Metropolitan Sewerage District of Buncombe County

System Performance Annual Report

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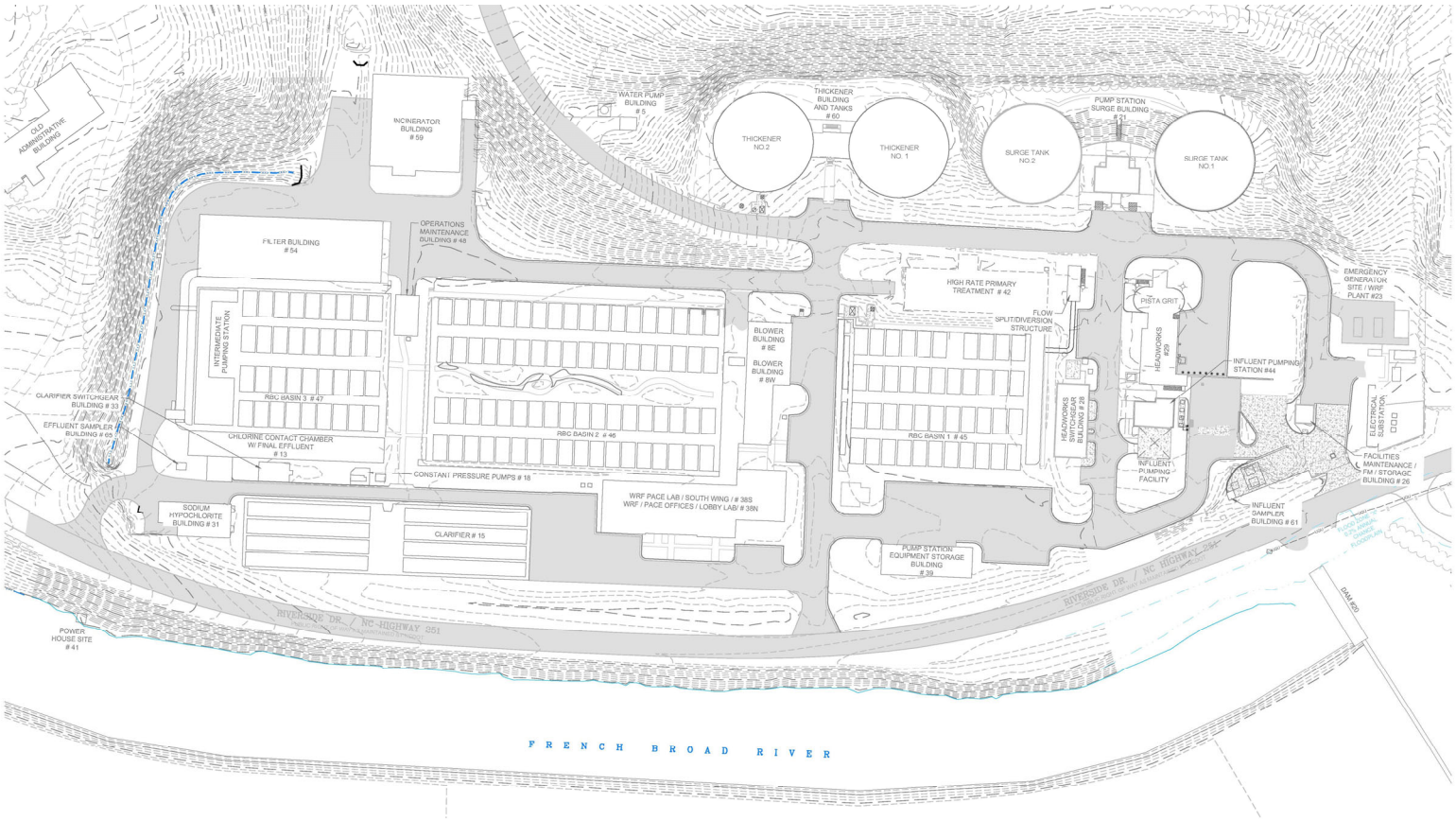
System Performance Annual Report

Fiscal Year 2022 (July 2021 - June 2022)

I. General Information



Permit Numbers:

NPDES Permit # NC0024911

General Storm Water Permit # NCG110000 COC # NCG110158

Air Quality (WNCRAQA) Title V Permit # 11-772-18

Collection System # WQCS00004

II. Description of Facilities

Collection System—System Services Division

In the fiscal year of 2022 (FY22), the Metropolitan Sewerage District provided wastewater service to over 56,900 customers with an estimated population of 172,932. This large service area spans the French Broad River and Swannanoa River Valleys covering about 215 square miles of land. Pipes conveying the wastewater from homes and businesses form an extensive collection system operated and maintained by our System Services Division. With over 1,130 miles of public sanitary sewer lines, 40 pump stations and approximately 33,428 manhole access points; significant manpower and equipment is required. Pipes vary in size from 66" diameter large interceptors down to 6" serving residential communities. Most of the piping within the District is between 50 and 100 years old and requires continual upkeep and/or replacement.

Water Reclamation Facility (WRF)

The Water Reclamation Facility (WRF) is rated at 40 million gallons per day (MGD) capacity serving most of Buncombe County (Asheville, Biltmore Forest, Black Mountain, Montreat, Weaverville, Woodfin and part of northern Henderson County). In FY22 an average flow of 22.2 million gallons per day were treated with the majority coming from residences. For the year, 8.1 billion gallons were treated with more than one-third coming from Infiltration & Inflow (I&I). That's the industry term for groundwater seeping in from cracks in pipes and manholes or rainwater entering through manhole lids and unauthorized Storm Water connections. The District is continually working to abate this problem.

The design of our wastewater treatment system is called "attached growth" relying heavily on 152 rotating biological contactors (RBC's) to do the bulk of treatment. These RBC's provide over 400 acres (about 2.5 acres per unit) of surface area for microorganisms to grow upon. As the backbone of treatment, these microorganisms do the heavy lifting providing the return of clean, safe water back to the French Broad River; our receiving stream. MSD's facility is believed to be the largest RBC plant in the world.

