Local Limits Evaluation

For the

City of Woonsocket, Rhode Island

FINAL

November, 2013

Prepared by:

planning, permitting, design, construction, operation, maintenance

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CITY OF WOONSOCKET, RHODE ISLAND
LOCAL LIMITS EVALUATION

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LOCAL LIMITS EVALUATION

1.0 EXECUTIVE SUMMARY

This report has been prepared to document the development of revised local limits in compliance with the EPA, RIDEM and City of Woonsocket requirements.

The June 2008 Consent Agreement (RIA-368), as amended by the December 2010 Modified Consent Agreement issued to the City of Woonsocket by the Rhode Island Department of Environmental Management (RIDEM) requires the City to conduct a local limits update. The need to develop, enforce and revise local limits, as necessary, is outlined in Part I.C.3 of Rhode Island Discharge Elimination Permit (RIPDES No. RI0100111, effective October 1, 2008). Also in accordance with the Consent Agreement, the City's recently contracted Design-Build-Operate company is in the design phase of a Wastewater Treatment Facility Improvements project that includes process upgrades for nutrient removal to meet near future (by May 2017) effluent discharge requirements that are significantly more stringent than current requirements.

The intent of this update is to evaluate whether the City will need to revise its current local limits in order for the Woonsocket Regional WWTF to reliably satisfy the more stringent effluent discharge requirements outlined in the City's new interim RIPDES permit, to protect the WWTF operations and to ensure that its discharge complies with State and Federal requirements. The local limits are intended to control and regulate the discharge of pollutants to a publicly owned treatment works (POTW) that may:

- Pass through the POTW's treatment system and result in a violation of effluent limitations or receiving water standards
- Contaminate the POTWs sludge, resulting in a violation of disposal standards
- Endanger POTW worker health and safety
- Interfere with the POTW's collection or treatment works, such that regulatory compliance or operating costs are significantly affected

Following completion of the construction and start-up phases of the Wastewater Treatment Facility Improvements project, local limits will be re-evaluated.

In accordance with the RIDEM approved *Local Limits Workplan (January 29, 2011)*, the pollutants of concern (POCs) that were evaluated include: arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, zinc, cyanide, total toxic organics, biochemical oxygen demand (BOD_5), total suspended solids (TSS), chemical oxygen demand (COD), total nitrogen, ammonia, total phosphorus, oil & grease, and pH.

In accordance with the Office of Wastewater Management of the *U.S. Environmental Protection Agency's (EPA) Local Limits Development Guidance* document, July 2004,

allowable headworks loadings for this publically operated treatment works (AHL_{POTW}) were calculated for pollutants based on environmental limiting criteria that guard against interference or the pass through of a pollutant in quantities or concentrations that would result in a violation of the WWTF's discharge permit. The limiting criteria used in this evaluation included: effluent based criteria per RIPDES permit limitations or Rhode Island Water Quality Criteria and Standards; sludge quality based criteria per Section 503.43 *Standards for the Use and Disposal of Sewage Sludge* for sludge sent to incineration; and activated sludge and nitrification inhibition based criteria per EPA literature.

The MAHL is the maximum daily mass loading of a pollutant in pounds per day that can be accepted by the WWTF. Any pollutant loading which is greater than the MAHL would be predicted to cause adverse impact to the WWTF's process treatment systems, receiving water quality, worker health and safety, sludge quality or potentially pass through the treatment facility and cause a RIPDES violation. For certain conventional (BOD, TSS) and non-conventional pollutants (Total Nitrogen, Ammonia, Total Phosphorus) the MAHL was set to the average design capacity of the WWTF and used to calculate the technically based local limits.

At a typical WWTF, all loads from outside the plant are directed through the facility's preliminary treatment facility (or headworks) and the MAHL is often set to the facility's raw influent average design capacity. The Woonsocket WWTF differs in that a portion of the pollutant load being treated at the facility is associated with outside trucked-in sludge (merchant sludge), which is received through the WWTF's return flow discharges from the privately operated Sludge Disposal Facility. Therefore, the AHL_{POTW} is set downstream of the point where recycle flows are received and just upstream of the Bioprocess in order to adequately account for these loads received from trucked-in sludge. A flow diagram is included in Appendix E. Additionally, the return flow loads are not sufficiently defined for most metals. Therefore, the concentration from unknown recycle flow components (centrate cake liquid and gravity thickener overflow) are conservatively assumed equal to the industrial flow concentration. By using this method of calculation, the AHL_{POTW} used in this local limit evaluation accounts for all of the outside loads being processed at the WWTF.

The MAHL arrives to the plant from several sources. Per EPA standards, the portion of each pollutant MAHL that can be allocated to industrial users is termed the maximum allowable industrial loading (MAIL). The MAIL is typically equal to the total MAHL, less the loading contributed by uncontrolled sources (M_{UNC}) within the collection system including domestic, commercial and infiltration and inflow (I&I), and less an amount held in reserve as a safety factor (SF). Because the AHL_{POTW} calculated for this facility actually includes recycle loads, these loads (M_{REC}) must also be removed from the AHL_{POTW}.

$$MAIL = AHL_{POTW} (1\text{-}SF) - (M_{REC} + M_{UNC})$$

The most stringent or protective MAIL is used to develop the local limit for each POC.

The recommended local limits for Woonsocket are based on the uniform concentration method across the industrial flow base, which consists of the known significant industrial users (SIU) and recognition of flow associated with the outside merchant sludge being processed at the Sludge Disposal Facility (reference Section 6.1.7 for additional discussion). The uniform concentration method results in similar local limits for all industrial users. The calculated local limits were reviewed with City representatives and best engineering judgment was used to establish the recommended local limits revisions presented in Table 1. The local limits evaluation were performed consistent with the City's objectives of: 1) Satisfying the RIDEM requirements; 2) Meeting the MAHL limits so as to protect the treatment plant functionality; 3) Providing limits that minimize impacts on local industry consistent with (constrained by) item 1 & 2. Due to the short-term nature of the event the limits are protecting against and the infrequency of most industrial user sampling requirements, the concentration limits are recommended to be implemented as daily maximums. This basis is in accordance with *EPA Local Limits Development Guidance* document, July 2004, *Section 6.4.1*.

Some existing industrial users have historically discharged concentrations above the current local limit amounts and the existing WWTF has been able to provide adequate treatment of specific supplemental loads for certain non-metal POCs. In order to be comprehensive in our analysis and provide for consideration of the City's economic need to maintain the local industries, Section 7 of this evaluation documents calculations to assign more of the maximum allowable industrial load capacity to specific industrial uses that have exhibited a need for more nutrient or solids capacity than the base concentrations proposed.

The following table summarizes the City's current local limits and the changes recommended as a result of this local limits evaluation.

Table 1A: Recommended Changes Local Limits

Pollutant	Current Local Limits[1] (daily max / monthly avg.)	Recommended Local Limits[2] / Uniform Concentration Surcharge Levels[3] (daily max)
Arsenic	no limit	0.381 mg/l
Cadmium	0.11 / 0.07 mg/l	0.055 mg/l
Chromium	2.77 / 1.71 mg/l	2.77 mg/l
Copper	3.38 / 2.07 mg/l	3.38 mg/l
Lead	0.69 / 0.43 mg/l	0.69 mg/l
Mercury	no limit	0.002 mg/l
Nickel	3.98 / 2.38 mg/l	3.98 mg/l
Silver	0.43 / 0.24 mg/l	0.186 mg/l
Zinc	2.61 / 1.48 mg/l	2.61 mg/l
Cyanide	1.2 / 0.65 mg/l	1.20 mg/l
BOD_5[3]	250/- mg/l	500 mg/l
COD[3]	750/- mg/l	930 mg/l
Total Nitrogen[3]	no limit	50 mg/l
Ammonia-N[3]	no limit	30 mg/l
Total Phosphorus[3]	no limit	25 mg/l
Total Toxic Organics	2.13/- mg/l	2.13 mg/l
TSS[3]	300/- mg/l	300 mg/l
Oil & Grease	100/- mg/l	100 mg/l
pH	5 ≤ pH ≤ 11	5 ≤ pH ≤ 11

Note:
1 - Current local limits were established by adopting the Categorical Limits for Metal Finishers.
2 - Revised local limits are recommended to be implemented as daily maximums as recommended by the *EPA Local Limits Development Guidance* document, July 2004.
3- Supplemental load allocations for certain specific industrial users have been calculated in Section 7 and are summarized in Table 1B, below. For industries with a proposed mass load limit, the recommended local limit values in Table 1A are recommended uniform surcharge levels. For industries without a proposed mass load limit, these values are actual limits.

Table 1B: Recommended Mass Load Limits for Specific Non-conventional Pollutants

Pollutant	Recommended Uniform Concentration Surcharge Levels (daily max)	Proposed Mass Load Limits[1] by SIC Code (daily max)
BOD_5	500 mg/l	SIC 2759 – 3 lbs/d SIC 3356/3399 – 2,605 lbs/d
COD	930 mg/l	SIC 2759 – 6 lbs/d SIC 3356/3399 – 4,845 lbs/d
Total Nitrogen	50 mg/l	SIC 3671/3691 – 14 lbs/d SIC 3356/3399 – 723 lbs/d
Ammonia-N	30 mg/l	SIC 2262/2294/2672 – 59 lbs/d SIC 3356/3399 – 443 lbs/d
Total Phosphorus	25 mg/l	SIC 0241 - 1 lbs/d SIC 3471 – 24 lbs/d SIC 3611/3676 - 3 lbs/d SIC 4953 – 11 lbs/d
TSS	300 mg/l	SIC 2759 – 2 lbs/d SIC 3471 – 352 lbs/d SIC 4941 – 808 lbs/d

1 Supplemental load allocations for certain specific industrial users have been calculated in Section 7 and are summarized in Table 1B, above. For industries with a proposed mass load limit, the recommended local limit values in Table 1A are recommended uniform surcharge levels. For industries with a proposed mass load limit, exceedance of the mass load limit will be subject to enforcement.

New industries proposing to operate under any SIC with a proposed mass load limit listed in Table 1B (above) in the future would require City review of the available allocation for non-conventional pollutants.

2.0 INTRODUCTION

Publically Owned Treatment Works (POTWs) are responsible for limiting, where necessary, the character and volume of pollutants being discharged into their wastewater treatment system in order to protect the treatment facility against pass through and interference, adverse receiving water quality impacts, adverse sludge quality impacts, and worker health and safety problems. POTWs control the discharge of toxic pollutants by non-domestic sources to their wastewater treatment facility through the development and implementation of Pretreatment Standards, called local limits. The recommended procedures for evaluating and deriving local limits are described in the *EPA Local Limits Development Guidance* document, July 2004.

The Rhode Island Pollutant Discharge Elimination System (RIPDES) Permit No. RI0100111 (effective 10/1/2008) (Current Permit) issued to the City of Woonsocket Wastewater Treatment Facility (WWTF) by the Rhode Island Department of Environmental Management (RIDEM) contains new Interim and Final water quality-based effluent limitations that must be achieved in the discharge from the WWTF into the Blackstone River (Appendix H). The new RIPDES permit also requires the facility to perform an evaluation of the local discharge limitations for non-domestic users. This includes all industrial dischargers to the WWTF collection system, whether located in Woonsocket RI, North Smithfield RI, Bellingham MA, or Blackstone RI.

This new RIPDES permit is the subject of a Consent Agreement issued June 27, 2008, and as modified in December 23, 2010, and most recently in correspondence from RIDEM dated March 23, 2012, which calls for capital improvements to meet the revised more-stringent Final discharge limits for total nitrogen, total phosphorous and various metals. The March 2012 revision to the ACO extended the date for completion of the proposed capital improvements to May 1, 2017, and includes new Interim Discharge Limits that must be met until the improvements are completed. Therefore, because the local limits developed in this this Locals Limits Evaluation are applicable for a 5 year period this evaluation is based on meeting the Interim Discharge Limits specified in the current RIPDES permit using the existing treatment processes. Revision of these limits may be warranted once the capital improvements are completed to reflect the improved process performance as a result of those improvements and to meet the applicable Final Permit Limits. The intent of this Local Limits Evaluation is to determine whether the City will need to revise its current local limits and if so what those new limits should be, in order to meet the Interim Discharge Limits contained in the renewed permit, to protect the WWTF operations and to ensure that its discharges comply with State and Federal requirements while minimizing impacts to local industry.

3 FACILITY DESCRIPTION

3.1 CITY OF WOONSOCKET COLLECTION SYSTEM

The City of Woonsocket's sanitary sewer collection system conveys flow from the City of Woonsocket and three adjacent communities (Bellingham MA, Blackstone MA, and North Smithfield, RI) to the Woonsocket Regional WWTF located along the Blackstone River. The Woonsocket sewer system consists of approximately 111 miles of gravity sewer and contains 18 pumping stations. The Town of Bellingham, MA has a pump station and force main that feeds the Bellingham Interceptor conveying flow directly to the WWTF. The Town of Blackstone, MA has two interconnection locations, one on Rathbun Street and one on Canal Street. The Town of North Smithfield, RI also has two interconnections, one on Elizabeth Avenue and one on Alice Avenue.

3.2 WOONSOCKET REGIONAL WWTF

The Woonsocket Regional WWTF has been designed to provide secondary treatment and biological nutrient removal by use of the MLE activated sludge process to remove nitrogen as well as carbonaceous demand from the wastewater. The WWTF has a design maximum month capacity of 16 million gallons day (MGD) with design peak hourly flow rate of 32 MGD. Presently the WWTF receives an average influent flow of approximately 6.7 MGD. A 5-year average of approximately 2,000 gal/day of septage is accepted which is off-loaded directly into the wastewater influent ahead of the WWTF. The WWTF presently treats wastewater through preliminary treatment using Screening and Comminutors, Aerated Grit Chambers, Primary Clarification, Aeration Tanks configured for Biological Nitrification/Denitrification using the MLE process, Secondary Clarification, Tertiary Sand Filtration and Chlorination/Dechlorination disinfection. The treated wastewater is ultimately discharged to the Blackstone River.

Capital improvements to meet the revised nitrogen and phosphorus limits, required by RIDEM regulations, have been proposed and are identified in the City's *Facility Plan Amendment,* May 2013 (Appendix I). The main proposed process related changes include: a new influent pump, new influent screening facility with odor control system, new influent flow measurement, new primary effluent pump station, activated sludge modifications to include first and second stage activated sludge basins, lamella plate first stage settling, and new first stage return and waste sludge pumping. However, because of the timing of implementation of these improvements, consideration of the proposed new tertiary treatment processes have not been included in this evaluation as construction will not be complete until the end of the 5 years in which this study is valid. This assumption is conservative in that these improvements will improve the WWTFs ability to treat various POCs.

3.3 SLUDGE DISPOSAL FACILITY

The Sludge Disposal Facility located on the grounds of the Woonsocket WWTF is privately operated by Synagro in accordance with the terms of the Operating Agreement between the City and Synagro. The Sludge Disposal Facility utilizes a fluidized bed incinerator to incinerate wastewater treatment plant sludges. The Sludge Disposal Facility processes and disposes of trucked-in liquid sludge and dewatered sludge cake from other wastewater treatment facilities in addition to the liquid sludge from the Woonsocket WWTF. The Woonsocket primary sludge is wasted directly to the sludge holding tank in the Synagro Sludge Disposal Facility, where it mixes with trucked-in liquid sludge while Woonsocket secondary sludge is thickened in a gravity thickener. Thickened secondary sludge is then pumped together with the wasted primary and trucked in sludge from the holding tank to centrifuges where it is dewatered prior to incineration. The WWTF provides treated plant effluent to the Sludge Disposal Facility for scrubber water and receives and treats the return flow from the Synagro operated Sludge Disposal Facility.

In accordance with a prior EPA/RIDEM determination, the Sludge Disposal Facility is considered to be part of the Woonsocket WWTF, and as such is not regulated separately even though all associated facility operations are contracted separately to Synagro under an Operating Agreement that was Amended and Restated in 2003 (*note, Section 4.2 of the Operating Agreement reinforces the position that sludge disposal facilities are to be consider a component of the Plant*). As a result, the privately operated Synagro operations are not regulated by the City's local limits. The Operating Agreement does address return flow limitations and includes monitoring requirements similar to an industrial pretreatment limit. The Operating Agreement has provisions for change in law in Section 9.4 which state that revised return flow standards shall be no more restrictive than those imposed on other industrial users. While considering the terms of the existing Operating Agreement between Synagro and the City, it was also deemed appropriate that the trucked-in merchant sludge portion of the Sludge Disposal Facility operations be considered while evaluating the City's local limits. However, from a regulatory perspective the Sludge Disposal Facility is not considered separate from the Woonsocket Regional WWTF. This local limits evaluation takes into account the trucked in sludge residual liquid that is recycled to the Woonsocket WWTP as an “outside” waste stream. Because this waste stream is not directly monitored for the POC’s this LL analysis includes the residual liquid from outside sludge processing as a component of the total industrial waste load.

4 POLLUTANTS OF CONCERN

The purpose of developing local limits is to prevent interference of WWTF treatment operations, protect worker health and safety, prevent pass-through of conventional and toxic pollutants, prevent adverse impacts a sludge quality, and maintain discharge permit and regulatory compliance. This is accomplished by identifying which pollutants of concern (POCs) need to be controlled to meet these goals and to meet Federal, State, and local requirements. The EPA has identified 15 pollutants that it considers potential POCs. These include the ten original POCs; Arsenic, Cadmium, Chromium, Copper, Cyanide, Lead, Mercury, Nickel, Silver, and Zinc and the five new POCs; Ammonia, BOD, Molybdenum, Selenium and Total Suspended Solids. Two of the national POCs have been removed from this work plan since the Woonsocket WWTF's primary and secondary means of sludge disposal is incineration. Selenium and Molybdenum have been removed from the proposed list of POC's since the sludge quality concerns related to beneficial use do not apply. In addition to the EPA's list of national pollutants, additional potential POCs were identified that may adversely impact compliance with effluent limitations, environmental standards and regulatory requirements, protection of the WWTF, collection system and workers. Additional POCs, Total Nitrogen, Ammonia, Total Phosphorus, BOD_5, and TSS, have been included due to the effluent limitations set forth in the Woonsocket WWTF RIPDES permit which are based on water quality effects on the Blackstone River. As pollutants of concern, COD, Total Toxic Organics (TTOs), Oil & Grease have also been included because there are already in the existing local limits, they have been retained for this evaluation.

Therefore, the list of Woonsocket POCs applicable to this local limits update is as follows:

Arsenic
Cadmium
Chromium
Copper
Lead
Mercury
Nickel
Silver
Zinc
Cyanide
Biochemical Oxygen Demand (BOD)
Chemical Oxygen Demand (COD)
Total Suspended Solids (TSS)
Total Nitrogen
Ammonia
Total Phosphorus Total Toxic Organics Oil & Grease
pH

5 EVALUATION OF AVAILABLE DATA

This section summarizes the available POC data that was used in the development of technically- based local limits for the Woonsocket Regional WWTF. In instances where the data values were below the detection limit, this local limits evaluation implemented the substitution method, as described in Appendix Q of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F of this report), which allows for the value below the detection limit to be replaced with another value set at one-half the detection limit.

