

2020 Biosolids Management Program Performance Report

Objective

Biosolids is a term used for several types of treated sewage sludge that can be used as soil conditioner. A **soil conditioner** is a product which is added to soil to improve the soil's physical qualities, usually its fertility (ability to provide nutrition for plants) Soil conditioners can be used to improve poor soils, or to rebuild soils which have been damaged by improper soil management. They can make poor soils more usable, and can be used to maintain soils in peak condition

In the United States [Code of Federal Regulations](#) (CFR), Title 40, Part 503 governs the management of Biosolids. Within that federal regulation Biosolids are generally classified differently depending upon the quantity of pollutants they contain and the level of treatment they have been subjected to (the latter of which determines both the level of vector attraction reduction and the level of pathogen reduction). These factors also affect how they may be disseminated (bulk or bagged) and the level of monitoring oversight which, in turn determines where and in what quantity they may be applied

The Biosolid Management Program (BMP) is a designed program specifically tailored to ensure that all facets of the BMP processes be properly conducted. It entails the rigid adherence to process controls, the conveyance of information to all clients (current and prospective) and in-depth training indoctrination. The City Of Richmond; Biosolids Management Policy; adheres to the principles and standards set forth in the National Biosolids Code of Good Practice. The Richmond Wastewater Treatment Plant is wholeheartedly committed to obtaining and wherever possible exceeding all of the objectives as outlined by the policy. The treatment plant's primary focus is to produce Class B Biosolids.

The Biosolids Management Program (BMP) has proven that it's a valuable yet needed mechanism used by the Richmond Wastewater Treatment Plant to monitor and report the successes of the work performed surrounding Biosolids.

A- COMPLIANCE:

To commit to compliance with all applicable federal, state, and local requirements regarding production at the wastewater treatment facility, the Richmond Wastewater Treatment Plant facility has elected to:

- 1) Meet concentration limits,
- 2) Meet class "B" pathogen standards;
- 3) Achieve 38% volatile solids reduction for vector control

As treatment for its anaerobically digested Biosolids, Primary Biosolids is collected from our primary clarifiers, grit removed by 3 hydro-grit units and thickened in four gravity thickeners. Waste activated sludge is pulled from the return Biosolids stream and thickened in four thickening centrifuges. Biosolids is then pumped to one of the five anaerobic digesters. Overflow from the digesters is stored in one of the 2 Biosolids storage tanks and pumped to one of the five dewatering centrifuges where polymer is added. Once dewatered, Biosolids is stored in the plant's storage pads and then hauled to land application site by the hauling/land application contractor.

B- Standards

(1) **Class "B" pathogen standards:** The optimum temperature required for microorganisms to stabilize the organic matter is 95F. During this year, the monthly average temperature and detention time were greater than 95F and 15 days respectively and comply with the federal regulation requirements [40 CFR 503.32(b) (3)].