II. Description of Facilities — WRF Treatment Components

Preliminary Treatment Components

- Influent Multi-rake Barscreens (2 units, ½ inch Bar Spacing, 40 MGD each) with screenings washer/compactor and shaftless screw conveyer
- Influent Pumps (3 units) - 35 MGD rated capacity each
- Perforated Plate Fine Screens (3 units, ¼ inch openings, 40 MGD each) with screenings washer/compactor
- Vortex Grit Removal (2 units rated at 50 MGD) - Removal Rate 95% of Grit > 140 Mesh
- Storm Surge System - Utilizes three pumps rated at 5MGD each and two storm surge tanks rated at 2.1 million-gallons each

Primary Treatment Components

- Primary Clarification - Chemically Enhanced Kruger ACTIFLO system (Construction substantially complete in December of 2021)

Secondary Treatment Components

- 1st Stage RBC's (44 units)
- 2nd Stage RBC's (72 units)
- 3rd Stage RBC's (36 units)
- Intermediate Pumps (3 units) - pump water to clarifier from 3rd RBC stage
- Intermediate Clarifier (4 cells - total volume 2 MG)
- Microfiltration via AASI AquaDisk Units (16 units)

Disinfection Components

- Sodium Hypochlorite solution - average feed 1000 gallons/day at 6.5% solution strength

Residuals Handling Components

- Gravity Thickeners (2 units) - 100 foot-diameter each
- 2.5 Meter Belt Presses (2 units)
- Fluidized Bed Incinerator (2,651 dry pounds per hour)

Energy Management Components

- Two separate power circuits from Duke Energy for plant, with Automatic Transfer Switch if one fails
- 4-Megawatt total from three Diesel Generators (emergency backup power for WRF; will maintain full treatment processes during a power outage)
- 850 Kilowatt Hydro Turbines (3 units) - induction units (French Broad River source). These generate power using the District's dam/flume. The power is sold back to Duke Energy.

Automation Components

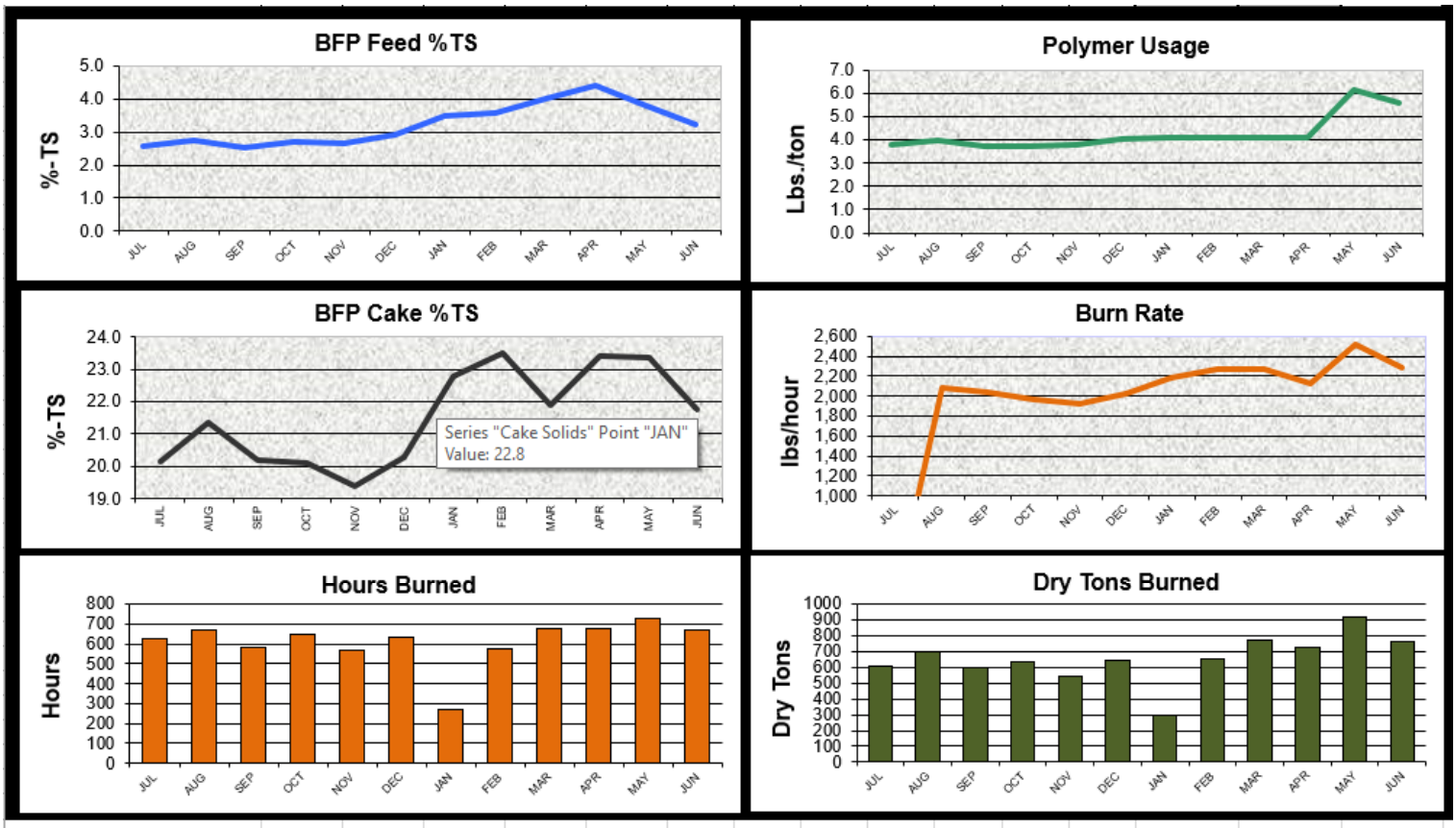
- SCADA (Supervisory Control and Data Acquisition) - full automated control of WRF

MSD utilizes its Fluidized Bed Incinerator as its primary residual management option. Presently the facility is managing 17-20 dry tons per day of residuals. The facilities are designed for 2,651 dry pounds per hour. Due to the lack of true primary clarifiers, most of the sludge generated at the facility is secondary in nature (i.e. sloughings from the RBC's).

