

BCRSD PRAIRIE MEADOWS SSES TECHNICAL MEMORANDUM

Boone County Regional Sewer District
February 2024
McClure Project No. 2023001832-000

Report For:

Boone County Regional Sewer District
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BCRSD Prairie Meadows SSES Technical Memorandum

Boone County Regional Sewer District

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McClure Project No. 2023001832-000


	<p>I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Missouri.</p> <p><i>Ellen Woltjen</i> 2-12-2024</p> <hr/> <p>Ellen E. Woltjen, P.E., Missouri Reg. No. 2022033170.</p> <p>My license renewal date is December 31, 2024.</p>
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1.0 INTRODUCTION

Boone County Regional Sewer District (BCRSD) retained the services of McClure in a General Consultant Services Agreement dated November 3, 2023 to perform an evaluation of the wastewater collection system that flows into the BCRSD Prairie Meadows Wastewater Treatment Plant (WWTP). The primary purpose of the investigation of the collection system, also referred to as a Sanitary Sewer Evaluation Survey (SSES), is to identify defects in the collection system infrastructure that may be sources of inflow and infiltration (I/I). The SSES investigation tools included as part of the General Services Agreement are as follows:

1. Desktop review of past reports and field investigations applicable to the project area.
2. Manhole inspections.
3. Closed circuit television (CCTV) and cleaning of a portion of the collection system.
4. Review of operational data and reports.

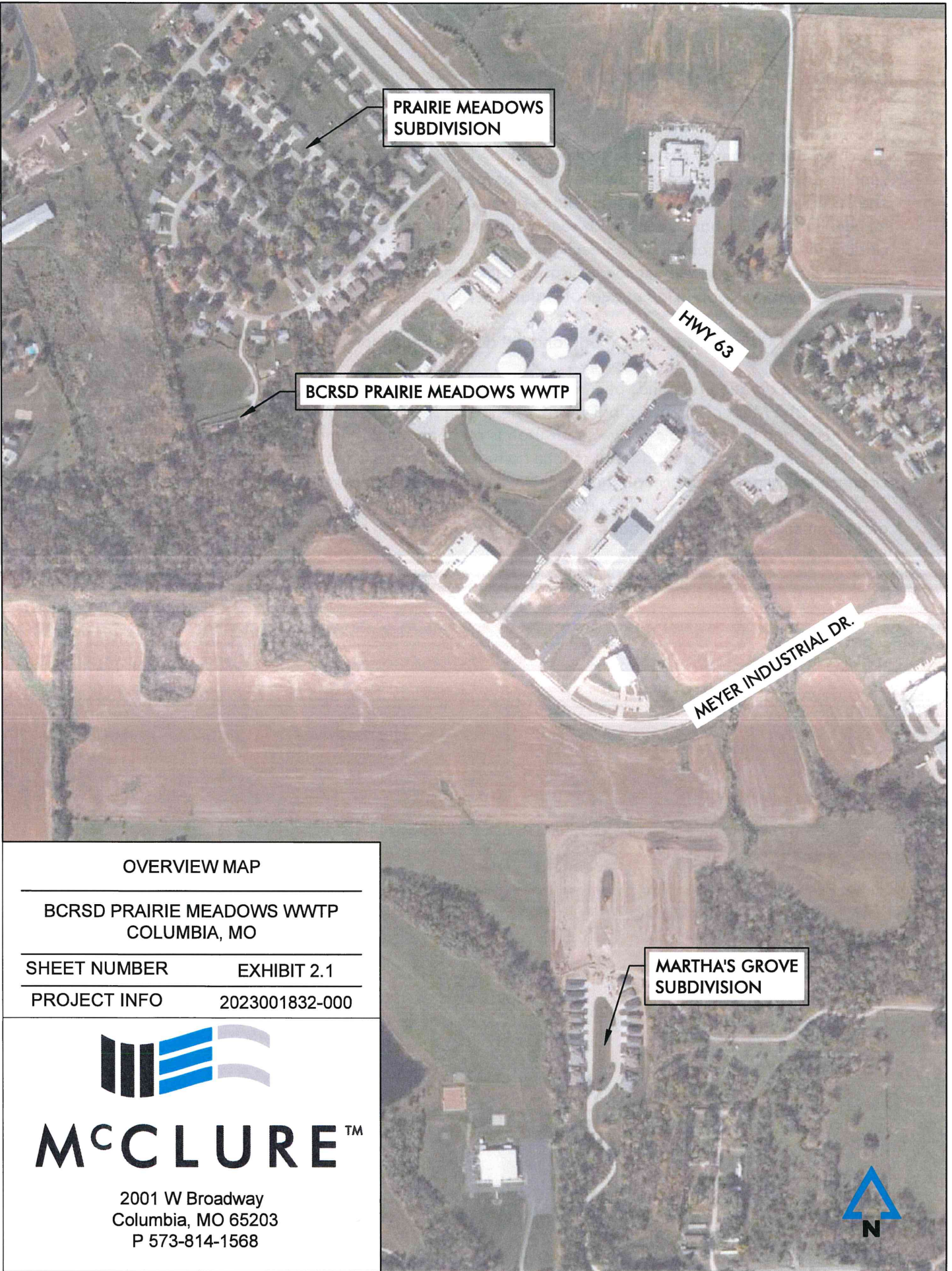
The purpose of this Technical Memorandum is to summarize the results of the desktop and field investigations performed as part of the SSES. The scope of the Technical Memorandum includes:

1. Estimation and prioritization of defects identified, based on a cost per gallon of extraneous water removed.
2. Evaluation of manholes inspected to recommend grouting, other forms of rehabilitation, or full replacement to reduce extraneous water entering the system.
3. Evaluation of sewer mains inspected to recommend in-situ replacement, lining of sewer mains, or full replacement to reduce extraneous water entering the system, or upsizing of mains to reduce bottlenecks in the collection system.
4. Prepare recommendations for improvements.
5. Prepare Engineer's opinion of probable cost.

