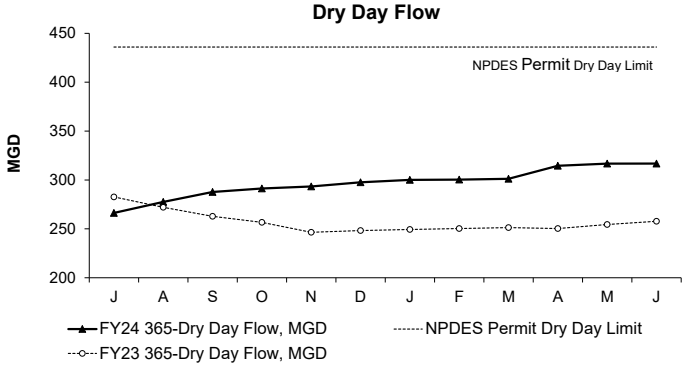
Deer Island Operations

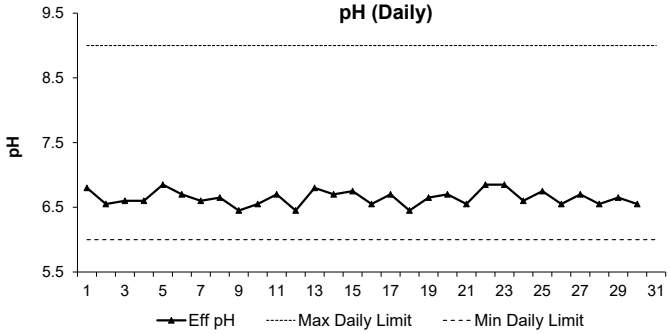
June 2024 - FY24

Dry Day Flow



June's Dry Day Flow is the average of all dry weather influent flows over the previous 365 days from 7/1/2023 to 6/30/2024. The Dry Day Flow for the month was 316.8 MGD, well below the permit limit of 436 MGD.

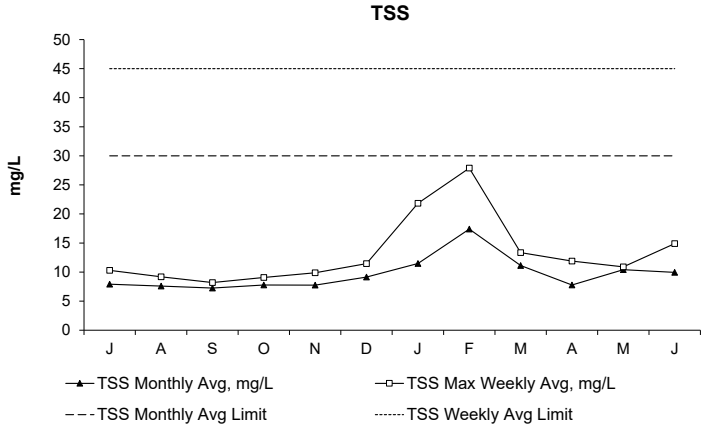
pH (Daily)



In June, all pH measurements were fairly typical for the season and within permit limits.

pH is a measure of the acidity or basicity of the effluent. Small fluctuations in pH do not have an adverse effect on marine environments. Because pure oxygen is used in the activated sludge reactors, the effluent pH tends to be at the lower range.