Sludge is thickened in on-site gravity thickeners to a consistency of 2-5% solids at which time it is then pumped to the 2 1/2-meter belt presses. These units dewater the sludge to over 22% solids and then it is pumped to the incinerator. Air emissions from the incinerator are of excellent quality, and air quality is further enhanced by a new filtration system added in 2016. Incinerator ash is thickened on-site via a gravity ash thickener and then pumped to an on-site lagoon. Ground-water is monitored in accordance with NCDEQ requirements (up & down gradient).

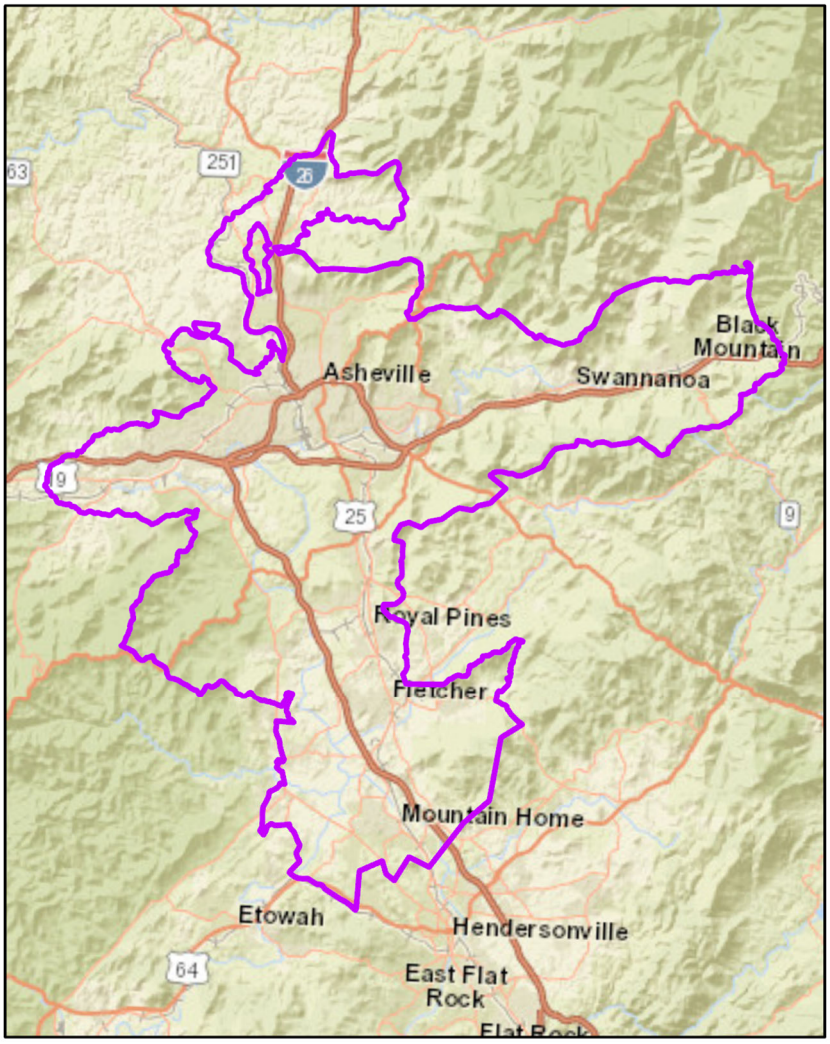
The incinerator system provides the most cost-effective method for sludge management. Supplementary fuel is sometimes required due to the 22% solids content - natural gas via Dominion Energy is utilized for this purpose.

MSD also maintains an agreement with the local county landfill (lined) to dispose of dewatered sludge during emergency and/or maintenance activities. This provides a second residuals management alternative, when or if needed.



* Temporary polymer system was used during the whole month of June 2022.

Collection System Improvements



MSD assumed ownership and maintenance of the various local public collection systems in 1990, and since that time MSD has undertaken an aggressive program to correct existing known collection system problems. Between 1990 and 2022, over 1,326,969 linear feet (or 251 miles) of pipe have been replaced and over $461 million has been re-invested in plant and collection system rehabilitation projects. However, due to the large size of the MSD system, there is much work still to be done. From FY 2023 to FY 2032, the District expects to rehabilitate or replace an additional 398,148 linear feet.

Approximately $389 million will be spent for the District's Capital Improvement Program (CIP) over the next ten years. Of this, 26% will be spent on rehabilitating medium to large Interceptors, 32% on rehabilitating or replacing small collection lines, and 40% on the treatment plant and pump station projects. The total estimated cost to rehabilitate the District's aged collection system and WRF facilities over the next twenty-year period is estimated at over $550 million.