2.0 BACKGROUND INFORMATION

The wastewater collection system being evaluated flows to the BCRSD Prairie Meadows WWTP, which is located approximately 0.1 miles southwest of the intersection of E. Prairie Circle & Meadow Lark Lane in Columbia, Missouri. An overview map of the project location is provided on the follow page. The WWTP is an extended aeration package plant, and the treatment process primarily consists of an influent lift station, a bar screen, a flow equalization basin, an extended aeration basin, a final clarifier, and an ultraviolet (UV) disinfection system. The solids processing treatment includes an aerobic sludge digester with biosolids disposed offsite as needed by a hauler. The treatment plant is regulated by the Missouri Department of Natural Resources (MoDNR) under the Missouri State Operating Permit number MO-0083542 (see Appendix A). The permitted design average flow of WWTP is 80,000 gallons per day (gpd), and the design population equivalent is 1,000 persons.

The extended aeration plant has been in operation since 2006 and primarily serves the Prairie Meadows and Martha's Grove subdivisions. The Prairie Meadows subdivision is primarily duplex residences, and the Martha's Grove subdivision is primarily single-family homes. Additionally, there are two churches connected, a small mobile home park connection, and a few commercial/industrial connections located along Meyer Industrial Drive. As of January 2024, the WWTP serves a total of 183 connections. There are additional lots in the Meyer Industrial Drive area available for industrial and commercial development that could become connections in the future if there is sufficient capacity in the wastewater system.



PRAIRIE MEADOWS
SUBDIVISION

BCRSD PRAIRIE MEADOWS WWTW

HWY 63

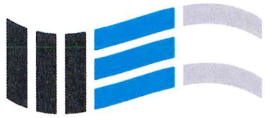
MEYER INDUSTRIAL DR.

MARTHA'S GROVE
SUBDIVISION

OVERVIEW MAP

BCRSD PRAIRIE MEADOWS WWTW
COLUMBIA, MO

SHEET NUMBER	EXHIBIT 2.1
PROJECT INFO	2023001832-000



M^cCLURE™

2001 W Broadway
Columbia, MO 65203
P 573-814-1568



3.0 WWTP FLOW ANALYSIS

Operational Monitoring Reports provided by BCRSD from 2019 through 2023 were reviewed to analyze flow trends at the WWTP. Effluent flow at the WWTP is typically recorded two or three times per week. Influent flow data was not available. The monthly average effluent flow data from 2019 through 2023 is summarized in Table 3.1. Over this five-year period, the average effluent flow at the WWTP was approximately 34,349 gpd.

Table 3.1 Average Effluent Flow Data 2019 – 2023

<i>Month</i>	2019 Avg. Flow (MGD)	2020 Avg. Flow (MGD)	2021 Avg. Flow (MGD)	2022 Avg. Flow (MGD)	2023 Avg. Flow (MGD)
<i>Jan</i>	0.0273	0.0286	0.0268	0.0290	0.0418
<i>Feb</i>	0.0451	0.0267	0.0255	0.0258	0.0453
<i>March</i>	0.0339	0.0361	0.0363	0.0289	0.0413
<i>April</i>	0.0338	0.0264	0.0408	0.0402	0.0404
<i>May</i>	0.0321	0.0265	0.0342	0.0309	0.0527
<i>June</i>	0.0667	0.0244	0.0375	0.0275	0.0344
<i>July</i>	0.0270	0.0285	0.0282	0.0318	0.0511
<i>August</i>	0.0250	0.0259	0.0284	0.0291	0.0935
<i>Sept</i>	0.0205	0.0236	0.0295	0.0276	0.0518
<i>Oct</i>	0.0270	0.0252	0.0290	0.0333	0.0432
<i>Nov</i>	0.0208	0.0261	0.0293	0.0500	0.0475
<i>Dec</i>	0.0254	0.0225	0.0288	0.0432	0.0414
<i>Yearly Avg.</i>	0.0283	0.0267	0.0313	.0331	0.0493

As seen in Table 3.1, the yearly average effluent flow has generally increased from 0.0283 MGD in 2019 to 0.0493 MGD in 2023. For comparison with the effluent flow data, precipitation data was gathered from the Bradford Research and Extension Center weather station available through the University of Missouri Extension – Missouri Historical Agricultural Weather Database. The Bradford Research and Extension Center is approximately 3.8 miles east of the WWTP. Exhibit 3.1 illustrates the monthly average effluent flow from the WWTP compared to the total monthly precipitation. As seen by the linear projections in the graph, annual precipitation amounts generally decreased over the course of the five-year period while the average effluent flow trend increased.

