

McKINNEY WATER DISTRICT

WATER LOSS INVESTIGATION AND RESPONSE

AGE ENGINEERING SERVICES INC

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INTRODUCTION:

The overriding problem the McKinney Water District faces is the inability to generate enough funds from the operation of the water system to make major capital improvements. This is primarily due to a declining agricultural economy and a significant portion of the system customers existing below the poverty level. Recent CDBG income survey indicated a 65% low to moderate income level in the system customers. Little to no upgrades of the original water system, now 55 years old, have been made to this date.

McKinney Water District (MWD) is located in Lincoln County, Kentucky and primarily serves the south and south-west section of Lincoln County. Some small additional areas include around Rowland, Stanford, Ottenheim, Maywood and a small piece of Casey County.

The McKinney Water District began in 1965 with the McKinney Water District and in 1972 with the McKinney Water Association. In 1986 the two merged into the MWD as it is now. From the beginning the District has been aggressive in extending water mains to the rural portions of Lincoln County and as a result is serving a significant sparsely populated section of the County. That aggressive expansion policy has led to an increase in the customer count from 180 in 1973 to 2,348 in 2019. The District serves such name places as McKinney, Geneva, Turnersville, Mt Salem, New Salem, South Fork, Yocum, Jumbo, Miracle, Chicken Bristle, Blue Lick, Boneyville, Neals Creek, Maywood, Roland and Ottenheim.

A significant portion of the original water main system was installed in the 1960's and was installed with asbestos cement piping. Also the current water towers in the McKinney area are two stand pipe tanks built in 1966. Both are reaching the end of their useful life and are major contributors to the water quality issues the District is having. In the 1990's the District expanded water service on the East side of Stanford in the Roland area, as well as service in the Ottenheim area. Stanford and Eubank respectively supply water to these master meters.

Statement of Challenges, Goals, and Objectives:

The McKinney Water District is a drinking water system which has developed over the last 58 years to the point where it serves the majority of the rural portions of Lincoln County. The system is presently in a condition that allowed an unaccounted water loss of 35.7% in 2021. In the previous water loss Plan the water loss was reduced to 16.7% in 2012. In a record review the District reported a water loss of 14% in

1997. One of the issues with the McKinney water system is the length of pipes that is used to serve the customers. The system has a very low density of customers outside of McKinney and a few very small rural communities. This means that everything the District does require distances to be overcome to accomplish the tasks. This of course includes finding water loss in the water mains and customer services. Since 1997 the district has added more than 35 miles of water mains. The system currently has 676,436 feet (128 miles see table 4 for more details) of water mains. The system has six master meters purchasing water from the Cities of Stanford and Eubank. The system serves 2308 water customers. This is an average 293 feet of water main for each metered customer.

Another of the issues with any water system is the water that flows through the customer water meters and are not measured. This can be due to failing of slow meters but also very low flow that is not enough to turn the meter measuring device. This low flow amount can be significant in that one meter can under register water consumption at 1/8th gpm for a one month total of up to 5,400 gallons per month. Research has shown that unregistered low flows can be shown to be as much as 25% of the meters in use. This can be particularly troublesome when the low flow occurs on a continuous basis like a dripping faucet.

The 7 year average water usage from the City of Stanford was 247,317 gpd at a rate of \$2.99 per 1,000 g. and from the City Eubank was 72,164 gpd at a rate of \$3.60 per 1,000 g. The effective combined purchase price was \$3.15 per 1,000 g. The cost of the water loss at 35.7% was \$359.27 per day or \$131,134 per year based on 7 year average water usage.

The 2022 water purchases for the Cities is 310,795 gpd at \$3.23 per 1,000 g from Stanford and 74,341 gpd at \$3.60 per 1,000 g from Eubank. The system water loss for each City is 39.31% for Stanford and 9.51% for Eubank. The cost of lost water for each is \$394.62 for Stanford and \$25.45 for Eubank each day. This is an annualized total of \$153,326.22 per year.

The current cost of water loss calculations will be shown later in this report.

Goal:

The goal of this report and related activities is to reduce the water loss in the McKinney Water District water system to a level equal to 15 percent of the water purchased.

Objectives:

- 1) Have support of the Board of Commissioners and communicate with the utility customers the need for supporting the water loss elimination program.
- 2) Improve Water Meter accuracy in recording, reading, and billing for customer accounts, billing and collection.
- 3) Test meters and calculations to confirm accuracy of the data.
- 4) Analyze water loss on a monthly basis and adjust program as need to target specific high loss zones.
- 5) Target high water loss zones with check and portable ultrasound meters to narrow down water loss areas for further investigation.

Conditions of Existing Facilities:

System water loss and cost:

The McKinney Water District (District) last planned for water loss detection in 2011 when Kenvirons, Inc. assisted the District in developing a plan and implementing it for a period of time. When the project started in June 2011 the water loss was 42%, by April 2012 the water loss was calculated at 16.7% of water purchased. The Plan established a process for water loss detection and elimination that if followed would result in control of water loss at a level of near 15% which is the industrial standard target maximum water loss. However, due to staff shortages, turnover and other staffing problems the recommended water loss operations were only partially completed and maintained. The system is presently in a condition that allowed a unaccounted water loss of 35.7% in 2021, 34% in 2022 and from October 2022 to September 2023 the water loss was 27.1%. The system has six master meters purchasing water from the Cities of Stanford and Eubank. The system serves 2308 water customers about 1853 active meters at any one time.