5.1 WOONSOCKET REGIONAL WWTF

Data collected by the Woonsocket Regional WWTF as part of daily operations were utilized to characterize WWTF flows, determine the average levels of POCs that enter the treatment plant and determine the WWTF's site specific removal efficiencies. While conducting this evaluation, some additional data collection was necessary to allow for a more detailed characterization for each of the POC parameters. Therefore, the City conducted a supplemental sampling program at the WWTF between October and December of 2010. Appendix A contains the historic Monitoring Data Summary for the Woonsocket WWTF. Appendix B contains the Supplemental Sampling Data Summary for the Woonsocket WWTF and Sludge Disposal Facility.

5.2 WOONSOCKET PRETREATMENT PROGRAM

The City of Woonsocket has implemented and enforces a Pretreatment Program based on prohibited discharges, categorical standards, and technically-based local limits. The primary objective of the City's Pretreatment Program is to maintain compliance with the waste discharge requirements in the RIPDES permit.

The *EPA Region 1 Annual Pretreatment Report Summary Sheet for the fiscal Year 2009 - 2010*, included in the *City of Woonsocket 2010 Annual Pretreatment Report*, indicates that there are currently sixteen (16) Significant Industrial Users (SIUs) contributing flow to the Woonsocket Regional WWTF. The City of Woonsocket Pretreatment Department requires that each significant industrial user (SIU) collect and test composite samples to determine if the effluent limitations are being exceeded or have reasonable potential to exceed. The testing frequency is dependent upon the parameter being tested and the required frequency may be continuously, monthly or semi-annually. Flow and testing data, from January 2009 through May 2011, were reviewed for this Local Limits Evaluation. The results of the SIU monitoring were averaged and are presented in Appendix C: Existing Pollutant Concentrations for Industrial Users & Incinerator Return Flow.

5.3 SLUDGE DISPOSAL FACILITY

Sludge processed by the Sludge Disposal Facility (Synagro operated and managed facility) is tested for hazardous waste and other toxic components. Daily samples are drawn from both the Sludge Storage Tank and the cake conveyor to produce corresponding monthly composite samples which are analyzed for the following Testing Parameters: Antimony, Beryllium, Cadmium, Chromium, Copper, Lead, Magnesium, Mercury, Nickel, Selenium and Zinc. Daily samples of pH and Total Solids are also collected and analyzed.

Return flows from the Sludge Disposal Facility are routinely monitored and tested for BOD, TSS, COD, Alkalinity, pH, Temperature, Cadmium, Chromium, Copper, Lead, Nickel, Silver and Zinc. The Sludge Disposal Facility loads which are discharged to the WWTF via the facility's recycle/return flows represent a significant component of the overall pollutant loadings being processed at the WWTF. The Sludge Disposal Facility's return flows combine with the collection system's raw influent wastewater prior to the Aerated Grit chamber. The historic operating data were not sufficient to fully evaluate the loading impacts for all POCs. Therefore, return flows from the Sludge Disposal Facility were tested for all POCs in conjunction with the supplemental testing at the WWTF. The results of the standard return flow monitoring were averaged and are presented in Appendix C: Existing Pollutant Concentrations for Industrial Users & Incinerator Return Flow. Appendix B contains the Woonsocket WWTF Supplemental Sampling Data Summary.

During the preparation of the Local Limits Workplan, the sludge disposal facility was contacted for input regarding any POCs that may need to be limited due to sludge quality issues that would negatively affect air emissions from the fluidized bed incinerator. Synagro indicated that the Sludge Disposal Facility has not had problems meeting the metals regulated by *Part 503 - Standards for the Use and Disposal of Sewage Sludge* and do not anticipate any future problems with sludge metals concentrations which would require additional POCs be added to the sampling plan.

5.4 COLLECTION SYSTEM

The City of Woonsocket does not have any historical data available that could be used to characterize the uncontrolled sources that contribute pollutants to the Woonsocket WWTF. Therefore, additional sampling of uncontrolled sources in the collection system, upstream of the influence of industry, was conducted in December of 2010. The sampling included taking 24- hour time based composite samples for 7-days at five (5) locations throughout the contributing area to the Woonsocket WWTF. These manhole locations were selected such that they were upstream of any influence from the 16 regulated SIUs and therefore are representative of the City's uncontrolled (Non-SIU) sources: residential, light commercial, inflow & infiltration, etc. The specific sampling

locations within the collection system were selected following review of available data and input from the City of Woonsocket staff and are identified in Table 2: Collection System Testing Manholes. One of the five sampling locations was selected to be representative of contributing communities outside of Woonsocket which convey nearly 20% of the flow received by the WWTF. The results from the uncontrolled sampling are provided in Appendix D.

Table 2: Collection System Testing Manholes

Manhole ID	Location	Collection System
MH 1169	Third Avenue	Woonsocket
MH 1987	Intersection of Fourth Avenue & Chestnut Street	Woonsocket
MH 3111	Singleton Street	Woonsocket
MH 4380	Intersection of Pichette Blvd & Marie Anne Court	Woonsocket
Unknown	Leo Street	North Smithfield

6 DETERMINATION OF LOCAL LIMITS

6.1 METHODOLOGY

The general methodology used to calculate updated local limits is that described in the *EPA Local Limits Development Guidance* document, July 2004. Actual local limits calculations were made using an Excel spreadsheet, copies of which are presented in Appendix E along with the associated flow diagram that reflects the approach used in the analysis. The overall approach includes 2 basic steps:

1. Determination of the Allowable Headworks Load from all outside sources for each POC based on the process removal efficiencies for site specific processes and applicable effluent quality, sludge quality and process inhibition limits.
2. Allocation of the Allowable Headworks Load across all process influent load sources.

The specific methodologies, calculations and assumptions used to determine the various flows and loads are described more fully below. The proposed loadings to the Woonsocket Wastewater Treatment facility (following the impending facility upgrade) that have been used in this local limits analysis were sourced from the Facility Plan Amendment (FPA), May 2013 completed by CH2M Hill. Specific source references to values from the FPA are included in Appendix I of this Local Limits Evaluation report. The calculations of the local limits for each POC follow the general methodology description.

6.1.1 Flow Data

Typically, the influent flow to a WWTP from outside sources enters through one or more sewers that discharge to the facility "headworks". In the case of the Woonsocket WWTP there are additional "off-site" inputs to the treatment system from merchant sludge (both liquid and dewatered) received and processed by the Synagro Solids Handling Facility. These offsite inputs enter the Woonsocket WWTP downstream of some of the headworks facilities via the plant drain where they are combined with plant recycles before they enter the main treatment facilities. In addition, the Synagro facility uses a significant flow of effluent from the Woonsocket WWTP as cooling and process water that is also recycled back to the Woonsocket WWTP treatment processes through the plant drain. This Local Limits evaluation considers these additional off-site and internal recycle flows which are shown schematically in the process flow diagram presented in Appendix E. The following table defines and summarizes the measured and or calculated flows which were used in this local limits evaluation including the source of the flow data for measured flows and in the case of calculated values, the calculation used to determine it consistent with the flow diagram presented in Appendix E.

Table 3: Woonsocket WWTF Flow Data

Abbr.	Description	Value [(1)] (MGD)	Source
Q_{ASH}	liquid in incinerator ash	0.00	Moisture in incinerator ash negligible
Q_{CENT}	total centrate	0.35	*Synagro flow and load allocation letter, Woodard & Curran*, 11/23/10 (Appendix J)
Q_{COMB}	combined overflow from ash thickener and cooling system returns from	1.94	*Synagro flow and load allocation letter, Woodard & Curran*, 11/23/10 (Appendix J)
Q_{COOL}	Synagro Incinerator building fed from WWTF Effluent	1.87	Calculated: Q_{COMB} - Q_{INC}
Q_{EFF}	plant effluent	6.98	Effluent flow data 2010 & 2011 (Appendix N) [(2)]
Q_{FBW}	filter backwash	0.40	*Facility Plan Amendment,* May 2013 (Appendix I)
Q_{GTMW}	gravity thickener makeup water	0.56	Calculated: Q_{GTO} + Q_{INC} - Q_{PS} - Q_{WAS} - Q_{MER}
Q_{GTO}	gravity thickener overflow	0.91	*Facility Plan Amendment,* May 2013 (Appendix I)
Q_{INC}	liquid in incinerator cake feed (condensate)	0.066	*Facility Plan Amendment,* May 2013 (Appendix I) [(2)]
Q_{MER}	merchant sludge trucked-in from offsite	0.245	Calculated: 70% of Q_{CENT} based on reported average ratio of tons city sludge dewatered to merchant sludge dewatered
Q_{POTW}	publically operated treatment works total process influent flow	9.99	Calculated: Q_{REC} + Q_{UNC} + Q_{SIU}
Q_{PS}	Primary sludge	0.09	*Facility Plan Amendment,* May 2013 (Appendix I)
Q_{REC}	Recycle	3.25	Calculated: Q_{FBW} + Q_{COMB} + Q_{GTO}
Q_{SIU}	Significant industrial users	0.212	Industrial pretreatment program data from 1/1/09 to 5/1/11 (Appendix C) with a 5% growth factor applied [(2, 3)]
Q_{UNC}	Uncontrolled sources	6.53	Calculated: Q_{EFF} x (1.05) - Q_{SIU} - Q_{ASH} - Q_{MER} [(2)]
Q_{WAS}	Waste activated sludge	0.080	*Facility Plan Amendment,* May 2013 (Appendix I)

(1) Values are average annual unless noted otherwise.

(2) Uncontrolled and industrial flows have been increased by 5% as an estimate of the projected growth likely to occur over the 5 year effective period of the local limits calculated herein. The *Facility Plan Amendment,* May 2013, estimates 15% growth over the next 20 years. Assuming linear growth, the 5% estimation for this local limits period is conservative.

(3) Assumes Technics discharge remains at or below the historic high period reported

(100,800 gpd). This assumption has been confirmed based on review of recent Technic discharge data (approximately 34,800 gpd annual average daily flow for 2012) and a maximum monthly average daily flow for 2012 of approximately 60,000 gpd.

6.1.2 Limiting Criteria

One critical component associated with evaluating technically-based local limits is the identification of the limiting criteria, or factors, which are intended to protect both the treatment processes and the environment. There are several criteria that need to be considered including:

1. Daily effluent based criteria - Based on RIPDES permit limitations (Appendix H), or when none exist, based on the Rhode Island Water Quality Criteria and Standards (Appendix K).
2. Monthly effluent based criteria - Based on RIPDES permit limitations (Appendix H), or when none exist, based on the Rhode Island Water Quality Criteria and Standards (Appendix K).
3. Inhibition based criteria for nitrification inhibition - Based on Site Specific Inhibition Criteria if available, otherwise based on published inhibition values. Appendix G of the *EPA Local Limits Development Guidance* (July 2004) provides a listing of nitrification inhibition criteria (Appendix F of this report).
4. Inhibition based criteria for activated sludge inhibition - Based on Site Specific Inhibition Criteria if available, otherwise based on published inhibition values. Appendix G of the *EPA Local Limits Development Guidance* (July 2004) provides a listing of activated sludge inhibition criteria (Appendix F of this report).
5. Sludge quality based criteria for sludge incineration - Based on sludge concentration limits specified in Section 503.43 of the *EPA Standards for the Use and Disposal of Sewage Sludge* for sludge sent to incineration (Appendix G of this report).

6.1.3 Removal Efficiency

Removal efficiency is the percentage of the pollutant loading entering the treatment system that is removed from the wastewater through the wastewater treatment processes. Removal rates for each POC are fundamental inputs to the AHL calculations.

The mean removal efficiency (MRE) method was used in this local limits evaluation. The MRE averages plant influent values and effluent values separately and then calculates removal efficiencies for the various wastewater treatment plant process effluents. MREs were calculated from the "head of the plant" through primary effluent, secondary effluent and plant effluent as required. The MREs for the Woonsocket WWTF have been calculated using primary influent values as the "head of the plant".

This was done to account for all pollutant loadings originating from outside the WWTF. In the case of the Woonsocket WWTF, the raw influent load from the collection system and the load associated with the processing of the trucked-in outside merchant sludge combine just prior to the primary influent. In some instances the site-specific sampling data did not allow for the determination of site-specific removal efficiencies. When it was deemed appropriate, median removal efficiencies as reported by other POTWs were used. Appendix R of the *EPA Local Limits Development Guidance* (July 2004) provides a listing of removal efficiency data for priority pollutants gathered from other POTWs (Appendix F of this report). Use of this data was determined on a case-by-case basis and the specific reasons are described in the individual POC calculations descriptions presented in Section 6.2. Generally, some of the instances which lead to the use of the EPA removal efficiency values included uncertainties and/or anomalies with available sampling data and low influent pollutant levels near or below the detection limits. A summary table of the available removal efficiency data and justification for its use is included in Appendix M.

6.1.4 Allowable Headworks Loading

Allowable headworks loading for the POTW (AHL_{POTW}) is the maximum daily loading of a pollutant at the influent to the plant processes, expressed in pounds per day, which can be accepted by the POTW that should not cause the POTW to violate a particular treatment plant limit or environmental criteria
The following limiting criteria were identified as being applicable to the Woonsocket WWTP and are reflected in the flow diagram in Appendix E shows in red:

Limiting Criteria No. 1 & 2: Maximum Daily and Average Monthly Effluent concentration limit in mg/L using the more stringent of effluent permit (1) or water quality concentration limits (2).

Limiting Criteria No. 3 & 4: Maximum concentration limit in mg/L that will not result in process inhibition for activated sludge organics removal (3) and nitrification (4).

Limiting Criteria No. 5: Maximum concentration limit in mg/kg dry solids for liquid sludge to an incinerator as specified in the *Part 503 – Standards for the Use and Disposal of Sewage Sludge*.. This limit is applied to the combined primary and secondary sludge leaving the wet stream processes and directed to the Synagro Solids Handling Facility. This approach assumes that the metals received from off site by Synagro also meet the Part 503 regulations.

The equations for calculation of the AHL_{POTW} for each of the above listed criteria are as follows:

Limiting Criteria No. 1 & 2: effluent concentration limits in mg/L * total bioprocess influent flow in MGD * CF / (1 - bioprocess removal efficiency%/100):

$$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$$

Where: C_{EFF} = concentration limit by RIPDES permit (Appendix H), or when none exist, based on Rhode Island Water Quality Criteria Standards (Appendix K).

R_{BP} = % bioprocess treatment removal efficiency as defined by Site Specific Inhibition Data or standard values provided in Appendix R of the *EPA Local Limits Development Guidance,* July 2004 (Appendix F of this report).

CF = conversion factor

Limiting Factor No. 3 & 4: inhibition concentration in mg/L * total bioprocess influent flow in MGD * CF / (1 – primary clarifier removal efficiency%/100):

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 – R_{PC}, \%/100)$

Where: C_{PEFF} = primary clarifier effluent (bioprocess influent) inhibition concentration as defined by Site Specific Inhibition Criteria or standard values provided in Appendix G of the *EPA Local Limits Development Guidance,* July 2004 (Appendix F).

R_{PC} = % primary treatment removal efficiency as defined by Site Specific Removal Data or standard values provided in Appendix R of the *EPA Local Limits Development Guidance,* July 2004 (Appendix F).

Limiting Factor No. 5: (sludge concentration limits in mg /kg DS) * (Total of Primary and Secondary Waste Sludge Solids Load in lb DS/d) / (Bioprocess Removal Efficiency%/100) / CF:

$AHL_{POTW} = C_{MAX\ DS} * [Q_{PS} * TSS_{PS} * CF + Q_{WAS} * TSS_{WAS} * CF] / (R_{BP}, \%/100) / 1{,}000{,}000$

Where: C_{MAXDS} = maximum allowable sludge POC concentration, mg POC/kg dry solids. (Reference Synagro letter re: Wright Pierce Request for Sludge Quality Effects on Air Emissions, Woodard & Curran, 11/5/10 – Appendix L of this report)

Q_{PS} = primary sludge flow

TSS_{PS} = primary sludge solids concentration

Q_{WAS} = waste activated sludge flow

TSS_{WAS}= waste activated sludge solids concentration

R_{BP} = % bioprocess removal efficiency as defined by Site Specific Removal Data or standard values provided in Appendix R of the *EPA Local Limits Development Guidance,* July 2004 (Appendix F of this report).

6.1.5 Maximum Allowable Headworks Loading

The maximum allowable headworks load, is the maximum daily loading of a pollutant,

expressed in pounds per day, which can be accepted by the POTW, ($MAHL_{POTW}$). A pollutant loading that is greater than the calculated $MAHL_{POTW}$ would be predicted to cause adverse impacts to the performances of treatment processes, receiving water quality, worker health and safety, sludge quality or potentially pass through the treatment facility at level which would result in a RIPDES permit violation. The $MAHL_{POTW}$ is set to the level of the most stringent of the AHL_{POTW}s calculated for a particular pollutant.

It is important to note here that the plant wet stream processes must process not only the loads from off-site domestic and industrial sources discharging to the Woonsocket WWTP collection system, but also those from trucked in sludge received and processed by Synagro and returned through the plant's internal recycle. In addition, the City provides a significant amount of cooling water from its treated plant effluent to Synagro which is returned to the plant via the plant drain. These loads are components of the total allowable load to the plant's treatment processes (i.e. the AHL_{POTW}) which are specifically accounted for in the evaluation.

6.1.6 Maximum Allowable Industrial Loading

A mass balance at the Headworks where raw influent and plant recycle flows combine can be used to calculate the maximum allowable industrial loading (MAIL) for SIUs by removing the recycle loads and the load from "uncontrolled sources" (based on reported flow and concentration data) from the $MAHL_{POTW}$ (reference flow diagram Appendix E).

The recycle loads can be calculated with a mass balance of contributing flows and loads to the recycle stream. These flows include filter backwash, incinerator cooling water feed, gravity thickener makeup water, gravity thickener overflow and incinerator cake feed liquid. The filter backwash, incinerator cooling water feed and gravity thickener makeup water are recycled effluent, so their concentrations are assumed to be equal to the plant effluent concentration ($C_{FBW} = C_{COOL} = C_{GTMW} = C_{EFF}$). This assumes that the solids in the filter backwash do not contribute a significant POC concentration to the backwash flow. Sufficient recent data for the POC concentrations in the gravity thickener overflow (which includes centrate and City waste sludge supernatant) and the liquid associated with the cake fed to the incinerator (which is returned as condensate with the cooling water) is not available. So, the POC concentrations from these flows have been conservatively assumed in the mas balance to be equal to the concentration allocated to industry ($C_{SIU} = (C_{GTO}\text{-}C_{GTMW}) = C_{INC}$).

Using these assumptions the MAIL for each potential limiting factor is calculated as follows:

MAIL in lb/d = maximum allowable headworks load in lb/d – [filter backwash flow in

MGD * concentration in mg/L * CF] - [incinerator cooling water flow in MGD * cooling water concentration in mg/L * CF] - [gravity thickener makeup water in MGD * concentration in mg/L * CF] - [uncontrolled source flow in MGD * concentration in mg/L * CF]

$$MAIL = MAHL_{POTW} - (Q_{FBW} * C_{FBW} * 8.34) - (Q_{COOL} * C_{COOL} * 8.34) – (Q_{GTWM} * C_{GTMW} * 8.34) - (Q_{UNC} * C_{UNC} * 8.34)$$

Where:

Q_{FBW} = filter backwash flow

C_{FBW} = filter backwash concentration

Q_{COOL} = incinerator cooling water flow

C_{COOL} = incinerator cooling water concentration

Q_{UNC} = uncontrolled sources total flow

Q_{GTMW} = Gravity thickener makeup water

For the metals, a safety factor has been selected in accordance with the minimum EPA recommendation (Section 6.2. *EPA Local Limits Development Guidance,* July 2004 - Appendix F of this report) and the City's stated objectives of balancing RIDEM requirements and protecting the WWTF's functionality with minimizing impacts on local industry. Because some removal efficiency data is based on standard EPA values not specific to this WWTF a 10% safety factor has been incorporated for those metals. There is inherent variability in sampling data due to collection frequency and accuracy, so a 10% SF has also been incorporated into the metals with removal efficiencies calculated from site specific data. Additionally, the total industrial flow is a small percentage of the total plant influent (about 3%). Finally, because of the uniform concentration method has been utilized, it is understood that not every industry will be at, or near, its maximum concentration which provides additional safety factor to these calculations.