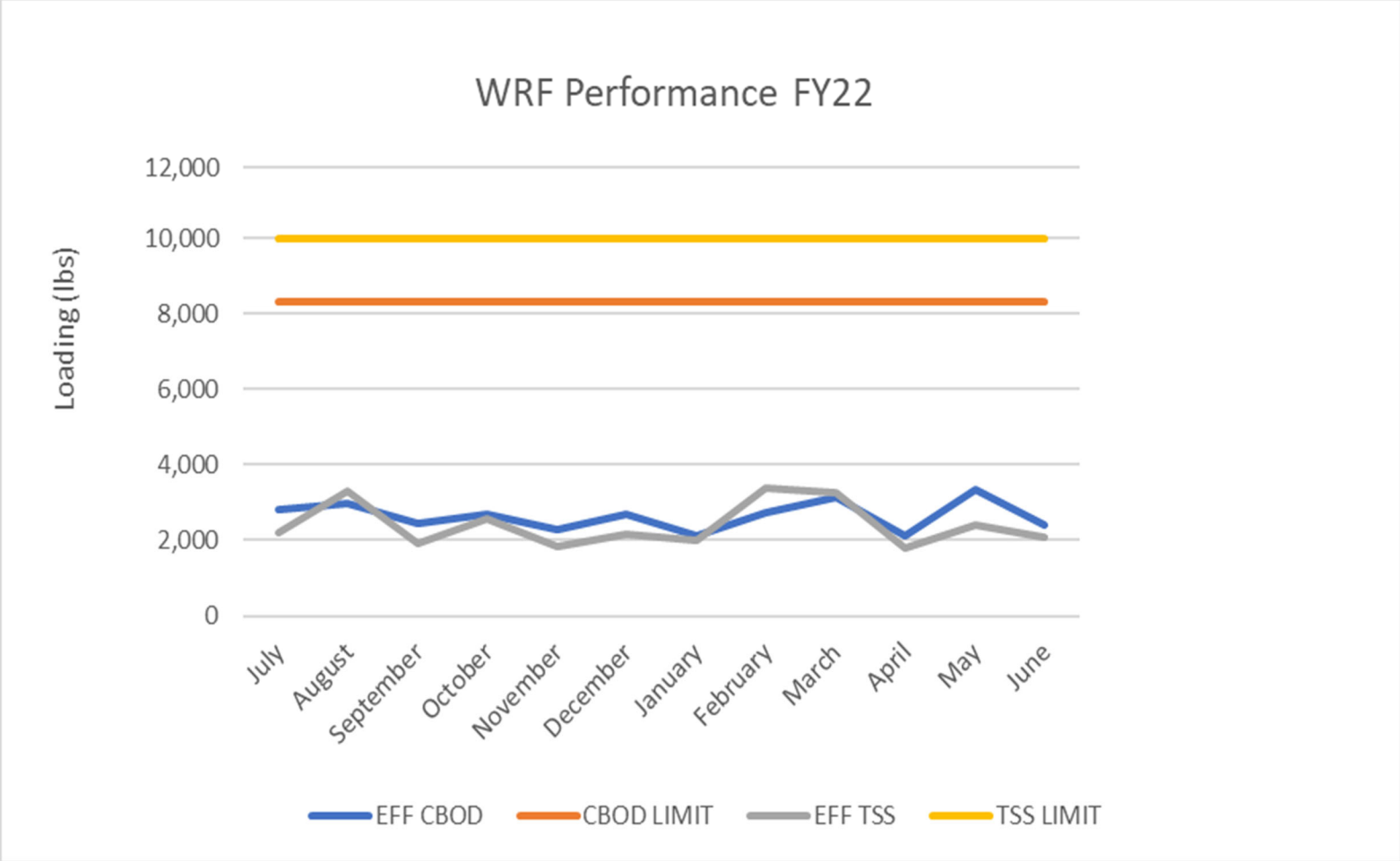
MSD's Pipe Rating Program is used to objectively prioritize rehabilitation projects throughout the regional collection system. This published, award winning program utilizes the District's Geographic Information System (GIS) and database software to collect rating data for each project. The data include Sanitary Sewer Overflow (SSO) history, customer service requests, proximity to streams/waterways, structural condition, and monitoring/maintenance schedules by MSD staff. A priority rating is then generated for each project, which is used to prioritize the ten -year CIP.

MSD maintains an aggressive Preventative Maintenance Program whereby approximately 844,902 lineal feet (or about 160 miles) of sewer lines were cleaned by high pressure water jetting equipment. In addition, over 29,997 linear feet of sewer lines are mechanically treated to remove tree roots and blockages. MSD also maintains its Rights-of-Way to ensure access to the system for cleaning and maintenance activities. During FY 2022 over 83,718 ft. were cleared.

Water Reclamation Facility (WRF) Performance Measures

During the FY22 annual reporting period, high performance measures were again achieved. The WRF continues to provide effective/efficient treatment services to the community averaging wastewater CBOD & TSS removal efficiencies of 93% and 94% respectively (state permit requires a minimum of 85% removal rates for compliance). The volume of flow to the WRF continues to remain well below hydraulic capacity for the plant averaging 21.7 million gallons per day. The WRF remains in compliance for all permitted parameters and receives favorable reviews by NC Department of Environmental Quality and the WNC Regional Air Quality Agency.

MSD maintains a service contract agreement with Pace Analytical, Inc. (NC certified lab). This progressive opportunity continues to yield significant long-term savings to MSD. Also, the WRF successfully participated in surveillance audits regarding ISO14001 certification , coming through with zero (0) non-conformances. This program, also referred to as an Environmental Management System, continues to provide significant benefits to MSD both in the short & long-term.
#



Water Reclamation Facility Improvements

The High Rate Primary Treatment Project is recommended by the Water Reclamation Facility Plan. This $17.0 million project will provide high-rate primary clarification and will help the plant's Rotating Biological Contactor system perform at a higher level and be better equipped to meet future regulations. Construction was substantially complete in December of 2021.

CONSTRUCTION TOTALS BY DATE COMPLETED - Monthly

From 7/1/2021 to 6/30/2022

	Dig Ups	Emergency Dig Ups	Dig Up ML Ftg	Dig Up SL Ftg	Manhole Repairs	Taps Installed	Creek Crossings Cleared	ROW Ftg	Service Line Bore Ftg	Service Line Burst Ftg
July 2021	29	12	164	509	15	20	0	13,113	0	0
August 2021	24	7	96	631	11	28	14	5,000	0	35
September 2021	22	10	70	320	20	17	1	30,058	0	20
October 2021	23	7	51	826	14	33	7	30,659	0	0
November 2021	19	12	107	631	10	26	0	710	103	0
December 2021	18	15	99	465	18	15	1	215	0	35
January 2022	17	5	35	504	12	20	0	2,175	0	0
February 2022	30	4	94	739	13	28	1	0	70	0
March 2022	44	12	126	1,109	13	39	0	0	155	65
April 2022	23	8	40	954	12	36	0	0	55	28
May 2022	39	6	61	942	16	30	0	1,788	0	0
June 2022	36	11	171	707	24	25	8	0	56	126
Grand Total	**324**	**109**	**1,113**	**8,337**	**178**	**317**	**32**	**83,718**	**439**	**309**