The 2022 current water purchases for the Cities is 310,795 gpd at \$3.23 per 1,000 g from Stanford and 74,341 gpd at \$3.60 per 1,000 g from Eubank. The system water loss for each City is 39.31% for Stanford and 9.51% for Eubank. The cost of lost water for each is \$394.62 for Stanford and \$25.45 for Eubank each day. This is an annualized total of \$153,326.22 per year.

System pumps:

The MWD system currently has three pumping station. The major portion of the system operates off of the City of Stanford pressure head. Since large portions of the City of Stanford water system operate under high pressures (over 110 psi) this means that portions of the MWD system is also under high pressure. The principle water meter for the MWD is the meter and pumping station call "Ball Park". It is location on KY Hwy 78 near Buffalo Springs. This pump station is only used when city of Stanford water pressure drops or when high demand in the MWD requires higher flows due to higher customer demand. This pump is rated at 150 GPM. The second pump is located on Mt Salem Road and is designed to serve an area of high elevation. It is rated at 50 GPM. This pump can cause problems of low water pressure in other areas of the system when operating at high demand times. The third pump station pumps water from the City of Stanford through the Maywood area from the Neal's Creek meter meter to the Ottenheim area. This is to offset water bought from the City of Eubank which is at a higher price for Eubank water. The pup is not metered and is estimated based on the run time of the pump.

Water Mains:

The original water mains constructed in the 1960s were asbestos cement pipe. All of this system is still in use today. Other major water main extensions were done in the 1970s, 1990s and 2000s. Of particular problems are the zones that constructed in the 1970s. These include the KY 198-Short Pike meter, Petry meter zone and Neals Creek meter zone (see tables 2B & 4). Another smaller zone of concern is the Rowland meter. This area has numerous extensions constructed by other with limited supervision. This area has a history numerous service leaks and other non-metered problems.

The MWD water system is primarily built in the valleys of the Knobs Region that surround the Bluegrass Region. This results in many of the water mains being installed along, near or under numerous small streams, creeks and rivers. This makes construction difficult and location of water leaks, especially small leaks very difficult to identify. Also due to the service of water to some customers on the top of the knob the water pressure in the main must be maintained higher than desirable in the lower valley areas. In addition the water system at time will experience landslides and floods that will do damage to the system.

Of particular concern are the customer service lines installed in the 1970s in the Neals Creek meter area. This area has a history of such leaks. It is also an area that has higher than desirable water pressure (110psi).

Water Quality:

The MWD is still having problems with the water quality requirements. The District has recently failed to meet disinfection products limits in HAA5s. The major source of this is the City of Stanford water treatment plant. The water delivered at the meter is at time at 95% of the limit. Since McKinney does not add additional disinfection products to its system there is very little MWD can do about meeting these limit. The HAA5s area also created due to detention time (water age) in the water mains and tanks. The MWD must flush the system in order to improve water age to help with water quality. This is of course a significant cost to the MWD.

The MWD has planned a construction project to purchase water from the City of Danville. This project will also replace two standpipes that have limited useful storage capacity with a new ground storage tank. This is expected to improve water age as well as have much lower HAA5s at the meter.

Pressure Problems:

High Pressure in a water system can be a problem for leaks. It causes leaks in mains, service lines and in home and business plumbing fixtures. These small leaks such as drips in faucets can be a significant source of unaccounted water loss since most meters will not register these very low flows. The McKinney System being in the Knobs Region has the problem of having high and low pressures in the same water mains. This makes managing a desirable water pressure in the system very difficult. The proposed water construction project will install numerous pressure reducers in the system to improve the high pressure areas.

Water Usage Accounting:

The District uses a number of operational techniques to determine the water purchase and usage for various branches of the water system. Following is a list of the Master Meters and the subsequent flow and check meters identified in each branch.

<u>Master Meter</u>	<u>Flow Metered Branch</u>	<u>Test (check) Meter</u>
Ball Bark	Ball Park	Thornhill Lane
	Short Pike	Ky Hwy 518
	Petreys	Ky Hwy 1778
		Happy Hollow
		Tombs Hollow
	Bonneville	Moccason Road

Rowland

Neals Creek

Sunvalley Rd
 Maywood 1
 Maywood 2
 US HWY 27 1 North
 US HWY 27 2 South

Ottenheim

West Skyline

NOTE: The Master meter is the meter to purchase water from the provider.
 Flow Meter Branch is a permanent installed meter to measure the follow to a branch.
 Test (check) meter is a meter at a valve to manually check the instantaneous flow at that time for potential leaks or other problems in the specific branch of the system. These meters are not used on a regular bases due to pressure and flow concerns.

In normal operations are to do the water loss accounting is done for the master and flow meter branches of the system on monthly bases. It should be noted that the water bought and sold for anytime period is approximate due to timing of meter readings. The test meters are not included in the accounting on a regular basis but can be used manually during times of low flow demand due to the nature of the typical installation. These meters are best used at night time for most useful results.

The District produces their monthly water loss report for the PSC. In this report the District accounts for water loss in numerous branches of the system. Table 1 shows the areas and the results for these accountings for 2022.