(2) **Vector Attraction Reduction: [40 CFR 503.33(b) (1)/alt (10)].**

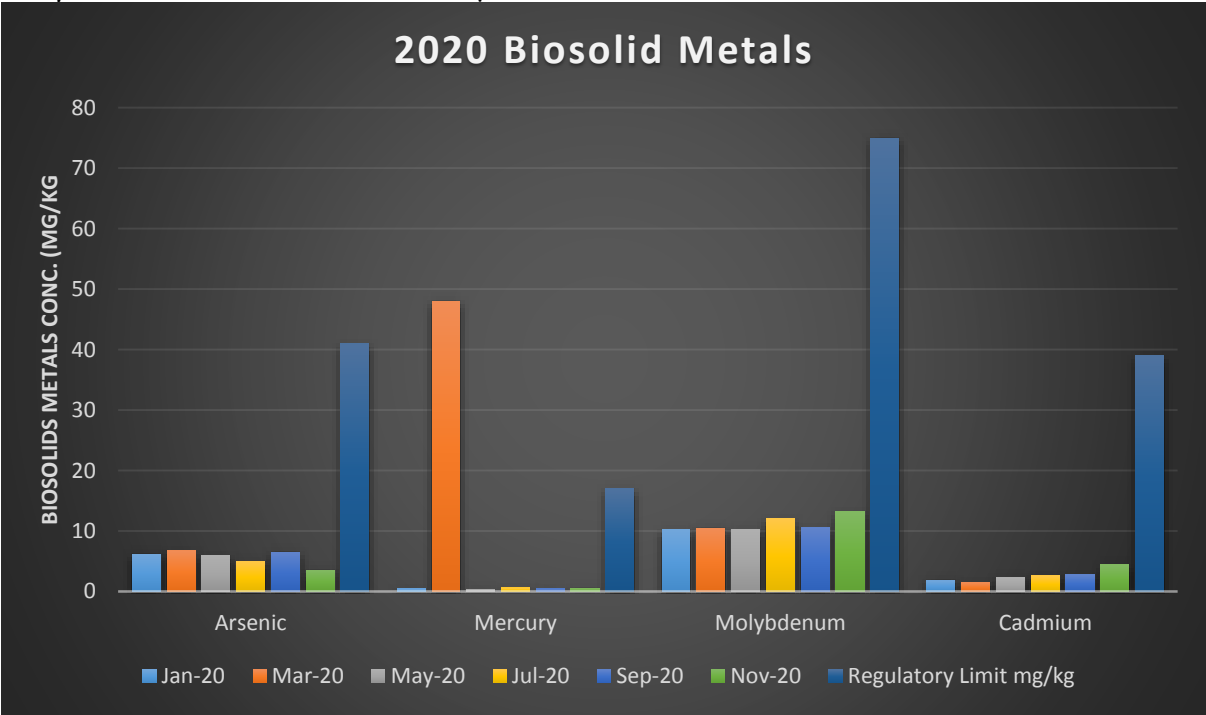
Samples are collected bimonthly; the volatile solids reduction must be equal or greater than 38% to allow the Biosolids to be land applied. Biosolids failing to meet a 38% reduction are incorporated into the ground within six hours or hauled to landfill. All samples meet the required 38% reduction for this year.

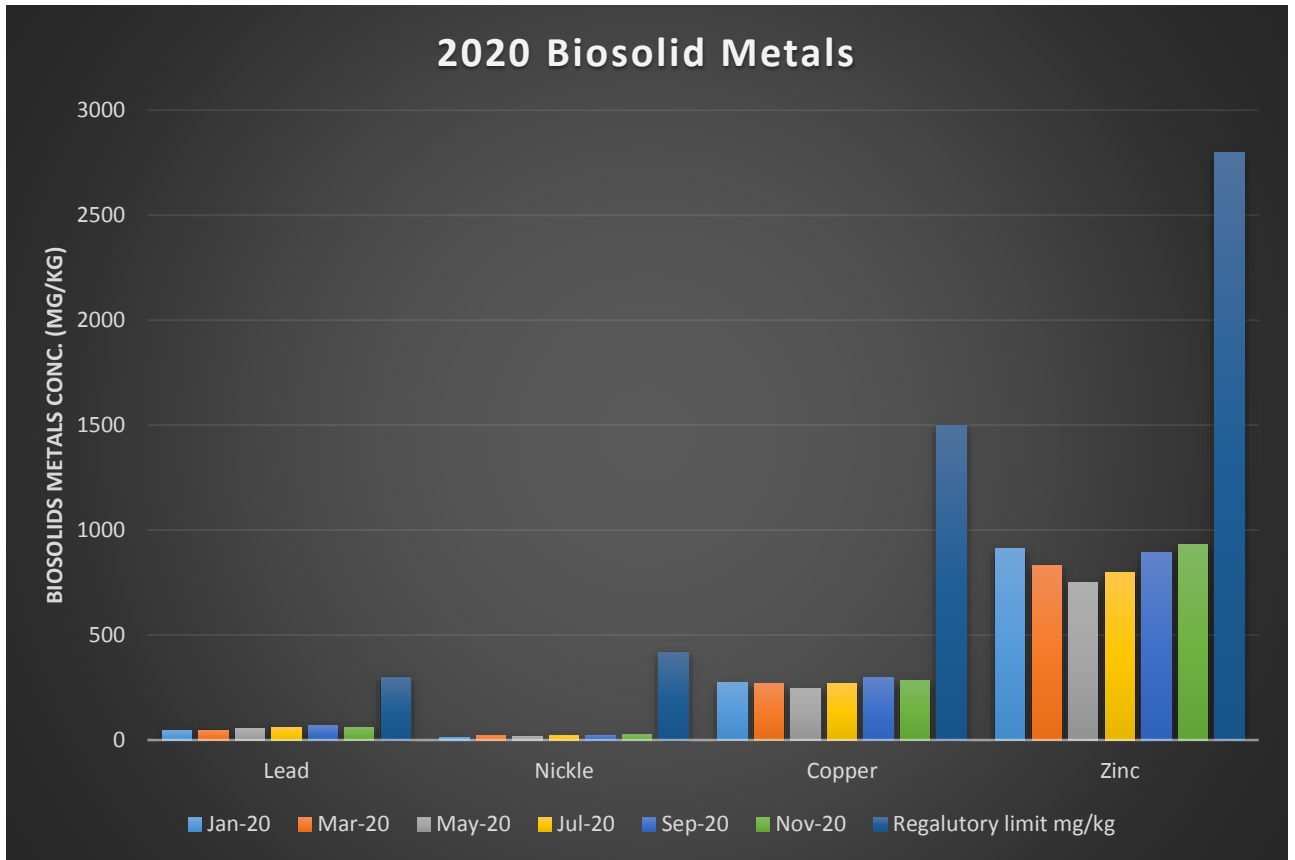
<i>Sample Period</i>	<i>Gravity Thickeners Volatiles</i>	<i>%</i>	<i>Thickening Centrifuges Volatiles</i>	<i>%</i>	<i>Digester Overflow % Volatiles</i>	<i>Volatile Reduction%</i>
JAN-FEB	80.8		71.5		62.0	57.6
MAR-APR	84.7		71.8		62.6	65.6