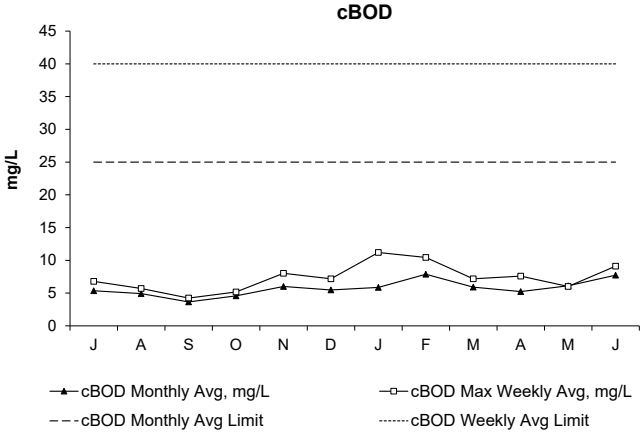
TSS



In June, both the weekly and monthly concentrations of TSS were below permit limits. Both the TSS Monthly Avg. and the Max Weekly Avg. were elevated in January due to reduced solids removal caused by significantly higher plant flows resulting from much higher than normal precipitation. TSS levels in February increased further due to the seasonal change in the wastewater temperature resulting in a shift in the biological activity of the secondary activated sludge microbes, which occurred earlier than normal this year due to the warmer temperatures. The TSS have subsequently returned to more typical levels.

TSS, or Total Suspended Solids, in the effluent is a measure of the amount of solids that remain suspended after treatment.

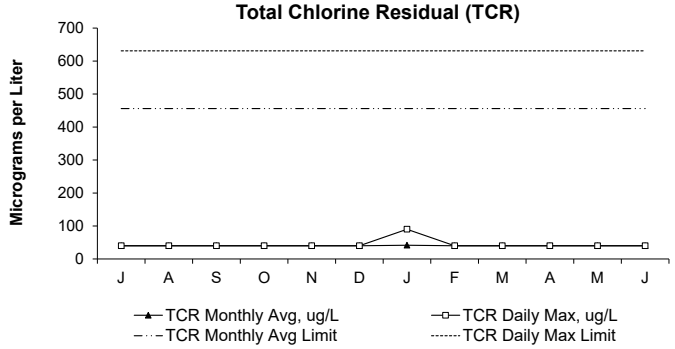
cBOD



In June, both the weekly and monthly concentrations of cBOD were well below permit limits.

cBOD, or Carbonaceous Biochemical Oxygen Demand, is a measure of the amount of dissolved oxygen required for the decomposition of organic materials in the environment.

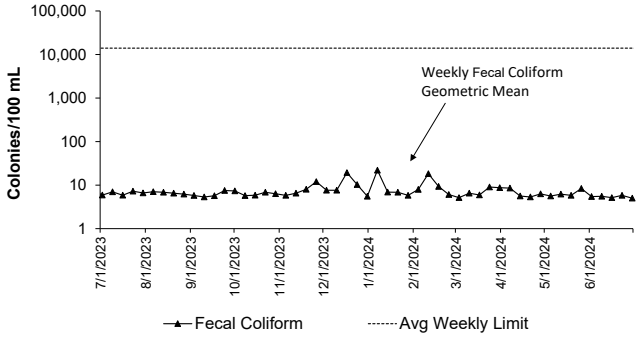
Total Chlorine Residual (TCR)



In June, both the maximum daily and monthly concentrations of TCR were below permit limits. The TCR Monthly Avg and the TCR Daily Max values have been non-detectable at 40 ug/L for every month except for January. Therefore, both parameters may appear to be represented by the same trendline except for the low detectable TCR result recorded in January.

TCR, or Total Chlorine Residual, in the effluent is a measure of the amount of chlorine that remains after the disinfection/dechlorination process. If the chlorine residual in the effluent is too high, it may threaten marine organisms.

Fecal Coliform by Week



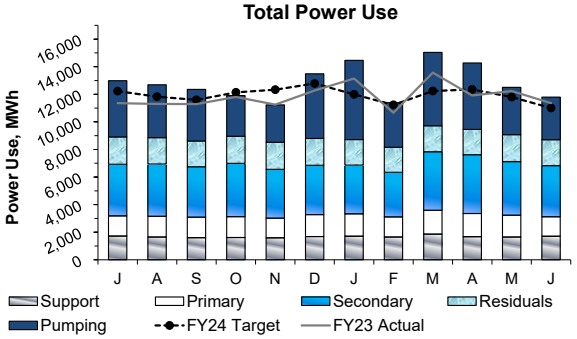
In June, all permit conditions for Fecal Coliform were met. Fecal Coliform is an indicator for the possible presence of pathogens. The levels of these bacteria after disinfection show how effectively the plant is inactivating many forms of disease-causing microorganisms.