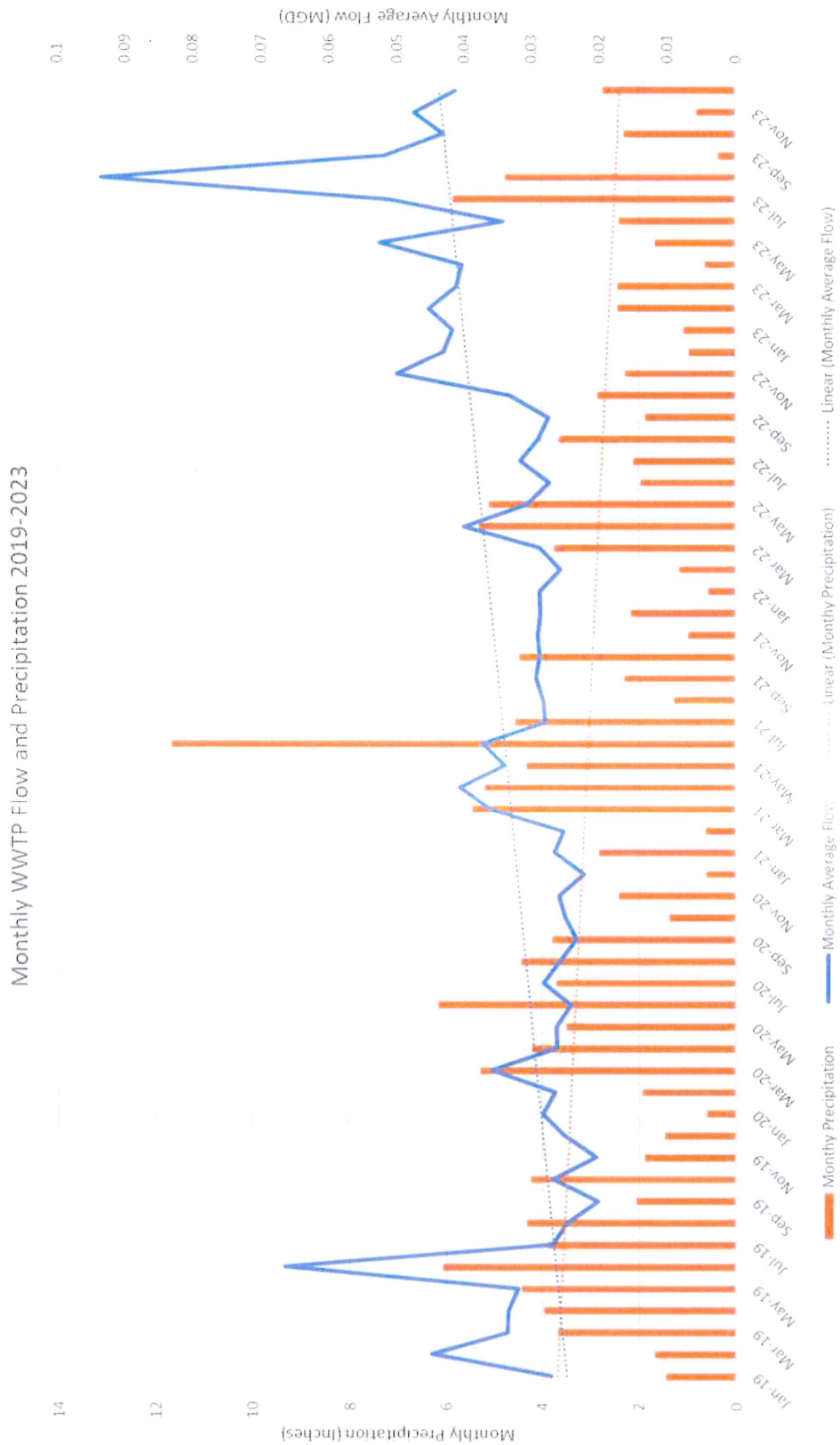


Exhibit 3.1: Monthly WWTP Flow and Precipitation Trend 2019-2023

To determine potential causes for the increase in average flow at the WWTP, the data provided was also used to estimate average dry weather flow, average wet weather flow and maximum wet weather flow on an annual basis. The average dry weather flow primarily consists of the wastewater discharged by all users connected to the collection system with minimal I/I influence. The average dry-weather flow (ADW) was estimated for each year as the minimum average flow recorded over a 30 consecutive day period. The average wet-weather flow (AWW) was estimated for each year as the maximum average flow recorded over a 30 consecutive day period. The maximum wet weather flow (MWW) was estimated as the highest recorded daily flow for each year. The ratio of MWW flow rates to ADW flow rates was then used to calculate a peaking factor for each year. The peaking factor metric is used to quantify if the peak flow observed during wet weather events is significantly higher than the typical average daily flow. As a general rule of thumb, peaking factors less than 10 are deemed typical and peaking factors greater than 10 are considered excessive. The information described above is presented in Table 3.2. The ADW flow for each year was also compared to the number of connections at that time to account for the addition of new customers.

Table 3.2 Summary of Estimated Flow Characteristics 2019-2023

	2019	2020	2021	2022	2023
<i>ADW Flow (MGD)</i>	0.0203	0.0213	0.0246	0.0243	0.0308
<i>AWW Flow (MGD)</i>	0.0667	0.0362	0.0418	0.0536	0.113
<i>MWW Flow (MGD)</i>	0.0882	0.0678	0.0864	0.0968	0.382
<i>PF (MWW/ADW)</i>	4.3	3.2	3.5	4.0	12.4
<i>Est. # of Connections</i>	151	164	182	183	183
<i>ADW per Connection (GPD)</i>	134.6	129.8	135.0	132.9	168.5

As seen in the table, the peaking factors for 2019 to 2022 are all within 3.2 to 4.3 indicating minimal I/I impact on the collection system. However, in 2023 the peaking factor increased significantly to 12.4. There were no known new connections in 2023 to account for the increase in flow. In general, 2023 was a dry year with much of Boone County experiencing drought conditions. July and August were the wettest months of 2023 with recorded rainfall of totals of 5.84 inches and 4.77 inches respectively. The MWW of 0.382 MGD occurred on August 2, 2023. The Bradford Research and Extension Center weather station recorded a 1.13-inch rainfall on the same day. Additionally, BCRSD staff reported a manhole ahead of the influent pump station overflowed in late July 2023 as the influent pump station could not handle the increased peak flows. The spike in AWW and MWW flow observed in 2023 indicates a potentially severe defect or increased number of I/I pathways developed in 2023.