CONSTRUCTION REHAB TOTALS BY DATE COMPLETED - Monthly

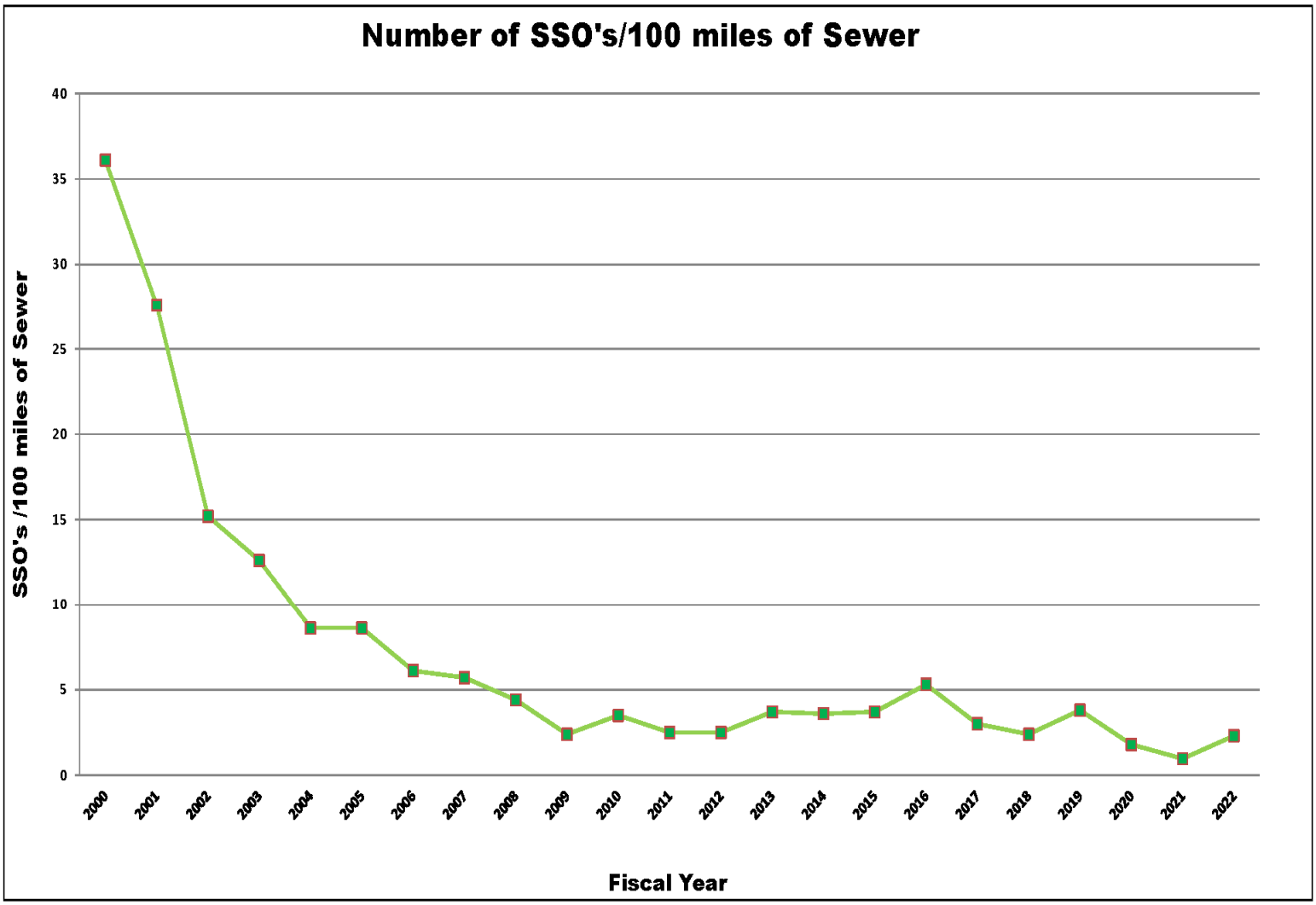
From 7/1/2021 to 6/30/2022

	# IRS Repairs	IRS Ftg	IRS Accept Ftg	Const Ftg	Const Accept Ftg	# D-R	D-R Ftg	#MH	Mainline PB Ftg	Mainline Bore Ftg	Total Rehab Ftg
July 2021	0	0	0	368	368	1	244	3	0	0	612
August 2021	0	0	0	161	161	0	0	0	0	0	161
September 2021	0	0	0	0	0	2	1082	8	0	0	1082
October 2021	0	0	0	917	917	0	8	1	0	0	925
November 2021	0	0	0	220	220	2	1545	14	0	223	1988
December 2021	0	0	0	0	0	2	614	3	0	0	614
January 2022	0	0	0	344	344	1	297	5	0	0	641
February 2022	0	0	0	135	326	1	258	8	0	0	584
March 2022	0	0	0	408	408	2	2423	8	0	0	2831
April 2022	0	0	0	204	204	1	70	0	0	0	274
May 2022	1	128	128	98	555	1	1113	11	0	0	1796
June 2022	0	0	0	40	40	1	206	1	0	0	246
Grand Totals	**1**	**128**	**128**	**2895**	**3543**	**14**	**7860**	**62**	**0**	**223**	**11754**

