Metropolitan Sewerage District of Buncombe County

System Performance Annual Report

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Asheville, North Carolina 28804

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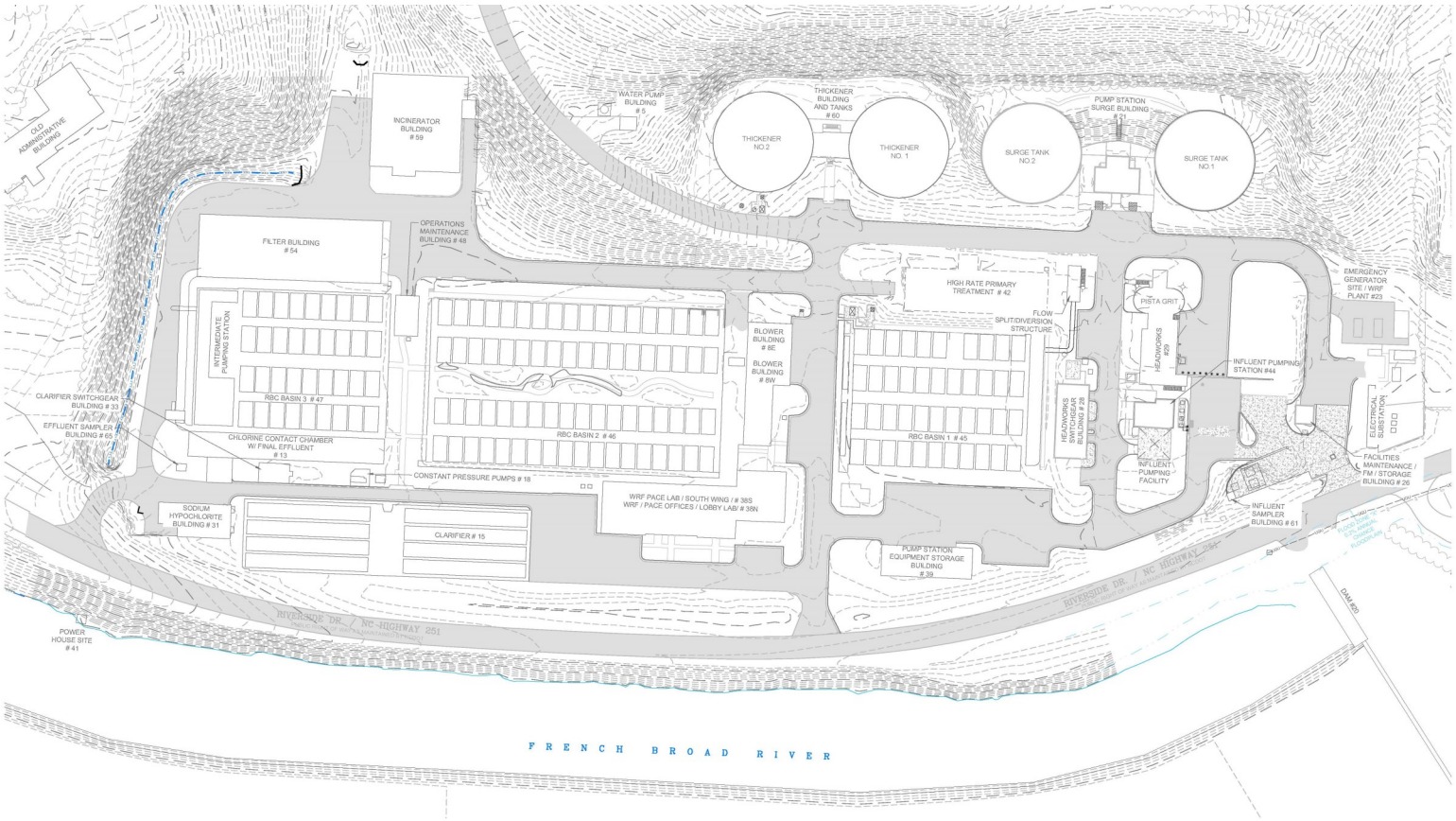
Table of Contents

System Performance Annual Report

Fiscal Year 2021 (July 2020 - June 2021)

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

Collection System—System Services Division

In the fiscal year of 2021 (FY21), the Metropolitan Sewerage District provided wastewater service to over 56,000 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, 41 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 FY21 an average flow of 23.9 million gallons per day were treated with the majority coming from residences. For the year, 8.7 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 (Under Construction as of March 2019. Completion expected by Fall 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 (2,561 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