Table 1: 2022 water loss percentages by zone

Water Zone	22-Jan Bought	22-Jan Sold	22-Feb Bought	22-Feb Sold	22-Mar Bought	22-Mar Sold	22-Apr Bought	22-Apr Sold	22-May Bought	22-May Sold	YEAR 2022 Bought	YEAR 2022 Sold	PERCENT LOSS
Short Pike	1,731,500	881,200	1,498,900	709,000	1,713,400	947,900	1,607,100	903,800	1,817,000	937,900	8,367,900	4,379,800	48%
Petreys	1,470,500	821,200	1,192,600	595,300	1,385,900	842,400	1,300,300	765,900	1,455,900	821,000	6,805,200	3,845,800	43%
Donneyville	496,700	341,800	528,300	295,400	554,800	397,600	414,100	359,100	443,800	399,500	2,437,700	1,793,400	26%
Ballpark	2,729,300	1,558,200	2,648,200	2,915,200	2,320,900	1,861,400	2,250,500	2,051,700	2,681,300	2,121,800	12,630,200	10,508,300	17%
Total Ballpark	5,428,000	3,602,400	5,868,000	4,514,900	5,975,000	4,049,300	5,572,000	4,080,500	6,398,000	4,280,200	30,241,000	20,527,300	32%
Neals Creek	2,537,000	1,195,100	2,672,000	1,458,000	2,684,000	1,246,400	2,444,000	1,388,300	2,805,000	1,225,900	13,142,000	6,513,700	50%
Rowland	692,000	255,400	711,000	307,800	738,000	354,000	660,000	255,600	746,000	266,200	3,547,000	1,439,000	59%
Ottenheim	1,589,000	1,205,400	1,433,000	1,263,800	1,754,000	1,715,800	1,671,000	1,523,100	1,591,000	1,604,800	8,038,000	7,312,900	9%
Greasy Ridge	443,300	377,900	407,700	345,100	435,100	430,500	419,700	384,100	554,600	460,700	2,260,400	1,998,300	12%
Skyline	162,600	150,900	180,500	131,300	177,400	202,000	179,200	142,900	227,400	220,700	927,100	846,900	9%
Total	11,851,900	6,786,200	11,272,200	8,020,900	11,763,500	7,998,000	10,945,900	7,774,500	12,322,000	8,058,500	58,155,500	38,638,100	34%

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2022 Chart of water loss by zone

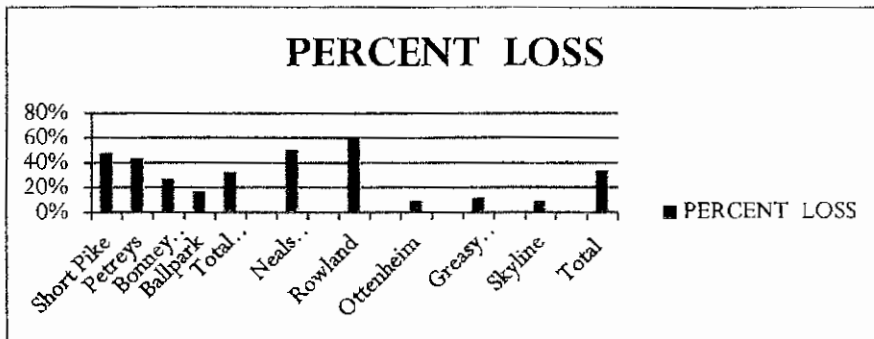


Table 2A: October 2022 to September 2023 water loss percentage (See Appendix B for details)

Current	12 month water purchase	12 month water sales	Annual Water Loss Percent
Water Loss	138,673,934	101,069,800	27.1%

Table 2B: October 2022 to September 2023 water loss percentages by zone

MONTH	ADJUSTED REMAINDER BALL PARK METER	ROWLAND METER	NEALS CREEK METER	GREASY RIDGE METER	OTTENHEIM METER	WEST SKYLINE METER	PETREYS METER	BONEYVILLE METER	SHORT PIKE METER
Oct-22	0.02	0.70	0.39	0.10	0.14	0.14	0.61	0.22	0.45
Nov-22	0.06	0.59	0.54	0.08	(0.01)	0.03	0.50	0.01	0.31
Dec-22	0.01	0.56	0.48	0.05	(0.00)	0.09	0.44	0.15	0.25
Jan-23	(0.09)	0.49	0.25	(0.08)	(0.18)	(0.23)	0.31	(0.08)	0.26
Feb-23	0.10	0.51	0.50	(0.02)	(0.05)	0.00	0.56	0.17	0.37
Mar-23	0.19	0.51	0.46	0.11	0.11	0.30	0.56	0.20	0.16
Apr-23	0.08	0.45	0.40	0.20	0.03	0.10	0.53	0.21	0.35
May-23	0.14	0.57	0.43	0.08	0.10	0.15	0.56	0.18	0.47
Jun-23	(0.06)	0.50	0.41	(0.08)	(0.07)	(0.02)	0.52	0.14	0.07
Jul-23	0.17	0.51	0.33	0.13	0.27	0.24	0.57	0.45	0.23
Aug-23	0.02	0.58	0.47	0.20	0.05	0.10	0.51	0.34	0.25
Sep-23	0.09	0.60	0.52	0.05	0.01	0.14	0.36	0.23	0.42
ANNUAL %	6%	55%	43%	8%	3%	9%	50%	19%	30%
Annual water loss as percent of total purchased water	1%	3%	9%	0%	1%	0%	8%	1%	4%
Annual cost of water loss of total revenue	\$ 6,586	\$ 15,945	\$ 48,527	\$ 1,640	\$ 2,735	\$ 848	\$ 41,736	\$ 3,982	\$ 20,636