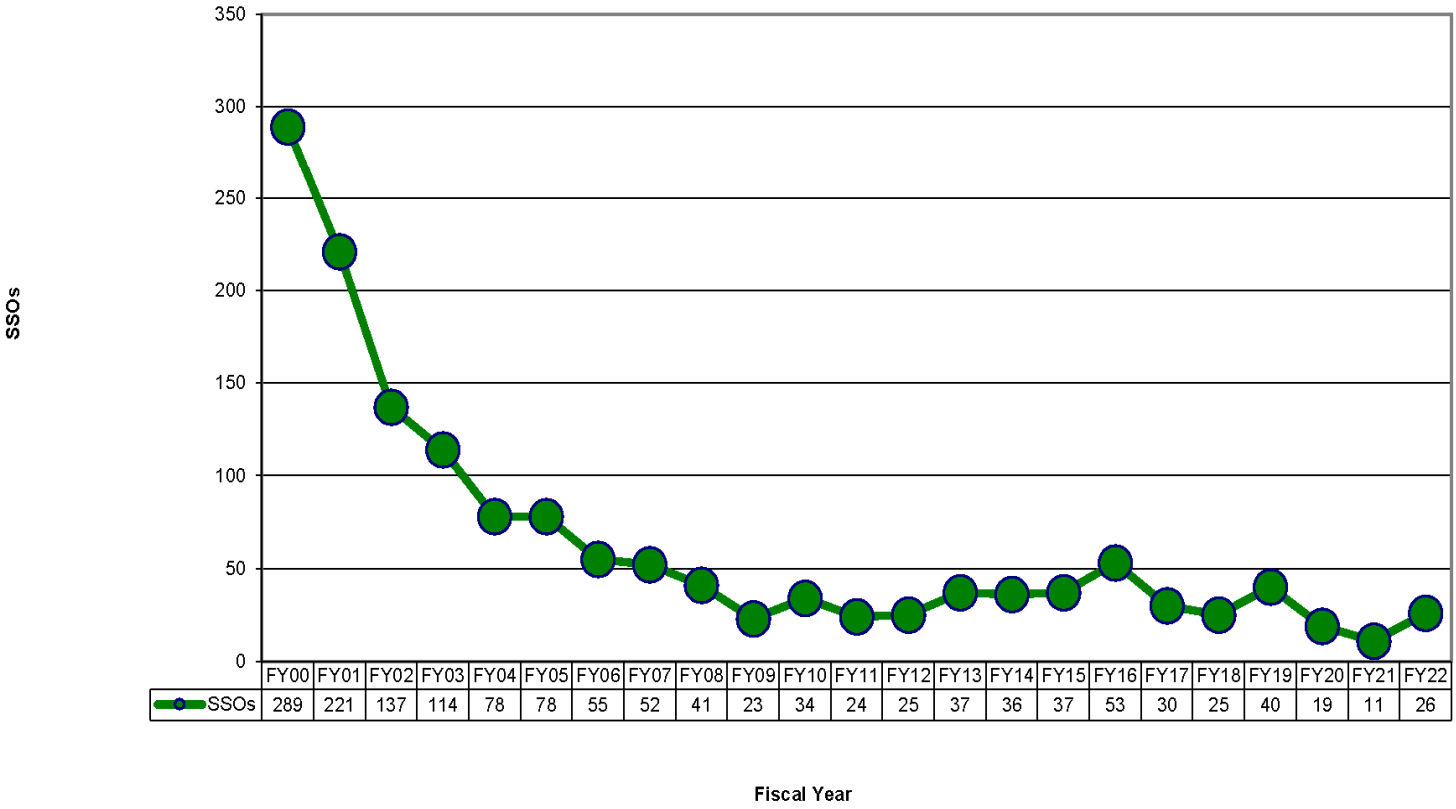
Collection System, System Services Division Performance Measures

System Services division completed and submitted to NCDEQ-DWR two six-month High Priority Line Inspection Reports. The High Priority Line report documents inspection of aerial lines, siphons and lines in proximity to vulnerable creeks and streams.

The collection system recorded 26 sanitary sewer overflows (SSO's) which equates to 2.3 SSO's per 100 miles of sewer. All SSO's were remediated according to the District's standard operating procedures for sanitary sewer overflow cleanup and no severe environmental impact occurred.



Sanitary Sewer Overflows



SSO Report - Monthly

From 7/1/2021 to 6/30/2022

	SSO Count	AVG Response Time (min.)	AVG SSO Volume (gal.)	AVG Surface Volume (gal.)	Spills >= 1000 Gallons	Spills >= 15,000 Gallons	Total SSO Volume (gal.)	Total Surface Volume (gal.)
July, 2021	3	32	2,983	2,983	1	0	8,950	8,950
August, 2021	3	17	1,782	1,782	1	0	5,345	5,345
September, 2021	4	34	575	575	0	0	2,300	2,300
October, 2021	3	18	4,633	4,633	1	0	13,900	13,900
November, 2021	3	29	333	333	0	0	1,000	1,000
December, 2021	2	23	588	563	0	0	1,175	1,125
January, 2022	1	25	760	760	0	0	760	760
February, 2022	2	411	290	290	0	0	580	580
March, 2022	2	26	500	500	0	0	1,000	1,000
April, 2022	0	0	0	0	0	0	0	0
May, 2022	0	0	0	0	0	0	0	0
June, 2022	3	30	713	713	0	0	2,140	2,140
Grand Totals:	26	56	1,429	1,427	3	0	37,150	37,100

CUSTOMER SERVICE REQUESTS
Monthly - All Crews

CREW	MONTH	JOBS	AVERAGE REPSONSE TIME	AVERAGE TIME SPENT
DAY 1ST RESPONDER				
	July, 2021	89	33	39
	August, 2021	112	30	31
	September, 2021	80	26	38
	October, 2021	99	27	38
	November, 2021	100	30	34
	December, 2021	99	28	37
	January, 2022	97	47	34
	February, 2022	122	31	35
	March, 2022	146	31	38
	April, 2022	126	30	34
	May, 2022	101	27	33
	June, 2022	95	28	38
		1,266	**31**	**36**
NIGHT 1ST RESPONDER				
	July, 2021	40	29	29
	August, 2021	37	35	25
	September, 2021	36	29	24
	October, 2021	28	41	40
	November, 2021	30	23	33
	December, 2021	43	26	27
	January, 2022	30	35	30
	February, 2022	36	38	26
	March, 2022	40	28	31
	April, 2022	27	24	40
	May, 2022	39	32	38
	June, 2022	36	35	43
		422	**31**	**32**
ON-CALL CREW *				
	July, 2021	24	64	51
	August, 2021	20	47	36

* On-Call Crew Hours: 8:00pm-7:30am (Jul. - Oct.) 11:30pm-7:30am (from Nov. onward) Monday-Friday, Weekends, and Holidays

CUSTOMER SERVICE REQUESTS
Monthly - All Crews

CREW	MONTH	JOBS	AVERAGE REPSONSE TIME	AVERAGE TIME SPENT
ON-CALL CREW *				
	September, 2021	24	53	31
	October, 2021	24	43	47
	November, 2021	27	45	46
	December, 2021	50	53	36
	January, 2022	44	50	39
	February, 2022	37	42	35
	March, 2022	31	59	32
	April, 2022	29	49	49
	May, 2022	37	50	43
	June, 2022	31	55	49
		378	**51**	**41**
Grand Totals:		**2,066**	**34**	**36**