MAY-JUN	74.5	72.3	62.5	42.0
JUL-AUG	78.7	66.1	56.5	60.6
SEPT-OCT	70.9	63.4	55.9	43.8
NOV-DEC	78.5	69.9	58.4	57.8

(3) Concentration Limits.

The chart below shows the Biosolids metals concentration in 2020 and the concentration limits for Arsenic, Mercury, Molybdenum, Cadmium, Lead, Nickel, Copper and Zinc. All metal analytical results are under the required concentration limits.





C PRODUCT & QUALITY MONITORING:

To provide Biosolids that meets the applicable standards for their intended use or disposal, the Richmond Biosolids program is built around the concept of beneficial reuse of nutrients contained within the Biosolids produced from the treatment process. During 2020, we recycled 30637 tons of class B Biosolids for our agricultural customers in rural Virginia.

D BIOSOLIDS MANAGEMENT PROGRAM:

The WWTP has implemented the Biosolids Management Program that includes a method of internal audit and independent third-party verification to ensure effective ongoing Biosolids operations.

AUDIT FINDING

In December 2020, the NSF-International Strategic Registrations conducted the tenth Re-verification Audit for the City, the lead auditor recommended that the City of Richmond obtained the platinum plus NBP certification.

Audit's results and actions taken in response to the audit results:

As a result of the 2020 audit there were no major nonconformance, 2 minor nonconformance, 2 positive observation, and 13 opportunities for improvement!

Audit Results/Commendations	Responses/Corrective Actions
<p>Multiple Elements – Opportunity for improvement – Several elements of the NBP standard have specific requirements for contractors (prime contractors and all their subcontractors) in their service agreements. These are: Requirement 7.4 - Service agreements must define and document the roles and responsibilities of contractors retained to perform various biosolids management activities and EMS functions; Requirement 8.4 - Service agreements require contractors to establish their own training programs consistent with their roles and responsibilities in biosolids management activities; Requirement 9.4 - Contractors' roles and responsibilities in the communications program must be defined; Requirement 10.4 - Contractors must establish their own operational controls consistent with their roles and responsibilities in biosolids management activities; Requirement 11.4 - Contractors are required to establish and maintain Emergency Preparedness and Response Plans and Procedures to assure effective responses to accidents and emergency situations associated with biosolids management activities; Requirement 12.4 - Contractors service agreements require contractors to establish documentation, document control and record requirements for biosolids management activities conducted by them, and that these are incorporated into its EMS for biosolids; and Requirement 13.3 - Contractors are required to establish and maintain regular monitoring and measurement procedures and practices for all their assigned biosolids management activities, as defined in their service</p>	<p>CAR Ref: 212- I've spoken with Mr.David Simons, President of Nutriblend, he has agreed to amend the current contract to require all it's subcontractors to adhere to Richmond's BMP. Furthermore, any future solicitation for bid will require subcontractors meet EMS requirement.</p>