Calculated annual revenue loss	\$ 142,637
Primary Zone of Revenue loss	\$ 126,845

Table 3: Cost of Water Loss at Purchased Price

Cost of purchased water loss	Annual Gallons	Rate per 1,000 gal	
STANFORD	34,067,229	3.23	\$ 110,037
EUBANK	3,536,905	3.60	\$ 12,733
		TOTAL	\$ 122,770

Table 4A: Water Tank inventory and year of installation

Tank	Elevation	Capacity	Year
Boneyville	1188	100,000	1964
McKinney	1176	100,000	1965
Ottenheim	1296	100,000	1997

Table 4B: Water main inventory and year of installation

Area	Main Size	Type	Length	Year
McCORMACK	3	PVC	5892	1970
	6	PVC	4305	1970
NEALS CREEK #1	<=2	PVC	2076	1970
	3	PVC	5112	1970
	3	PVC	2293	2000
	4	PVC	19017	1970
	6	PVC	33169	1970
	8	PVC	4764	1970
NEALS CREEK #2	<=2	PVC	1850	1970
	3	PVC	15846	1970
	4	PVC	1745	1970
	4	PVC	6547	1990
	6	PVC	21826	1970

	6	PVC	172	1990
OTTENHEIM #1	<=2	PVC	9979	1970
	3	PVC	121	1970
	4	PVC	23607	1970
	4	PVC	22535	2000
	6	AC	4406	1960
	6	PVC	1576	1970
BALL PARK 1	<=2	AC	11872	1960
	3	AC	735	1960
	4	AC	2649	1960
	4	PVC	1628	2000
	6	AC	8447	1960
	6	AC	606	1970
Area	Main Size	Type	Length	Year
	6	PVC	6007	2000
SHORT PIKE	<=2	PVC	5726	1970
BALL PARK 2	3	PVC	9824	1970
	3	PVC	6940	1990
	4	PVC	12049	1970
	4	PVC	44729	1990
	4	PVC	4199	2000
	6	AC	3402	1970
	6	PVC	15021	1970
OTTENHEIM #2	3	PVC	4216	1990
	3	PVC	11598	2000
	4	PVC	28128	1970
	4	PVC	39803	1990
	4	PVC	5010	2000
	6	PVC	248	1970
	6	PVC	5980	2000
PETREYS	4	PVC	67641	1970
	4	PVC	14766	1990
	4	PVC	21372	2000
	6	AC	2547	1960
	6	PVC	34850	1990
	6	PVC	2518	2000
BALL PARK	4	PVC	91	1960
	4	PVC	30564	2000
	6	AC	36070	1960
	6	PVC	50362	2000

OPERATIONS TARGETING WATER LOSS:

1. Communication and Board Support:

The District will hold monthly meetings to address the status of water loss. The Staff and/or contractors will provide to the Board the information as determined by the accounting of the various meter braches in the system. The Board will provide support for the staff and/or contractors in adequate personnel, funds and equipment to assure a unified team effort in the water loss program.

2. Data analysis:

The District will continue to account for water loss in the zones identified above. The existing and proposed check meters and the portable ultrasonic meter will be used in various parts of the system to further split the zones into smaller parts to assist in the identification of problem areas. These sites will be shown on an attached map. The check meters sites that exist and any other added will be used to check for specific unexplained water flow in a particular branch in order to identify areas where the portable meter may be useful. This will add to the data analysis that will narrow the problem areas to a more manageable level.

The District will use the data to identify the trouble zones in the system and concentrate the leak detection effort in the areas with either the highest rate of loss or the largest amount of water loss. This will assure the most financial gain for the effort and funds expended.

3. Consistent meter reading schedule and accuracy:

The Board will establish a schedule for the reading of all meters in the system. Master and Zone meters should be read daily and the customers meters should be read as nearly to the same time of the month as possible. The 18th day of each month will be used as the day to compare water loss to customers meter readings. It generally takes four (4) days to read customer meters. This generally begins on the 15th day of each month and continues until complete. Adjustments are made when the 15th and 18th falls on weekends. Monthly water loss calculation dates should match as nearly as possible the customer reading dates. The board must confirm and monitor the reading of all meters and identify and minimize the estimating of meter readings within the system. The staff and/or contractors must identify all estimated readings each day or month within the accounting or computer system. Accurate and timely meter readings are the most essential part of any water loss program. Every meter in the system will be mapped.

The District will begin the implementation of an automated meter reading system to include replacement of water meters with automation capabilities and develop the other related hardware and software to implement this system over time. It is anticipated that the total conversion of the meter reading system to an automated system will be complete by the end of 2026.

The Board will continue to test the Master and will begin testing Zone check meters on an annual basis.