The MAIL with a safety factor is calculated as follows:

MAIL in lb/d = maximum allowable headworks load in lb/d * (1 – SF, %/100) – [filter backwash flow in MGD * concentration in mg/L * CF] - [incinerator cooling water flow in MGD * cooling water concentration in mg/L * CF] - [uncontrolled source flow in MGD * concentration in mg/L * CF]

$$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - (Q_{FBW} * C_{FBW} * 8.34) - (Q_{COOL} * C_{COOL} * 8.34) - (Q_{UNC} * C_{UNC} * 8.34)$$

Where: SF = safety factor

For conventional (BOD, TSS) and non-conventional (TN, NH3, TP) POCs, the sum of the existing facility design loads for raw and recycle loads represents the $MAHL_{POTW}$.

These loads were established in 2000 and are presented in Table 3-4 of the *Facility Plan Amendment,* May 2013 (Appendix I). The MAIL calculation for these parameters is simplified in that only actual recycle loads and calculated uncontrolled loads need to be removed from the $MAHL_{POTW}$. The actual recycle loads as of 2010 are included in Table 3-4 of the *Facility Plan Amendment,* May 2013 (Appendix I) in the "Observed in 2010" column.

The uncontrolled loads for non-metals presented in Appendix D are uncommonly elevated and contradictory, so they have been assumed to be unreliable. Consequently, the best available method for determining the uncontrolled load to serve as a basis for this study involved analysis of the raw influent load when non-metal loads from industry was minimal. So, the raw load for the period of time from 2007 to 2009 when the influence of industry was greatly diminished due to a known SIU being off-line was assumed to be the best available estimate of uncontrolled source load. The average raw influent flow during this time period is used to calculate the uncontrolled load:

$$M_{UNC} = Q_{UNC} * C_{UNC} * 8.34$$

Where:

M_{UNC} = uncontrolled load (07-09)

Q_{UNC} = uncontrolled flow (07-09) = Q_{RAW}

C_{UNC} = uncontrolled concentration (07-09)

The uncontrolled load from 2007 to 2011 is assumed to have remained constant because there was not an increase in users added to the system. Additionally, the flows have decreased due to a reduction in inflow and infiltration because of significant rehabilitation within the collection system. So, this uncontrolled load along with the average flow from 2010 to 2011 was used to calculate the current uncontrolled source concentration.

$$C_{UNC} = M_{UNC} / (Q_{UNC} * 8.34)$$

Where: M_{UNC} = uncontrolled load (07-09) = uncontrolled load (10-11)

Q_{UNC} = uncontrolled flow from (10-11)

C_{UNC} = uncontrolled concentration from (10-11)

This uncontrolled source concentration (2010-2011) is assumed to be constant for the remainder of the study period. An uncontrolled source load calculated from this uncontrolled source concentration (2010-2011) and the uncontrolled source flow for the study period which includes a 5% flow increase (reference Section 6.1.1) serves as the basis for this evaluation for the conventional and non-conventional POCs.

$$M_{UNC} = Q_{UNC} * C_{UNC} * 8.34$$

Where: M_{UNC} = uncontrolled load (study period)

Q_{UNC} = uncontrolled flow (study period)

C_{UNC} = uncontrolled concentration (study period)

A safety factor is not applied to the conventional and non-conventional loads in the

same manner in which it was applied for the metals. The load calculations for these POCs are based on average annual data. Because the WWTF is designed to treat maximum month loads for these non-metals, there is adequate conservatism, or safety factor, built into these calculations already. Therefore, the SF term in the MAIL equation has been set equal to 0%.

MAIL in lb/d = allowable raw influent load in lb/d * (1 – SF, %/100) – [uncontrolled source flow in MGD * concentration in mg/L * CF]

$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - (M_{UNC}) – M_{REC}$

Where:

SF = safety factor

M_{REC}= mass in the recycle flow

6.1.7 Allocation of Local Limits

The calculation of the technically-based local limits was based on a uniform concentration allocation of the MAIL across a flow base consisting of significant industrial flow base and the portion of the return flow related to the trucked-in merchant sludge as discussed in the preceding section. This uniform allocation method results in similar local limits for all industrial users and acknowledges the impact of the loading contribution associated with the privately operated Sludge Disposal Facility.

The calculated revised local limit recommendations were collectively reviewed with the City and best engineering judgment was used to establish the recommended local limits.

6.2 LOCAL LIMITS CALCULATIONS

6.2.1 Arsenic

6.2.1.1 Arsenic Water Quality Criteria

Arsenic does not have an effluent limitation under the current Woonsocket WWTF RIPDES permit (Appendix H). Therefore, RIDEM Water Quality Criteria was used to determine the arsenic effluent water quality limits. Source information for the Water Quality Criteria is the *Woonsocket WWTF Permit Development Document, Appendix A: Calculation of Allowable Acute and Chronic Discharge Limitations Based on Freshwater Aquatic Life Criteria and Human Health Criteria* (Appendix K).

1,392.64 ug/L - Daily Maximum Effluent Limit

17.3 ug/L - Monthly Average Effluent Limit

6.2.1.2 Arsenic Inhibition Criteria

Site specific inhibition criteria for the WWTF could not be determined with the available data, therefore EPA literature values for typical POTW arsenic removal efficiencies were used instead. Source information for arsenic inhibition of activated sludge and nitrification is from Appendix G of the *EPA Local Limits Development Guidance,* July 2004 (Appendix F of this report F).

0.10 mg/L - Arsenic inhibition level for activated sludge

1.50 mg/L - Arsenic inhibition level for nitrification

6.2.1.3 Arsenic Woonsocket WWTF Removal Efficiency

A review of the WWTF supplemental sampling data (Appendix B) for arsenic indicated the following:

- Primary influent pollutant concentrations (C_{POTW}) were reported to be less than the arsenic detection limit of 10.5 ug/L.
- Primary effluent pollutant concentrations (C_{PEFF}) were reported to be 8.1 ug/L.
- Final effluent pollutant concentrations (C_{EFF}) were reported to be less than the arsenic detection limit of 7.5 ug/L.

Site-specific arsenic removal efficiencies for the WWTF could not be determined with the available data and low influent concentrations, therefore EPA literature values for typical POTW removal efficiencies were used instead. Source information for arsenic removal efficiencies is from Appendix R of the *EPA Local Limits Development Guidance,* July 2004 (Appendix F of this report). The overall WWTF removal efficiency was determined from the individual process removal efficiencies.

EPA Arsenic Pollutant Removal Efficiencies (%):

38% - Median Primary Treatment removal efficiency, R_{PC}

45% - Median Activated Sludge Treatment removal efficiency, R_{SC}

The overall WWTF arsenic removal efficiency, R_{BP}, used in this local limits evaluation was 66%.

6.2.1.4 Arsenic Allowable Headworks Loading (AHL_{POTW}) w/o Safety Factor

(1) Daily Max Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [1.392\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.66] =$ 341.02 $_{lb/day}$

(2) Monthly Average Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.017\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.66] = 4.24\ _{lb/day}$

(3) For Activated Sludge Inhibition:

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 - R_{PC}, \%/100)$
$AHL_{POTW} = [0.10\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.38] = 13.43\ _{lb/day}$

(4) For Nitrification Inhibition:

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 - R_{PC}, \%/100)$
$AHL_{POTW} = [1.50\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.38] = 201.52\ _{lb/day}$

(5) For Sludge Incineration:

$AHL_{POTW} = C_{MAX\ DS} * [Q_{PS} * TSS_{PS} * CF + Q_{WAS} * TSS_{WAS} * CF] / (R_{BP}, \%/100) / 1,000,000$

Where: C_{MAXDS} = 636 mg/dry Kg (Synagro letter re: Wright Pierce Request for Sludge Quality Effects on Air Emissions, Woodard & Curran, 11/5/10 – Appendix L)

$AHL_{POTW} = 636\ _{mg/dry\ Kg} * [0.090\ _{MGD} * 9,800\ _{mg/L} * 8.34 + 0.080\ _{MGD} * 15,000\ _{mg/L} * 8.34] / 0.66 / 1,000,000$

AHL_{POTW}= 16.74 lb/d

6.2.1.5 Arsenic Maximum Allowable Headworks Loading ($MAHL_{POTW}$)

The most stringent AHL based on the Monthly Average Effluent Quality Limit was chosen as the $MAHL_{POTW}$ for arsenic at 4.24 lb/day.

6.2.1.6 Arsenic Safety Factor

A safety factor of 10% was used in the development of this arsenic local limit.

6.2.1.7 Arsenic Uncontrolled Sources

Testing of the uncontrolled sources in the WWTF collection system was conducted to determine the site-specific pollutant concentration. The testing occurred in December of 2010 (Appendix D). The uncontrolled sources arsenic concentration, based on the testing was reported to be below the detection limit of 5.0 ug/L for 8 of the 17 samples and below the detection limit of 2.0 ug/L for 3 of the 17 samples. The remaining samples ranged from 24.5 to 50.9 ug/L. For determination of the uncontrolled sources arsenic concentration, samples that were reported to be below the detection limit were replaced with a value of one-half of the detection limit for each instance. The uncontrolled sources arsenic concentration used in this evaluation was 26.0 ug/L.

M_{UNC} = Loading from uncontrolled sources (domestic, commercial, I+I)
$M_{UNC} = C_{UNC} * Q_{UNC} * 8.34$
$M_{UNC} = 0.026\ _{mg/L} * 6.53\ _{MGD} * 8.34 = 1.42\ _{lb/day}$

6.2.1.8 Arsenic Maximum Allowable Industrial Loading (MAIL) with Safety Factor

$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - (Q_{FBW} * C_{FBW} * 8.34) - (Q_{COOL} * C_{COOL} * 8.34) - (Q_{GTMW} * C_{GTMW} * 8.34) - M_{UNC}$
$MAIL = 4.2\ _{lb/d} * (1\text{-}0.10) – (0.40\ _{MGD} * 0.017\ _{mg/L} * 8.34) – (1.874\ _{MGD} * 0.017\ _{mg/L} * 8.34) – (0.561\ _{MGD} * 0.017\ _{mg/L} * 8.34) – 1.42\ _{lb/day}$
$MAIL = 1.99\ _{lb/d}$

6.2.1.9 Arsenic Uniform Limits For All Controlled Discharges

$C_{SIU} = MAIL / (Q_{INC} + (Q_{GTO} – Q_{GTMW}) + Q_{SIU}) / 8.34$
$C_{SIU} = 2.07\ _{lb/day} / (0.066_{MGD} + (0.91_{MGD} - 0.561_{MGD}) + 0.21_{MGD}) / 8.34 = 0.381\ _{mg/L}$

6.2.1.10 Arsenic RIDEM Best Available Technology Limits

RIDEM Office of Water Resources (OWR) local limit development policy requires adoption of "best available technology" limits. OWR considers the EPA categorical limits for metal finishing (40 CRF 433.17) to be the "best available technology" limits. As such, no final local limits may exceed the limits found in 40 CFR 433.17. 40 CFR 433.17 does not have a limit for arsenic.

It is recommended that the local limit for arsenic be set at 0.381 mg/l and implemented as a daily maximum as recommended in Section 6.4.1 of the EPA Local Limits Development Guidance, July 2004 (Appendix F).

6.2.2 CADMIUM

6.2.2.1 Cadmium Water Quality Criteria

Cadmium has an effluent limitation under the current Woonsocket WWTF RIPDES permit (Appendix H). Cadmium is one of the pollutants with more stringent requirements under the new RIPDES permit.

4.32 ug/L - Daily Maximum Effluent Limit

1.50 ug/L - Monthly Average Effluent Limit (interim limit)

0.66 ug/l – Monthly Average Effluent Limit (final limit)

6.2.2.2 Cadmium Inhibition Criteria

Site specific inhibition criteria for the WWTF could not be determined with the available data, therefore EPA literature values for typical POTW cadmium removal efficiencies were used instead. Source information for cadmium inhibition of activated sludge and nitrification is in Appendix G of the *EPA Local Limits Development Guidance,* July 2004 (Appendix F of this report).

5.0 mg/L - Cadmium inhibition level for activated sludge

5.2 mg/L - Cadmium inhibition level for nitrification

6.2.2.3 Cadmium Woonsocket WWTF Removal Efficiency

A review of the available WWTF sampling data (Appendix B) indicated the following:

- Primary influent pollutant concentrations (C_{POTW}) were reported to be less than the cadmium detection limit of 4 ug/L.
- Primary effluent pollutant concentrations (C_{PEFF}) were reported to be 0.25 ug/L.
- Final effluent pollutant concentrations (C_{EFF}) were reported to be less than the cadmium detection limit of 2 ug/L.

Site-specific cadmium removal efficiencies for the WWTF could not be determined with the available data and low influent concentrations, therefore EPA literature values for typical POTW cadmium removal efficiencies were used instead. Source information for removal efficiencies is Appendix R of the *EPA Local Limits Development Guidance,* July 2004 (Appendix F of this report). The overall WWTF removal efficiency was determined from the individual process removal efficiencies.

EPA Cadmium Pollutant Removal Efficiencies (%):

15% - Median through Primary Treatment, R_{PC}

67% - Median value through Activated Sludge Treatment, R_{SC}

50% - Median value through Tertiary Treatment, R_{TT}

The overall WWTF cadmium removal efficiency, R_{BP} used in this local limits evaluation was 86%.

6.2.2.4 Cadmium Allowable Headworks Loading (AHL_{POTW}) w/o Safety Factor

(1) Daily Max Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.0043\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.86] =$ 2.57 $_{lb/day}$

(2) Monthly Average Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.00066\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.86]$ = 0.39 $_{lb/day}$

(3) For Activated Sludge Inhibition:

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 - R_{PC}, \%/100)$
$AHL_{POTW} = [5.0\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.15]$ = 489.98 $_{lb/day}$

(4) For Nitrification Inhibition:

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 - R_{PC}, \%/100)$
$AHL_{POTW} = [5.2\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.15]$ = 509.57 $_{lb/day}$

(5) For Sludge Incineration:

$AHL_{POTW} = C_{MAX\ DS} * [Q_{PS} * TSS_{PS} * CF + Q_{WAS} * TSS_{WAS} * CF] / (R_{BP}, \%/100) / 1{,}000{,}000$

Where: C_{MAXDS} = 1576 mg/dry Kg (Synagro letter re: Wright Pierce Request for Sludge Quality Effects on Air Emissions, Woodard & Curran, 11/5/10 – Appendix L)

$AHL_{POTW} = 1576\ _{mg/dry\ Kg} * [0.090\ _{MGD} * 9{,}800\ _{mg/L} * 8.34 + 0.080\ _{MGD} * 15{,}000\ _{mg/L} * 8.34] / 0.86 / 1{,}000{,}000$

AHL_{POTW}= 31.83 lb/d

6.2.2.5 Cadmium Maximum Allowable Headworks Loading ($MAHL_{POTW}$)

The most stringent AHL based on the Monthly Average Effluent Quality Limit was

chosen as the $MAHL_{POTW}$ for cadmium at 0.39 lb/day.

6.2.2.6 Cadmium Safety Factor

A safety factor of 10% was used in the development of this local limit.

6.2.2.7 Cadmium Uncontrolled Sources

Testing of the uncontrolled sources in the WWTF collection system was conducted to determine the site-specific pollutant cadmium concentration. The testing occurred in December of 2010 (Appendix D). Testing results of the uncontrolled sources cadmium concentration was reported to be less than the detection limit of 4 ug/L. Use of half the detection limit would result in an uncontrolled sources cadmium concentration of 2 ug/L. The WWTF regularly tests for cadmium in the raw influent. The concentration of cadmium in the raw influent averaged 0.92 ug/L between 1/1/2007 and 9/30/2010. For the local limits evaluation, the average concentration of cadmium in the raw influent was used as the uncontrolled sources concentration.

M_{UNC} = Loading from uncontrolled sources (domestic, commercial, I+I) $M_{UNC} = C_{UNC} * Q_{UNC} * 8.34$

$M_{UNC} = 0.00092_{\ mg/L} * 6.53_{\ MGD} * 8.34$

$M_{UNC} = 0.050_{\ lb/day}$

6.2.2.8 Cadmium Maximum Allowable Industrial Loading (MAIL) with Safety Factor

$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - (Q_{FBW} * C_{FBW} * 8.34) - (Q_{COOL} * C_{COOL} * 8.34) - (Q_{GTMW} * C_{GTMW} * 8.34) - M_{UNC}$

$MAIL = 0.39_{\ lb/d} * (1\text{-}0.10) - (0.40_{\ MGD} * 0.00066_{\ mg/L} * 8.34) - (1.874_{MGD} * 0.00066_{\ mg/L} * 8.34) - (0.561_{MGD} * .002_{\ mg/L} * 8.34) - 0.050_{\ lb/day}$

$MAIL = 0.29_{\ lb/d}$

6.2.2.9 Cadmium Uniform Limits For All Controlled Discharger

$C_{SIU} = MAIL / (Q_{INC} + (Q_{GTO} - Q_{GTMW}) + Q_{SIU}) / 8.34$

$C_{SIU} = 0.29_{\ lb/day} / (0.066_{MGD} + (0.91_{MGD} - 0.561_{MGD}) + 0.21_{MGD}) / 8.34 = 0.055_{\ mg/L}$

6.2.2.10 Cadmium RIDEM Best Available Technology Limits

RIDEM Office of Water Resources (OWR) local limit development policy requires adoption of "best available technology" limits. OWR considers the EPA categorical limits for metal finishing (40 CRF 433.17) to be the "best available technology" limits. As such, no final local limits may exceed the limits found in 40 CFR 433.17. For cadmium, the daily maximum limit is 0.11 mg/l.

It is recommended that the local limit for cadmium be changed to 0.055 mg/l and implemented as a daily maximum as recommended in Section 6.4.1 of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F).

6.2.3 CHROMIUM

6.2.3.1 Chromium Water Quality Criteria

Chromium does not have an effluent limitation under the current Woonsocket WWTF RIPDES permit. Therefore, RIDEM Water Quality Criteria was used to determine effluent chromium water quality limits. Source information for the Water Quality Criteria is *Woonsocket WWTF Permit Development Document, Appendix A: Calculation of Allowable Acute and Chronic Discharge Limitations Based on Freshwater Aquatic Life Criteria and Human Health Criteria* (Appendix K). The more stringent criteria for chromium VI were as the total chromium criteria.

66.74 ug/L - Daily Maximum Effluent Limit

46.84 ug/L - Monthly Average Effluent Limit

6.2.3.2 Chromium Inhibition Criteria

Site specific chromium inhibition criteria for the WWTF could not be determined with the available data, therefore EPA literature values for typical POTW chromium removal efficiencies were used instead. Source information for inhibition of activated sludge and nitrification is Appendix G of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F of this report).