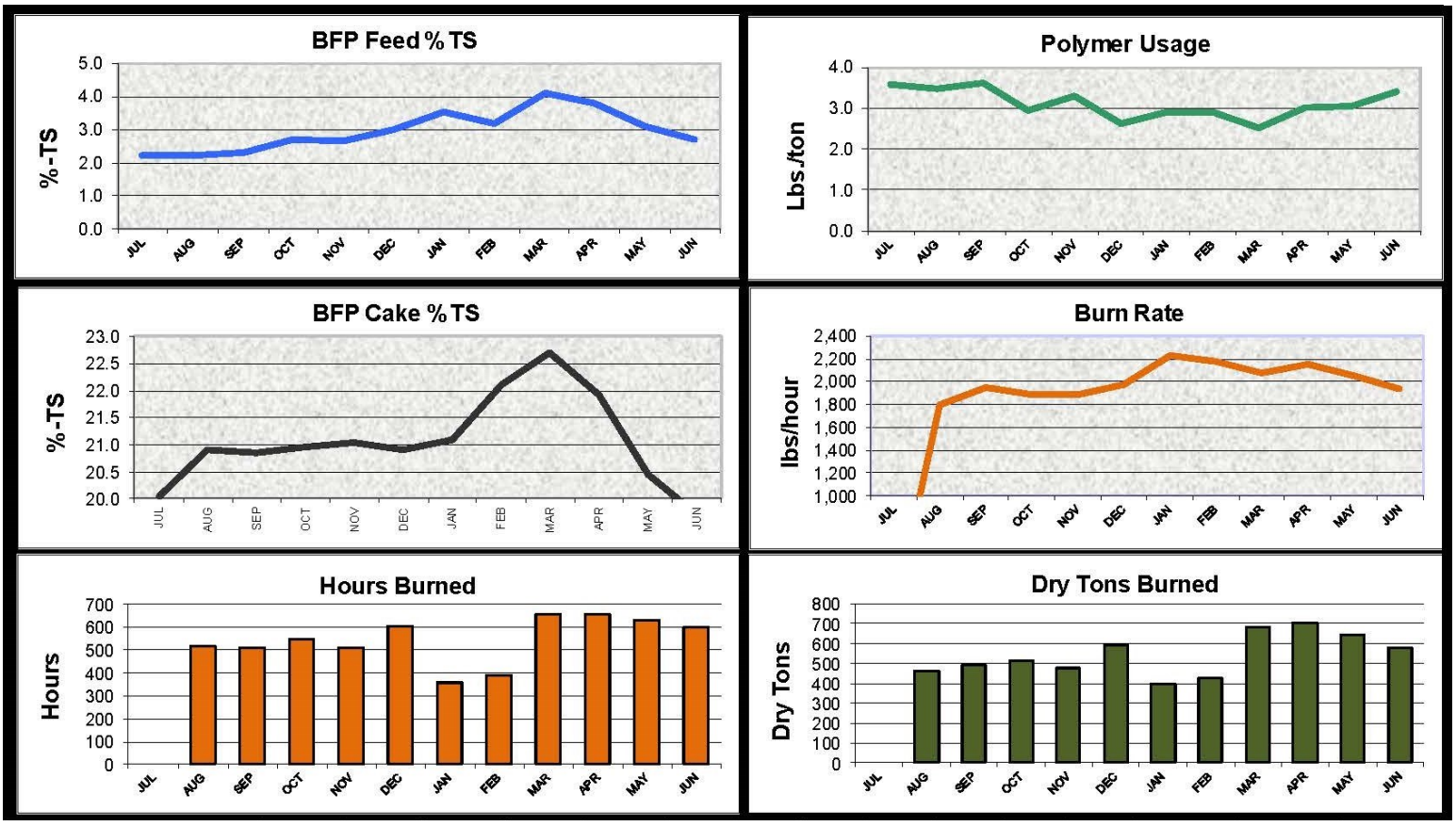
- SCADA (Supervisory Control and Data Acquisition) - full automated control of WRF

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).