4. Customer meter replacement program:

The District will continue and accelerate the customer meter replacement program. The District will continue to identify deficient meters and replace immediately. The District will continue to replace meters that are more than 10 years old as identified by the customer meter installation information. The District is currently behind in the replacement of old meters for 2023. This is partially due to the increase in cost of new meters. The District will complete replacing all customer meters 10 years or older on an annual basis

by the end of October each year. All new meters will be equipped to use a new automated reading system as well as manual read capability. The District's meter replacement program will begin a program to replace all the meters in the zones with highest water loss with an automated meter reading system regardless of age. All water meters slow with age. In addition they do not record very low flow such as drips and small leaks in customer lines. New technology can help identify some of these issues.

5. Ultrasonic Meter Placement:

The District will install several permanent meter pits to be used as need by the ultrasonic meter to test and retest the branches of the system. This will provide safe, easy and immediate intermittent access to the water mains of primary importance to the leak detection program without the expense of a permanent check meter installation. The District will develop operating procedures to best identify the locations for these meter pits. The District will develop analytical methods to optimize the benefits of use of the portable meter to the water loss program. The zones where water loss and cost are the highest will be targeted with this approach. As outlined in the data analysis above the data analysis will be used to establish these specific sites to be targeted and may change for those shown on the map over time as details are developed.

6. Operation of Test meters and geo-sound equipment:

The District will develop a program that will consist of staff and/or consultants routinely using portable meters, test meters and/or geo-sound equipment to further investigate and isolate problem zones within the system. Using the analytical data to target the areas of high water loss the program will have personnel operate during nighttime hour to establish areas for further investigation. It is suggested that the staff work regular work hours Monday thru Thursday and nighttime hours Thursday night 11:00 PM to 7:00 AM Friday to complete the work week. This would be done during summer months and dry weather for best benefits. This also avoid overtime for employees as a routine operations. In this night-time investigation geo-phones would be used along with check meter readings, customer meter readings or portable flow meter to narrow down the zone to inspect for possible water leak locations. Customer meter / service connection will be check with geo-sound equipment in this area to insure that customer service lines are intact and not compromised. The area would be further investigated by excavation if needed during routine business hours.

7. Phase 1B of the water improvements project:

The district is undertaking a water improvements project in the west end of Lincoln County to address a number of issues with the water system including disinfection products, low water pressure, pump station failures, and water loss. As part of this project a number of changes will be made to improve the ability of the District to control their water system and to regulate and identify problem zones. Among these changes will be the addition of a new water tank to replace two standpipes, replacement of existing water mains, pressure regulators along with check meters at locations where the water system splits into two directions, thus further delineating the zones of water loss into smaller areas to investigate. The project will be replacing large sections of the existing aging water mains and meters in this portion of the water system. We are anticipating this to improve the water loss issues in this area by identifying unmetered water usage, leaking mains and service lines. Many of the mains to be replaced are 1960s vintage asbestos cement pipe. The project will increase pressures in some areas and decrease pressure in other areas. The areas with pressure in excess of 90 psi will have pressure reducers install on customer meters. It is anticipated the

reduced pressure in the customer water lines will reduce the water loss due to low flow leaks not measured by the meter.

CAPITAL EXPENDITURES TARGETING WATER LOSS:

1. Meters:

The District will begin implementing an upgrade of the meters in the system to an automated reading system. This will include targeting section of the system where water loss is the highest with a complete replacement of all meters in this area and establishing the automated system to read these meters. In addition the District will be using automation ready meters with manual read capability in the meter replacement program to begin preparing for the eventual conversion of the entire system to an automated read system. The District will increase the meter purchases to include the above mention meter changes along with the program to replace all meters 10 years old or older.

The District will install inline check meters as part of the proposed Phase 1B project in order to improve analysis of the system and water loss. In addition the District will install meter pits for repeated use of the portable ultrasonic meter system in zones of high water loss that is not included in the Phase 1B project. Additional flow meters and check meters will be installed as needed, indicated by analysis of the ongoing water loss program. The attached map will show location of existing and proposed pits and meters. Others will be added as the program determines need.

2. Service line replacement:

One particular area where the District is having repeated leaks in the system is the area of Maywood Loop. This area was constructed with a particular type of plastic tapping devised that has proven to be insufficient and prone to failure. The area is subject to high water main pressures which makes service lines subject to failure. It is proposed as funds may be available to completely replace the service connection of each of the customer taps in this area. It would include about 400 customer taps.

3. Valve replacement:

The District will develop a program to locate and exercise the gate valves in system. Any gate valve which is not fully operational will be replaced. Of particular emphasis will be the gate valves which also allow for the operation of the check meters and/or pressure reducers. Any check meter install will not be accurate if the associated valve does not work properly. Much of this work will be done as part of the proposed Phase 1B project.

4. Maps:

A map system will be developed to establish the GPS coordinates of each meter in the system. The meter readers will obtain GPS coordinates of each meter during route reading by cell phone GPS or survey GPS to establish real repeatable location of each meter in the system. This information will required in the future to implement the automated reading system. Emphasis will be made to locate and identify each meter that is listed as inactive on the records to assure no water usage in inactive meters is taking place.