50 mg/L - Chromium inhibition level for activated sludge

1 mg/L - Chromium inhibition level for nitrification

6.2.3.3 Chromium Woonsocket WWTF Removal Efficiency

A review of the available WWTF supplemental sampling data (Appendix B) indicated there is adequate data to determine the site specific chromium removal efficiencies at the WWTF.

- Primary influent pollutant concentration (C_{POTW}) was reported to be 11.6 ug/L.
- Primary effluent pollutant concentration (C_{PEFF}) was reported to be 3.0 ug/L.
- Final Effluent pollutant concentration (C_{EFF}) was reported to 1.4 ug/L.

R_{PC} = Removal efficiency from headworks to primary treatment, as decimal.
$R_{PC} = (C_{POTW}-C_{PEFF})/(C_{POTW})$
$R_{PC} = (11.6\ _{ug/L}-3.0\ _{ug/L})/(11.6\ _{ug/L}) = 0.74$

R_{BP} = Plant removal efficiency from headworks to final effluent, as decimal.
$R_{BP}= (C_{POTW}-C_{PEFF})/(C_{POTW})$
$R_{BP} =(11.6_{ug/L}-1.4\ _{ug/L})/(11.6_{ug/L}) = 0.88$

For comparison purposes, EPA literature values for typical POTW chromium removal efficiencies are listed below. Source information for removal efficiencies is Appendix R of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F of this report).

EPA Chromium Pollutant Removal Efficiencies (%):

27% - Median Primary Treatment removal efficiency, R_{PC}

82% - Median Activated Sludge Treatment removal efficiency, R_{SC}

72% - Median Tertiary Treatment removal efficiency, R_{TT}

The overall WWTF removal efficiency, $R_{BP,}$ used in this local limits evaluation was 88%.

6.2.3.4 Chromium Allowable Headworks Loading (AHL_{POTW}) w/o Safety Factor

(1) Daily Max Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.06674\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.88] = 46.33\ _{lb/day}$

(2) Monthly Average Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.04688\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.88] = 32.51\ _{lb/day}$

(3) For Activated Sludge Inhibition:

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 - R_{PC}, \%/100)$
$AHL_{POTW} = [50\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.74] = 16{,}018.41\ _{lb/day}$

(4) For Nitrification Inhibition:

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 - R_{PC}, \%/100)$
$AHL_{POTW} = [1.0\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.74] = 320.37\ _{lb/day}$

(5) For Sludge Incineration:

$AHL_{POTW} = C_{MAX\ DS} * [Q_{PS} * TSS_{PS} * CF + Q_{WAS} * TSS_{WAS} * CF] / (R_{BP}, \%/100) / 1{,}000{,}000$

Where: C_{MAXDS} = 6357 mg/dry Kg (Synagro letter re: Wright Pierce Request for Sludge Quality Effects on Air Emissions, Woodard & Curran, 11/5/10 – Appendix L)

AHL_{POTW} = 6357 $_{mg/dry\ Kg}$ *[0.090 $_{MGD}$ * 9,800 $_{mg/L}$*8.34 + 0.080 $_{MGD}$ * 15,000 $_{mg/L}$* 8.34] / 0.88 /1,000,000

AHL_{POTW}= 125.46 lb/d

6.2.3.5 Chromium Maximum Allowable Headworks Loading (MAHL)

The most stringent AHL based on the Monthly Average Effluent Quality Limit was chosen as the $MAHL_{POTW}$ for chromium at 32.51 lb/day

6.2.3.6 Chromium Safety Factor

A safety factor of 10% was used in the development of this local limit.

6.2.3.7 Chromium Uncontrolled Sources

Testing of the uncontrolled sources in the WWTF collection system was conducted to determine the site-specific pollutant chromium concentration. The testing occurred in December of 2010 (Appendix D). All but one of the 17 samples were reported to be below the chromium detection limit of 5 ug/L, with one sample reported to be 14.8 ug/L. For determination of the uncontrolled sources chromium concentration, samples that were reported to be below the chromium detection limit were replaced with a value of one-half of the chromium detection limit or 2.5 ug/L for each instance. For the local limits evaluation, the average uncontrolled sources chromium concentration of 3 ug/L was used.

M_{UNC} = Loading from uncontrolled sources (domestic, commercial, I+I) $M_{UNC} = C_{UNC} * Q_{UNC} * 8.34$
$M_{UNC} = 0.003_{mg/L} * 6.53_{MGD} * 8.34$
$M_{UNC} = 0.16_{lb/day}$

6.2.3.8 Chromium Maximum Allowable Industrial Loading (MAIL) with Safety Factor

$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - (Q_{FBW} * C_{FBW} * 8.34) - (Q_{COOL} * C_{COOL} * 8.34) - (Q_{GTMW} * C_{GTMW} * 8.34) - M_{UNC}$
$MAIL = 32.5_{lb/d} * (1\text{-}0.10) - (0.40_{MGD} * 0.047_{mg/L} * 8.34) - (1.874_{MGD} * 0.047_{mg/L} * 8.34) - (0.561_{MGD} * 0.047_{mg/L} * 8.34) - 0.16_{lb/day}$
$MAIL = 27.99_{lb/d}$

6.2.3.9 Chromium Uniform Limits For All Controlled Discharger

$C_{SIU} = MAIL / (Q_{INC} + (Q_{GTO} - Q_{GTMW}) + Q_{SIU}) / 8.34$
$C_{SIU} = 27.99_{lb/day} / (0.066_{MGD} + (0.91_{MGD} - 0.561_{MGD}) + 0.21_{MGD}) / 8.34 = 5.354_{mg/L}$

6.2.3.10 Chromium RIDEM Best Available Technology Limits

RIDEM Office of Water Resources (OWR) local limit development policy requires adoption of “best available technology” limits. OWR considers the EPA categorical limits for metal finishing (40 CRF 433.17) to be the “best available technology” limits. As such, no final local limits may exceed the limits found in 40 CFR 433.17. For chromium, the daily maximum limit is 2.77 mg/l.

It is recommended that the local limit for chromium be set at 2.77 mg/l and implemented as a daily maximum as recommended in Section 6.4.1 of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F).

6.2.4 COPPER

6.2.4.1 Copper Water Quality Criteria

Copper has an effluent limitation under the current Woonsocket WWTF RIPDES permit (Appendix H).

29.84 ug/L - Daily Maximum Effluent Limit

21.13 ug/L - Monthly Average Effluent Limit

6.2.4.2 Copper Inhibition Criteria

Site specific copper inhibition criteria for the WWTF could not be determined with the available data, therefore EPA literature values for typical POTW copper removal efficiencies were used instead. Source information for copper inhibition of activated sludge and nitrification is Appendix G of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F of this report).

1.0 mg/L - Copper inhibition level for activated sludge

0.25 mg/L - Copper inhibition level for nitrification

6.2.4.3 Copper Woonsocket WWTF Removal Efficiency

A review of the available WWTF supplemental sampling data (Appendix B) indicated there is adequate data to determine the site specific copper removal efficiencies at the WWTF.

- Primary influent pollutant concentration (C_{POTW}) was reported to be 101.2 ug/L.
- Primary effluent pollutant concentration (C_{PEF}) was reported to be 32 ug/L.
- Final Effluent pollutant concentration (C_{EFF}) was reported to 7.2 ug/L.

R_{PC} = Removal efficiency from headworks to primary treatment, as decimal.
$R_{PC}=(C_{POTW}-C_{PEF})/(C_{POTW})$
$R_{PC}=(101.2_{ug/L}-32.0_{ug/L})/(101.2_{ug/L}) = 0.68$

R_{BP} = Plant removal efficiency from headworks to final effluent, as decimal.
$R_{BP}=(C_{POTW}-C_{EFF})/(C_{POTW})$
$R_{BP}=(101.2_{ug/L}-7.2_{ug/L})/(101.2_{ug/L}) = 0.93$

For comparison purposes, EPA literature values for typical POTW copper removal efficiencies are listed below. Source information for removal efficiencies is Appendix R of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F of this report).

EPA Copper Pollutant Removal Efficiencies (%):

22% - Median through Primary Treatment, R_{PC}

86% - Median value through Activated Sludge Treatment, R_{SC}

85% - Median value through Tertiary Treatment, R_{TT}

6.2.4.4 Copper Allowable Headworks Loading (AHL_{POTW}) w/o Safety Factor

(1) Daily Max Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.02984\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.93] = 35.51\ _{lb/day}$

(2) Monthly Average Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.02113\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.93] = 25.14\ _{lb/day}$

(3) For Activated Sludge Inhibition:

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 – R_{PC}, \%/100)$
$AHL_{POTW} = [1.0\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.68] = 260.30\ _{lb/day}$

(4) For Nitrification Inhibition:

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 – R_{PC}, \%/100)$
$AHL_{POTW} = [0.25\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.68] = 65.07\ _{lb/day}$

(5) For Sludge Incineration:

Not Applicable

6.2.4.5 Copper Maximum Allowable Headworks Loading (MAHL)

The most stringent AHL based on the Monthly Average Effluent Quality Limit was chosen as the $MAHL_{POTW}$ for copper at 25.14 lb/day

6.2.4.6 Copper Safety Factor

A safety factor of 10% was used in the development of this local limit.

6.2.4.7 Copper Uncontrolled Sources

Testing of the uncontrolled sources in the WWTF collection system was conducted to determine the site-specific pollutant copper concentration. The testing occurred in

December of 2010 (Appendix D). The uncontrolled sources copper concentration based on the testing was reported to be 57 ug/L.

M_{UNC} = Loading from uncontrolled sources (domestic, commercial, I+I) $M_{UNC} = C_{UNC} * Q_{UNC} * 8.34$
$M_{UNC} = 0.046_{mg/L} * 6.53_{MGD} * 8.34$
$M_{UNC} = 2.50_{lb/day}$

6.2.4.8 Copper Maximum Allowable Industrial Loading (MAIL) with Safety Factor

$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - (Q_{FBW} * C_{FBW} * 8.34) - (Q_{COOL} * C_{COOL} * 8.34) - (Q_{GTMW} * C_{GTMW} * 8.34) - M_{UNC}$
$MAIL = 25.14_{lb/d} * (1\text{-}0.10) - (0.40_{MGD} * 0.021_{mg/L} * 8.34) - (1.874_{MGD} * 0.0211_{mg/L} * 8.34) - (0.561_{MGD} * 0.021_{mg/L} * 8.34) - 2.50_{lb/day}$
$MAIL = 19.63_{lb/d}$

6.2.4.9 Copper Uniform Limits For All Controlled Discharger

$C_{SIU} = MAIL / (Q_{INC} + (Q_{GTO} - Q_{GTMW}) + Q_{SIU}) / 8.34$
$C_{SIU} = 19.63_{lb/day} / (0.066_{MGD} + (0.91_{MGD} - 0.561_{MGD}) + 0.21_{MGD}) / 8.34 = 3.754_{mg/L}$

6.2.4.10 Copper RIDEM Best Available Technology Limits

RIDEM Office of Water Resources (OWR) local limit development policy requires adoption of "best available technology" limits. OWR considers the EPA categorical limits for metal finishing (40 CRF 433.17) to be the "best available technology" limits. As such, no final local limits may exceed the limits found in 40 CFR 433.17. For copper, the daily maximum limit is 3.38 mg/l.

It is recommended that the local limit for copper be set at 3.38 mg/l and implemented as a daily maximum as recommended in Section 6.4.1 of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F of this report).

6.2.5 LEAD

6.2.5.1 Lead Water Quality Criteria

Lead has an effluent limitation under the current Woonsocket WWTF RIPDES permit (Appendix H).

138.38 ug/L - Daily Maximum Effluent Limit

5.39 ug/L - Monthly Average Effluent Limit

6.2.5.2 Lead Inhibition Criteria

Site specific lead inhibition criteria for the WWTF could not be determined with the available data, therefore EPA literature values for typical POTW lead removal efficiencies were used instead. Source information for lead inhibition of activated sludge and nitrification is Appendix G of the *EPA Local Limits Development Guidance* document, July 2004 *(Appendix F of this report)*.

30.0 mg/L - Lead inhibition level for activated sludge

0.5 mg/L - Lead inhibition level for nitrification

6.2.5.3 Lead Woonsocket WWTF Removal Efficiency

A review of the available WWTF supplemental sampling data (Appendix B) indicated the following:

- Primary influent pollutant concentrations (C_{POTW}) were reported to be 40.6 ug/L with 2 of the 3 samples less than the lead detection limit of 40 ug/L.
- Primary effluent pollutant concentrations (C_{PEFF}) were reported to be 2.2 ug/L.
- Final effluent pollutant concentrations (C_{EFF}) were reported to be 1.1 ug/L with 5 of the 6 samples less than the lead detection limit of 1.0 ug/L.

Site-specific lead removal efficiencies for the WWTF could not be determined with the available data and low influent lead concentrations, therefore EPA literature values for typical POTW lead removal efficiencies were used instead. Source information for lead removal efficiencies is Appendix R of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F of this report). The overall WWTF removal efficiency was determined from the individual process removal efficiencies.

EPA Lead Pollutant Removal Efficiencies (%):

57% - Median Primary Treatment removal efficiency, R_{PC}

61% - Median Activated Sludge Treatment removal efficiency, R_{SC}

52% - Median Tertiary Treatment removal efficiency, R_{TT}

The overall WWTF lead removal efficiency, $R_{BP,}$ used in this local limits evaluation was 92%.

6.2.5.4 Lead Allowable Headworks Loading (AHL_{POTW}) w/o Safety Factor

(1) Daily Max Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.13839\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.92] = 144.08\ _{lb/day}$

(2) Monthly Average Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.00539\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.92] = 5.61\ _{lb/day}$

(3) For Activated Sludge Inhibition:

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 - R_{PC}, \%/100)$
$AHL_{POTW} = [30\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.57] = 5811.33\ _{lb/day}$

(4) For Nitrification Inhibition:

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 - R_{PC}, \%/100)$
$AHL_{POTW} = [0.5\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.57] = 96.86\ _{lb/day}$

(5) For Sludge Incineration:

$AHL_{POTW} = C_{MAX\ DS} * [Q_{PS} * TSS_{PS} * CF + Q_{WAS} * TSS_{WAS} * CF] / (R_{BP}, \%/100) / 1{,}000{,}000$

Where: C_{MAXDS} = 2,211 mg/dry Kg (Synagro letter re: Wright Pierce Request for Sludge Quality Effects on Air Emissions, Woodard & Curran, 11/5/10 – Appendix L)

$AHL_{POTW} = 2211\ _{mg/dry\ Kg} * [0.090\ _{MGD} * 9{,}800\ _{mg/L} * 8.34 + 0.080\ _{MGD} * 15{,}000\ _{mg/L} * 8.34] / 0.92 / 1{,}000{,}000$

AHL_{POTW}= 41.74 lb/d

6.2.5.5 Lead Maximum Allowable Headworks Loading ($MAHL_{POTW}$*)*

The most stringent AHL based on the Monthly Average Effluent Quality Limit was chosen as the $MAHL_{POTW}$ for lead at 5.61 $_{lb/day}$.

6.2.5.6 Lead Safety Factor

A safety factor of 10% was used in the development of this local limit.

6.2.5.7 Lead Uncontrolled Sources

Testing of the uncontrolled sources in the WWTF collection system was conducted to determine the site-specific pollutant lead concentration. The testing occurred in December of 2010 (Appendix D). The uncontrolled sources lead concentration, based on the testing was reported to be less than lead detection limit of 40 ug/L except for one sample (1of 17 total samples) that had a reported lead concentration of 54 ug/L. The WWTF does regularly test for lead in the raw influent. The concentration of lead in the raw influent averaged 4.39 ug/L between 1/1/2007 and 9/30/2010. This concentration was used for determining the uncontrolled sources concentration to the WWTF.

M_{UNC} = Loading from uncontrolled sources (domestic, commercial, I+I) $M_{UNC} = C_{UNC} * Q_{UNC} * 8.34$

$M_{UNC} = 0.0044_{\ mg/L} * 6.53_{\ MGD} * 8.34$

$M_{UNC} = 0.24_{\ lb/day}$

6.2.5.8 Lead Maximum Allowable Industrial Loading (MAIL) with Safety Factor

$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - (Q_{FBW} * C_{FBW} * 8.34) - (Q_{COOL} * C_{COOL} * 8.34) - (Q_{GTMW} * C_{GTMW} * 8.34) - M_{UNC}$

$MAIL = 5.6_{\ lb/d} * (1\text{-}0.10) - (0.40_{\ MGD} * 0.005_{\ mg/L} * 8.34) - (1.874_{\ MGD} * 0.005_{\ mg/L} * 8.34) - (0.561_{\ MGD} * 0.005_{\ mg/L} * 8.34) - 0.24_{\ lb/day}$

$MAIL = 4.68_{\ lb/d}$

6.2.5.9 Lead Uniform Limits For All Controlled Discharger

$C_{SIU} = MAIL / (Q_{INC} + (Q_{GTO} - Q_{GTMW}) + Q_{SIU}) / 8.34$

$C_{SIU} = 4.68_{\ lb/day} / (0.066_{MGD} + (0.91_{MGD} - 0.561_{MGD}) + 0.21_{MGD}) / 8.34 = 0.896_{\ mg/L}$

6.2.5.10 Lead RIDEM Best Available Technology Limits

RIDEM Office of Water Resources (OWR) local limit development policy requires adoption of "best available technology" limits. OWR considers the EPA categorical limits for metal finishing (40 CRF 433.17) to be the "best available technology" limits. As such, no final local limits may exceed the limits found in 40 CFR 433.17. For lead, the daily maximum limit is 0.69 mg/l.

It is recommended that the local limit for lead be set at 0.69 mg/l and implemented as a daily maximum as recommended in Section 6.4.1 of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F).

6.2.6 MERCURY

6.2.6.1 Mercury Water Quality Criteria

Mercury does not have an effluent limitation under the current Woonsocket WWTF RIPDES permit (Appendix H). Therefore, RIDEM Water Quality Criteria was used to determine effluent water quality limits. Source information for the Water Quality Criteria is *Woonsocket WWTF Permit Development Document, Appendix A: Calculation of Allowable Acute and Chronic Discharge Limitations Based on Freshwater Aquatic Life Criteria and Human Health Criteria* (Appendix K).

6.75 ug/L - Daily Maximum Effluent Limit

0.91 ug/L - Monthly Average Effluent Limit

6.2.6.2 Mercury Inhibition Criteria

Site specific mercury inhibition criteria for the WWTF could not be determined with the available data, therefore EPA literature values for typical POTW mercury removal efficiencies were used instead. Source information for inhibition of activated sludge and nitrification is Appendix G of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F of this report).

0.5 mg/L - Mercury inhibition level for activated sludge

Not applicable - Mercury inhibition level for nitrification

6.2.6.3 Mercury Woonsocket WWTF Removal Efficiency

A review of the available WWTF supplemental sampling data (Appendix B) indicated the following:

- Primary influent pollutant concentration (C_{POTW}) was reported to be 0.29 ug/L with 4 of the 8 samples less than the mercury detection limit.
- Primary effluent pollutant concentration (C_{PEFF}) was reported to be 0.14 ug/L with 7 of the 8 samples less than the mercury detection limit.
- Final Effluent pollutant concentration (C_{EFF}) was reported to 0.11 ug/L with 7 of the 8 samples less than the mercury detection limit.

Site-specific mercury removal efficiencies for the WWTF could not be determined with the available data and low influent mercury concentrations, therefore EPA literature values for typical POTW mercury removal efficiencies were used instead. Source information for mercury removal efficiencies is Appendix R of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F of this report). The overall WWTF removal efficiency was determined from the individual

process removal efficiencies.