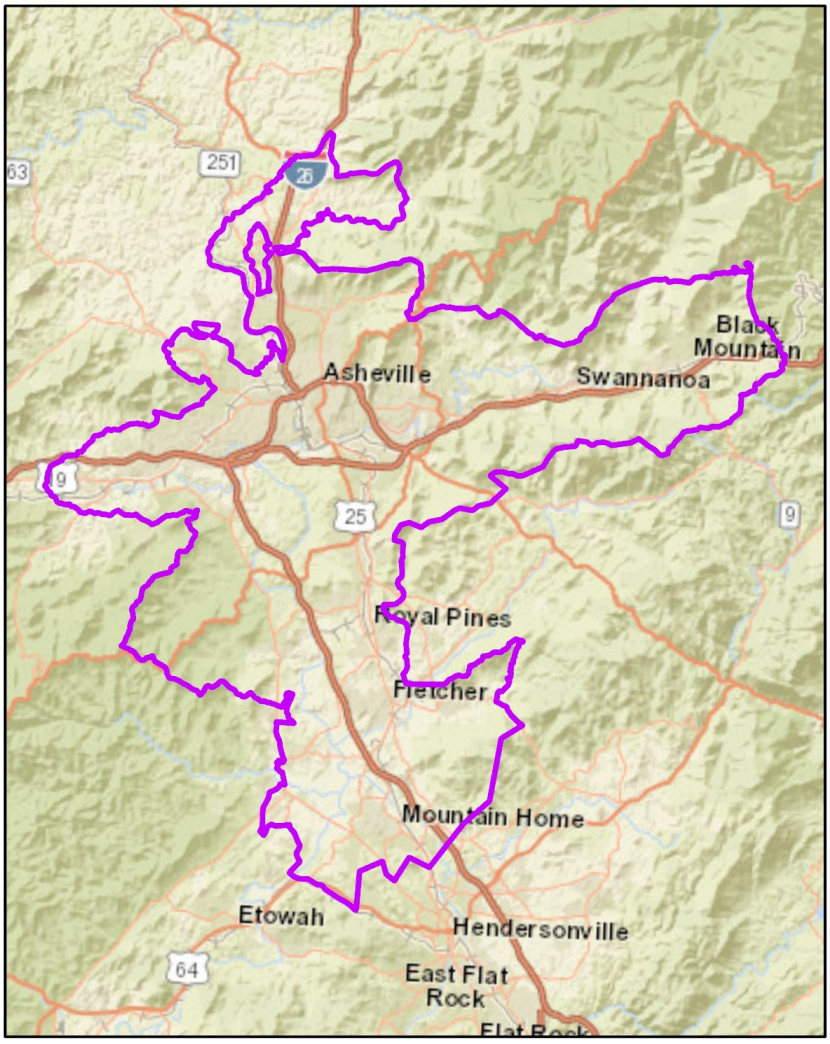
Sludge is thickened in on-site gravity thickeners to a consistency of 2-5% solids at which time it is then pumped to the 2 1/2-meter belt presses. These units dewater the sludge to over 22% solids and then it is pumped to the incinerator. Air emissions from the incinerator are of excellent quality, and air quality is further enhanced by a new filtration system added in 2016. Recent air emissions testing place removal efficiency of the air scrubbers at 99+% for regulated parameters. Incinerator ash is thickened on-site via a gravity ash thickener and then pumped to an on-site lagoon. Groundwater 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 (formerly PSNC 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.



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 2021, over 1,326,969 linear feet (or 251 miles) of pipe have been replaced and over $442 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 2022 to FY 2030, the District expects to rehabilitate or replace an additional 403,371 linear feet.

Approximately $354 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.

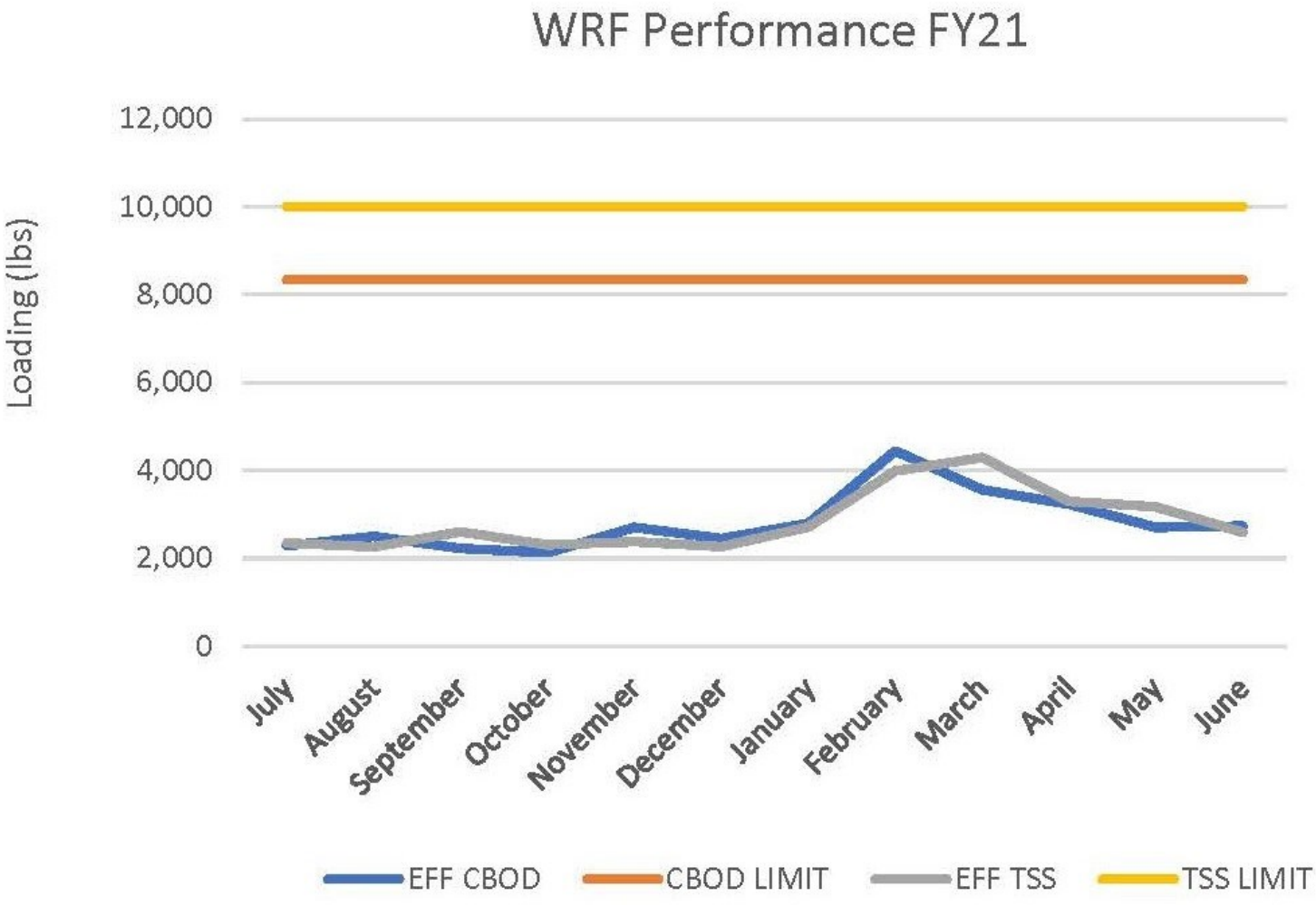
MSD's Pipe Rating Program is used to objectively prioritize rehabilitation projects throughout the regional collection system. This published, award winning program utilizes the District's Geographic Information System (GIS) and database software to collect rating data for each project. The data include 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 891,700 lineal feet (or about 169 miles) of sewer lines were cleaned by high pressure water jetting equipment. In addition, over 26,280 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 2021 over 80,110 ft. were cleared.