<p>agreements. The existing contract with Nutriblend does not have these requirements specifically identified in their subcontract for hauling biosolids. Also consider including each of these requirement in all future biosolids contract solicitations.</p>	
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Audit Results/Commendations	Responses/Corrective Actions
<p>Element 5-Requirement 5.5 – Opportunity for improvement – based on discussions with biosolids management personnel the following clarifications should be made to the goals and objectives:</p> <p>For the goal related to lowering the average time of completion of Work Orders, the modified goal will be that within 30 days completely close 100 % of the work orders that have been open for more than 90 days. Also continue to track the average time for completion of work orders to ensure the average time continues to decrease.</p> <p>For the goal to improve the ratio of preventive to corrective work, continue to track the ratio of the number of preventive work orders verses the number of corrective work orders with a ratio goal of 70/30 based on work order numbers. Also, track the actual number of work <u>hours</u> required to complete preventive work orders, versus the actual work <u>hours</u> required to complete corrective work orders. These can be used to establish an acceptable ratio goal in the future.</p> <p>For the goal associated with planned work hours verses actual work hours on individual work orders, specify that no work hours should be expended beyond 20% more than the estimated</p>	<p>CAR Ref: 213- As of 12/07/20, the BMP updated the Goals and objective table to reflect the auditor’s suggestions in retrospect to the modifications of our current goals. The Biosolids supervisor will periodically review the BMP goals and objectives.</p>

<p>hours. (note: an exception to this goal on an individual work order may be made through authorization from the supervisor.) This goal is to be implemented within three months.</p> <p>For the goal associated with covering the biosolids storage area establish the measurability as lowering the weight of biosolids removed from the storage area compared to the weight of the biosolids added to the storage area by 18%. That is, the quantity of biosolids removed from the storage area should be 18% less than that added due to loss of water associated with evaporation and solids drying.</p>	
<p>Element -6 requirement 6.4 – Opportunity for improvement- The standard requires that interested parties be provided with meaningful opportunities to express views and perspectives relative to biosolids management activities. A key area of interpretation of this requirement is that interested parties and regulators should be provided with a notice of intent to receive a third party audit along with information on approaches for observing the audit. Richmond did not provide such a notice for the re-verification audit.</p>	<p>CAR Ref: 214- The Biosolids supervisor will send out notifications to interested parties for all future third-party audits 2 week prior to the scheduled audit. Furthermore, the Plant Operations Supervisor-Senior will follow-up with the biosolids supervisor during their bi-weekly meeting before the audit to ensure that notifications were sent out.</p>
<p>Element -8 requirement 8.1 – Opportunity for improvement- Consider having two or three plant personnel trained in ISO 14001- Environmental Management System Auditor Training so that they can supplement and eventually replace the current internal auditors as part of succession planning</p>	<p>CAR Ref: 216-The Plant Superintendent will assign at least two additional staff to receive EMS training and to be trained as internal auditors by August 2021. The Biosolids supervisor will ensure continuously that there is an internal auditor as backup to support the audit team.</p>
<p>Element- 7 Positive – The city has appointed an individual with overall responsibility for ensuring that the biosolids management program and EMS are implemented and maintained. In the year since Faheem has taken on this responsibility he has implemented several improvements that deserve recognition: he has initiated an aggressive training program to ensure all employees are aware of their biosolids management system responsibilities, he had used the CAR form to recommend a spill control improvement for</p>	<p>The BMP team will continue to develop and improve the BMP program.</p>