* On-Call Crew Hours: 8:00pm-7:30am (Jul. - Oct.) 11:30pm-7:30am (from Nov. onward) Monday-Friday, Weekends, and Holidays

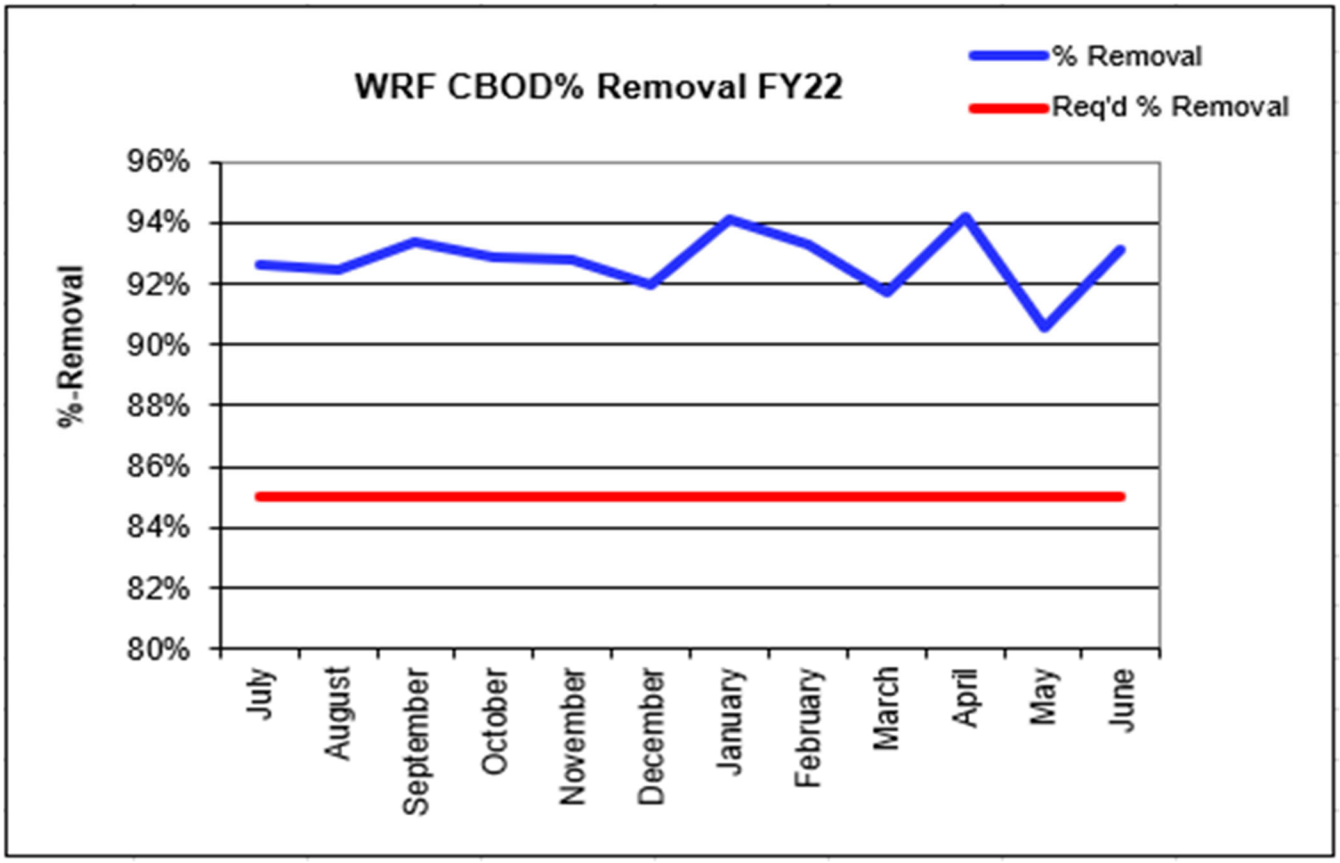
PIPELINE MAINTENANCE TOTALS BY DATE COMPLETED - Monthly

July 01, 2021 to June 30, 2022

	Main Line Wash Footage	Service Line Wash Footage	Rod Line Footage	Cleaned Footage	CCTV Footage	Smoke Footage	SL-RAT Footage
2021							
July	88,857	1,558	0	88,857	24,368	1,600	21,884
August	104,500	972	610	105,110	32,703	347	26,520
September	57,013	996	1,608	58,621	24,916	4,265	23,383
October	65,871	967	2,250	68,121	22,498	0	0
November	51,867	1,863	2,647	54,514	16,570	917	0
December	65,031	2,411	2,225	67,256	21,251	850	0
2022							
January	40,421	1,636	2,180	42,601	13,595	50	0
February	75,546	1,660	3,145	78,691	18,857	600	0
March	121,513	2,060	5,992	127,505	21,087	766	0
April	54,379	1,335	3,083	57,462	20,631	0	0
May	32,530	1,101	1,664	34,194	22,222	50	1,012
June	87,374	1,214	4,593	91,967	27,835	200	0
Grand Total:	**844,902**	**17,773**	**29,997**	**874,899**	**266,532**	**9,645**	**72,799**
Avg Per Month:	**70,409**	**1,481**	**2,500**	**72,908**	**22,211**	**804**	**6,067**