Water Reclamation Facility (WRF) Performance Measures

During the FY20 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 92% and 93% 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 23.9 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

Facility projects that are underway at the WRF include the High Rate Primary Treatment Project: This 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 is currently underway, and completion is expected by Fall 2021.

CONSTRUCTION TOTALS BY DATE COMPLETED - Monthly

From 7/1/2020 to 6/30/2021

	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 2020	29	9	180	514	15	18	2	16,700	40	0
August 2020	25	9	73	591	18	20	1	19,850	0	0
September 2020	28	11	201	634	18	25	1	240	4	0
October 2020	30	12	72	872	20	20	1	1,260	30	0
November 2020	26	9	157	519	16	14	3	0	60	0
December 2020	22	13	74	631	9	27	0	0	0	0
January 2021	29	8	85	741	11	26	2	490	0	0
February 2021	27	17	125	758	16	27	1	0	0	0
March 2021	39	15	129	868	15	28	5	0	75	0
April 2021	19	11	59	939	13	38	1	50	0	0
May 2021	29	5	40	540	18	21	0	11,010	0	0
June 2021	33	11	123	993	14	21	0	30,510	35	0
Grand Total	**336**	**130**	**1,318**	**8,600**	**183**	**285**	**17**	**80,110**	**244**	**0**