<p>minimizing the impact of polymer spills, and he has instituted an increase in communication and coordination of biosolids improvements with operations personnel.</p>	
<p>Element -7 requirement 7.3 – Opportunity for improvement -Consider including specific measurable targets related to the Biosolids Management Program in individuals’ annual performance evaluations.</p>	<p>CAR Ref: 215- The plant manager suggest that a BMP refresher could be added to an individual’s evaluation. This is an ongoing internal discussion that needs time to develop.</p>
<p>Element -8 requirement 8.4 – Minor nonconformance-- Nutriblend has not formally identified its training program for communication of the Richmond BMS Policy to its employees, its BMS roles and responsibilities, its communication responsibilities related to Richmond’s biosolids, its Emergency Preparedness and Response Plans and Procedures; and its operational controls and monitoring and measurement responsibilities (with assistance of DEQ).</p>	<p>CAR Ref: 210- As of 12/04/20, spoken with Mr.David Simons, President of Nutriblend, to bring awareness of the importance of having documentation of the issues that is of concern to the BMP program. Mr.Simons, has committed to start documenting his efforts towards Richmond’s BMP program and the Biosolids supervisor will follow-up with Mr.Simons prior to the internal audit to ensure that this has been fulfilled.</p>
<p>Element -9 requirement 9.1 – Opportunity for improvement- The standard requires the establishment of a proactive communication program that provides ongoing information about the BMP to interested parties and the public. Consider periodically posting information on the beneficial uses of biosolids on the appropriate Richmond Facebook site.</p>	<p>CAR Ref: 217- The biosolids Supervisor will communicate with the communications manager about adding biosolids info. to the department’s Facebook page. Upon confirmation from the communications manager, this will be updated periodically.</p>
<p>Element -9 requirement 9.4 – Opportunity for improvement- Nutriblend should consider preparing a printed brochure or handout describing Richmond’s biosolids land application program, which its employees and subcontractors can distributed to anyone requesting information.</p>	<p>CAR Ref: 218- As of 12/07/20, Nutriblend has received brochures outlining the City Of Richmond biosolids program.</p>
<p>Element -10 requirement 10.5 –Positive Observation- The City of Richmond’s biosolids contractor maintains a massive enclosed biosolids storage facility which is capable of storing an entire season of Richmond’s final product biosolids during the rainy season when it can’t be land applied. This flexibility not only saves the City a considerable amount of money, it results in the environmentally beneficial use of the biosolids</p>	<p>The BMP will continue to incorporate best management practices throughout its value chain.</p>

<p>for agriculture or silviculture activities as opposed to the wasteful disposal of a resource in a landfill.</p>	
<p>Element -11 requirement 11.2 – Opportunity for improvement- The standard requires that the organization reviews and evaluates the effectiveness of emergency preparedness and response procedures, including communication systems, and revises them as necessary. The City of Richmond performed a mock spill exercise on 9 September 2020 but did not include a written summary of evaluation of the effectiveness, also the Standard Operating Procedure entitled Biosolids Spill Response Plan does not address periodic reviews and evaluations of the emergency preparedness and response procedures, such as spill drills or table top exercises.</p>	<p>CAR Ref: 219- Updated the Biosolids Spill Response Plan to include an annual simulation of the procedure. All future spill drill simulations will include post evaluations.</p>
<p>Element -11 requirement 11.2 – Opportunity for improvement- The standard requires that the organization reviews and evaluates the effectiveness of emergency preparedness and response procedures, including communication systems, and revises them as necessary. Because the contractor has fairly frequent incidents associate with biosolids spills it should consider using those occurrences for its review and evaluation of the effectiveness of it emergency preparedness and response procedures. If there have been no incidents within a year the contract should consider implementing a spill drill.</p>	<p>CAR Ref: 220- The contractor will include a post evaluation of incidents involving biosolids spills. The contractor has committed to doing annual spill drill in the event no incidents occur.</p>
<p>Element -13 requirement 13.1 – Opportunity for improvement- In section 5.23 Operational problems of EMS procedure: Control Building Digesters #1-5 SOP consider including in the definition of a temperature decrease problem the value of a drop below 95 degrees F, and in the definition of a temperature increase problem the value of an increase to 102 degrees F.</p>	<p>CAR Ref: 221- As of 12/07/20, Updated the SOP for Control Building Digesters #1-5, to include temp. values for increase/decrease below setpoints 102 degrees F, and below 95 degrees F.</p>
<p>Element -13 requirement 13.1 – Opportunity for improvement- In section 5.0 Procedures of EMS Procedure: Class B Biosolids sampling consider describing the specific method used to monitor and record the digester temperatures. Also consider maintaining a record of the 15-day</p>	<p>CAR Ref: 222- As of 12/09/20, Updated the Class B Sampling SOP, added “5.6-monitoring method”, and also added a column on Op10 that will capture the 15-day rolling avg.</p>