Drinking water sales records for the connections to the BCRSD Prairie Meadows WWTP were also reviewed for 2022 and 2023 for comparison to the wastewater flow data. As seen in Table 3.2, from 2022 to 2023 the ADW flow per connection increased by approximately 35.6 gallons per day. In 2022 the average daily drinking water usage was approximately 0.0240 MGD. In 2023, the average daily drinking water usage was approximately 0.0215 gpd. The observed increase in ADW flow from 2022 to 2023 and decrease in drinking water usage is another indicator that extraneous water is entering the collection system.

4.0 COLLECTION SYSTEM INVESTIGATION

4.1 Existing Collection System

The collection system includes approximately 9,735 LF of gravity sewer mains and 43 manholes. Additionally, there are approximately 6,300 LF of forcemain and one pump station. The collection system in the Prairie Meadows subdivision is older, with the first lines installed in the 1960s and 70s. The collection system in the Martha’s Grove subdivision is much newer, mostly constructed in the 2000s. Maps of the collection system provided by BCRSD are shown in Exhibit 4.1 and Exhibit 4.2.

The sewer pipe characteristics of the gravity segments are listed in Table 4.1 below.

Table 4.1 Gravity Sewer Pipe Characteristics

Sewer Pipe Characteristics	
Size/Material	Approximate Linear Feet
8" PVC	7,477
8" FRP Lined	2,160
8" DIP	98
Total	9,735

Additionally, there are private service laterals, which generally consist of 4-inch and 6-inch lines that connect the individual residences and buildings to the Prairie Meadows collection system. The property owner is generally responsible for the condition of the entire service lateral. During the CCTV inspection described in further detail in Section 4.2, a total of 95 active lateral tap connections were observed. Additionally, there are 3 connections that use private grinder pumps to tie into the public forcemain via private pressure sewers. A private manhole is located at the mobile home park connection to the Martha’s Grove subdivision. Investigation of the private components of the collection system was not included in the scope of this Technical Memorandum.