The attached map will show the currently proposed plan for implementation of the Phase 1B project and any proposals included in this report. To be included in the map is the following;

1. Water system water mains.
2. Proposed Phase 1B water mains.
3. Existing and proposed Permanent Check Meters, these meters will be read daily and continually monitors all water usage in a zone. (See attached detail).
4. Temporary Portable Ultrasonic Meter Pits, to be used in conjunction with geo-sonic devices and customer meter readings in a small area identified as high water loss.
5. Check Meter location used to isolate sub-zones of the system such as creek crossings and high water loss areas to be read on an as needed basis.
5. Pressure Regulators:

The McKinney water system has areas of water pressure above desirable levels while at the same time and sometimes in the same water main has areas of low water pressure. These low pressure areas can at times of high demand can be below DOW and PSC minimum requirements of 30 psi at the meter. As part of the proposed water improvements project the District will be installing a number of pressure regulation stations in conjunction with Zone check meters to reduce and regulate the pressure to maintain pressures in the desirable zone. This will aid in water loss by reducing main pressure and small leaks in customer homes and businesses due to high water pressure. Small leaks can add to water loss due to flows below meter operating levels. In addition customer service lines that see water pressures above 90psi will have pressure regulators installed at the water meter to reduce the pressure thereby reducing the risk of small water drips and leaks that are not measure by the low flow requirements of the meter.

6. Flushing:

The McKinney water district will install the necessary equipment to meter by permanent meter installation or temporary portable meter a means to accurately measure the water used in the flushing operations. The proposed water improvements project is intended to reduce the need to flush for disinfection-byproducts with the replacement of two standpipes that contribute to water age. The District currently estimates the water flow during flushing activities based on a previous study. The amount of water flowed during flushing can vary significantly due to pressure, valve and time variations that make estimates questionable.

- 7.

CAPITAL OPINION OF COST

YEAR ONE - 2024

ITEM	UNITS	QUANTITIES	AMOUNT
CHECK METERS*	EACH	4	10,000
INLINE FLOW METERS*	EACH	7	70,000
PITS FOR ULTRASONIC METER	EACH	5	25,000
MEULLER 3/4- 5/8 METERS	EACH	500	125,000
METER MAPS	LS	1	3,500
FLUSH HYDRANT METERING	EACH	6	<u>6,000</u>
		TOTAL	\$239,500

* Phase 1B Project Cost

YEAR TWO - 2025

ITEM	UNITS	QUANTITIES	AMOUNT
CHECK METERS	EACH	2	5,000
AUTOMATED READING SYSTEM	LS	1	25,500
MEULLER 3/4- 5/8 METERS**	EACH	1380	345,000
SERVICE LINE REPLACEMENT**	LS	400	<u>400,000</u>
		TOTAL	\$770,500

**Phase 3 Project Cost

YEAR THREE - 2026

ITEM	UNITS	QUANTITIES	AMOUNT
MEULLER 3/4- 5/8 METERS	EACH	200	50,000
AUTOMATED READING SYSTEM	LS	1	5,500
VALVE REPLACEMENT	EACH	5	<u>10,000</u>
		TOTAL	\$65,500

YEAR FOUR - 2027

ITEM	UNITS	QUANTITIES	AMOUNT
MEULLER 3/4- 5/8 METERS	EACH	200	50,000
		TOTAL	\$50,000

FOUR YEAR TOTAL \$1,125,500

SEE APPENDIX A: CAPITAL COST OF PHASE 1B WATER SYSTEM IMPROVEMENTS PROJECT

**CAPITAL OPINION OF COST
WATER LOSS SURCHARGE**

YEAR ONE - 2024

ITEM	UNITS	QUANTITIES	AMOUNT
MEULLER 3/4- 5/8 METERS	EACH	230	57,500
PITS FOR ULTRASONIC METER	EACH	5	25,000
METER MAPS	LS	1	3,500
FLUSH HYDRANT METERING	EACH	6	<u>6,000</u>
		TOTAL	\$ 92,000
		SUSRCHARGE REVENUE	\$ 90,590

YEAR TWO - 2025

ITEM	UNITS	QUANTITIES	AMOUNT
MEULLER 3/4- 5/8 METERS	EACH	500	125,000
CHECK METERS	EACH	2	5,000
AUTOMATED READING SYSTEM	LS	1	<u>25,500</u>
		TOTAL	\$155,500
		TOTAL TO DATE	\$ 247,500
		SUSRCHARGE REVENUE TO DATE	\$ 181,181

YEAR THREE - 2026

ITEM	UNITS	QUANTITIES	AMOUNT
MEULLER 3/4- 5/8 METERS	EACH	200	50,000
VALVE REPLACEMENT	EACH	5	<u>10,000</u>
AUTOMATED READING SYSTEM	LS	1	5,500
		TOTAL	\$65,500
		TOTAL TO DATE	\$ 313,000
		SUSRCHARGE REVENUE TO DATE	\$ 271,771

YEAR FOUR - 2027

ITEM	UNITS	QUANTITIES	AMOUNT
MEULLER 3/4- 5/8 METERS	EACH	200	50,000
		TOTAL	\$50,000
		FOUR YEAR TOTAL	\$363,000
		SUSRCHARGE REVENUE TO DATE	\$ 362,362

APPENDIX A
Proposed Capital
Improvement Projects
Phase 1B
Budget
WX 21137017

Phase 1B Projected Construction and Project Cost (Water Mains to McKinney and New Water Tank)

	Construction	Contingency	Total
Water Mains to McKinney	\$2,153,783.00	\$215,378.30	\$2,369,161.30
Water Mains on KY Hwy 78 (Optional)	\$247,000.00	\$24,700.00	\$271,700.00
Water Mains Total	\$2,400,783.00	\$240,078.30	\$2,640,861.30
New Water Tank	\$1,071,700.00	\$107,170.00	\$1,178,870.00
Total Phase 1B	\$3,472,483.00	\$347,248.30	\$3,819,731.30

Estimated Project Cost:	Estimated 3/9/22
Administration	80,000
Legal	25,000
Planning/Land/Easements	25,000
Engineering, Design	182,220
Engineering, Other	17,500
Engineering, Inspection	116,643
Construction	3,472,483
Contingency	347,284
<hr/>	
Project Totals Phase 1B	\$4,266,130

Current Funding for the project approved or pending.