There are four (4) conditions in the permit that must be met: daily geomean; weekly geomean; 10% of all samples in a month; and greater than three (3) consecutive samples not to exceed 14,000 colonies/100mL.

Deer Island Operations

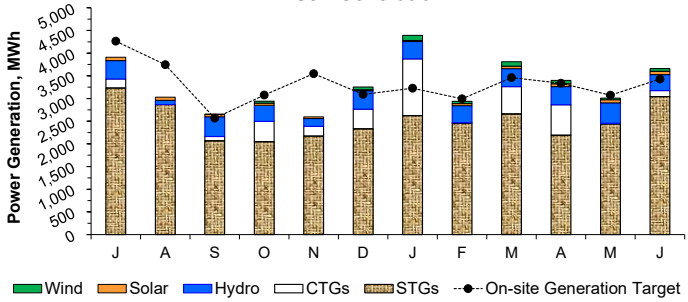
June 2024 - FY24

Total Power Use



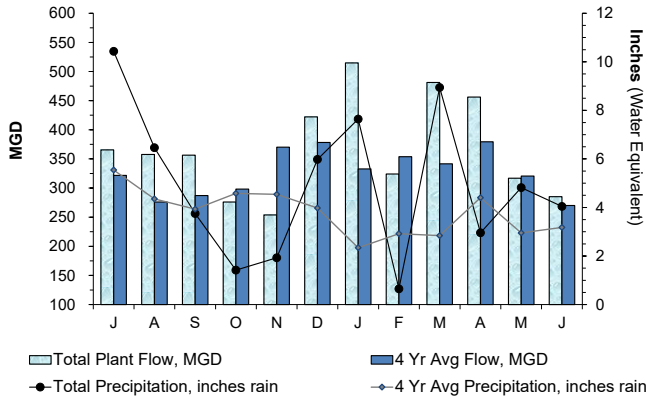
Total power usage for June was 7.2% above target. Plant flow for this month was 5.6% above target with historical data (4 yr avg) used to generate the electricity model as precipitation was 27.1% above target. Power used for most treatment processes was on or near target, while power usage for raw wastewater pumping (+9.8%) and secondary treatment (+14.6%) were significantly higher than target due to the higher plant flows and a greater oxygen demand in the activated sludge treatment process, respectively.

Self-Generation



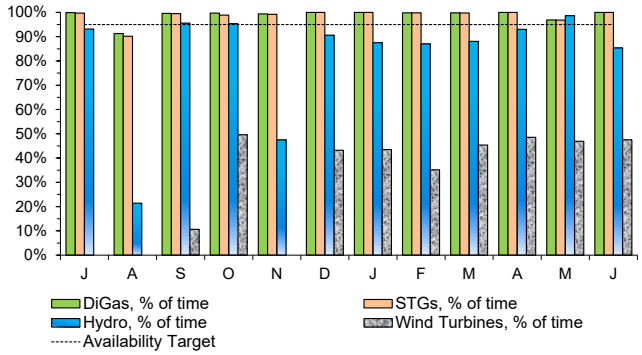
Total on-site generation for June was 6.7% above target with budgetary estimates. The CTGs were operated for an ISO-New England summer demand response audit, an ISO-NE demand response called event, and on two (2) days during peak ISO-NE system demand to avoid the capacity charge on DITP's electricity bills. As a result, CTGs generation was 2.7% above budget estimates. STGs generation was 12.7% above target as supplemental fuel oil was used to maintain consistent boiler operation during periods of low or unstable digester gas production. Hydro Turbine generation was 17.3% below target as Turbine #2 availability was only 85.4% due to high plant flow trips during storm events and several wicket gate issues during the second half of the month, and Turbine #1 remains offline. Solar Panel generation was 21.9% below target, partially due to a failed grid inverter on the Residuals Odor Control Facility solar array which has kept the array out of service since September 12, 2022. Wind Turbine generation was 26.0% below target as Turbine #1 remains out of service.

