will continue to decrease in efficiency and the risk of failure will increase as they continue to age. These pumps provide all water to the distribution system from the Valley Woods Tank. In order to prevent unexpected pump failure, the pumps are in need of rehabilitation or replacement.
- For this project, a hydraulic model of the Valley Rural Utility Company Water System was created to evaluate pressure and fire flow needs throughout the system. The Northwest section of the system and the north section in front of the hilltop ground storage tank were found to have inadequate pressure during projected peak demand. Most of the system was found to be unable to provide sufficient emergency fire flow.
- The Stateline Tower has security cameras that are currently non-functional, leaving the Utility unprotected in the case of vandalism. Further, the cameras that are currently installed are not NDAA compliant and are at heightened risk for cyberattacks. Additionally, the Utility does not currently have remote notification for alarms. This means that if an alarm were to occur while nobody is present at the utility office, there would be no notification of the alarm to the staff, potentially leaving an alarm unaddressed for a long period of time. **These are major security concerns and should be corrected to protect the security of the water supply.**
- The storage tanks are in overall good condition but do require repairs according to their most recent inspections (a copy of the inspection reports is included in **Appendix A**). Both the Stateline and the Valley Woods tanks are in need of minor repairs due to typical aging of the storage tanks as well as updated health and safety standards outlined by the American Water Works Association since the original construction of the tanks. Additionally, the Valley Woods Tank is in need of more extensive improvements, including sandblasting and recoating the interior of the tank as well as replacing the support structure on the roof plates.
- The results of the modeling scenarios indicate that the existing distribution system has significant difficulty providing fire flow at each of the hydrants. The primary limitation for hydrants is residual pressures within the distribution system, and not necessarily inadequately sized water mains in the system.

ES.4 Alternative Analysis

The alternatives considered are compared through a life cycle cost analysis or Present Worth Analysis. This analysis identifies the most cost-effective alternative as a measure of the total money spent to implement. The alternative with the lowest present worth is the least costly alternative to implement. **Tables ES-1** through **ES-6** illustrate the outcome of these analyses.

Table ES-1
Customer Meters – Cost Effective Comparison

Alternatives	No Action	Alternative 1 - New Meters and Automatic Meter Reading with Advanced Metering Infrastructure (AMI)
Cost Summary		
a. Estimated Construction Costs	$0	$1,658,600
b. Estimated Non-Construction Costs	$0	$414,650
c. Estimated Capital Costs	$0	$2,073,250
d. Estimated Annual O&M&R	$0	$42,800
e. Estimated Salvage Value	$0	$0
Present Worth		
(20 year at 2.5%)		
a. Total Capital Cost	$0	$2,073,250
b. Present Worth Annual O&M&R	$0	$667,216
(Present Worth Factor 15.59)		
c. Present Worth Salvage	$0	$0
(Present Worth Factor 0.610)		
d. Total Present Worth	$0	$2,740,466
(TPW = a + b – c)		

Table ES-2
Distribution System – Water Main Improvement – Cost Effective Comparison

Alternatives	No Action	Alternative 1 - Replace All Lines at the End of Remaining Useful Life	Alternative 2 - Replace All Lines Less than 4-Inches in Diameter	Alternative 3 - Replace Areas of Concern
Cost Summary				
a. Estimated Construction Costs	$0	$35,505,100	$28,720,050	$7,390,500
b. Estimated Non-Construction Costs	$0	$8,876,275	$7,180,013	$1,847,625
c. Estimated Capital Costs	$0	$44,381,375	$35,900,063	$9,238,125
d. Estimated Annual O&M&R	$0	$0	$0	$0
e. Estimated Salvage Value	$0	$5,334,600	$4,197,100	$642,000
Present Worth				
(20 year at 2.5%)				
a. Total Capital Cost	$0	$44,381,375	$35,900,063	$9,238,125
b. Present Worth Annual O&M&R	$0	$0	$0	$0
(Present Worth Factor 15.59)				
c. Present Worth Salvage	$0	$3,255,551	$2,561,368	$391,794
(Present Worth Factor 0.610)				
d. Total Present Worth	$0	$41,125,824	$33,338,694	$8,846,331
(TPW = a + b – c)				

Table ES-3
Distribution System – Looping – Cost Effective Comparison

Alternatives	No Action	Alternative 1 - Add a Redundant Feed Line on South Side of Dam
Cost Summary		
a. Estimated Construction Costs	$0	$2,771,000
b. Estimated Non-Construction Costs	$0	$692,750
c. Estimated Capital Costs	$0	$3,463,750
d. Estimated Annual O&M&R	$0	$0
e. Estimated Salvage Value	$0	$0
Present Worth		
(20 year at 2.5%)		
a. Total Capital Cost	$0	$3,463,750
b. Present Worth Annual O&M&R	$0	$0
(Present Worth Factor 15.59)		
c. Present Worth Salvage	$0	$0
(Present Worth Factor 0.610)		
d. Total Present Worth	$0	$3,463,750
(TPW = a + b – c)		