<p>rolling average of digester temperatures to ensure that the standard of having an average temperature of between 35 and 55 degrees C (95 – 131 degrees F) for the mean cell residence time of 15 days is met.</p>	
<p>Element 14 – Opportunity for improvement – BMP Element 14 – Nonconformance: Preventive and Corrective Action procedure does not currently document in the procedure the process of using CARs to address opportunities for improvement.</p>	<p>CAR Ref: 223- As of 12/07/20, updated Element 14 procedure to include how to address an opportunity for improvement.</p>
<p>Element 14 – Opportunity for improvement- Consider promoting the use of CARs for the improvement of operations identified by operating and maintenance personnel.</p>	<p>CAR Ref: 224- The biosolids supervisor will bring awareness to plant personnel about the use of CARs.</p>
<p>Element -14 requirement 14.5 and 14.6- Minor nonconformance- The standard requires that the organization documents corrective action plans and describes what actions will be taken to address the audit findings and tracks progress in completing the corrective actions and periodically updates the status to reflect completion. A corrective action plan was developed to address the following finding from the 2019 interim audit: <i>Element 2 – Opportunity for improvement – The City is committed to the NBP Code of Good Practice, which sets forth as one of its principles the preparation and maintenance of a formal plan for preventive maintenance. The City uses “Mainsaver” as a tool in accomplishing preventive and corrective actions. he City has identified three Key Performance Indicators (KPIs) to improve performance for each of the maintenance trades and each of the employees within each trade. There is reported to be tracking, checking and regular monthly reporting on number of work orders completed, number of open work orders, hours planned for each work order versed actual hours required for completion, total hours each employee spent working on work orders verses total hours paid, average time required to complete work orders in each priority category, etc.</i> <i>There is no monthly summary of the minutes of the monthly meetings to include date, time, attendees, discussion of overall performance in meeting</i></p>	<p>CAR Ref: 211- The maintenance program manager has committed to holding these quarterly meeting with his team and documenting the KPI findings in a report which should include date, time, attendees, and topics of discussion. The biosolids supervisor will continue to follow-up with the maintenance program manager for status updates of this goal.</p>

<p><i>KPIs, identification and praising those individuals who are star performers in each of the appropriate KPI categories, as well as individuals who are most improved on a monthly basis, discussion of what things went well, discussion of areas of concern, and action items. Also provide recommendation of items that should be published in the periodic “Biosolids News” to share the accomplishment of the maintenance management group with all plant employees.</i></p> <p>In spite of periodic checks and reminders on the corrective action needed to implement this corrective action no record (date, agenda, attendees, minutes and recommendations) of any monthly meetings was made in the last year.</p> <p>While this is a minor nonconformance this year, it has the potential if not addressed of becoming a major nonconformance next year and keeping Richmond from maintaining its certification status.</p>	
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E Goals and Objectives:

The City of Richmond Public Utilities Biosolids Management Program continued to improve and redefine its goals and objectives program. The Biosolids team established 8 SMART goals that cover each of the four outcomes focal points of the NBP program as identified below:

- Environmental Performance,
- Regulatory Compliance,
- Relations with Interested Parties, and
- Quality Biosolids Management Practices.

The Biosolids team has made some modification to the current goals. Below is a table of goals and progress.