CONSTRUCTION REHAB TOTALS BY DATE COMPLETED - Monthly

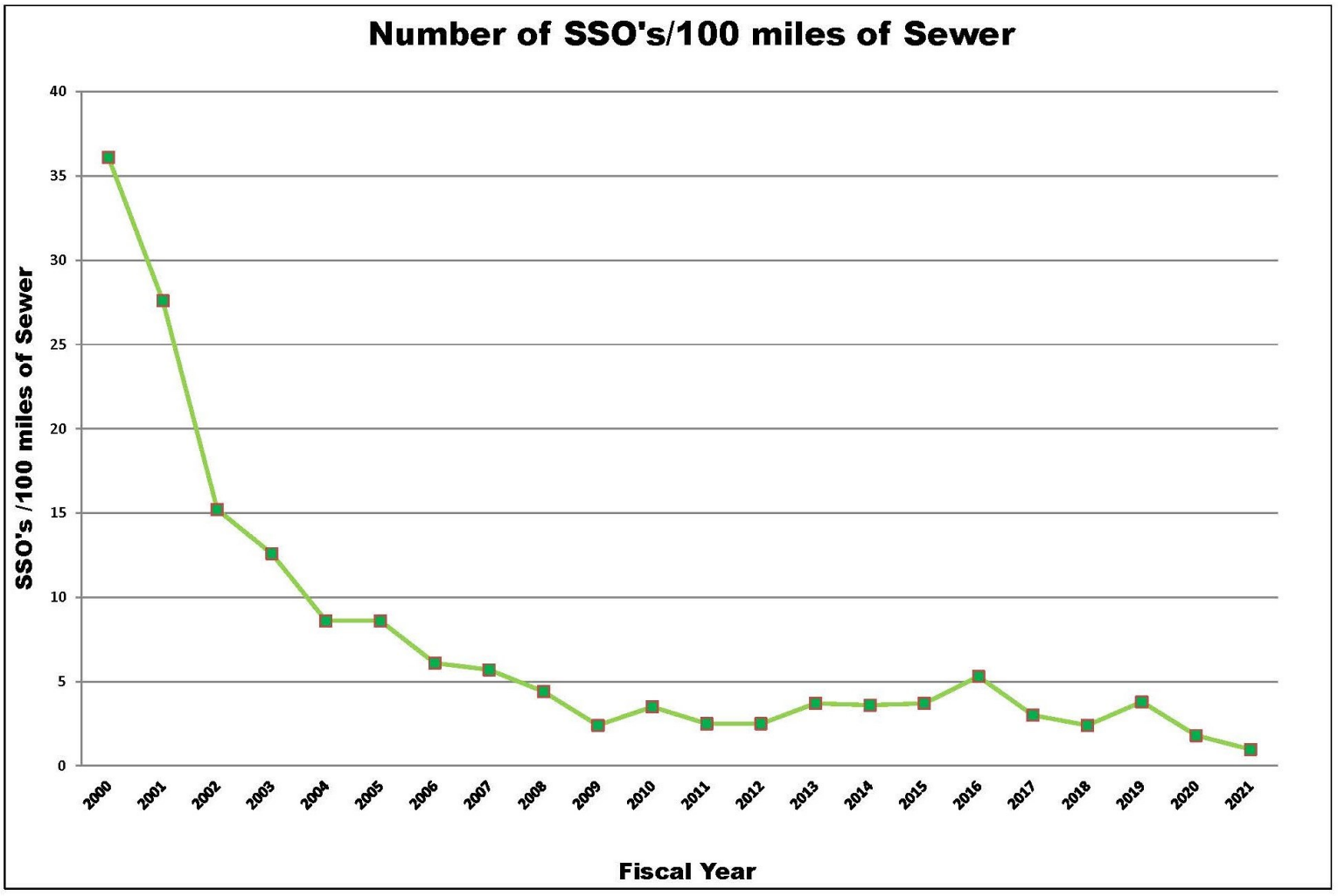
From 7/1/2020 to 6/30/2021

	# 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 2020	0	0	0	0	0	4	2124	11	0	0	2124
August 2020	0	0	0	114	474	2	1439	8	0	0	1913
September 2020	0	0	0	0	0	2	1213	10	0	0	1213
October 2020	0	0	0	0	0	4	1816	10	0	260	2076
November 2020	0	0	0	987	987	1	0	0	0	0	987
December 2020	0	0	0	296	553	0	0	0	0	0	553
January 2021	0	0	0	89	89	1	364	3	0	0	453
February 2021	0	0	0	185	185	2	2684	19	0	0	2869
March 2021	0	0	0	189	189	1	173	2	0	0	362
April 2021	0	0	0	695	695	0	0	1	0	0	695
May 2021	0	0	0	173	472	2	2004	21	75	0	2551
June 2021	0	0	0	0	0	2	1042	5	0	0	1042
Grand Totals	**0**	**0**	**0**	**2728**	**3644**	**21**	**12859**	**90**	**75**	**260**	**16838**

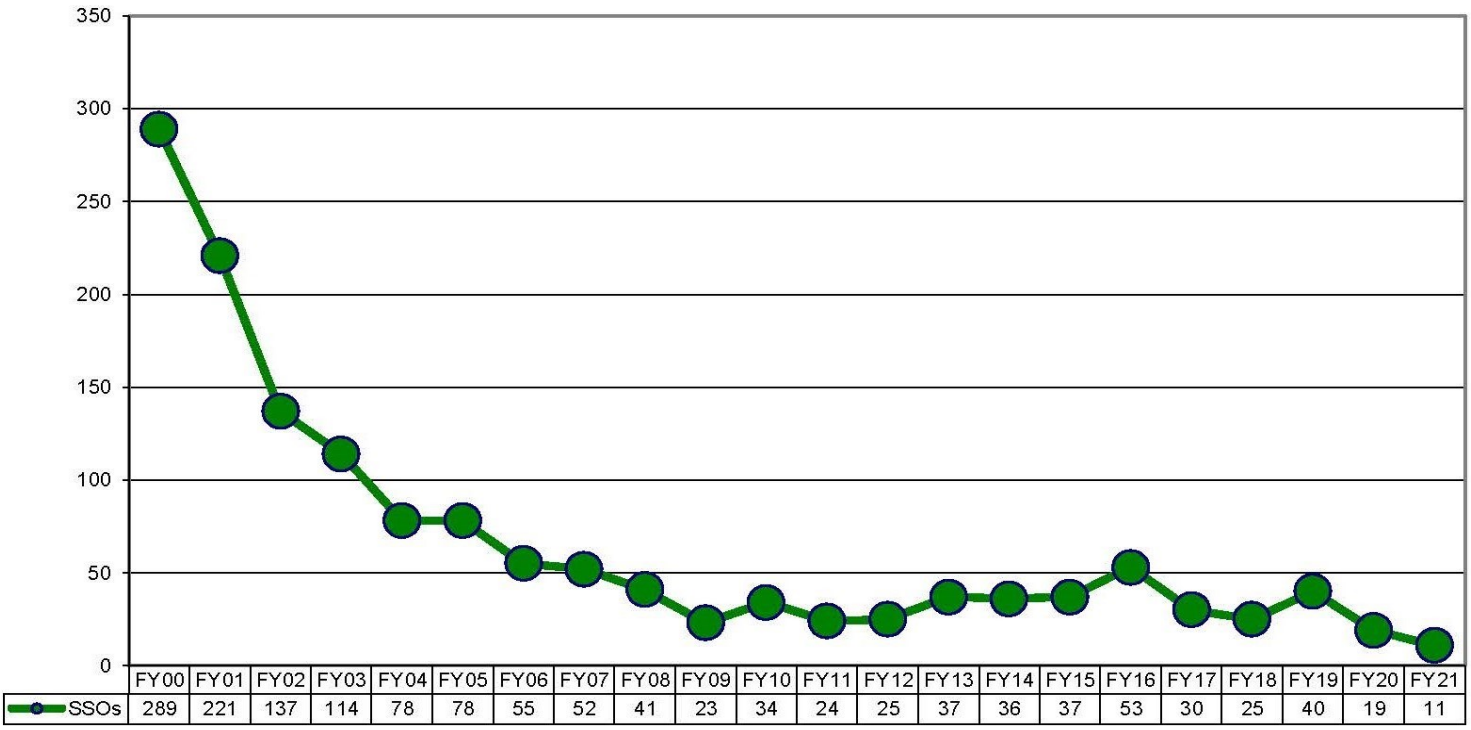
Collection System, System Services Division Performance Measures