Plant Flow & Precipitation



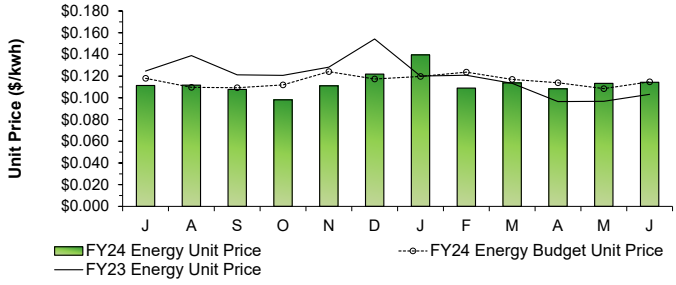
Total Plant Flow for June (285.2 MGD) was 5.6% above target with the 4 year average flow estimate (270.0 MGD) as precipitation was 27.1% higher than the 4 year average (4.04 inches actual vs. 3.18 inches expected).

Self-Generation Equipment On-Line
(% of Time in Operation)



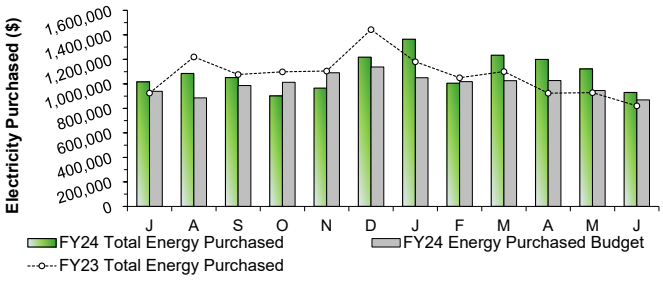
The DiGas System and STGs exceeded the 95% availability target in June. Hydro Turbine availability was 85.4% due to high plant flow trips during storm events and several wicket gate issues during the second half of the month. Hydro Turbine #1 remains offline pending a replacement gearbox and bearings. Wind Turbine availability was 47.5%, well below target, as Turbine #1 remains out of service indefinitely while Turbine #2 availability was 95.0%.

Total Electricity Pricing
(includes fixed block price, spot energy price, ancillary costs, and NSTAR's transmission & distribution costs)

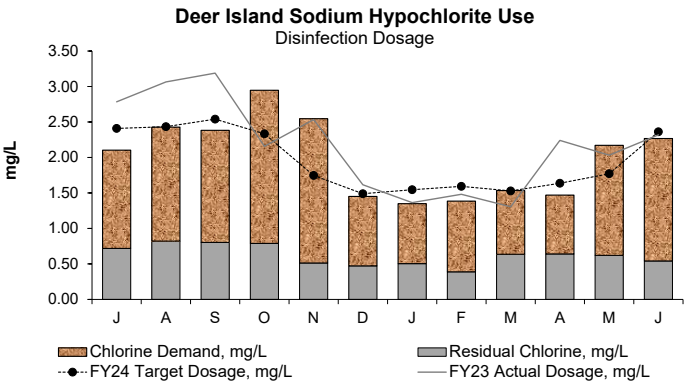


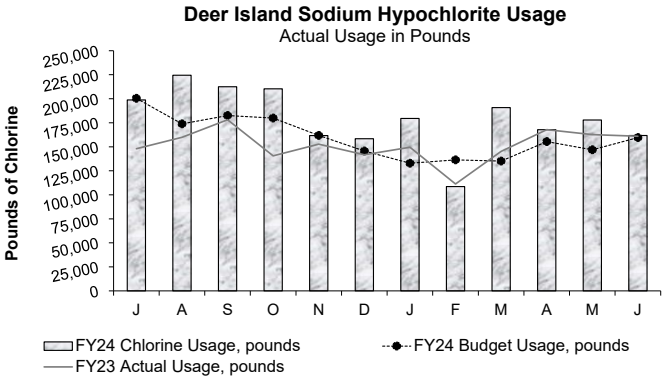
Under the current energy supply contract, a block portion of DI's energy is a fixed rate and the variable load above the block is purchased in real time. The actual Total Energy Unit Price is depicted for July through April (months with the latest available unit prices), while the May and June unit prices are estimated due to a billing delay with Direct Energy (NRG). Overall, the average unit price is estimated to be 1.9% lower than the budgetary estimate through June. The Total Energy Unit Price includes a fixed block price, spot energy price, transmission & distribution charges, and ancillary charges.