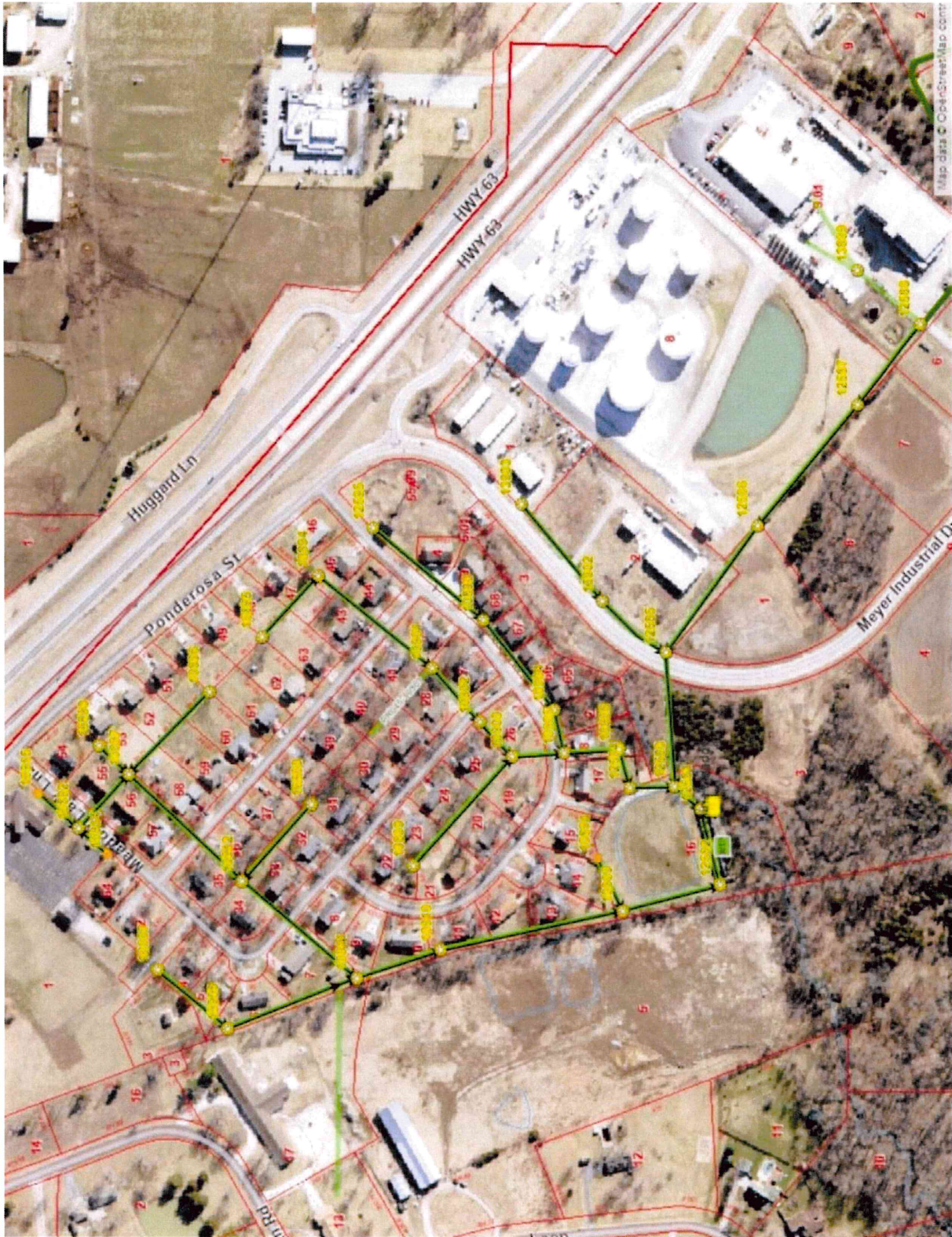


Exhibit 4.1: Existing Collection System – Prairie Meadows Subdivision

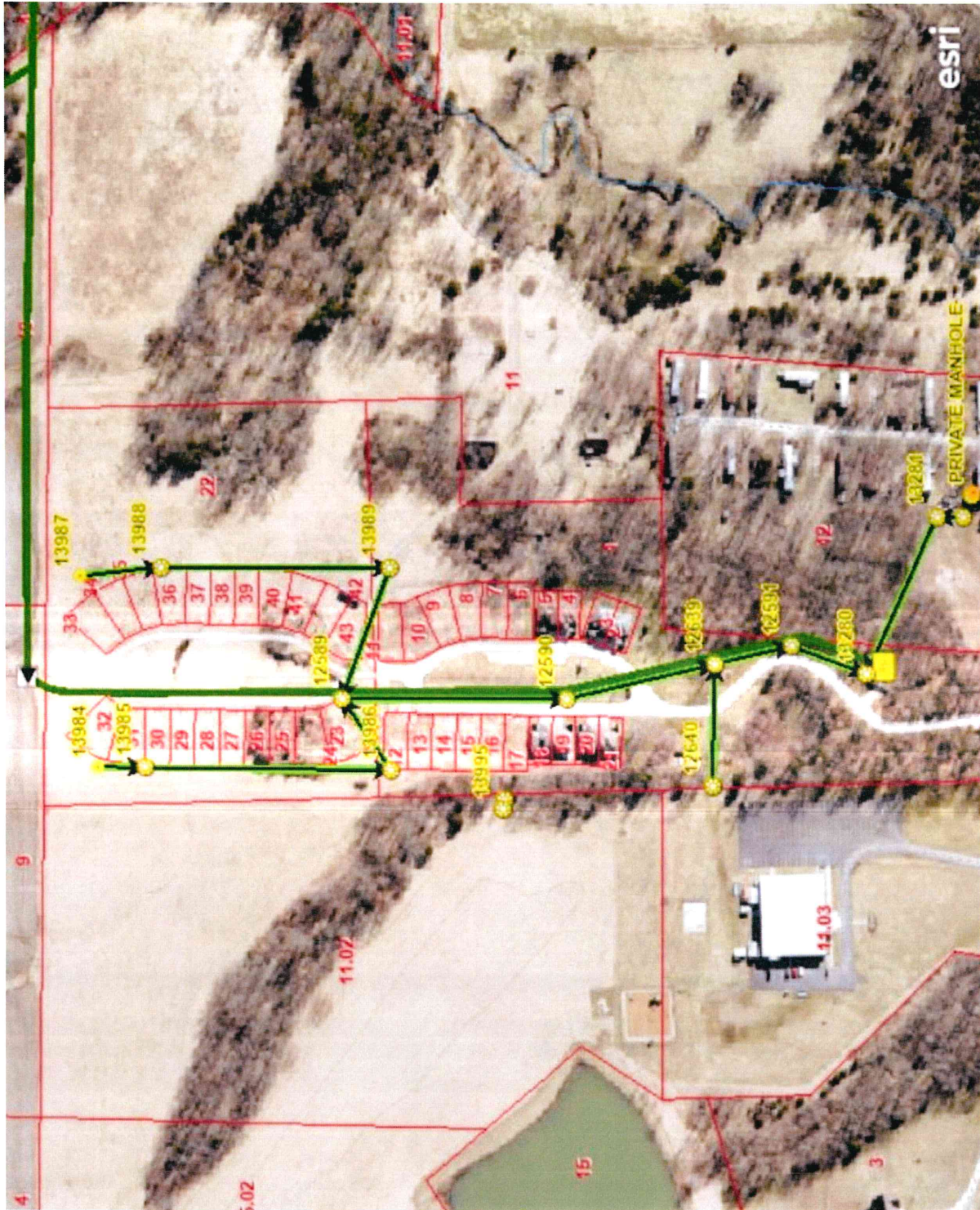


Exhibit 4.2: Existing Collection System – Matha's Grove Subdivision

4.2 CCTV Inspection Results

In December 2023, closed-circuit television (CCTV) inspections were performed by BCRSD staff on all accessible gravity lines within the collection system. The CCTV inspections and grading were conducted according to the National Association of Sewer Services Companies (NASSCO) Pipe Assessment and Certification Program (PACP) system. During the inspections, 43 sewer segments totaling approximately 9,803.9 LF were televised. One of the 43 segments, approximately 101.3 LF in length was a 6" vitrified clay pipe (VCP) private service line.

Using the PACP system, identified defects were graded on a scale of 1 to 5 (low-to-high) based on severity. Grade 1 defects are generally characterized as general observations or insignificant defects. The grade of the individual defects observed during the CCTV inspection are then averaged to develop a pipe rating index (PRI) for each segment. If no defects are observed, the segment is given a PRI of 0. A summary of the overall pipe rating index of the segments inspected is given in Table 4.2.

Table 4.2 Overall Pipe Rating Index (PRI) Scores

Overall-PRI Ratings	
Rating	Count
5.0	0
4.0-4.9	1
3.0-3.9	5
2.0-2.9	7
1.0-1.9	0
0	29

Of the 43 segments televised, 13 segments, or approximately 30 percent, were found to have defects and were graded at an overall PRI of greater than or equal to 2. The overall PRI ratings provide a snapshot of the general condition of the collection system; however, the number and type of defects identified within each segment must also be considered to develop a more complete understanding of the sewer condition. Table 4.3 below provides a summary of the defects observed during the CCTV inspection.