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 11 sanitary sewer overflows (SSO's) which equates to 0.97 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



	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21
SSOs	289	221	137	114	78	78	55	52	41	23	34	24	25	37	36	37	53	30	25	40	19	11

Fiscal Year

SSO Report - Monthly

From 7/1/2020 to 6/30/2021

	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, 2020	1	58	330	330	0	0	330	330
August, 2020	3	33	29,017	28,600	1	0	87,050	85,800
September, 2020	1	48	945	700	0	0	945	700
October, 2020	3	29	1,100	1,100	1	0	3,300	3,300
November, 2020	0	0	0	0	0	0	0	0
December, 2020	2	17	625	625	0	0	1,250	1,250
January, 2021	0	0	0	0	0	0	0	0
February, 2021	0	0	0	0	0	0	0	0
March, 2021	0	0	0	0	0	0	0	0
April, 2021	0	0	0	0	0	0	0	0
May, 2021	1	28	300	300	0	0	300	300
June, 2021	0	0	0	0	0	0	0	0
Grand Totals:	**11**	**32**	**8,470**	**8,335**	**2**	**0**	**93,175**	**91,680**

CUSTOMER SERVICE REQUESTS
Monthly - All Crews

CREW	MONTH	JOBS	AVERAGE REPSONSE TIME	AVERAGE TIME SPENT
DAY 1ST RESPONDER				
	July, 2020	111	25	36
	August, 2020	103	26	36
	September, 2020	109	27	39
	October, 2020	137	26	41
	November, 2020	107	25	31
	December, 2020	110	28	33
	January, 2021	132	34	35
	February, 2021	136	27	33
	March, 2021	170	33	36
	April, 2021	111	31	29
	May, 2021	108	34	34
	June, 2021	94	35	32
		1,428	**29**	**35**
NIGHT 1ST RESPONDER				
	July, 2020	42	29	26
	August, 2020	34	36	33
	September, 2020	23	32	36
	October, 2020	38	36	30
	November, 2020	24	43	28
	December, 2020	46	25	28
	January, 2021	35	31	26
	February, 2021	48	35	32
	March, 2021	41	34	24
	April, 2021	36	40	39
	May, 2021	32	24	25
	June, 2021	37	26	26
		436	**32**	**29**
ON-CALL CREW *				
	July, 2020	26	44	34
	August, 2020	34	46	31

* 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, 2020	22	46	37
	October, 2020	32	60	36
	November, 2020	29	54	36
	December, 2020	43	30	39
	January, 2021	49	37	37
	February, 2021	36	46	38
	March, 2021	39	49	36
	April, 2021	36	29	42
	May, 2021	32	27	38
	June, 2021	21	51	41
		399	**42**	**37**
Grand Totals:		**2,263**	**32**	**34**