EPA Pollutant Removal Efficiencies (%):

10% - Median through Primary Treatment, R_{PC}

60% - Median value through Activated Sludge Treatment, R_{SC}

67% - Median value through Tertiary Treatment, R_{TT}

The overall WWTF mercury removal efficiency, $R_{BP,}$ used in this local limits evaluation was 88%.

6.2.6.4 Mercury Allowable Headworks Loading (AHL_{POTW}) w/o Safety Factor

(1) Daily Max Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.00675\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.88] = 4.69\ _{lb/day}$

(2) Monthly Average Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.00019\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.88] = 0.63\ _{lb/day}$

(3) For Activated Sludge Inhibition:

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 – R_{PC}, \%/100)$
$AHL_{POTW} = [0.5\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.10] = 46.28\ _{lb/day}$

(4) For Nitrification Inhibition:
Not Applicable

(5) For Sludge Incineration:

$AHL_{POTW} = C_{MAX\ DS} * [Q_{PS} * TSS_{PS} * CF + Q_{WAS} * TSS_{WAS} * CF] / (R_{BP}, \%/100) / 1{,}000{,}000$

Where: C_{MAXDS} = 3,372 mg/dry Kg (Synagro letter re: Wright Pierce Request for Sludge Quality Effects on Air Emissions, Woodard & Curran, 11/5/10 – Appendix L)

$AHL_{POTW} = 3{,}372\ _{mg/dry\ Kg} * [0.090\ _{MGD} * 9{,}800\ _{mg/L} * 8.34 + 0.080\ _{MGD} * 15{,}000\ _{mg/L} * 8.34] / 0.88 / 1{,}000{,}000$

AHL_{POTW}= 66.55 lb/d

6.2.6.5 Mercury Maximum Allowable Headworks Loading (MAHL)

The most stringent AHL based on the Monthly Average Effluent Quality Limit was chosen as the $MAHL_{POTW}$ for mercury at 0.63 lb/day.

6.2.6.6 Mercury Safety Factor

A safety factor of 10% was used in the development of this local limit.

6.2.6.7 Mercury Uncontrolled Sources

Testing of the uncontrolled sources in the WWTF collection system was conducted to determine the site-specific pollutant mercury concentration for 17 samples. The testing occurred in December of 2010 (Appendix D). There were two different testing methods used for establishing the mercury concentration. The mercury concentration, based on the testing for the first protocol was reported to be below this method's detection limit of 0.5 ug/L for the 8 samples tested. The mercury concentration, based on the testing for the second protocol was reported to be below this method's detection limit of 0.2 ug/L for the 9 samples tested. For determination of the average uncontrolled sources concentration, all samples were reported to be below the detection limit of their respective testing protocol and were, therefore, replaced with a value of one-half of the detection limit for each instance and then averaged. The uncontrolled sources mercury concentration used in this evaluation was 0.17 ug/L.

M_{UNC} = Loading from uncontrolled sources (domestic, commercial, I+I)
$M_{UNC} = C_{UNC} * Q_{UNC} * 8.34$
$M_{UNC} = 0.00017_{\ mg/L} * 6.53_{\ MGD} * 8.34$
$M_{UNC} = 0.009_{\ lb/day}$

6.2.6.8 Mercury Maximum Allowable Industrial Loading (MAIL) with Safety Factor

$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - (Q_{FBW} * C_{FBW} * 8.34) - (Q_{COOL} * C_{COOL} * 8.34) - (Q_{GTMW} * C_{GTMW} * 8.34) - M_{UNC}$
$MAIL = 0.63_{\ lb/d} * (1\text{-}0.10) - (0.40_{\ MGD} * 0.0009_{\ mg/L} * 8.34) - (1.874_{\ MGD} * 0.0009_{\ mg/L} * 8.34) - (0.561_{\ MGD} * 0.0009_{\ mg/L} * 8.34) - 0.009_{\ lb/day}$
$MAIL = 0.54_{\ lb/d}$

6.2.6.9 Mercury Uniform Limits For All Controlled Discharger

$C_{SIU} = MAIL / (Q_{INC} + (Q_{GTO} - Q_{GTMW}) + Q_{SIU}) / 8.34$
$C_{SIU} = 0.54_{\ lb/day} / (0.066_{MGD} + (0.91_{MGD} - 0.561_{MGD}) + 0.21_{MGD}) / 8.34 = 0.103_{\ mg/L}$

6.2.6.10 Mercury RIDEM Best Available Technology Limits

RIDEM Office of Water Resources (OWR) local limit development policy requires adoption of “best available technology” limits. OWR considers the EPA categorical limits for metal finishing (40 CRF 433.17) to be the “best available technology” limits. As such, no final local limits may exceed the limits found in 40 CFR 433.17. 40 CFR 433.17 does not have a limit for mercury.

Mercury is known to be a highly toxic metal in many chemical forms and has considerable potential for bioaccumulation within the environment. The City recognizes that the calculated local limit for mercury is high relative to the recorded levels of mercury in the raw influent to the plant which typically are below a detection limit of 0.2 ug/l. In response to these concerns, the City has chosen to set a more restrictive local limit for mercury. In the process of setting a more restrictive local limit, the recorded levels of mercury in the return flow from the sludge disposal facility were also reviewed. The maximum recorded concentration of mercury in the sludge disposal facility return flows was 0.77 ug/L, or 0.00077 mg/L (Appendix B). Considering the City's desire to prevent increases in mercury discharges in the future, it is recommended that the local limit for mercury be set to the typical wastewater average concentration of 0.002 mg/l as identified in Appendix V of the EPA Local Limits Development Guidance document, July 2004 (Appendix F of this report).

6.2.7 NICKEL

6.2.7.1 Nickel Water Quality Criteria

Nickel does not have an effluent limitation under the current Woonsocket WWTF RIPDES permit (Appendix H). Therefore, RIDEM Water Quality Criteria was used to determine effluent water quality limits. Source information for the Water Quality Criteria is *Woonsocket WWTF Permit Development Document, Appendix A: Calculation of Allowable Acute and Chronic Discharge Limitations Based on Freshwater Aquatic Life Criteria and Human Health Criteria* (Appendix K).

1069.11 ug/L - Daily Maximum Effluent Limit

118.86 ug/L - Monthly Average Effluent Limit

6.2.7.2 Nickel Inhibition Criteria

Site specific nickel inhibition criteria for the WWTF could not be determined with the available data, therefore EPA literature values for typical POTW nickel removal efficiencies were used instead. Source information for nickel inhibition of activated sludge and nitrification is Appendix G of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F of this report).

3.0 mg/L - Nickel inhibition level for activated sludge

2.5 mg/L - Nickel inhibition level for nitrification

6.2.7.3 Nickel Woonsocket WWTF Removal Efficiency

A review of the available WWTF supplemental sampling data (Appendix B) indicated there is adequate data to determine the site specific nickel removal efficiencies at the WWTF.

- Primary influent pollutant concentration (C_{POTW}) was reported to be 14.9 ug/L.
- Primary effluent pollutant concentration (C_{PEFF}) was reported to be 7.4 ug/L.
- Final Effluent pollutant concentration (C_{EFF}) was reported to 5 ug/L.

R_{PC} = Removal efficiency from headworks to primary treatment, as decimal.
$R_{PC}=(C_{POTW} - C_{PEFF})/(C_{POTW})$
$R_{PC}= (14.9_{ug/L}-7.4_{ug/L})/(14.9_{ug/L}) = 0.50$

R_{BP} = Plant removal efficiency from headworks to final effluent, as decimal.
$R_{BP} =(C_{POTW} - C_{EFF})/(C_{POTW})$
$R_{BP}=(14.9_{ug/L}-5.0_{ug/L})/(14.9_{ug/L}) = 0.66$

For comparison purposes, EPA literature values for typical POTW nickel removal efficiencies are listed below. Source information for removal efficiencies is Appendix

R of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F of this report).

EPA Nickel Pollutant Removal Efficiencies (%):

14% - Median through Primary Treatment, R_{PC}

42% - Median value through Activated Sludge Treatment, R_{SC}

17% - Median value through Tertiary Treatment, R_{TT}

6.2.7.4 Nickel Allowable Headworks Loading (AHL_{POTW}) w/o Safety Factor

(1) Daily Max Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [1.06911\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.66] = 261.92\ _{lb/day}$

(2) Monthly Average Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.11886\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.66] = 29.12\ _{lb/day}$

(3) For Activated Sludge Inhibition:

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 - R_{PC}, \%/100)$
$AHL_{POTW} = [3.0\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.50] = 499.77\ _{lb/day}$

(4) For Nitrification Inhibition:

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 - R_{PC}, \%/100)$
$AHL_{POTW} = [2.5\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.50] = 416.48\ _{lb/day}$

(5) For Sludge Incineration:

$AHL_{POTW} = C_{MAX\ DS} * [Q_{PS} * TSS_{PS} * CF + Q_{WAS} * TSS_{WAS} * CF] / (R_{BP}, \%/100) / 1{,}000{,}000$

Where: C_{MAXDS} = 55,281 mg/dry kg (Synagro letter re: Wright Pierce Request for Sludge Quality Effects on Air Emissions, Woodard & Curran, 11/5/10 – Appendix L)

$AHL_{POTW} = 55{,}281\ _{mg/dry\ Kg} * [0.090\ _{MGD} * 9{,}800\ _{mg/L} * 8.34 + 0.080\ _{MGD} * 15{,}000\ _{mg/L} * 8.34] / 0.66 / 1{,}000{,}000$

AHL_{POTW}= 1,454.62 lb/d

6.2.7.5 Nickel Maximum Allowable Headworks Loading (MAHL)

The most stringent AHL based on the Monthly Average Effluent Quality Limit was chosen as the $MAHL_{POTW}$ for nickel at 29.12 lb/day.

6.2.7.6 Nickel Safety Factor

A safety factor of 10% was used in the development of this local limit.

6.2.7.7 Nickel Uncontrolled Sources

Testing of the uncontrolled sources in the WWTF collection system was conducted to determine the site-specific pollutant concentration. The testing occurred in December of 2010 (Appendix D). The uncontrolled sources concentration, based on the testing was reported to be below the nickel detection limit of 5.0 ug/L for 7 of the 17 samples and below the nickel detection limit of 0.2 ug/L for 8 of the 17 samples. For determination of the uncontrolled sources concentration, samples that were reported to be below the nickel detection limit were replace with a value of one-half of the nickel detection limit for each instance. The uncontrolled sources nickel concentration used in this evaluation was 4 ug/L.

M_{UNC} = Loading from uncontrolled sources (domestic, commercial, I+I)

$M_{UNC} = C_{UNC} * Q_{UNC} * 8.34$

$M_{UNC} = 0.004_{\ mg/L} * 6.53_{\ MGD} * 8.34$

$M_{UNC} = 0.22_{\ lb/day}$

6.2.7.8 Nickel Maximum Allowable Industrial Loading (MAIL) with Safety Factor

$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - (Q_{FBW} * C_{FBW} * 8.34) - (Q_{COOL} * C_{COOL} * 8.34) - (Q_{GTMW} * C_{GTMW} * 8.34) - M_{UNC}$

$MAIL = 29.1_{\ lb/d} * (1\text{-}0.10) - (0.40_{\ MGD} * 0.119_{\ mg/L} * 8.34) - (1.874_{\ MGD} * 0.119_{\ mg/L} * 8.34) - (0.561_{\ MGD} * 0.119_{\ mg/L} * 8.34) - 0.22_{\ lb/day}$

$MAIL = 23.18_{\ lb/d}$

6.2.7.9 Nickel Uniform Limits For All Controlled Discharger

$C_{SIU} = MAIL / (Q_{INC} + (Q_{GTO} - Q_{GTMW}) + Q_{SIU}) / 8.34$

$C_{SIU} = 23.18_{lb/day} / (0.066_{MGD} + (0.91_{MGD} - 0.561_{MGD}) + 0.21_{MGD}) / 8.34 = 4.433$ mg/L

6.2.7.10 Nickel RIDEM Best Available Technology Limits

RIDEM Office of Water Resources (OWR) local limit development policy requires adoption of "best available technology" limits. OWR considers the EPA categorical limits for metal finishing (40 CRF 433.17) to be the "best available technology" limits. As

such, no final local limits may exceed the limits found in 40 CFR 433.17. For nickel, the daily maximum limit is 3.98 mg/l.

It is recommended that the local limit for nickel be set at 3.98 mg/l and implemented as a daily maximum as recommended in Section 6.4.1 of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F).

6.2.8 SILVER

6.2.8.1 Silver Water Quality Criteria

Silver does not have an effluent limitation under the current Woonsocket WWTF RIPDES permit (Appendix H). Therefore, RIDEM Water Quality Criteria was used to determine effluent water quality limits. Source information for the Water Quality Criteria is *Woonsocket WWTF Permit Development Document, Appendix A: Calculation of Allowable Acute and Chronic Discharge Limitations Based on Freshwater Aquatic Life Criteria and Human Health Criteria* (Appendix K).

5.05 ug/L - Daily Maximum Effluent Limit

5.05 ug/L - Monthly Average Effluent Limit

6.2.8.2 Silver Inhibition Criteria

Not Applicable - Silver inhibition level for activated sludge

Not Applicable - Silver inhibition level for nitrification

6.2.8.3 Silver Woonsocket WWTF Removal Efficiency

A review of the available WWTF supplemental sampling data (Appendix B) indicated there is adequate data to determine the site specific silver removal efficiencies at the WWTF.

- Primary influent pollutant concentration (C_{POTW}) was reported to be 4.66 ug/L.
- Final Effluent pollutant concentration (C_{EFF}) was reported to 1.15 ug/L.

R_{BP} = Plant removal efficiency from headworks to plant effluent, as decimal.
$R_{BP} = (C_{POTW} - C_{EFF})/(C_{POTW})$
$R_{BP} = (4.66_{ug/L} - 1.15_{ug/L})/(4.66_{ug/L}) = 0.75$

For comparison purposes, EPA literature values for typical POTW silver removal efficiencies are listed below. Source information for removal efficiencies is Appendix R of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F of this report).

EPA Silver Pollutant Removal Efficiencies (%):

20% - Median through Primary Treatment, R_{PC}

75% - Median value through Activated Sludge Treatment, R_{SC}

62% - Median value through Tertiary Treatment, R_{TT}

The overall WWTF silver removal efficiency, $R_{BP,}$ used in this local limits evaluation was 75%.

6.2.8.4 Silver Allowable Headworks Loading (AHL_{POTW}) w/o Safety Factor

(1) Daily Max Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.0051\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.75] = 1.68\ _{lb/day}$

(2) Monthly Average Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.0051\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.75] = 1.68\ _{lb/day}$

(3) For Activated Sludge Inhibition:
Not Applicable

(4) For Nitrification Inhibition:
Not Applicable

(5) For Sludge Incineration:
Not Applicable

6.2.8.5 Silver Maximum Allowable Headworks Loading ($MAHL_{POTW}$*)*

The most stringent AHL based on the Daily Average Effluent Quality Limit was chosen as the $MAHL_{POTW}$ for silver at 1.68 $_{lb/day.}$

6.2.8.6 Silver Safety Factor

A safety factor of 10% was used in the development of this local limit.

6.2.8.7 Silver Uncontrolled Sources

Testing of the uncontrolled sources in the WWTF collection system was conducted to determine the site-specific pollutant silver concentration. The testing occurred in December of 2010 (Appendix D). All but one of the 17 samples were reported to be below the silver detection limits of 10 ug/L or 20 ug/L (depending on test), with one sample reported to be 13.0 ug/L. Use of one-half the silver detection limit would result in an uncontrolled sources concentration of 7.8 ug/L.

M_{UNC} = Loading from uncontrolled sources (domestic, commercial, I+I)
$M_{UNC} = C_{UNC} * Q_{UNC} * 8.34$
$M_{UNC} = 0.0078\ _{mg/L} * 6.53\ _{MGD} * 8.34$
$M_{UNC} = 0.42\ _{lb/day}$

6.2.8.8 Silver Maximum Allowable Industrial Loading (MAIL) with Safety Factor

$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - (Q_{FBW} * C_{FBW} * 8.34) - (Q_{COOL} * C_{COOL} * 8.34) - (Q_{GTMW} * C_{GTMW} * 8.34) - M_{UNC}$

$MAIL = 1.71\ _{lb/d} * (1\text{-}0.10) - (0.40\ _{MGD} * 0.0051\ _{mg/L} * 8.34) - (1.874\ _{MGD} * 0.0051\ _{mg/L} * 8.34) - (0.561\ _{MGD} * 0.0051\ _{mg/L} * 8.34) - 0.42\ _{lb/day}$

$MAIL = 0.97\ _{lb/day}$

6.2.8.9 Silver Uniform Limits For All Controlled Discharger

$C_{SIU} = MAIL / (Q_{INC} + (Q_{GTO} - Q_{GTMW}) + Q_{SIU}) / 8.34$

$C_{SIU} = 0.97\ _{lb/day} / (0.066_{MGD} + (0.91_{MGD} - 0.561_{MGD}) + 0.21_{MGD}) / 8.34 = 0.186\ _{mg/L}$

6.2.8.10 Silver RIDEM Best Available Technology Limits

RIDEM Office of Water Resources (OWR) local limit development policy requires adoption of "best available technology" limits. OWR considers the EPA categorical limits for metal finishing (40 CRF 433.17) to be the "best available technology" limits. As such, no final local limits may exceed the limits found in 40 CFR 433.17. For silver, the daily maximum limit is 0.43 mg/l.

It is recommended that the local limit for silver be changed to 0.186 mg/l and implemented as a daily maximum as recommended in Section 6.4.1 of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F).

6.2.9 ZINC

6.2.9.1 Zinc Water Quality Criteria

Zinc has an effluent limitation under the current Woonsocket WWTF RIPDES permit (Appendix H).

272.78 ug/L - Daily Maximum Effluent Limit

272.78 ug/L - Monthly Average Effluent Limit

6.2.9.2 Zinc Inhibition Criteria

Site specific zinc inhibition criteria for the WWTF could not be determined with the available data, therefore EPA literature values for typical POTW zinc removal efficiencies were used instead. Source information for zinc inhibition of activated sludge and nitrification is Appendix G of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F of this report).

5.0 mg/L - Zinc inhibition level for activated sludge

0.30 mg/L - Zinc inhibition level for nitrification

6.2.9.3 Zinc Woonsocket WWTF Removal Efficiency

A review of the available WWTF supplemental sampling data indicated there is adequate data to determine the site specific zinc removal efficiencies at the WWTF.

- Primary influent pollutant concentration (C_{POTW}) was reported to be 159.1 ug/L.
- Primary effluent pollutant concentration (C_{PEFF}) was reported to be 50.2 ug/L.
- Final Effluent pollutant concentration (C_{EFF}) was reported to 32.4 ug/L.

R_{PC} = Removal efficiency from headworks to primary treatment, as decimal.
$R_{PC}=(C_{POTW} - C_{PEFF})/(C_{POTW})$
$R_{PC} =(159.1\ _{ug/L}-50.2\ _{ug/L})/(159.1\ _{ug/L}) = 0.68$
R_{BP} = Plant removal efficiency from headworks to plant effluent, as decimal.
$R_{BP} =(C_{POTW} - C_{EFF})/(C_{POTW})$
$R_{BP} =(159.1\ _{ug/L}-32.4\ _{ug/L})/(159.1\ _{ug/L}) = 0.80$

For comparison purposes, EPA literature values for typical POTW zinc removal efficiencies are listed below. Source information for zinc removal efficiencies is Appendix R of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F of this report).