Table 4.3 Summary of Pipe Defects

Defect	Total Observed
Water Level Sag	12
Hole Soil Visible	1
Broken	1
Deformed	1
Joint Offset Medium	1
Joint Offset Large	1
Infiltration Runner	1
Roots Fine Joint	5
Roots Medium Joint	9

Roots Ball Joint	1
Roots Fine Lateral	4
Roots Medium Lateral	4
Roots Ball Lateral	5
Tap Break-in Defective	5

A total of 51 defects were observed during the CCTV inspection. Of these defects, 38 could potentially allow for extraneous water to enter the collection system through infiltration. The Water Level Sag and Deformed defects are structural defects that do not contribute to infiltration. Twelve of the remaining 38 defects were found on the 6" private line. These included: Broken (1), Roots Medium Joint (5), Roots Fine Joint (5), and Roots Ball Joint (1). The District does not have jurisdiction over private service lines, and the cost to rehabilitate private lines generally falls to the property owners. Excluding the private service line with the 12 defects noted, a total of 26 defects among 12 pipe segments remain as possible sources of infiltration that could be rehabilitated by the District. None of these defects appear to be sources of severe infiltration.

4.3 Manhole Inspection Results

In January 2024 topside manhole inspections were performed by McClure staff on all accessible manholes within the collection system. A total of 41 manholes were inspected. Manhole 12587 could not be opened, and Manhole 13903 was not located. During inspection, field investigation forms were utilized to record observations for each manhole and photos of each structure were taken at regular intervals.

The condition of each manhole was graded on a scale of 1 to 5 (best to worst). A perfectly set manhole without cracks, infiltration, missing steps, etc. would be a 1. Limited cracks, missing steps, and slight infiltration would generally be considered a 2. Slight to moderate infiltration but structurally adequate manholes would be considered a 3. Moderate to heavy infiltration, along with major structural deficiencies, missing bricks, missing grout, and requires rehabilitation soon before failure occurs is generally considered a 4. Manholes that are structurally deficient, allow severe infiltration and require attention immediately are generally regarded as a 5. A summary of the overall manhole ratings given in the field is presented in Table 4.4

Table 4.4 Overall Manhole Condition Ratings

Overall Manhole Ratings	
Rating	Count
5	0
4	0
3	6
2	31
1	4

Of the 41 manholes inspected, 35 were graded at an overall condition rating of greater than or equal to two, 6 were graded at a condition rating of three, and none were graded at a four or five. All manholes inspected were found to be pre-cast, with a few having brick adjustment rings. In general, the manholes appeared to be in good condition with some slight infiltration occurring mainly at the joints.

5.0 IMPROVEMENT ALTERNATIVES

5.1 Sewer Pipe Rehabilitation Alternatives

Sewer pipe rehabilitation alternatives were developed based on the results of the CCTV investigation for segments with observed defects. Table 5.1 below summarizes the improvements that could be implemented to repair the defects in each segment.

Table 5.1 Sewer Pipe Rehabilitation Recommendations

Segment	Observed Defects	Rehabilitation Recommendations
13280-12591	(2) Water Level Sag @ 1.6 ft & 9.8 ft	(1) Point Repair at WLS (less than 12')
10897-10896	(2) Roots Ball Lateral @ 235.7 & 270.6 ft (1) Joint Offset Medium @ 271.7 ft (2) Defective Tap @ 225.1 & 290.7	(4) Tap Replacement at RBL & DT (1) Point Repair at JOM
10907-10908	(1) Defective Tap @ 39.9 ft	(1) Tap Replacement at DT
10908-10911	(2) Water Level Sag at 337.7 ft & 359.6 ft (1) Defective Tap @ 80.8ft	(1) Tap Replacement at DT New Approx. 25 LF pipe segment at WLS
10901-10913co (PRIVATE LINE)	(1) Broken at 22.3 (5) Roots Medium Joint, (5) Roots Fine Joint (1) Roots Ball Joint at 71.3 ft	CIPP Line Segment (6" Diameter) Approx. 101.3 LF (private line)
10894-10901	(2) Water Level Sag @ 0.5 ft & 21.7 ft (2) Material change @ 13.9 ft & 183.3 ft (VCP segment) (4) Roots Medium Joint (in VCP segment) (1) Roots Ball Lateral @ 67.5	CIPP Line Segment (8" Diameter) Approx. 170 LF (1) Tap Replacement at RBL New 25 LF pipe segment at WLS
10912-10900	(2) Roots Fine Lateral @ 61.6 & 164.9 (1) Roots Medium Lateral @ 358.2 (2) Roots Ball Lateral @ 299.7 & 351.6	(5) Tap Replacement at RFL, RML, & RBL
10911-10912	(1) Deformed at 136.5 ft (4) Water Level Sag @ 79.2, 85.2, 346.2, 367.6 (1) Roots Fine Lateral @ 350.9	(1) Tap Replacement at RFL (1) Point Repair at Deformed Pipe (Sags are minor, no rehab. recommended)
10910-10911	(1) Infiltration Runner @ 1.6 ft (1) Defective Tap @ 1.6 ft	(1) Tap Replacement at DT/IR
10905-10903	(1) Roots Ball Lateral @ 40.7 ft	(1) Tap Replacement at RBL
10903-10899	(2) Water level Sag at 120.9 & 175.9 ft (1) Hole Soil Visible at 290.1 ft (2) Roots Medium Lateral @ 73.5 & (1) Roots Fine Lateral @ 172.4	(2) Tap Replacement @ 73.5 & 290.1 (HSV is at tap connection) New Approx. 50 LF pipe segment at WLS
10893-12595	(1) Defective Tap at 5.2 ft (capped)	none
10894-10895	(1) Joint Offset Large at 189.4 ft	(1) Point Repair at JOL

Not including engineering and other associated fees, the estimated cost for completing the improvements identified above is approximately \$182,802. This cost estimate is broken down in Table 5.2 below.