Total Cost of Electricity



Year-to-date Total Cost of Electricity is estimated to be $1,100,823 (9.2%) higher than budgeted through June. The actual Total Cost of Electricity is depicted for July through April (months with the latest available unit prices), while the May and June Costs of Electricity are estimated due to a billing delay with Direct Energy (NRG). Even though the estimated Total Energy Unit Price through June was 1.9% lower than target, the Total Volume of Electricity Purchased was 11.3% above target due mainly to higher-than-expected overall power usage as a result of higher plant flows.





The disinfection dosing rate in June was 4% below target with budgetary estimates, while sodium hypochlorite usage in poundswas 1.3% higher-than-expected as plant flows were 5.6% above target. DITP maintained an average disinfection chlorine residual of 0.54 mg/L this month with an average dosing rate of 2.27 mg/L as chlorine demand was 1.73 mg/L. On March 4, the disinfection basin effluent total chlorine residual target for dry weather flows was increased from 0.30 mg/L to greater than or equal to 0.50 mg/L in preparation for potential new NPDES seasonal permit limits for indicator bacteria. The purpose for the higher chlorine residual target (and higher sodium hypochlorite dosing) is to continue developing operating strategies for the new permit, an effort that was also undertaken in 2023.

The overall disinfection dosing rate (target and actual) is dependent on plant flow, target effluent total chlorine residual levels, effluent quality and NPDES permit levels for fecal coliform.

Secondary Blending Events

Month	Count of Blending Events	Count of Blending Events Due to Rain	Count of Blending Events Due to Non-Rain-Related Events	Secondary, as a Percent of Total Plant Flow	Total Hours Blended During Month
July	8	8	0	98.4%	27.30
August	3	3	0	99.1%	13.32
September	2	2	0	99.4%	12.36
October	0	0	0	100.0%	0.00
November	0	0	0	100.0%	0.00
December	3	3	0	96.7%	53.67
January	5	5	0	94.9%	90.09
February	0	0	0	100.0%	0.00
March	6	6	0	96.9%	63.77
April	3	3	0	97.4%	57.10
May	1	1	0	99.6%	4.74
June	1	1	0	99.8%	4.07
Total	32	32	0	98.2%	326.43

99.8% of all flows were treated at full secondary during the month of June. There was one (1) secondary blending event due to high plant flows from heavy precipitation. This blending event resulted in 4.07 hours of blending and a total of 14.84 MGal of primary-only treated effluent blended with secondary effluent. The Maximum Secondary Capacity during the month was 700 MGD.

Secondary permit limits were met at all times in June.

Deer Island Operations & Maintenance Report

Environmental/Pumping:
The plant achieved an instantaneous peak flow rate of 855.1 MGD mid-day on June 26. This peak flow occurred during a storm event that brought 2.05 inches of total precipitation to the metropolitan Boston area. The Total Plant Flow in June was 5.6% above the 4 year average plant flow target for the month, as precipitation was 27.1% higher than the 4 year average (4.04 inches actual vs. 3.18 inches expected).