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

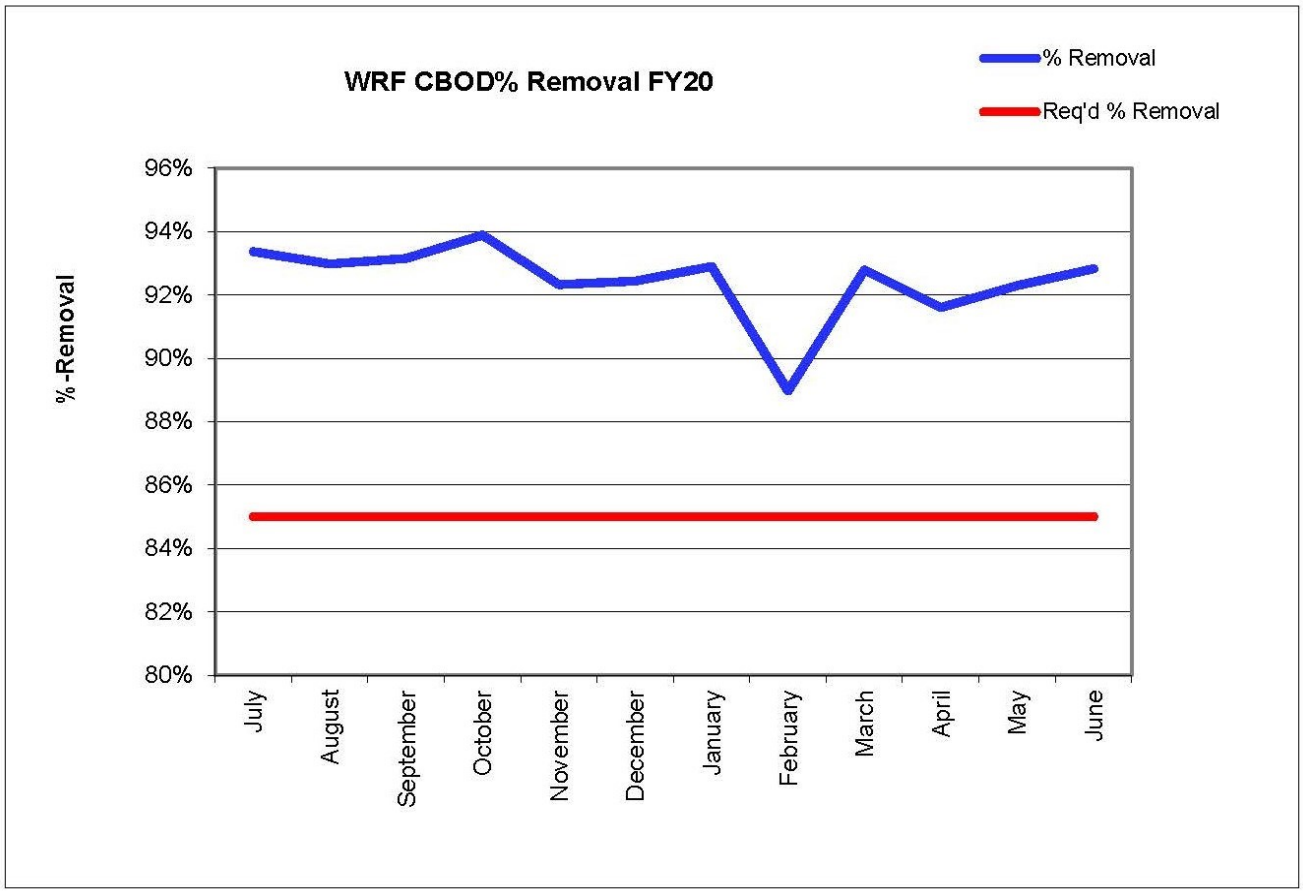
PIPELINE MAINTENANCE TOTALS BY DATE COMPLETED - Monthly

July 01, 2020 to June 30, 2021

	Main Line Wash Footage	Service Line Wash Footage	Rod Line Footage	Cleaned Footage	CCTV Footage	Smoke Footage	SL-RAT Footage
2020							
July	139,745	1,781	1,508	141,253	17,283	17,249	16,389
August	120,958	1,682	1,115	122,073	29,203	30,909	24,117
September	86,789	1,342	2,545	89,334	22,635	4,520	31,359
October	70,467	1,264	5,903	76,370	21,650	3,640	83,346
November	71,302	1,592	1,675	72,977	18,441	2,890	50,836
December	56,115	1,262	275	56,390	16,585	0	50,297
2021							
January	72,173	2,395	2,772	74,945	13,327	276	42,747
February	68,713	1,972	1,661	70,374	23,089	1,673	42,287
March	54,659	3,137	3,588	58,247	19,323	100	28,763
April	39,710	1,654	1,785	41,495	29,491	5,852	95,426
May	48,169	2,152	1,852	50,021	26,328	2,687	21,325
June	62,900	2,028	1,599	64,499	33,882	38,068	14,681
Grand Total:	**891,700**	**22,261**	**26,278**	**917,978**	**271,237**	**107,864**	**501,573**
Avg Per Month:	**74,308**	**1,855**	**2,190**	**76,498**	**22,603**	**8,989**	**41,798**