Table 5.2 Total Sewer Pipe Rehabilitation Cost Estimate

BCRSD Prairie Meadows SSES
Collection System Improvements
Columbia, Missouri
Project No. 2023001832-000



Collection System Improvements

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Sewer Pipe Rehabilitation - Total					
1	Mobilization	1	LS	\$7,914	\$7,914
2	8-in PVC Sanitary Sewer Replacement	100	LF	\$200	\$20,000
3	Sanitary Sewer CIPP Lining, 6-in Diameter	102	LF	\$35	\$3,570
4	Sanitary Sewer Main CIPP Lining, 8-in Diameter	170	LF	\$40	\$6,800
5	Point Repairs on Pipes (up to 12')	4	EA	\$8,000	\$32,000
6	Grouting: Laterals	1	EA	\$800	\$800
7	Tap Cuts	1	EA	\$100	\$100
8	Tap Replacement	17	EA	\$5,000	\$85,000
9	Bypass Pumping During Construction	1	LS	\$10,000	\$10,000
Subtotal of Probable Construction Cost					\$166,184
Contingency Allowance (10%)					\$16,618
Total Construction					\$182,802

Consultant's opinions of probable construction costs are to be made on the basis of Consultant's experience, qualifications, and general familiarity with the construction industry. However, because Consultant has no control over the cost of labor, materials, equipment, or services furnished by others, or over contractors' methods of determining prices, or over competitive bidding or market conditions, Consultant cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from opinions of probable construction cost prepared by Consultant.

As previously discussed, the Water Level Sag and Deformed defects are not contributors to infiltration. Additionally, the segment from MH 10901 to cleanout 10913 is a private line and should be maintained by the individual property owners. Removing these improvements reduces the cost estimate to approximately \$131,324 as seen in Table 5.3.

Table 5.3 Reduced Sewer Pipe Rehabilitation Cost Estimate

BCRSD Prairie Meadows SSES
Collection System Improvements
Columbia, Missouri
Project No. 2023001832-000



Collection System Improvements

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Sewer Pipe Rehabilitation - Reduced					
1	Mobilization	1	LS	\$5,685	\$5,685
2	Sanitary Sewer Main CIPP Lining, 8-in Diameter	170	LF	\$40	\$6,800
3	Point Repairs on Pipes (up to 12')	2	EA	\$8,000	\$16,000
4	Grouting: Laterals	1	EA	\$800	\$800
5	Tap Cuts	1	EA	\$100	\$100
6	Tap Replacement	17	EA	\$5,000	\$85,000
7	Bypass Pumping During Construction	1	LS	\$5,000	\$5,000
Subtotal of Probable Construction Cost					\$119,385
Contingency Allowance (10%)					\$11,939
Total Construction					\$131,324

Consultant's opinions of probable construction costs are to be made on the basis of Consultant's experience, qualifications, and general familiarity with the construction industry. However, because Consultant has no control over the cost of labor, materials, equipment, or services furnished by others, or over contractors' methods of determining prices, or over competitive bidding or market conditions, Consultant cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from opinions of probable construction cost prepared by Consultant.

5.2 Manhole Rehabilitation Alternatives

Manhole rehabilitation alternatives were developed based on the results of the manhole inspection field investigation forms and photos. Manholes that were identified as priorities for rehabilitation based on the observed defects are summarized in Table 5.4.

Table 5.4 Manhole Rehabilitation Recommendations

Manhole	Observed Defects	Rehabilitation Recommendations
10892	Offset Frame Staining and Roots at Joints	Reset Frame and Seal Grout Joints and Cementitious Liner
10894	Staining and Roots at Joints	Grout Joints and Cementitious Liner
10897	Staining at Joints Roots in Pipe Seals	Grout Joints and Cementitious Liner Repair Pipe Seals (3)
10899	Staining at Joints Cracks in Concrete	Grout Joints and Cementitious Liner Reset Frame and Seal
10901	Missing Brick in Ring Major Roots at Joints and Pipe Seals	Replace with New Manhole
10902	Poor Frame Seal	Reset Frame and Seal
10903	Deteriorated Brick Rings Major Roots at Joints and Pipe Seals	Replace with New Manhole
10905	Staining at Joints Poor Pipe Seals	Grout Joints and Cementitious Liner Repair Pipe Seals (3)
10909	Roots at Joints	Grout Joints and Cementitious Liner
10910	Defects in Brick Rings and Concrete Poor Pipe Seal	Grout Joints and Cementitious Liner Repair Pipe Seal (1)
10911	Roots under Frame Seal Slight Staining at Joints	Reset Frame and Seal
12581	Staining at Ring/Chimney Roots at Pipe Seal Slight Corrosion Damage	Exterior Chimney Seal Repair Pipe Seal (1)
12582	Broken Lid	Replace Frame and Lid
12583	Roots at Frame Seal Staining at Joints Corrosion Damage	Reset Frame and Seal Grout Joints and Epoxy Coating
12585	Staining at Ring/Chimney Slight Corrosion Damage	Exterior Chimney Seal
12586	Staining at Joints Corrosion Damage	Grout Joints and Epoxy Coating
12588	Staining at Joints Corrosion Damage	Grout Joints and Epoxy Coating
12589	Lid Approx. 8-in Below Grade Slight Staining at Joints	Raise Lid to Grade
12595	Staining at Joints	Grout Joints and Cementitious Liner

13895	Lid Approx. 10-in Below Grade Poor Frame Seal	Raise Lid to Grade
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Although an inspection was not performed on MH 12587 as the lid could not be removed, it should likely be prioritized for epoxy coating due to its location downstream of the forcemain and the corrosion damage observed in manholes 12586 and 12588. MH 12587 is estimated to be around 12 ft deep. Manholes with the recommendation of “Grout Joints and Cementitious Liner” or “Grout Joints and Epoxy Coating” should have chemical grout injected through the manhole and into the soil at each joint to seal leaks and form a barrier on the exterior wall of the manhole. The applicable lining or coating should then be applied on the interior surface to further seal the manhole. The epoxy coating should be resistant to damage from corrosive gases.