EPA Pollutant Removal Efficiencies (%):
27% - Median through Primary Treatment, R_{PC}

79% - Median value through Activated Sludge Treatment, R_{SC}

78% - Median value through Tertiary Treatment, R_{TT}

6.2.9.4 Zinc Allowable Headworks Loading (AHL_{POTW}) w/o Safety Factor

(1) Daily Max Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.27278\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.80] \quad = 113.6\ _{lb/day}$

(2) Monthly Average Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.27278\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.80] \quad = 113.6\ _{lb/day}$

(3) For Activated Sludge Inhibition:

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 - R_{PC}, \%/100)$
$AHL_{POTW} = [5.0\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.68] \quad = 1,301.50\ _{lb/day}$

(4) For Nitrification Inhibition:

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 - R_{PC}, \%/100)$
$AHL_{POTW} = [0.30\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.68] \quad = 78.09\ _{lb/day}$

(5) For Sludge Incineration:

Not Applicable

6.2.9.5 Zinc Maximum Allowable Headworks Loading ($MAHL_{POTW}$*)*

The most stringent AHL based on the nitrification inhibition was chosen as the $MAHL_{POTW}$ for zinc at 78.09 $_{lb/day.}$

6.2.9.6 Zinc Safety Factor

A safety factor of 10% was used in the development of this local limit.

6.2.9.7 Zinc Uncontrolled Sources

Testing of the uncontrolled sources in the WWTF collection system was conducted to determine the site-specific pollutant zinc concentration. The testing occurred in December of 2010 (Appendix D). The uncontrolled sources zinc concentration based on the testing was reported to be 368 ug/L. For the local limits evaluation, the average uncontrolled sources value was used.

M_{UNC} = Loading from uncontrolled sources (domestic, commercial, I+I)
$M_{UNC} = C_{UNC} * Q_{UNC} * 8.34$
$M_{UNC} = 0.368\ _{mg/L} * 6.53\ _{MGD} * 8.34$
$M_{UNC} = 20.03\ _{lb/day}$

6.2.9.8 Zinc Maximum Allowable Industrial Loading (MAIL) with Safety Factor

$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - (Q_{FBW} * C_{FBW} * 8.34) - (Q_{COOL} * C_{COOL} * 8.34) - (Q_{GTMW} * C_{GTMW} * 8.34) - M_{UNC}$
$MAIL = 78.09\ _{lb/d} * (1\text{-}0.10) - (0.40\ _{MGD} * 0.188\ _{mg/L} * 8.34) - (1.874\ _{MGD} * 0.188\ _{mg/L} * 8.34) - (0.561\ _{MGD} * 0.188\ _{mg/L} * 8.34) - 20.03\ _{lb/day}$
$MAIL = 45.82\ _{lb/d}$

6.2.9.9 Zinc Uniform Limits For All Controlled Discharger

$C_{SIU} = MAIL / (Q_{INC} + (Q_{GTO} - Q_{GTMW}) + Q_{SIU}) / 8.34$
$C_{SIU} = 45.82\ _{lb/day} / (0.066_{MGD} + (0.91_{MGD} - 0.561_{MGD}) + 0.21_{MGD}) / 8.34 = 8.764_{mg/L}$

6.2.9.10 Zinc RIDEM Best Available Technology Limits

RIDEM Office of Water Resources (OWR) local limit development policy requires adoption of "best available technology" limits. OWR considers the EPA categorical limits for metal finishing (40 CRF 433.17) to be the "best available technology" limits. As such, no final local limits may exceed the limits found in 40 CFR 433.17. For zinc, the daily maximum limit is 2.61 mg/l.

It is recommended that the local limit for zinc be set at 2.61 mg/l and implemented as a daily maximum as recommended in Section 6.4.1 of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F).

6.2.10 CYANIDE

6.2.10.1 Cyanide Water Quality Criteria

Cyanide does not have an effluent limitation under the current Woonsocket WWTF RIPDES permit (Appendix H). Therefore, RIDEM Water Quality Criteria was used to determine effluent water quality limits. Source information for the Water Quality Criteria is *Woonsocket WWTF Permit Development Document, Appendix A: Calculation of Allowable Acute and Chronic Discharge Limitations Based on Freshwater Aquatic Life Criteria and Human Health Criteria* (Appendix K).

90.11 ug/L - Daily Maximum Effluent Limit

21.30 ug/L - Monthly Average Effluent Limit

6.2.10.2 Cyanide Inhibition Criteria

Site specific cyanide inhibition criteria for the WWTF could not be determined with the available data, therefore EPA literature values for typical POTW cyanide removal efficiencies were used instead. Source information for cyanide inhibition of activated sludge and nitrification is Appendix G of the *EPA Local Limits Development Guidance* document, July 2004 *(Appendix F of this report)*.

4 mg/L - Cyanide inhibition level for activated sludge

0.4 mg/L - Cyanide inhibition level for nitrification

6.2.10.3 Cyanide Woonsocket WWTF Removal Efficiency

A review of the available WWTF supplemental sampling data (Appendix B) indicated the following:

- Primary influent pollutant concentrations (C_{POTW}) were reported to be less than the cyanide detection limit of 10 ug/L.
- Primary effluent pollutant concentrations (C_{PEFF}) were reported to be 18 ug/L.
- Final effluent pollutant concentrations (C_{EFF}) were reported to be less than the cyanide detection limit of 10 ug/L.

Site-specific cyanide removal efficiencies for the WWTF could not be determined with the available data and low influent concentrations, therefore EPA literature values for typical POTW cyanide removal efficiencies were used instead. Source information for cyanide removal efficiencies is Appendix R of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F of this report).

EPA Pollutant Removal Efficiencies (%):

27% - Median Primary Treatment removal efficiency, R_{PC}

69% - Median Activated Sludge Treatment removal efficiency, R_{SC}

66% - Median Tertiary Treatment removal efficiency, R_{TT}

The overall WWTF cyanide removal efficiency, $R_{BP,}$ used in this local limits evaluation was 92%.

6.2.10.4 Cyanide Allowable Headworks Loading (AHL_{POTW}) w/o Safety Factor

(1) Daily Max Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.09011\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.92] \quad = 93.82\ _{lb/day}$

(2) Monthly Average Effluent Quality Limit:

$AHL_{POTW} = C_{EFF} * Q_{POTW} * 8.34 / (1 - R_{BP}, \%/100)$
$AHL_{POTW} = [0.02130\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.92] \quad = 22.18\ _{lb/day}$

(3) For Activated Sludge Inhibition:

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 - R_{PC}, \%/100)$
$AHL_{POTW} = [4.0\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.27] \quad = 456.42\ _{lb/day}$

(4) For Nitrification Inhibition:

$AHL_{POTW} = C_{PEFF} * Q_{POTW} * 8.34 / (1 - R_{PC}, \%/100)$
$AHL_{POTW} = [0.40\ _{mg/L} * 9.99\ _{MGD} * 8.34] / [1-0.27] \quad = 45.64\ _{lb/day}$

(5) For Sludge Incineration:

Not Applicable

6.2.10.5 Cyanide Maximum Allowable Headworks Loading ($MAHL_{POTW}$)

The most stringent AHL based on the Monthly Average Effluent Quality Limit was chosen as the $MAHL_{POTW}$ for cyanide at 22.18 $_{lb/day}$.

6.2.10.6 Cyanide Safety Factor

A safety factor of 10% was used in the development of this local limit.

6.2.10.7 Cyanide Uncontrolled Sources

Testing of the uncontrolled sources in the WWTF collection system was conducted to determine the site-specific pollutant cyanide concentration. The testing occurred in December of 2010 (Appendix D). All of the 17 samples were reported to be below the cyanide detection limit of 10 ug/L. For determination of the uncontrolled sources concentration, samples that were reported to be below the cyanide detection limit were replace with a value of one-half of the cyanide detection limit for each instance. For the local limits evaluation, the average uncontrolled sources value of 5 ug/L was used.

M_{UNC} = Loading from uncontrolled sources (domestic, commercial, I+I)
$M_{UNC} = C_{UNC} * Q_{UNC} * 8.34$
$M_{UNC} = 0.005_{\ mg/L} * 6.53_{\ MGD} * 8.34$
$M_{UNC} = 0.27_{\ lb/day}$

6.2.10.8 Cyanide Maximum Allowable Industrial Loading (MAIL) with Safety Factor

$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - (Q_{FBW} * C_{FBW} * 8.34) - (Q_{COOL} * C_{COOL} * 8.34) - (Q_{GTMW} * C_{GTMW} * 8.34) - M_{UNC}$
$MAIL = 22.18_{\ lb/d} * (1\text{-}0.10) – (0.40_{\ MGD} * 0.021_{\ mg/L} * 8.34) – (1.874_{\ MGD} * 0.021_{\ mg/L} * 8.34) – (0.561_{\ MGD} * 0.021_{\ mg/L} * 8.34) – 0.27_{\ lb/day}$
$MAIL = 19.18_{\ lb/d}$

6.2.10.9 Cyanide Uniform Limits For All Controlled Discharger

$C_{SIU} = MAIL / (Q_{INC} + (Q_{GTO} – Q_{GTMW}) + Q_{SIU}) / 8.34$
$C_{SIU} = 19.18_{\ lb/day} / (0.066_{MGD} + (0.91_{MGD} - 0.561_{MGD}) + 0.21_{MGD}) / 8.34 = 3.669_{mg/L}$

6.2.10.10 Cyanide RIDEM Best Available Technology Limits

RIDEM Office of Water Resources (OWR) local limit development policy requires adoption of “best available technology” limits. OWR considers the EPA categorical limits for metal finishing (40 CRF 433.17) to be the “best available technology” limits. As such, no final local limits may exceed the limits found in 40 CFR 433.17. For cyanide, the daily maximum limit is 1.20 mg/l.

It is recommended that the local limit for cyanide be set at 1.20 mg/l and implemented as a daily maximum as recommended in Section 6.4.1 of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F).

6.2.11 BOD_5 and COD

6.2.11.1 BOD_5 and COD Water Quality Criteria

BOD_5 has an effluent limitation under the current Woonsocket WWTF RIPDES permit (Appendix H):

50 mg/L - Daily Maximum Effluent Limit

30 mg/L - Monthly Average Effluent Limit

6.2.11.2 BOD_5 and COD Inhibition Criteria

Not used.

6.2.11.3 BOD_5 and COD Woonsocket WWTF Removal Efficiency

Not used

6.2.11.4 BOD_5 and COD Safety Factor

A safety factor of 0% was used in the development of this local limit. The WWTF is designed to treat maximum month flow and loadings to the required monthly permit limit. The ratio of maximum month to average BOD_5 load is typically on the order of 1.3 to 1.5:1. The local limit (maximum monthly and daily) is derived from the design average loads, and because the likelihood of maximum month loads from uncontrolled sources and all industries occurring simultaneously is very low, additional safety factor is not recommended.

6.2.11.5 BOD_5 and COD Uncontrolled Sources

Testing of the uncontrolled sources in the WWTF collection system was conducted to determine the site-specific pollutant concentration. The testing occurred in December of 2010 (Appendix D). The uncontrolled sources concentration for BOD_5, based on the testing was reported to be of 340 mg/L. This uncontrolled sources concentration is significantly higher than typical domestic waste strengths expected (on the order of 180 mg/l to 220 mg/l for older collection systems in the northeast). This raised concerns that it may be uncommonly elevated and lead to overestimating the pollutant load associated with the uncontrolled sources. Therefore, historical BOD_5 concentrations for the raw influent flow to the WWTF were reviewed. The average BOD_5 concentration in the raw influent flow as shown in Appendix A from 1/1/07 through 12/31/09 was 180 mg/l. The flow and load data from 2010 has been excluded due to a known significant soluble BOD_5 load increase associated with a specific industrial user which if considered would skew the pollutant concentrations. Based on the available data and typical industry experience, it was deemed that a more appropriate estimate of

the current plant influent BOD_5 load was provided by the 1/1/07 through 12/31/09 data. Therefore, the observed average concentration of 180 mg/l and associated average daily flow for the period (7.71 MGD) was used to estimate the current uncontrolled sources load to the WWTF (M'_{UNC}). This load was then increased by 5% (Growth Factor, GF) to produce the projected uncontrolled source load (M_{UNC}) accounting for projected domestic growth over the 5 year effective term of these local limits. The specific calculations are as follows:

Estimated Current Uncontrolled Source Load:

$M'_{UNC} = C_{UNC} * Q_{UNC} * 8.34$

$M'_{UNC} = 180\ _{mg/L} * 7.71\ _{MGD} * 8.34 = 11{,}574\ _{lb/day}$

Projected Uncontrolled Source Load:

$M_{UNC} = M'_{UNC} * (1 + GF)$

$M_{UNC} = 11{,}574\ lb/day * (1 + .05)$

$M_{UNC} = 12{,}153\ _{lb/day}$

It should be noted that the corresponding projected influent uncontrolled source BOD5 concentration is 223 mg/l which is previously noted is consistent with expectations for domestic wastewater in older collection systems in the northeast. The increase in concentration from that observed for the 2007-2009 data set reflects the reduction in flows due to I/I reductions as a result of collection system improvement completed in recent years.

6.2.11.6 BOD_5 and COD Maximum Allowable Headworks Loading ($MAHL_{POTW}$)

The *EPA Local Limits Development Guidance* document, July 2004, suggests that the MAHL be set to the POTW's average design capacity. In this case due to the atypical and significant internal and external recycle loads the analysis must include the recycle loads to properly account for outside loads that enter through the plant recycles. Therefore, the MAHL to the POTW for this analysis is equal to the sum of the design average daily raw influent load plus the design average total plant recycle loads for the existing facility which are presented in Table 3-4 of the *Facility Plan Amendment,* May 2013 (Appendix I).

Maximum Allowable Headworks Load ($MAHL_{POTW}$):

$MAHL_{POTW}$ = Existing Design Average Daily BOD_5 $Load_{RAW}$ + Existing Design Average Daily BOD_5 $Load_{REC}$

$MAHL_{POTW} = 21{,}350\ _{lb/d} + 4{,}644\ _{lb/d} = 25{,}994\ _{lb/day}$

6.2.11.7 BOD_5 and COD Maximum Allowable Industrial Loading (MAIL)

Because for the conventional and non-conventional parameters, the design and actual recycle loads inherently include all recycle components the Maximum Allowable

Industrial Load for the SIUs can be directly calculated from the available data and it is not necessary to specifically remove internal recycles as was done for the metals.

$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - M_{UNC} – M_{REC}$
$MAIL = 25{,}994\ _{lb/d} *(1\text{-}0) – 12{,}153 – 10{,}139\ _{lb/d}$
$MAIL = 3{,}702\ _{lb/d}$

6.2.11.8 BOD_5 Uniform Limits For All Controlled Discharger

$C_{SIU} = MAIL / (8.34*Q_{IND})$
$C_{SIU} = 3{,}702\ _{lb/day} / (8.34*0.212\ _{MGD}) = 2{,}095\ _{mg/L}$

The strict calculation of the LL demonstrates the significant capacity of the existing facility for industrial loads. However, it is not recommended that the local limit for BOD_5 be changed to 2,095 mg/l because although the analysis indicates the necessary capacity is available, there is considerable cost associated with treating BOD5. Furthermore, many of the contributing industries discharge at or even below typical domestic waste strength which, with a strict application of the calculated LL uniformly across all industries, could unnecessarily harm industries that either have very low flows at high concentrations and industries that need higher load limits to operate. This is not unique to the City but rather is something that must inherently be addressed at most facilities with significant industrial inputs to provide a fair and equitable distribution of the headworks load that recognizes these facts.

The local limits set through the Industrial Pretreatment Program in many municipalities addresses these factors by providing a base limit that reflects the actual average concentrations of the majority of industries (which should also be tempered based on typical domestic waste concentrations of the uncontrolled sources) and also provides for higher concentration and or load limits for industries that warrant them based on their production requirements. The higher load limits also can include a surcharge structure that allows the municipality an opportunity to recover the disproportionately high cost of treatment for the single waste load source.

As a starting point based on the local limit calculated here from the plant design capacity and review of the SIU sampling which shows that the majority of industries discharge at or below the current estimated uncontrolled source concentration of 223 mg/l, we suggest that an appropriate base industrial BOD_5 local limit would be 500 mg/l as a daily maximum.

A proposed BOD_5 mass load limit for specific industry categories is included in Section 7.1 to provide allocation of the available loading capacity to industries for which it is appropriate. For industries with a proposed mass load limit, the 500 mg/l BOD_5 value is the recommended uniform concentration surcharge level (not considered a limit) and the proposed mass load limit is the threshold beyond which discharges would be subject to enforcement.

Development of the appropriate rate structure is beyond the scope of this Local Limits analysis and is typically developed as part of the Industrial Pretreatment Program considering both the results of this Local Limits analysis, industry specific waste stream characteristics, review of actual operating costs and other factors.

6.2.11.9 COD Uniform Limits For All Controlled Discharger

Local limits recommendations for COD were developed using the historical COD to BOD, ratio at the WWTF. COD to BOD ratios of up to 2.2 to 1 have been considered for the WWTF. As presented in Appendix F of the Facilities Plan Amendment (FPA, May 2013), modeling for the process upgrades have used a COD to BOD ratio of 1.86 to 1. This lower ratio will be used for setting limits, as it will result in a more conservative limit. Using this ratio of 1.86 to 1, a revised local limit for COD of 930 mg/l is recommended to be established and implemented as a daily maximum.

Similar to BOD_5, a mass load limit for specific industry categories is included in Section 7.1 for COD to provide allocation of the available loading capacity to industries for which it is appropriate. For industries with a proposed mass load limit, the 930 mg/l COD value is the recommended uniform concentration surcharge level (not considered a limit) and the proposed mass load limit is the threshold beyond which discharges would be subject to enforcement.

6.2.12 Total Suspended Solids (TSS)

6.2.12.1 TSS Water Quality Criteria

TSS has an effluent limitation under the current Woonsocket WWTF RIPDES permit (Appendix H):

25 mg/L - Daily Maximum Effluent Limit

15 mg/L - Monthly Average Effluent Limit

6.2.12.2 TSS Inhibition Criteria

Not used.

6.2.12.3 TSS Woonsocket WWTF Removal Efficiency

Not used

6.2.12.4 TSS Safety Factor

A safety factor of 0% was used in the development of this local limit for the same reasons as previously discussed for BOD_5, the facility design for TSS is based on maximum month loads which inherently provides a "safety factor" over the average annual design basis used in this evaluation as the allowable headworks load and so additional safety factor is not appropriate

6.2.12.5 TSS Uncontrolled Sources

Testing of the uncontrolled sources in the WWTF collection system was conducted to determine the site-specific pollutant TSS concentration. The testing occurred in December of 2010 and coincided with a period of below average flow to the WWTF (Appendix D). The uncontrolled sources concentration for TSS, based on the testing was reported to be 215 mg/L. This reported concentration is reasonably consistent with the current uncontrolled source influent BOD5 value of 223 previously discussed and typical expectations for domestic wastewater. This concentration together with the estimated current average daily uncontrolled source flow (6.215 MGD) and a 5% growth factor was used for determining the uncontrolled sources concentration to the WWTF.