Disinfection/Dechlorination:
MWRA uses sodium hypochlorite to destroy pathogens in plant effluent after primary and secondary treatment. Indicator bacteria such as Fecal Coliform, *E. coli*, and Enterococcus are used to measure the presence of potential pathogens. To provide a proper pathogen kill, sodium hypochlorite, a disinfectant, is added to meet a chlorine demand, then regulated by maintaining a chlorine residual. On March 4, the disinfection basin effluent total chlorine residual target for dry weather flows was increased from 0.30 mg/L to greater than or equal to 0.50 mg/L in preparation for potential new NPDES seasonal permit limits for indicator bacteria. The purpose for the higher chlorine residual target (and higher sodium hypochlorite dosing) is to continue developing operating strategies for the new permit, an effort that was also undertaken in 2023. In June, DITP maintained an average disinfection chlorine residual of 0.54 mg/L with an average chlorine demand of 1.73 mg/L, with the adjusted higher target. Higher usage of both sodium hypochlorite and sodium bisulfite, used for removing the residual chlorine before discharging the effluent, will be necessary in order to comply with the more stringent indicator bacteria limits in the proposed new NPDES permit.

Deer Island Operations & Maintenance Report (continued)

Primary Treatment:
The contractor started the Clarifier Rehabilitation Project (Contract #7395) on May 15 by completing sump pump work that allowed the Primary Influent Channel A to be fully isolated during the clarifier rehabilitation work. Work completed through the end of June included putting all 96 primary influent gates in place, installing a new aeration header system, completing the installation of approximately 40% of the lower aeration system and 70% of the Linabond repair work, installing drains between Batteries A and B, among other work. Also in progress is work on the effluent gates, hatch and grating modifications, and expansion joint repairs. The contractor expects to complete this phase of work by the 42 calendar day milestone period.

Odor Control Treatment:
Emissions compliance testing for the West Odor Control (WOC) treatment system at DITP was conducted by a contractor on June 6. The WOC treatment system treats process air from the South System Pump Station, Primary Batteries C and D, and the WestGrit Facility. The DITP Air Quality Operating Permit issued by the MA DEP requires that DITP conduct emissions compliance testing for the various odor control emission units once every five (5) years to demonstrate compliance with applicable total reduced sulfur (TRS) and non-methane hydrocarbon (NMHC) emission limits. This testing requires the continuous emissions monitoring of the inlet and outlet of the odor control treatment system during three (3) separate, one (1) hour test runs for TRS at the outlet (stack) of the odor control system and for NMHC at each of the inlets. All preliminary emissions test results show that DITP was in compliance with the permit limits. The final report summarizing the test results will be prepared by the contractor and submitted to the MA DEP following review by DITP staff.

Carbon adsorber (CAD) units #4 and #5 in the West Odor Control (WOC) Facility were emptied and refilled with new regenerated activated carbon media this month as part of routine maintenance to replace spent activated carbon.

Energy and Thermal Power Plant:
Overall, total power generated on-site accounted for 31.0% of Deer Island's total power use for the month of June. Renewable power generated on-site (by Solar, Wind, STGs, and Hydro Turbines) accounted for 29.9% of Deer Island's total electrical power use for the month.

This summer, DITP is enrolled in an Eversource Connected Solutions Curtailment (Demand Response) program to reduce a portion of DITP's load from the regional electrical grid during peak energy usage periods. In this program only green energy can be used to offset a committed energy demand or the load shed can be achieved by curtailing existing energy demand sources. DITP is enrolled in this program by curtailing the cryogenic oxygen generation process. To be successful, the oxygen generation process would be taken onffline for the few hours of an event to defer 1.5 MW of power demand. From a treatment perspective, staff would use stored liquid oxygen that was previously produced and stored in the Liquid Oxygen (LOX) tank to feed the secondary activated sludge without impact to the process during this short interruption, then reactivate the cryogenic compressors after the event has ended to restore normal operation. DITP participated in this program during the summer of 2023 and earned over $46,000 by participating. The cryogenic oxygen generation process was taken offline for three (3) hours from 5 p.m. to 8 p.m. on June 20 for an Eversource demand response called event.