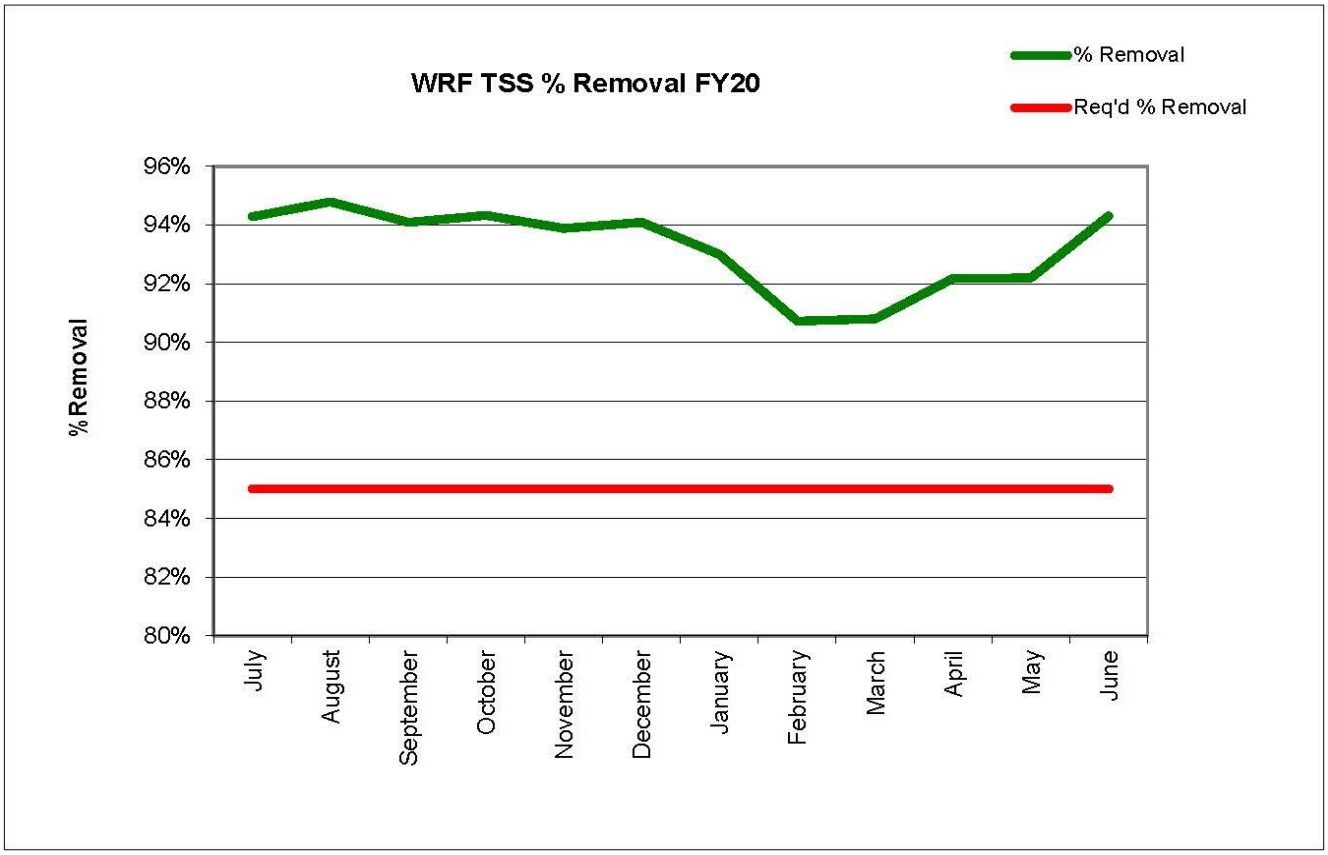
Water Reclamation Facility (WRF) Performance Measures

Month	INF CBOD	EFF CBOD	% Removal	Req'd % Removal
July	198.9	13.2	93%	85%
August	173.2	12.2	93%	85%
September	160.7	11.0	93%	85%
October	166.4	10.2	94%	85%
November	180.9	13.9	92%	85%
December	166.8	12.6	92%	85%
January	205.9	14.6	93%	85%
February	195.1	21.5	89%	85%
March	198.6	14.3	93%	85%
April	184.0	15.4	92%	85%
May	188.7	14.5	92%	85%
June	221.7	15.9	93%	85%
Average	186.7	14.1		
% Removal		92%		



Water Reclamation Facility (WRF) Performance Measures

Month	INF TSS	EFF TSS	% Removal	Req'd % Removal
July	237.3	13.6	94%	85%
August	211.4	11.0	95%	85%
September	217.8	12.9	94%	85%
October	194.1	11.0	94%	85%
November	199.5	12.2	94%	85%
December	196.9	11.7	94%	85%
January	203.1	14.2	93%	85%
February	208.3	19.3	91%	85%
March	187.8	17.3	91%	85%
April	201.3	15.8	92%	85%
May	218.4	17.0	92%	85%
June	265.6	15.1	94%	85%
Average	211.8	14.3		
% Removal		93%		



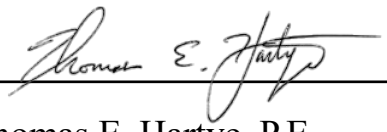
Hydroelectric Performance Measures

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	FY19	FY20	FY21
Daily (average) flow, treated MGD	25.9	23.4	23.9
Maximum daily flow treated, MGD	67.5	67.2	67.3
Dry tons of bio-solids processed	7,212	7,886	6,841
Cost per million gallons (MG), treated	$554	$729	$708
Energy costs per MG, treated	$107	$111	$91
Carbonaceous biochemical oxygen demand (CBOD) removal, %	92%	93%	92%
Total suspended solids (TSS) removal efficiency, %	95%	94%	93%
Number of NPDES permit non-compliance	3	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.
General Manager
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August 12, 2021

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