Uncontrolled Source Load:

$M_{UNC} = C_{UNC} * Q_{UNC} * (1 + GF) * 8.34$
$M_{UNC} = 215_{\ mg/L} * 6.215_{\ MGD} * (1 + .05) * 8.34$
$M_{UNC} = 11{,}701_{\ lb/day}$

6.2.12.6 TSS Maximum Allowable Headworks Loading ($MAHL_{POTW}$)

The *EPA Local Limits Development Guidance* document, July 2004, suggests that the MAHL be set to the POTW's average design capacity along with any improvements subsequent to the construction that have increased plant capacity. The values for the current design influent and recycle TSS loads have been set equal to the revised updated design capacity for 2030 as presented in Table 3-4 of the *Facility Plan Amendment,* May 2013 (Appendix I) rather than the existing 2000 design capacity as was done for BOD_5. This was done to reflect the fact that the existing but previously unused enhanced primary clarification chemical addition system has recently been brought on-line enabling the WWTF to handle year 2030 design TSS loads.

Maximum Allowable Headworks Load ($MAHL_{POTW}$):

$MAHL_{POTW}$ = Current Design Average Daily TSS Load $_{RAW}$ + Current Design Average Daily TSS Load $_{REC}$
$MAHL_{POTW}$ = 13,340 $_{lb/d}$ + 13,218 $_{lb/d}$ = 26,558 $_{lb/day}$

6.2.12.7 TSS Maximum Allowable Industrial Loading (MAIL)

$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - (M_{UNC}) – M_{REC}$
$MAIL$ = 26,558 $_{lb/d}$ *(1-0) – (11,701) – 13,024 $_{lb/d}$
$MAIL$ = 1,833 $_{lb/d}$

6.2.12.8 TSS Uniform Limits For All Controlled Discharger

$C_{SIU} = MAIL / (8.34*Q_{IND})$
C_{SIU} = 1,833 / (8.34*0.212 $_{MGD}$) = 1,037 $_{mg/L}$

It is recognized that the calculated local limit for TSS of 1,037 mg/l is significantly higher than the existing local limit of 300 mg/l. However, similar to BOD5, there are significant costs associated with handling and disposing of excess solids and as such we suggest that the current local limit of 300 mg/l is appropriate. Therefore, at this time it is recommended that the current baseline local limit for TSS of 300 mg/l be maintained and implemented as a daily maximum as recommended in Section 6.4.1 of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F).

Similar to BOD_5 and COD, a mass load limit for specific industry categories is included in Section 7.4 for TSS to provide allocation of the available loading capacity to industries for which it is appropriate. For industries with a proposed mass load limit, the 300 mg/l TSS value is the recommended uniform concentration surcharge level (not considered a limit) and the proposed mass load limit is the threshold beyond which discharges would be subject to enforcement.

6.2.13 Total Nitrogen (TN)

6.2.13.1 TN Water Quality Criteria

Total nitrogen has an Interim Effluent Limitation under the current Woonsocket WWTF RIPDES Permit, and a more stringent effluent limit is included in the RIPDES permit that will become effective upon completion of the WWTF improvements, by May 2017.

Not Applicable - Daily Maximum Effluent Limit

10.0 mg/L - Monthly Average Effluent Limit

6.2.13.2 TN Inhibition Criteria

Not Applicable - Total nitrogen inhibition level for activated sludge

Not Applicable - Total nitrogen inhibition level for nitrification

6.2.13.3 TN Woonsocket WWTF Removal Efficiency

Not Used

6.2.13.4 TN Safety Factor

A safety factor of 0% was used in the development of this local limit. The WWTF is designed to treat maximum month flow and loadings to the required monthly permit limit. The Facilities Plan Amendment (May 2013) uses a design ratio of approximately 1.2 to 1 for Total Nitrogen raw wastewater design loads (maximum month to average day load). Therefore, a ratio of maximum month to average Total Nitrogen (N) load on the order of 1.2 to 1 is consistent with the facility design data. The local limit (maximum monthly and daily) is derived from the design average loads, and because the likelihood of maximum month loads from uncontrolled sources, and all industries occurring simultaneously is very low, additional safety factor is not recommended.

6.2.13.5 TN Uncontrolled Sources

Testing of the uncontrolled sources in the WWTF collection system was conducted to determine the site-specific pollutant concentration. The testing occurred in December of 2010 (Appendix D). The uncontrolled sources concentration for total nitrogen, based on the testing was reported to be 35.5 mg/L. This concentration together with the estimated current average daily uncontrolled source flow (6.215 MGD), and a 5% growth factor was used for determining the uncontrolled sources concentration to the WWTF.

Uncontrolled Source Load:

$$M_{UNC} = C_{UNC} * Q_{UNC} * (1 + GF) * 8.34$$
$$M_{UNC} = 35.5_{\ mg/L} * 6.215_{\ MGD} * (1 + 0.05) * 8.34$$

M_{UNC} = 1,932 lb/day

6.2.13.6 TN Maximum Allowable Headworks Loading ($MAHL_{POTW}$)

The *EPA Local Limits Development Guidance* document, July 2004, suggests that the MAHL be set to the POTW's average design capacity. In this case, due to the atypical and significant internal and external recycle loads, the analysis must include the recycle loads to properly account for outside loads that enter through the plant recycles. However, for total N there is no available design recycle load for the existing facility. Therefore, the MAHL to the POTW for this analysis was set equal to the sum of the Existing Design (2000) average daily raw influent total N load plus the Existing Design (2000) average daily total plant recycle Ammonia load which are presented in Table 3-4 of the *Facility Plan Amendment,* May 2013 (Appendix I). The substitution of the design recycle ammonia load for the total N load is a conservative assumption as total N is always greater than Ammonia alone for any given waste stream that contains both ammonia and organic nitrogen. The use of Total Kjeldahl Nitrogen (TKN) design load for the raw wastewater is also conservative, as the total N is at least equal to the TKN load.

Maximum Allowable Headworks Load ($MAHL_{POTW}$):

$MAHL_{POTW}$ = Design Average Daily TKN $Load_{RAW}$ + Design Average Daily Ammonia $Load_{REC}$
$MAHL_{POTW}$ = 5,338 lb/d + 1,830 lb/d = 7,168 lb/day

6.2.13.7 TN Maximum Allowable Industrial Loading (MAIL)

$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - M_{UNC} – M_{REC}$
MAIL = 7,168 lb/d *(1-0) – 1,932 lb/day – 1,182 lb/d
MAIL = 4,054 lb/d

6.2.13.8 TN Uniform Limits For All Controlled Discharger

$C_{SIU} = MAIL / (8.34*Q_{IND})$
C_{SIU} = 4,054 lb/day / (8.34*0.212 MGD) = 2,292 mg/L

The calculated local limit for Total Nitrogen of 2,292 is unusually high. This is due largely to the fact that the design load for the existing facility is based on an influent nitrogen concentration of 40 mg/l at the existing system design flow of 16 MGD. It is recommended that the baseline local limit for total nitrogen be established as 50 mg/l and implemented as a daily maximum as recommended in Section 6.4.1 of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F). This is slightly higher than the reported average domestic influent strength providing some relief for industry while allowing the City to recover costs for treatment.

Similar to BOD_5, COD and TSS, a mass load limit for specific industry categories

is included in Section 7.3 for TN to provide allocation of the available loading capacity to industries for which it is appropriate. For industries with a proposed mass load limit, the 50 mg/l TN value is the recommended uniform concentration surcharge level (not considered a limit) and the proposed mass load limit is the threshold beyond which discharges would be subject to enforcement.

6.2.14 Ammonia-N (NH_3-N)

6.2.14.1 NH_3-N Water Quality Criteria

Ammonia, total as N, has a stringent effluent limitation under the current Woonsocket WWTF RIPDES permit (Appendix H):

49.4 mg/L - Daily Maximum Effluent Limit

2.0 mg/L - Monthly Average Effluent Limit

6.2.14.2 NH_3-N Inhibition Criteria

Not Applicable - Ammonia inhibition level for activated sludge

Not Applicable - Ammonia inhibition level for nitrification

6.2.14.3 NH_3-N Woonsocket WWTF Removal Efficiency

Not Used

6.2.14.4 NH_3-N Safety Factor

A safety factor of 0% was used in the development of this local limit. The WWTF is designed for maximum month flows and loadings. The local limit is derived from average loads, so additional safety factor is not recommended.

6.2.14.5 NH_3-N Uncontrolled Sources

Testing of the uncontrolled sources in the WWTF collection system was conducted to determine the site-specific pollutant concentration (Appendix D). The testing occurred in December of 2010. The uncontrolled sources concentration for ammonia, based on the testing was reported to be 15.3 mg/L. This concentration together with the estimated current average daily uncontrolled source flow (6.215 MGD) and a 5% growth factor was used for determining the uncontrolled sources concentration to the WWTF.

Uncontrolled Source Load:

$$M_{UNC} = C_{UNC} * Q_{UNC} * (1 + GF) * 8.34$$
$$M_{UNC} = 15.3_{\ mg/L} * 6.215_{\ MGD} * (1 + 0.05) * 8.34$$
$$M_{UNC} = 833_{\ lb/day}$$

6.2.14.6 NH_3-N Maximum Allowable Headworks Loading (MAHL)

The *EPA Local Limits Development Guidance* document, July 2004 suggests that the MAHL be set to the POTW's average design capacity. In this case due to the atypical and

significant internal and external recycle loads the analysis must include the recycle loads to properly account for outside loads that enter through the plant recycles. Therefore, the MAHL loading was set equal to the sum of the Exiting System Design raw and recycle loads presented in Table 3-4 of the *Facility Plan Amendment*, May 2013 (Appendix I). The value for AHL_{REC} is set equal to the revised updated design capacity for 2030 in lieu of the existing 2000 design capacity. The existing enhanced primary clarification chemical addition system has been brought on-line enabling the WWTF to handle year 2030 design loading.

Monthly Average Effluent Quality Limit:

$MAHL_{POTW} = AHL_{RAW} + AHL_{REC}$
$MAHL_{POTW} = 2{,}669\ _{lb/d} + 1{,}830\ _{lb/d} = 4{,}499\ _{lb/day}$

6.2.14.7 NH_3-N Maximum Allowable Industrial Loading (MAIL)

$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - M_{UNC} – M_{REC}$
$MAIL = 4{,}499\ _{lb/d} *(1\text{-}0) – 833 – 319\ _{lb/d}$
$MAIL = 3{,}347\ _{lb/d}$

6.2.14.8 NH_3-N Uniform Limits For All Controlled Discharger

$C_{SIU} = MAIL / (8.34*Q_{IND})$
$C_{SIU} = 3{,}347\ _{lb/day} / (8.34*0.212\ _{MGD}) = 1{,}894\ _{mg/L}$

The calculated local limit for Ammonia of 1,894 is unusually high and inconsistent with the calculated local limit for Total Nitrogen. This is due largely to the fact that the design load for the existing facility is based on an influent ammonia nitrogen concentration of 20 mg/l at the existing system design flow of 16 MGD and the fact that the Total Nitrogen limit calculation used the design recycle Ammonia load as a surrogate for Total Nitrogen because no design Total Nitrogen load is provided. It is recommended that the baseline local limit for ammonia nitrogen be established as 30 mg/l and implemented as a daily maximum as recommended in Section 6.4.1 of the *EPA Local Limits Development Guidance* document, July 2004 (Appendix F). This is higher than the reported average domestic influent strength providing some relief for industry while allowing the City to recover costs for treatment.

Similar to BOD_5, COD, TSS and TN, a mass load limit for specific industry categories is included in Section 7.2 for NH_3-N to provide allocation of the available loading capacity to industries for which it is appropriate. For industries with a proposed mass load limit, the 30 mg/l NH_3-N value is the recommended uniform concentration surcharge level (not considered a limit) and the proposed mass load limit is the threshold beyond which discharges would be subject to enforcement.

6.2.15 Total Phosphorus (P)

Review of the available existing system design data in the Facility Plan relative to Phosphorus shows a design influent Total Phosphorus (TP) load of 2,268 pounds per day at the design flow of 16 MGD. The resulting influent TP concentration is 17 mg/l. This is more than double the expectations for typical municipal wastewater, which are in the range of 6 to 8 mg/l. It is unlikely that these loads will be seen at the treatment facility, and even with the current multi-point chemical addition and tertiary filters provided at the plant, that loads of this magnitude can be reasonably and routinely accommodated.

Review of data for the design of the treatment facility upgrade, and the associated modeling suggest that much lower phosphorus levels will be seen from the raw influent and recycle loads. In fact, the process design (as outlined in the Facility Plan Amendment, May 2013) includes provisions for adding a source of phosphorus to support the biological process, based on the expectation that too little phosphorus may be available in the influent loadings.

Review of reported plant influent concentration data suggests that the current influent TP concentrations, including industry, are in the range of 3.5 to 5.5 mg/l depending on the data period considered. This seems reasonably consistent with a municipal wastewater in a system that experiences a moderate to high level of Inflow/Infiltration as is the case in Woonsocket, and based on the existing data analysis is what was used to develop the projected design loads presented in the Facility Plan. At the same time, the processes technology available offers some flexibility to handle higher loads (within reason) by simply increasing chemical dose. The extent of the load increase that can be accommodated can be more rigorously determined with additional data, but it is reasonable to expect that the current plant process technologies can in fact treat loads consistent with more typical municipal phosphorus concentrations of 6 to 8 mg/l previously mentioned.

The design of upgrades to the WWTF (as described in the Facility Plan Amendment, May 2013) to handle year 2030 design loadings has been well documented, and the process has been extensively modeled during the planning and design process. The facility process design criteria include the capacity for the WWTF to operate within permit while seeing maximum month design loads. As such, we can use these known loading design criteria for setting daily maximum local limits with the expectation that they provide some conservatism. The proposed design loadings are therefore used in the limit calculations presented below for phosphorus (P).

6.2.15.1 P Water Quality Criteria

Phosphorus, total as P, has a stringent effluent limitation under the current and proposed Woonsocket WWTF RIPDES permit (Appendix H) conditions:

1.0 mg/L - Monthly Average Effluent Limit (Existing Permit Limit)

0.10 mg/L - Monthly Average Effluent Limit (Future Permit Limit)

6.2.15.2 P Inhibition Criteria

Not Applicable - Phosphorus inhibition level for activated sludge

Not Applicable - Phosphorus inhibition level for nitrification

6.2.15.3 P Woonsocket WWTF Removal Efficiency

Not Used

6.2.15.4 P Safety Factor

A safety factor of 0% was used in the development of this local limit. The WWTF is designed for maximum month flows and loadings. The use of these loadings to calculate a daily maximum limit is expected to be conservative, so additional safety factor is not recommended.

6.2.15.5 P Uncontrolled Sources

Testing of the uncontrolled sources in the WWTF collection system was conducted to determine the site-specific pollutant concentration (Appendix D). The testing occurred in December of 2010. The uncontrolled sources concentration for phosphorus, based on the testing was reported to be 5.1 mg/L. This concentration together with the estimated current average daily uncontrolled source flow (6.215 MGD) and a 5% growth factor was used for determining the uncontrolled sources concentration to the WWTF.

Uncontrolled Source Load:

$$M_{UNC} = C_{UNC} * Q_{UNC} * (1 + GF) * 8.34$$
$$M_{UNC} = 5.1_{\ mg/L} * 6.215_{\ MGD} * (1 + 0.05) * 8.34$$
$$M_{UNC} = 278_{\ lb/day}$$

6.2.15.6 P Maximum Allowable Headworks Loading (MAHL)

The *EPA Local Limits Development Guidance* document, July 2004 suggests that the MAHL be set to the POTW's design capacity. In this case due to the atypical and significant internal and external recycle loads the analysis must include the recycle loads to properly account for outside loads that enter through the plant recycles. Therefore, the MAHL loading was set equal to the sum of the proposed design raw and recycle loads, as presented in Appendix F of the *Facility Plan Amendment*, May 2013. The value for AHL_{REC} is set equal to the revised updated design capacity for 2030 in lieu of the existing 2000 design capacity. The existing enhanced primary clarification chemical addition system has been brought on-line, enabling the WWTF to handle year 2030 design loading.

Monthly Average Effluent Quality Limit:

$$MAHL_{POTW} = AHL_{RAW} + AHL_{REC}$$

$MAHL_{POTW}$ = 358 $_{lb/d}$ + 139 $_{lb/d}$ = 497 $_{lb/day}$

6.2.15.7 P Maximum Allowable Industrial Loading (MAIL)

$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - M_{UNC} – M_{REC}$
$MAIL$ = 497 $_{lb/d}$ * (1-0) – 278 $_{lb/d}$ – 139 $_{lb/d}$
$MAIL$ = 80 $_{lb/d}$

6.2.15.8 P Uniform Limits For All Controlled Discharger

$C_{SIU} = MAIL / (8.34*Q_{IND})$
C_{SIU} = 80 $_{lb/day}$ / (8.34 * 0.212 $_{MGD}$) = 45.2 $_{mg/L}$

The calculated local limit for phosphorus of 45.2 mg/l is relatively high, and the intent of the City of Woonsocket is to limit phosphorus loadings to the WWTF. A recommended baseline local limit for phosphorus should be established as 25 mg/l and implemented as a daily maximum. This is higher than the reported average domestic influent strength, providing some relief for industry while limiting the WWTF costs for treatment.

Similar to BOD_5, COD, TSS, ammonia and total N, a mass load limit for specific industry categories is included in Section 7.5 for P to provide allocation of the available loading capacity to industries for which it is appropriate. For industries with a proposed mass load limit, the 25 mg/l P value is the recommended uniform concentration surcharge level (not considered a limit), and the proposed mass load limit is the threshold beyond which discharges would be subject to enforcement.

6.2.16 Total Toxic Organics

Most industrial toxic organic pollutants are regulated by the total toxic organic (TTO) local limit. The list of organic compounds comprising the TTO limit of 2.13 mg/l are based on the daily maximum categorical limit established by the EPA for dischargers in the metal finishing and electroplating source categories. TTO is defined as the sum of the mass or concentration of specific toxic organic compounds found in Categorical Industrial User discharges at levels >0.01 mg/l.

A review of the pretreatment testing results from January 2009 - June 2011(Appendix C) shows no violations of the current 2.13 mg/l local limit. The maximum concentration observed during this period was 0.564 mg/l. The highest average concentration observed during this period was 0.210 mg/L. A single test of the primary influent indicated a concentration of 0.033 mg/l. Furthermore, measurements of the plant effluent for regulatory compliance purposes have not indicated that any of these compounds or constituent classes would be expected to cause or contribute to a water quality exceedence.

Given the historical compliance with the existing TTO, it is recommended that the existing local limit for TTO of 2.13 mg/l be maintained.

6.2.17 Oil & Grease

The presence of oils and greases in wastewater can present a multitude of problems within the service area of the WWTP. Oils and greases can impact the collection system and the WWTF by coating, congealing and accumulating on sewer pipes, pumps and equipment to the extent that obstructions occur. They may also impact worker health and safety by increasing the potential for hazardous atmospheres within the collection system.

The current oil and grease discharge limit for the service area of the WWTF is a total oil and grease limit that encompasses both the polar (animal fat) and non-polar (petroleum-based) oils and greases. The City's Pretreatment Division enforces the current Sewer User Ordinance (SUO) total oil and grease limit of 100 mg/L to its current SIU permits. A review of the pretreatment testing results from January 2009 - June 2011 show no violations of the current 100 mg/L limit.