Table ES-4
High Service Pumps – Cost Effective Comparison

Alternatives	No Action	Alternative 1 - Replace High Service Pumps and Add VFDs	Alternative 2 - Replace High Service Pumps, Add VFDs, and Associated Piping, Valves, and Appurtenances
Cost Summary			
a. Estimated Construction Costs	$0	$282,000	$341,350
b. Estimated Non-Construction Costs	$0	$70,500	$85,338
c. Estimated Capital Costs	$0	$352,500	$426,688
d. Estimated Annual O&M&R	$0	$3,000	$3,100
e. Estimated Salvage Value	$0	$0	$11,300
Present Worth			
(20 year at 2.5%)			
a. Total Capital Cost	$0	$352,500	$426,688
b. Present Worth Annual O&M&R	$0	$46,767	$48,326
(Present Worth Factor 15.59)			
c. Present Worth Salvage	$0	$0	$6,896
(Present Worth Factor 0.610)			
d. Total Present Worth	$0	$399,267	$468,118
(TPW = a + b – c)			

While the least cost alternative is Alternative 1, Alternative 2 includes additional work that will increase the longevity of the system. It is recommended that Alternative 2 be included in the selected project to ensure long-lasting function.

Table ES-5
Storage – Cost Effective Comparison

Alternatives	No Action	Alternative 1 - Perform Storage Tank Repairs	Alternative 2 - Construct a New Elevated Storage Tank with 3 New Booster Stations and Rehabilitate the Small Tank	Alternative 3 - Construct a New Elevated Storage Tank with a Dedicated Feed Line and Rehabilitate the Small Tank
Cost Summary				
a. Estimated Construction Costs	$0	$640,000	$7,556,895	$12,599,945
b. Estimated Non-Construction Costs	$0	$160,000	$1,889,224	$3,149,986
c. Estimated Capital Costs	$0	$800,000	$9,446,119	$15,749,931
d. Estimated Annual O&M&R	$0	$0	$0	$1,200
e. Estimated Salvage Value	$0	$18,400	$50,000	$2,415,700
Present Worth				
(20 year at 2.5%)				
a. Total Capital Cost	$0	$800,000	$9,446,119	$15,749,931
b. Present Worth Annual O&M&R	$0	$0	$0	$18,707
(Present Worth Factor 15.59)				
c. Present Worth Salvage	$0	$11,229	$30,514	$1,474,232
(Present Worth Factor 0.610)				
d. Total Present Worth	$0	$788,771	$9,415,605	$14,294,407
(TPW = a + b – c)				

Multiple alternatives were considered in remedying pressure issues in the system, including installing new booster stations with a new elevated storage tank and installing a new eight (8)-inch primary transmission main with a new elevated storage tank. Both alternatives include strategically placed pressure reducing valves.

The new booster station alternative would provide adequate pressures into the system but would not be able to provide adequate emergency fire flow. The new elevated tank and dedicated feed line alternative would address both pressure and fire flow issues. However, while these alternatives serve to address pressure and emergency fire flow issues, they present an increased risk of failure should one of the pressure reducing valves fail, leading to large pressure spikes in the system.

Due to the high risk presented by alternatives 2 and 3, the recommended storage alternative is to perform storage tank repairs and rehabilitation, including all items outlined on the tank inspections included in **Appendix A** as well as security improvements and a new alarm system.

Table ES-6
Fire Flow
Cost Effective Comparison

Alternatives	No Action	*Alternative 1 - Upgrade the System to Provide Fire Flow
Cost Summary		
a. Estimated Construction Costs	$0	$28,051,550
b. Estimated Non-Construction Costs	$0	$7,012,888
c. Estimated Capital Costs	$0	$35,064,438
d. Estimated Annual O&M&R	$0	$6,200
e. Estimated Salvage Value	$0	$5,034,500
Present Worth		
(20 year at 2.5%)		
a. Total Capital Cost	$0	$35,064,438
b. Present Worth Annual O&M&R	$0	$96,653
(Present Worth Factor 15.59)		
c. Present Worth Salvage	$0	$3,072,409
(Present Worth Factor 0.610)		
d. Total Present Worth	$0	$32,088,681
(TPW = a + b – c)		

To provide Fire Flow to the system, the recommended project should include* ***Alternative 4.2.D.* *Replace Areas of Concern,* ***Alternative 4.3.B.*** *Redundant Feed Line on South Side of Dam, and* ***Alternative 4.5.D.*** *Construct a New 500,000-Gallon Elevated Storage Tank with a Dedicated Feed Line in addition to the alternative outlined above. The total present worth of providing fire flow to the system is $58,693,169.*

ES.5 Recommended Improvements Project

The recommended improvements are summarized below based on the analysis and needs discussed in this PER:

- New Meters and Automatic Meter Reading with Advanced Metering Infrastructure (AMI)
- Replace Areas of Concern and Add Isolation Valves
- Add a Redundant Feed Line on South Side of Dam
- Replace High Service Pumps, Add VFDs, and Associated Piping, Valves, and Appurtenances
- Perform Storage Tank Repairs and Rehabilitation

The recommended improvements are summarized in **Figure ES-2**. In addition to these improvements, it is recommended that the utility implement a valve maintenance and replacement program to ensure the longevity of the system.