Not including engineering and other associated fees, the estimated capital cost to complete the manhole improvements identified above is approximately \$96,016. These costs are summarized below in Table 5.5.

Table 5.5 Manhole Rehabilitation Cost Estimate

BCRSD Prairie Meadows SSES
Collection System Improvements
Columbia, Missouri
Project No. 2023001832-000



Collection System Improvements

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Manhole Rehabilitation					
1	Mobilization	1	LS	\$4,038	\$4,038
2	New 48" Manhole Replacement	2	EA	\$11,500	\$23,000
3	Raise MH Lid to Grade (6" to 12")	2	EA	\$2,500	\$5,000
4	New MH Frame and Lid	1	EA	\$2,500	\$2,500
5	Reset Frame and Seal	5	EA	\$2,000	\$10,000
6	External Chimney Seal	2	EA	\$1,500	\$3,000
7	Repair Pipe Seals	8	EA	\$500	\$4,000
8	48" Manhole Grout Joint & Cementitious Lining	65	VF	\$200	\$13,000
9	48" Manhole Grout Joints & Epoxy Coating	45	VF	\$450	\$20,250
10	Seeding, Fertilizing, and Mulching	1	LS	\$2,500	\$2,500
Subtotal of Probable Construction Cost					\$87,288
Contingency Allowance (10%)					\$8,729
Total Construction					\$96,016

Consultant's opinions of probable construction costs are to be made on the basis of Consultant's experience, qualifications, and general familiarity with the construction industry. However, because Consultant has no control over the cost of labor, materials, equipment, or services furnished by others, or over contractors' methods of determining prices, or over competitive bidding or market conditions, Consultant cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from opinions of probable construction cost prepared by Consultant.

All of the manhole improvements recommended have the potential to decrease the amount of inflow and infiltration entering the collection system. Exact quantities of potential I/I flow reduction could not be determined. None of the manholes were identified as a source of severe infiltration.

6.0 RECOMMENDATIONS

Based on the results of the field investigations, it is recommended that the defects identified as sources of I/I are repaired. Rehabilitating the collection system should reduce the overall amount of I/I entering the WWTP; however, exact quantities of I/I reduction could not be determined as the majority of defects identified are considered minor sources of I/I. Based on the significant increase in average wet weather and maximum wet weather flows observed in 2023, there may be additional sources of I/I in the collection system that were not discovered by this investigation. With this initial round of collection system improvements, it is estimated that additional connections with design flows up to a total of 10,000 gpd could be connected to the WWTP. Allowing an additional 10,000 gpd of connected wastewater flow should limit the average dry weather flow to the WWTP to approximately 40,000 gpd.

It is also recommended that a new flow meter is installed at the influent pump station of the WWTP to monitor influent flows more accurately. The data captured by the influent flow meter can be used to determine the level of I/I reduction achieved by the collection system rehabilitation. If a significant reduction in the average wet weather and maximum wet weather flows observed in 2023 is achieved, additional connections beyond the initial 10,000 gpd may be permissible. The total cost estimated for the recommended improvements including engineering, legal and administrative fees is approximately \$325,425 as detailed in Table 6.1 on the following page.

Data from the new influent flow meter should be compared to rainfall data on a regular basis to analyze the impact of wet weather events on the WWTP. If a reduction in I/I is not achieved after the proposed rehabilitation project is complete, additional collection system investigation such as smoke testing may be necessary. It should also be noted that new defects in the collection system that contribute to I/I could occur at any time.

Table 6.1 Total Project Cost Estimate

BCRSD Prairie Meadows SSES
Collection System Improvements
Columbia, Missouri
Project No. 2023001832-000



Collection System Improvements

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
Sewer Pipe Rehabilitation					
1	Mobilization	1	LS	\$5,685	\$5,685
2	Sanitary Sewer Main CIPP Lining, 8-in Diameter	170	LF	\$40	\$6,800
3	Point Repairs on Pipes (up to 12')	2	EA	\$8,000	\$16,000
4	Grouting: Laterals	1	EA	\$800	\$800
5	Tap Cuts	1	EA	\$100	\$100
6	Tap Replacement	17	EA	\$5,000	\$85,000
7	Bypass Pumping During Construction	1	LS	\$5,000	\$5,000
Manhole Rehabilitation					
11	Mobilization	1	LS	\$4,038	\$4,038
12	Manhole Replacement	2	EA	\$11,500	\$23,000
13	Raise MH Lid to Grade (6" to 12')	2	EA	\$2,500	\$5,000
14	New MH Frame and Lid	1	EA	\$2,500	\$2,500
15	Reset Frame and Seal	5	EA	\$2,000	\$10,000
16	External Chimney Seal	2	EA	\$1,500	\$3,000
17	Repair Pipe Seals	8	EA	\$500	\$4,000
18	48" Manhole Grout Joints & Cementitious Lining	65	VF	\$200	\$13,000
19	48" Manhole Grout Joints & Epoxy Coating	45	VF	\$450	\$20,250
20	Seeding, Fertilizing, and Mulching	1	LS	\$2,500	\$2,500
WWTP Improvements					
20	New Influent Flow Meter	1	LS	\$30,000	\$30,000
Subtotal of Probable Construction Cost					\$236,673
Contingency Allowance (10%)					\$23,667
Total Construction Cost					\$260,340
Engineering, Legal, and Administration (25%)					\$65,085
Total Project Cost					\$325,425

Consultant's opinions of probable construction costs are to be made on the basis of **Consultant's** experience, qualifications, and general familiarity with the construction industry. However, because **Consultant** has no control over the cost of labor, materials, equipment, or services furnished by others, or over contractors' methods of determining prices, or over competitive bidding or market conditions, **Consultant** cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from opinions of probable construction cost prepared by **Consultant**.