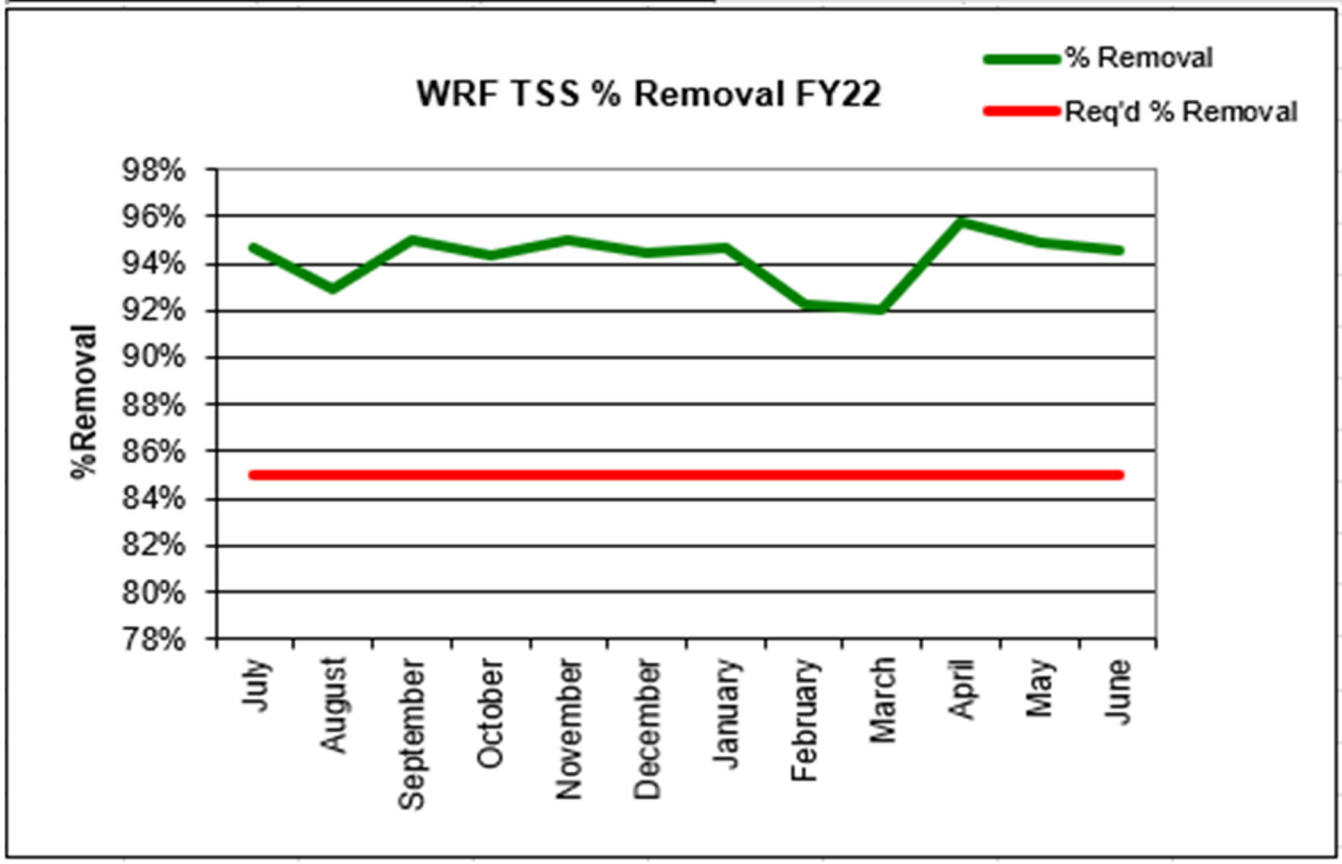
Water Reclamation Facility (WRF) Performance Measures

Month	INF CBOD	EFF CBOD	% Removal	Req'd % Removal
July	220.9	16.3	93%	85%
August	196.0	14.8	92%	85%
September	214.8	14.2	93%	85%
October	195.7	14.0	93%	85%
November	197.3	14.2	93%	85%
December	213.6	17.2	92%	85%
January	213.6	12.6	94%	85%
February	205.8	13.8	93%	85%
March	187.8	15.5	92%	85%
April	197.9	11.6	94%	85%
May	185.2	17.5	91%	85%
June	210.5	14.6	93%	85%
Average	203.2	14.7		
% Removal		93%		



Water Reclamation Facility (WRF) Performance Measures

Month	INF TSS	EFF TSS	% Removal	Req'd % Removal
July	239.1	12.8	95%	85%
August	231.5	16.4	93%	85%
September	226.4	11.2	95%	85%
October	232.2	13.2	94%	85%
November	228.6	11.5	95%	85%
December	250.5	13.8	94%	85%
January	218.5	11.8	95%	85%
February	218.9	17.0	92%	85%
March	199.1	16.0	92%	85%
April	233.6	9.9	96%	85%
May	246.9	12.5	95%	85%
June	234.2	12.6	95%	85%
Average	229.9	13.2		
% Removal		94%		



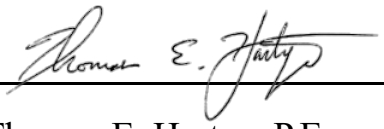
Hydroelectric Performance Measures

MSD operates a hydroelectric facility with three (3) horizontal turbines that produce electrical power. This energy is then sold back to the electrical grid to Duke Energy. These turbines benefit MSD because it offsets the cost of energy used to operate the WRF. The treatment of wastewater is an energy hungry process, but the hydroelectric facility allows MSD to save $300,000 to $600,000 in energy costs per year. The variation in savings is dependent on rainfall and maintenance requirements that occur during the year.

Task	FY20	FY21	FY22
Daily (average) Flow, treated MGD	23.4	23.9	22.2
Maximum daily flow treated, MGD	67.2	67.3	53.7
Dry tons of bio-solids processed	7,886	6,841	7,834
Cost per million gallons (MG), treated	$729	$708	$575
Energy cost per MG. treated	$111	$91	$136
Carbonaceous biochemical oxygen demand (CBOD) removal, %	93%	92%	93%
Total suspended solids (TSS) removal efficiency, %	94%	93%	94%
Number of NPDES permit non-compliance	1	1	1
Preventative to corrective maintenance ratio	70:30	70:30	70:30

V. Certification

I certify under penalty of law that this report is complete and accurate to the best of my knowledge. I further certify that this report has been made available to the users and customers of the MSD system and that those users have been notified of its availability.



Thomas E. Hartye, P.E. August 25, 2022
General Manager
Metropolitan Sewerage District of Buncombe County, NC

If you would like more information please email webmaster@msdbc.org