	Current	
KIA (Phases 1B)	\$ 2,078,317	Loan
ARC (Phase 1B)	\$ 500,000	Pending
Local	\$ 62,436	
Lincoln County CWF	\$287,280	
CDBG	\$1,000,000	Pending
TOTAL	\$3,928,033	

DETAILED COST ESTIMATE for Phase 1B Water Improvements Project

PHASE 2 ESTIMATED PROJECT COST Contract 2				
ITEMS	UNIT S	QUANTITY	PRICE	TOTAL
MOBILIZATION	EA	1	15000	\$15,000.00
DEMOBILIZATION	EA	1	10000	\$10,000.00
8" PVC CLASS 200	LF	35747	40	\$1,429,880.00
6" PVC CLASS 200	LF	1463	23	\$33,649.00
4" PVC CLASS 200	LF	7782	12	\$93,384.00
AIR RELEASE W/ VAULT	EA	18	2400	\$43,200.00
PRESSURE REDUCER-MAIN	EA	8	6600	\$52,800.00
VALVES	EA	16	1450	\$23,200.00
WET TAP W/ VALVE	EA	5	3000	\$15,000.00
CUT AND CAP LINE KILL	EA	5	500	\$2,500.00
PRESSURE REDUCER-METER/RECONNECTS	EA	64	450	\$28,800.00
METER CONNECTIONS	EA	30	1250	\$37,500.00
TYPE I CREEK CROSSINGS	EA	3	2500	\$7,500.00
TYPE II BORE CREEK CROSSINGS	LF	150	500	\$75,000.00
DITCH CONC CAPS	EA	1	500	\$500.00
GAS MAIN CROSSING	EA	5	3000	\$15,000.00
ROAD BORE 14-INCH ENCASEMENT	LF	165	350	\$57,750.00
1" SERVICE LINE ROAD BORE	LF	256	50	\$12,800.00
PUMP STATION	LS	1	75000	\$75,000.00
TELEMETRY	LS	1	4000	\$4,000.00
CHAIN LINK FENCE	LS	1	320	\$320.00
MASTER METER W/ VAULT	LS	1	2500	\$2,500.00
ROAD CUT ASPHALT	SQ FT	1290	30	\$38,700.00
FLUSH HYDRANT	EA	1	3000	\$3,000.00
FIRE HYDRANT	EA	1	3000	\$3,000.00
CONCRETE PAVEMENT	SQ FT	497	25	\$12,425.00
GRAVEL SURFACE	Ton	385	35	\$13,475.00
FARM FENCE	LF	160	15	\$2,400.00
PLANK FENCE	LF	120	25	\$3,000.00
LINE MARKERS	EA	25	110	\$2,750.00
ELECTRIC CONDUIT	EA	50	75	\$3,750.00
SEED AND STRAW	LS	1	25000	\$25,000.00
TESTING	LS	1	11000	\$11,000.00
TOTAL				\$2,153,783.00
CONTINGENCY				\$215,378.30

CONSTRUCTION COST	\$2,369,161.30
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PHASE 1B ESTIMATED PROJECT COST Contract 3				
ITEMS	UNITS	QUANTITY	PRICE	TOTAL
MOBILIZATION	EA	1	6000	\$6,000.00
DEMOBILIZATION	EA	1	6000	\$6,000.00
8" PVC	LF	891	56	\$49,896.00
VALVES VAULT	LS	1	12000	\$12,000.00
WET TAP 8-INCH W/ VALVE	EA	1	3000	\$3,000.00
STEEL WATER TANK	LS	1	780000	\$780,000.00
FOUNDATION DESIGN AND CONSTRUCTION	LS	1	195000	\$195,000.00
FIRE HYDRANT	EA	1	2000	\$2,000.00
BLACKTOP PAVEMENT	SQ FT	0	30	\$0.00
CONCRETE PAVEMENT	SQ FT	0	25	\$0.00
GRAVEL SURFACE	Ton	455	50	\$22,750.00
CHAIN LINK FENCE	LF	238	25	\$5,950.00
CHAIN LINK FENCE GATE	LS	1	3500	\$3,500.00
TELEMETRY	LS	1	54000	\$54,000.00
ELECTRIC SERVICE POLE	EA	1	2500	\$2,500.00
SEED AND STRAW	LS	1	3000	\$3,000.00
TESTING	LS	1	8000	\$8,000.00
TOTAL				\$1,071,700.00
CONTINGENCY				\$107,170.00
			CONSTRUCTION COST	\$1,178,870.00