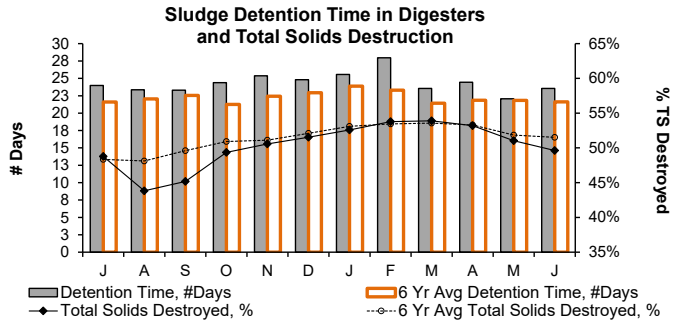
CTG-1A was operated for approximately 2.1 hours on June 11 for an ISO-New England demand response summer audit . The performance on this audit determines DITP's demand response program payment for the next six (6) months. On June 18, DITP participated in the first ISO-NE demand response event of the season and operated CTG-1A for approximately 1.8 hours.

The CTG mechanical contractor replaced the hydraulic accumulator used to supply hydraulic pressure for CTG-2B starts on June 14 as the existing accumulator was not able to maintain a full charge and was subject to periodic recharges. This work was completed in approximately two (2) hours followed by a successful test start of the CTG only to confirm proper operation of the accumulator. CTG-1A was available in the event backup power was needed.

The Wind Turbine Maintenance contractor performed a quarterly inspection of Turbine #2 on June 25 and completed minor mechanical repairs on June 26 that were warranted due to findings from the inspection. The turbine was offline for approximately 19.5 hours.

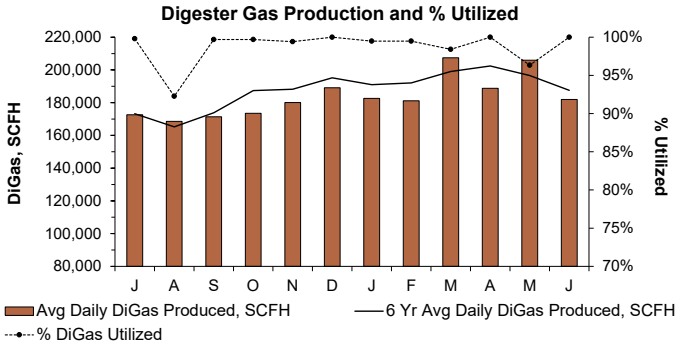
Deer Island Operations and Residuals

June 2024 - FY24



Total Solids (TS) destruction following anaerobic sludge digestion was 49.6% in June, 3.7% below target with the 6 year average of 51.5% solids destruction. Sludge detention time in the digesters was 23.5 days, 8.9% higher than the 21.6 days target, as the number of digesters in operation was slightly above target with budgetary estimates.

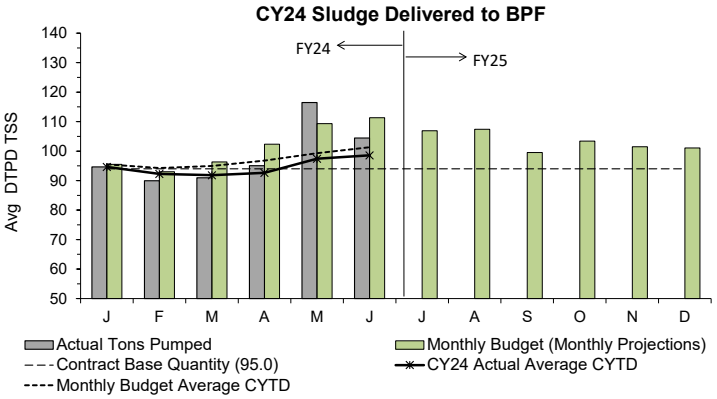
Total solids (TS) destruction is dependent on sludge detention time which is determined by primary and secondary solids production, plant flow, and the number of active digesters in operation. Solids destruction is also significanty impacted by changes in the number of digesters and the resulting shifting around of sludge.