F Summary

<u>GOAL</u>	<u>PROGRESS</u>
<p>Lower the Average time of completion of Work Order at the wastewater plant by 5% from 40 in 2019 to 38 days for 2020 and to 30 days for 2021</p>	<p>As dec-14, 8.7% of WO closed in 100 days and up, 7.8% closed the same day 86% closed in less than 1 week. As of Aug-15:- 4% WO closed in 100 days and up – 9.6% closed same day -40% in less than 2 weeks. Nov-16: 13/12/38 As of Feb-17 updated the goal and set 5% improvement. 2015:84 days 2016:37 days June-2017 Biosolids: 33 days. Oct-2017 Biosolids: 29 days. Oct-2018 Biosolids: 18 days. Sep 2019 WWTP: 40 days Jan 2020 WWTP: 27 days Apr 2020 WWTP: 18 days Oct 2020 WWTP: 23 days Dec 2020 WWTP: 25 days</p>
<p>Zero noticeable odors (less than 4 Dilution Threshold DT) in the gravity thickening area upon the start-up of the fermentation process.</p>	<p>-5/1/2014: completed The foul air system for the Gravity Thickeners - As Nov-14: System is ready to start and waiting to resolve some issues in the process of gravity thickening. May-16: odor control system in service. Sept-16 Ordered an Olfactometer. Oct-17: Operator started using the device to be more familiar with. Nov-18: stooped recording data due to short operation. Aug-18:Started recording data As of 10/13/19 DT=2 As of 11/2/20 DT= 2 Dec. 2020: Goal has been achieved</p>
<p>Improve the ratio Preventive/ Corrective maintenance work hours from 56/44 in 2019 to 60/40 in 2020 to 70/30 for 2021</p>	<p>-Aug-15 Biosolids: 28/72 -Aug-16 Biosolids: 33/67 -June-17 Biosolids: 34/66 -Oct-17 Biosolids: 37/63 -Oct-18 Biosolids: 40/60 Sep-19 WWTP: 56/44 Feb 20 Biosolids: 59/41 Sept 20 Biosolids: 60/40 Dec 20 Biosolids: 57/43</p>
<p>Obtain monthly average of 27% solids</p>	<p>As Dec-2017: Average: 26.2% Dec 2018: Average: 27.6% Sept 2019: Average of 26.4% Dec 2019: Average of 26.5% Mar 2020: Average of 27.0% Jun 2020: Average of 26.9% Sept 2020: Average of 27.3% Oct. 2020: Average of 27.0%</p>
<p>Cover 100% of the Biosolids pad by 2021</p>	<ul style="list-style-type: none"> • As of Oct-18: 30% of design with Preliminary Engineering Report (PER) imminent. • Final PER expected in December 2018.

	<ul style="list-style-type: none"> • Oct-19: PER-30% /\$2,100,000/ RFQ TBD, IFB TBD/A&E - JMT/ UDC presentation scheduled for 10/10/2019 • As of Apr.2020 60% PER determined new pad is needed instead of retrofit • Aug.2020: Approved Preliminary Design 30% stage.
Improve the planned labor hours for the work order at the wastewater plant by 100% in 2020 (from 0 % to 100%)	<ul style="list-style-type: none"> • Scheduled a meeting with all maintenance leaders on 12/07/18. • As of Nov-19: 74% • Oct.2020- Data not avail. due to 0 planned hours
Actual work hours should not exceed 20% more than the estimated planned hours (an exception may be made through the individual’s supervisor.	<ul style="list-style-type: none"> • Oct.2020- Data not available 0 planned/actual work data
Install a new head works to Remove 50% more of the monthly average influent grit from 190 tons to 285 tons	<ul style="list-style-type: none"> • As of Feb-16: Preliminary engineers report is available. • Oct-16: RFQ phase of the project awaiting work order revisions to cover proposed construction estimated costs. • Dec-16: RFQ is currently in Procurement Services, Permit submittals are ongoing, and Grit 1 MCC Amendment proposal is outstanding. • As of Aug-17: RFQ phase, selected 8 qualified contractors for IFB. • As of Aug-18 IFB posted on the City web, pre-bid meeting is scheduled for Aug 16. • 2018: Vendors offers exceeded the allocated budget. City will review the engineering design. • Oct-2019: Redesign /\$25Mil+/ RFQ, IFB TBD/A&E – G&H/100% Design Scope being finalized to begin IFB process. • Aug-2020: Finalized, currently waiting for advertisement for bids • Nov-2020- Q&A -Bid meeting held onsite • Dec.2020- Bid is open

The 2020 Biosolids Management Program was a completed success. Although not perfect, we were able to meet and very often exceed all Regulatory standards by a wide margin. We will continue to make tremendous strides to maintain the safely levels of all Biosolids handled through our plant. We have identified several opportunities to improve and will commence to tackle them immediately. We will not rest on our 2020 laurels as we aspire to set even better standards.