PHASE 2 ESTIMATED PROJECT COST Contract 2 ADD ALTERNATE				
ITEMS	UNITS	QUANTITY	PRICE	TOTAL
MOBILIZATION	EA	1	3000	\$3,000.00
DEMOBILIZATION	EA	1	2000	\$2,000.00
8" PVC	LF	5355	40	\$214,200.00
AIR RELEASE W/ VAULT	EA	1	2400	\$2,400.00
PRESSURE REDUCER-MAIN	EA	0	6600	\$0.00
VALVES	EA	2	1450	\$2,900.00
WET TAP 6-INCH W/ VALVE	EA	2	3000	\$6,000.00

McKINNEY WATER DISTRICT | 10/26/2023

CUT AND CAP LINE KILL	EA	2	500	\$1,000.00
METER CONNECTIONS	EA	4	1250	\$5,000.00
1" SERVICE LINE ROAD BORE	LF	80	50	\$4,000.00
SEED AND STRAW	LS	1	4500	\$4,500.00
TESTING	LS	1	2000	\$2,000.00
TOTAL				\$247,000.00
CONTINGENCY				\$24,700.00
				CONSTRUCTION COST
				\$271,700.00

APPENDIX B
Water Purchased and Used
October 2022 to September 2023

Water Purchased for October 2022 to September 2023

MONTHLY WATER PURCHASE	AJUSTED REMAINDER BALL PARK METER	ROWLAND METER	NEALS CREEK METER	GREASY RIDGE METER	OTTENHEI M METER	WEST SKYLINE METER	PETREYS METER	BONEYVIL LE METER	SHORT PIKE METER
Oct-22	2,506,200	1,090,000	2,498,934	493,900	1,754,066	202,800	2,003,000	407,300	1,745,500
Nov-22	2,256,300	738,000	2,543,135	662,000	1,633,865	194,800	1,835,800	372,600	1,702,300
Dec-22	1,863,300	555,000	2,345,361	497,300	1,320,639	168,300	1,621,500	362,700	1,390,500
Jan-23	1,956,900	531,000	1,928,474	716,800	1,597,526	174,600	1,395,500	428,000	1,449,600
Feb-23	1,765,800	410,000	2,112,000	410,500	1,333,000	191,300	1,664,000	351,600	1,371,600
Mar-23	1,985,200	407,000	2,078,933	401,100	1,324,067	156,100	1,779,500	346,300	1,058,000
Apr-23	2,143,400	489,000	2,357,721	512,500	1,557,279	184,100	1,776,700	412,200	1,489,700
May-23	2,317,400	494,000	2,258,649	448,600	1,635,351	193,100	1,765,600	523,200	1,535,800
Jun-23	3,102,900	623,000	2,686,220	551,000	1,906,780	238,000	2,240,200	615,800	1,754,100
Jul-23	2,782,500	659,000	2,465,157	494,800	1,929,843	252,800	2,014,700	508,200	1,227,600
Aug-23	2,995,600	690,000	2,854,660	518,400	2,079,340	234,600	1,886,200	579,600	1,578,600
Sep-23	3,137,800	778,000	3,223,185	451,700	1,896,815	270,600	1,538,400	475,500	1,738,300
TOTALS	28,813,300	7,464,000	29,352,429	6,158,600	20,058,571	2,461,100	21,521,100	5,383,000	17,541,600

Water Metered and Accounted Water Usage for October 2022 to September 2023

MONTHLY WATER SALES	AJUSTED REMAINDER BALL PARK METER	ROWLAND METER	NEALS CRREK METER	GREASY RIDGE METER	OTTENHEI M METER	WEST SKYLINE METER	PETREYS METER	BONEYVIL LE METER	SHORT PIKE METER
Oct-22	2,463,200	322,200	1,519,000	443,000	1,516,200	173,800	779,400	316,100	957,000
Nov-22	2,115,900	299,600	1,161,200	608,800	1,643,800	188,300	918,500	367,400	1,171,600
Dec-22	1,848,600	242,500	1,209,700	466,400	1,321,600	153,400	903,400	307,000	1,041,200
Jan-23	2,126,000	268,700	1,437,500	774,200	1,884,900	214,000	960,100	461,200	1,079,900
Feb-23	1,580,800	201,000	1,052,500	419,000	1,402,300	191,200	725,000	292,500	861,800
Mar-23	1,609,700	200,500	1,122,500	355,900	1,180,500	109,700	779,000	276,100	888,600
Apr-23	1,965,700	271,200	1,412,100	407,700	1,517,200	165,100	828,900	324,800	970,600
May-23	1,986,400	210,800	1,293,700	412,000	1,468,900	164,500	779,200	427,000	810,300
Jun-23	3,275,400	313,400	1,588,900	564,800	2,140,400	242,500	1,067,900	532,400	1,167,600
Jul-23	2,302,600	323,600	1,653,500	430,800	1,411,800	191,300	857,100	281,400	951,200
Aug-23	2,950,200	287,400	1,526,900	415,300	1,969,100	210,000	917,200	381,100	1,187,300
Sep-23	2,848,700	310,400	1,554,200	427,400	1,879,300	233,200	979,000	364,000	1,002,500
TOTALS	27,073,200	3,251,300	16,531,700	5,725,300	19,336,000	2,237,000	10,494,700	4,331,000	12,089,600

APPENDIX C
Water Loss Ongoing Maintenance
October 2023

Figure C-1

Typical water main leak found and repaired on October 10, 2023.

Location : Short Pike Zone Meter