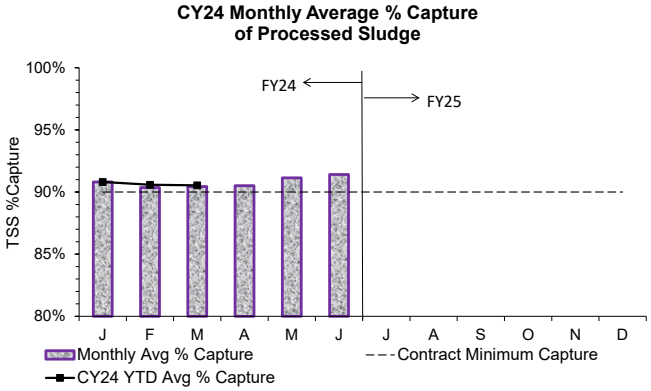
The Avg Daily DiGas Production in June was 3.0% below target with the 6 Year Avg Daily DiGas Production. 100.0% of the Digas produced was utilized at the Thermal Power Plant and supplemental fuel oil was used to maintain consistent boiler operation during periods of low or unstable Digas production

Residuals Pellet Plant

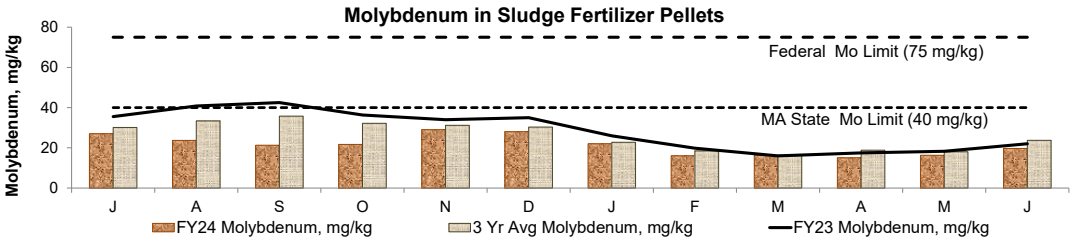
New England Fertilizer Company (NEFCO), a wholly-owned, indirect subsidiary of Synagro Technologies, Inc., operates the MWRA Biosolids Processing Facility (BPF) in Quincy under contract. MWRA pays a fixed monthly amount for the calendar year to process up to 95.0 DTPD/TSS as an annual average (for the new contract period of January 1, 2024 through December 31, 2034). The monthly invoice is based on 95.0 DTPD/TSS (Dry Tons Per Day/Total Suspended Solids) times 365 days divided by 12 months. At the end of the year, the actual totals are calculated and additional payments are made on any quantity above the base amount. On average, MWRA processes more than 95.0 DTPD/TSS each year (FY24's budget is 103.2 DTPD/TSS and the preliminary FY25 budget is 99.9 DTPD/TSS).



Total sludge sent to the Biosolids Processing Facility (BPF) was below target. DITP delivered 104.4 TSS Dry Tons Per Day (DTPD) to the BPF, resulting in a variance of 6.2% (approximately 6.9 TSS DTPD) from the June target of 111.3 TSS DTPD for the month. The lower amount of sludge sent to the BPF is attributed to an increase in sludge inventory in the Digested Sludge Holding Tanks at Deer Island at the end of the month which alone resulted in approximately 11.41 TSS DTPD less sludge being sent to the BPF and offsetting the approximately 3.55 TSS DTPD of higher than estimated sludge production following anaerobic digestion..



The contract requires NEFCO to capture at least 90.0% of the solids delivered to the Biosolids Processing Facility (BPF). The capture rate of solids in June was 91.41%.



Copper, lead, and molybdenum (Mo) are metals of concern for MWRA as their concentrations in its biosolids have, at times, exceeded regulatory standards for unrestricted use as fertilizer. Molybdenum-based cooling tower water is a significant source of Mo in the sludge fertilizer pellets. The Federal standard for Mo is 75 mg/kg. The Massachusetts Type I biosolids standard for molybdenum is 40 mg/kg (since 2016).

The levels were below the DEP Type 1 limit for all three (3) metals in June. For Mo, the level in the MWRA sludge fertilizer pellets was 19.7 mg/kg which was 17% below target with the 3 year average, 51% below the MA State Limit, and 74% below the Federal Limit.