Inspection of the collection system by Veolia's Underground Asset Management (UGAM) team, including CCTV and manhole inspections, have shown that areas within the collection system near restaurants (specifically fast food) have elevated levels of oil and grease. Potential causes for this include: violations of the existing sewer use ordinance and multiple years of build-up due to non-regular cleaning. A more stringent limit on oil and grease is not expected to alleviate the problem. Rather a more firm enforcement of the existing limit in conjunction with a regular schedule of sewer cleaning. The limit of 100 mg/L is achievable with the application of best management practices. The City has issued permits to and requires grease traps for all restaurants in Woonsocket RI, North Smithfield RI, Blackstone MA and Bellingham MA as part of the City's effort to reduce the impact of oils and greases on the collection system and WWTF.

Through their contract with Veolia-UGAM, the City has implemented an accelerated cleaning program for the entire collection system which will transition to an annual percentage scheduled cleaning program in subsequent years. This will allow for the City/Veolia-UGAM to compare the extent of oil and grease deposits build-up between the scheduled cleanings and identify problem areas within the collection system. Problem areas can then be identified for more aggressive cleaning and also identify areas where the SUO may be being violated.

It is recommended that the existing local limit for oil and grease of 100 mg/l be maintained.

6.2.18 pH

The General Pretreatment Regulations prohibit discharges with a pH lower than 5.0 unless the POTW is specifically designed to accommodate such discharges. The EPA also recommends establishing upper pH limits because corrosion damage has been attributable to high-pH discharges. Wastewater of pH 12.5 or higher is considered a hazardous waste, exhibiting the characteristic of corrosivity, under 40 CFR 261.22(a). The current local limit for pH established an acceptable pH range with a low of 5.0 and a high of 11.0. Additionally, to be considered a violation the pH must be outside of the local limit range for a period greater than 15 minutes.

It is recommended that the existing local limit range for pH $5.0 \leq pH \leq 11.0$ be maintained, along with the associated time constraints.

7 SUPPLEMENTAL LOADING ALLOCATIONS FOR SPECIFIC INDUSTRIAL USES

As part of this Local Limits Evaluation, the ability of the existing WWTF to provide adequate treatment of specific supplemental loads for certain non-metal POCs that have historically been received from existing industries in concentrations above the local limits was reviewed. This section of the evaluation documents calculations to assign more of the maximum allowable industrial load capacity to specific industrial uses that have exhibited a need for more nutrient or solids capacity than the base concentrations proposed. Using this mass allocation approach, would allow some SIC's the opportunity to have all or a portion of their treatment occur at the Woonsocket WWTF for a surcharge value.

As with all the limits in this evaluation, these supplemental loadings were calculated for the WWTF as existing, but were also checked against the design for the WWTF upgrades as presented in the Facility Plan Amendment (May 2013). In each case, the more restrictive calculation has been used for these supplemental loading allocations. It is expected based on the proposed WWTF Improvements design, future local limits concentrations could be higher (with BOD being a good example), and should be reviewed after the new process goes on line by 2017.

7.1 Individual SIC Limits for BOD_5 and COD

Based on the available monitoring data for local industries, establishing a uniform concentration limit of 500 mg/l for 5-day biochemical oxygen demand (BOD_5) is expected to result in all but two local industries being in compliance with the BOD_5 limit. These industries are SIC 2759 (National Marker Company) and SIC 3356/3399 (Technic Inc.), both of which significantly exceed the proposed 500 mg/l concentration limit. As there is significant additional BOD_5 MAIL available beyond the proposed 500 mg/l general concentration limit, a mass proportioned limit can be considered for these SICs requiring higher BOD_5 discharge limits. In establishing such a mass limit for these two specific SICs, the 500 mg/l concentration limit can be considered a background concentration for all other industrial users.

The industries covered by the concentration limit discharge a total industrial flow of approximately 101,000 gpd to the POTW system. In addition, this local limits evaluation and report has allocated a 5 percent increase to existing industrial flows over the term of the proposed local limits. The total flows and BOD_5 load proposed to be allocated as background to industries is calculated as follows:

$$BOD_5\ L_{BACKGROUND} = 500\ mg/l * 8.34 * (0.101\ mgd * 1.05)$$
$$= 442\ pounds\ per\ day\ BOD_5$$

The City has believes that an additional factor of safety is appropriate in allocating the load capacity to specific SIC requiring higher limits. This additional factor of safety will reserve 20% of the available load to be allocated to future industries or

changes to current industries. The specific load then available to be allocated to the two specific contributing SIC industries is calculated by subtracting the background load from the MAIL, as follows:

BOD_5 L $_{CONTRIB}$ = (MAIL = 3,702 #/d) – (L $_{BACKGROUND}$ = 442 #/d)
= 3,260 pounds per day BOD_5

and adjusting for additional factor of safety (future uses),

BOD_5 L $_{CONTRIB}$ = MAIL = 3,260 #/d) * (1 – 20% FS)
= 2,608 pounds per day BOD_5

The two specific contributing SIC industries discharge a total flow of approximately 101,000 gpd to the POTW system. Each of the contributing SIC industries can be assigned a proportionate share of the BOD_5 load to their proportional flows, as follows:

SIC 2759 (National Marker Company):

Q_X = 100 gpd (nominal)
L $_X$ = 2,608 #/d * (100 gpd / 101,000 gpd) = 3 pounds per day BOD_5

SIC 3356/3399 (Technic Inc.):

Q_X = 100,900 gpd (nominal)
L $_X$ = 2,608 #/d * (100,900 gpd / 101,000 gpd) = 2,605 pounds per day BOD_5

Based on these calculations, the two specific SIC industries contributing BOD_5 will be assigned mass load limits as maximum day limits, beyond the 500 mg/l uniform concentration surcharge level.

Similarly, using the historical COD to BOD, ratio at the WWTF, of 1.86 to 1, each of the contributing SIC industries can be assigned a proportionate share of the COD load to their proportional flows, as follows:

SIC 2759 (National Marker Company):

L $_X$ = 1.86 * (3 pounds per day BOD_5) = 6 pounds per day COD

SIC 3356/3399 (Technic Inc.):

L $_X$ = 1.86 * (2,605 pounds per day BOD_5) = 4,845 pounds per day COD

7.2 Individual SIC Limits for Ammonia Nitrogen (NH_3-N)

Based on the available monitoring data for local industries, establishing a uniform concentration limit of 30 mg/l for ammonia nitrogen (NH_3-N) is expected to result in all but two local industries being in compliance with the NH_3-N limit. These industries are SIC 2262/2294/2672 (FlockTex Inc.) and SIC 3356/3399 (Technic Inc.), both of which significantly exceed the proposed 30 mg/l concentration limit. As there is significant additional NH_3-N MAIL available beyond the proposed 30 mg/l general concentration limit, a mass proportioned limit can be considered for these SICs requiring higher NH_3-N discharge limits. In establishing such a mass limit for these two specific SICs, the 30 mg/l concentration limit can be considered a background concentration for all other industrial users.

The industries covered by the concentration limit discharge a total industrial flow of approximately 87,700 gpd to the POTW system. In addition, this local limits evaluation and report has allocated a 5 percent increase to existing industrial flows over the term of the proposed local limits. The total flows and NH_3-N load proposed to be allocated as background to industries is calculated as follows:

$$NH_3\text{-N } L_{BACKGROUND} = 30 \text{ mg/l} * 8.34 * (0.0877 \text{ mgd} * 1.05)$$
$$= 23 \text{ pounds per day } NH_3\text{-N}$$

Based on a comparison of the existing facility design loadings and the proposed design loadings for the WWTF included in the Facility Plan Amendment (May 2013), the proposed loadings are expected to provide more restrictive limits on ammonia nitrogen. For the purpose of assigning load allocation to specific industries, we therefore use the proposed facility design loadings to calculate the limits, with the revised MAHL and MAIL as follows:

Maximum Allowable Headworks Loading (MAHL)

The design of upgrades to the WWTF (as described in the Facilities Plan Amendment, May 2013) to handle year 2030 design loadings has been well documented, and the process has been extensively modeled during the planning and design process. The facility process design criteria include the capacity for the WWTF to operate within permit while seeing maximum month design loads. As such, the use of these known loading design criteria for setting daily maximum local limits continues to provide sufficient conservatism. The proposed design loadings (as reflected in the model data in Appendix F of the Amended Facility Plan, May 2013) for ammonia nitrogen and the resulting calculated MAHL are presented as follows:

$AHL_{RAW} = 1{,}450$ lb/day
$AHL_{REC} = 352$ lb/day

$$MAHL_{POTW} = AHL_{RAW} + AHL_{REC}$$

$MAHL_{POTW}$ = 1,450 $_{lb/d}$ + 352 $_{lb/d}$ = 1,802 $_{lb/day}$

Maximum Allowable Industrial Loading (MAIL)

MAIL = $MAHL_{POTW}$ * (1-SF, %/100) - M_{UNC} – M_{REC}
MAIL = 1,802 $_{lb/d}$ *(1-0) – 833 $_{lb/d}$ – 319 $_{lb/d}$
MAIL = 650 $_{lb/d}$

The City has believes that an additional factor of safety is appropriate in allocating the load capacity to specific SIC requiring higher limits. This additional factor of safety will reserve 20% of the available load to be allocated to future industries or changes to current industries. The specific load then available to be allocated to the two specific contributing SIC industries is calculated by subtracting the background load from the MAIL, as follows:

NH_3-N L $_{CONTRIB}$ = (MAIL = 650 #/d) – (L $_{BACKGROUND}$ = 23 #/d)
= 627 pounds per day NH_3-N

and adjusting for additional factor of safety (future uses),

NH_3-N L $_{CONTRIB}$ = (MAIL = 627 #/d) * (1 – 20% FS)
= 502 pounds per day NH_3-N

The two specific contributing SIC industries discharge a total flow of approximately 114,300 gpd to the POTW system. Each of the contributing SIC industries can be assigned a proportionate share of the NH_3-N load to their proportional flows, as follows:

<u>SIC 2262/2294/2672 (FlockTex Inc.):</u>

Q_X = 13,400 gpd (nominal)
L $_X$ = 502 #/d * (13,400 gpd / 114,300 gpd) = 59 pounds per day NH_3-N

<u>SIC 3356/3399 (Technic Inc.):</u>

Q_X = 100,900 gpd (nominal)
L $_X$ = 502 #/d * (100,900 gpd / 114,300 gpd) = 443 pounds per day NH_3-N

Based on these calculations, the two specific SIC industries contributing NH_3-N will be assigned mass load limits as maximum day limits, beyond the 30 mg/l uniform concentration surcharge level.

7.3 Individual SIC Limits for Total Nitrogen (N)

Based on the available monitoring data for local industries, establishing a uniform concentration limit of 50 mg/l for total nitrogen (N) is expected to result in all but two local industries being in compliance with the total N limit. These industries are SIC 3671/3691 (FAE BC Enterprise LLC) and SIC 3356/3399 (Technic Inc.), both of which significantly exceed the proposed 50 mg/l concentration limit. As there is significant additional total N MAIL available beyond the proposed 50 mg/l general concentration limit, a mass proportioned limit can be considered for these SICs requiring higher total N discharge limits. In establishing such a mass limit for these two specific SICs, the 50 mg/l concentration limit can be considered a background concentration for all other industrial users.

The industries covered by the concentration limit discharge a total industrial flow of approximately 99,200 gpd to the POTW system. In addition, this local limits evaluation and report has allocated a 5 percent increase to existing industrial flows over the term of the proposed local limits. The total flows and total N load proposed to be allocated as background to industries is calculated as follows:

$$\text{Total N L}_{\text{BACKGROUND}} = 50 \text{ mg/l} * 8.34 * (0.0992 \text{ mgd} * 1.05)$$
$$= 44 \text{ pounds per day Total N}$$

Based on a comparison of the existing facility design loadings and the proposed design loadings for the WWTF included in the Facility Plan Amendment (May 2013), the proposed loadings are expected to provide more restrictive limits on total N. For the purpose of assigning load allocation to specific industries, we therefore use the proposed facility design loadings to calculate the limits, with the revised MAHL and MAIL as follows:

Maximum Allowable Headworks Loading (MAHL)

The design of upgrades to the WWTF (as described in the Facilities Plan Amendment, May 2013) to handle year 2030 design loadings has been well documented, and the process has been extensively modeled during the planning and design process. The facility process design criteria include the capacity for the WWTF to operate within permit while seeing maximum month design loads. As such, the use of these known loading design criteria for setting daily maximum local limits continues to provide sufficient conservatism. The proposed design loadings for total N, and the resulting calculated MAHL are presented as follows:

$AHL_{RAW} = 2, 673$ lb/day
$AHL_{REC} = 1,406$ lb/day

$MAHL_{POTW} = AHL_{RAW} + AHL_{REC}$
$MAHL_{POTW} = 2,673_{\text{ lb/d}} + 1,406_{\text{ lb/d}} = 4,079_{\text{ lb/day}}$

Maximum Allowable Industrial Loading (MAIL)

$MAIL = MAHL_{POTW} * (1\text{-}SF, \%/100) - M_{UNC} – M_{REC}$
$MAIL = 4{,}079\ _{lb/d} *(1\text{-}0) – 1{,}932\ _{lb/d} – 1{,}182\ _{lb/d}$
$MAIL = 965\ _{lb/d}$

The City has believes that an additional factor of safety is appropriate in allocating the load capacity to specific SIC requiring higher limits. This additional factor of safety will reserve 20% of the available load to be allocated to future industries or changes to current industries. The specific load then available to be allocated to the two specific contributing SIC industries is calculated by subtracting the background load from the MAIL, as follows:

$Total\ N\ L_{CONTRIB} = (MAIL = 965\ \#/d) – (L_{BACKGROUND} = 44\ \#/d)$
$= 921$ pounds per day Total N

and adjusting for additional factor of safety (future uses),

$Total\ N\ L_{CONTRIB} = (MAIL = 921\ \#/d) * (1 – 20\%\ FS)$
$= 737$ pounds per day Total N

The two specific contributing SIC industries discharge a total flow of approximately 102,800 gpd to the POTW system. Each of the contributing SIC industries can be assigned a proportionate share of the total N load to their proportional flows, as follows:

<u>SIC 3671/3691 (FAE BC Enterprise LLC):</u>

$Q_X = 1{,}900$ gpd (nominal)
$L_X = 737\ \#/d * (1{,}900\ gpd / 102{,}800\ gpd) = 14$ pounds per day Total N

<u>SIC 3356/3399 (Technic Inc.):</u>

$Q_X = 100{,}900$ gpd (nominal)
$L_X = 737\ \#/d * (100{,}900\ gpd / 102{,}800\ gpd) = 723$ pounds per day Total N

Based on these calculations, the two specific SIC industries contributing Total N will be assigned mass load limits as maximum day limits, beyond the 50 mg/l uniform concentration surcharge level.

7.4 Individual SIC Limits for Total Suspended Solids (TSS)

Based on the available monitoring data for local industries, establishing a uniform concentration limit of 300 mg/l for total suspended solids (TSS) is expected to result in all but three local industries being in compliance with the TSS limit. These industries are SIC 4941 (Woonsocket Water Treatment Plant), SIC 2759 (National Marker Co) and SIC 3471 (Duralectra-CHN LLC), each of which significantly exceed the proposed 300 mg/l concentration limit. As there is significant additional TSS MAIL available beyond the proposed 300 mg/l general concentration limit, a mass proportioned limit can be considered for these SICs requiring higher TSS discharge limits. In establishing such a mass limit for these three specific SICs, the 300 mg/l concentration limit can be considered a background concentration for all other industrial users.

The industries covered by the concentration limit discharge a total industrial flow of approximately 144,500 gpd to the POTW system. In addition, this local limits evaluation and report has allocated a 5 percent increase to existing industrial flows over the term of the proposed local limits. The total flows and TSS load proposed to be allocated as background to industries is calculated as follows:

$$TSS\ L_{BACKGROUND} = 300\ mg/l * 8.34 * (0.1445\ mgd * 1.05)$$
$$= 380\ pounds\ per\ day\ TSS$$

The City has believes that an additional factor of safety is appropriate in allocating the load capacity to specific SIC requiring higher limits. This additional factor of safety will reserve 20% of the available load to be allocated to future industries or changes to current industries. The specific load then available to be allocated to the three specific contributing SIC industries is calculated by subtracting the background load from the MAIL, as follows:

$$TSS\ L_{CONTRIB} = (MAIL = 1{,}833\ \#/d) - (L_{BACKGROUND} = 380\ \#/d)$$
$$= 1{,}453\ pounds\ per\ day\ TSS$$

and adjusting for additional factor of safety (future uses),

$$TSS\ L_{CONTRIB} = (MAIL = 1{,}453\ \#/d) * (1 - 20\%\ FS)$$
$$= 1{,}162\ pounds\ per\ day\ TSS$$

The three specific contributing SIC industries discharge a total flow of approximately 57,500 gpd to the POTW system. Each of the contributing SIC industries can be assigned a proportionate share of the TSS load to their proportional flows, as follows:

SIC 4941 (Woonsocket Water Treatment Plant):

Q_X = 40,000 gpd (nominal)
L_X = 1,162 #/d * (40,000 gpd / 57,500 gpd) = 808 pounds per day TSS

SIC 2759 (National Marker Company):

Q_X = 100 gpd (nominal)
L_X = 1,162 #/d * (100 gpd / 57,500 gpd) = 2 pounds per day TSS

SIC 3471 (Duralectra-CHN LLC):

Q_X = 17,400 gpd (nominal)
L_X = 1,162 #/d * (17,400 gpd / 57,500 gpd) = 352 pounds per day TSS

Based on these calculations, the three specific SIC industries contributing TSS will be assigned mass load limits as maximum day limits, beyond the 300 mg/l uniform concentration surcharge level.

7.5 Individual SIC Limits for Total Phosphorus (P)

Based on the available monitoring data for local industries, establishing a uniform concentration limit of 25 mg/l for total phosphorus (P) is expected to result in all but four local industries being in compliance with the total P limit. These industries are SIC 3471 (Duralectra-CHN LLC), SIC 4953 (Stericycle), SIC 3611/ 3676_(Honeywell), and SIC 0241 (Wright's Dairy Farm), each of which exceed the proposed 25 mg/l concentration limit. As there is additional total P MAIL available beyond the proposed 25 mg/l general concentration limit, a mass proportioned limit can be considered for these SICs requiring higher total P discharge limits. In establishing such a mass limit for these four specific SICs, the 25 mg/l concentration limit can be considered a background concentration for all other industrial users.

The industries covered by the concentration limit discharge a total industrial flow of approximately 174,300 gpd to the POTW system. In addition, this local limits evaluation and report has allocated a 5 percent increase to existing industrial flows over the term of the proposed local limits. The total flows and total P load proposed to be allocated as background to industries is calculated as follows:

$$\text{Total P } L_{BACKGROUND} = 25 \text{ mg/l} * 8.34 * (0.1743 \text{ mgd} * 1.05)$$
$$= 31 \text{ pounds per day Total P}$$

The City has believes that an additional factor of safety is appropriate in allocating the load capacity to specific SIC requiring higher limits. This additional factor of safety will reserve 20% of the available load to be allocated to future industries or changes to current industries. The specific load then available to be allocated to the four specific contributing SIC industries is calculated by subtracting the background load from the MAIL, as follows:

$$\text{Total P } L_{CONTRIB} = (\text{ MAIL} = 80 \text{ \#/d }) - (L_{BACKGROUND} = 31 \text{ \#/d })$$
$$= 49 \text{ pounds per day Total P}$$

and adjusting for additional factor of safety (future uses),

$$\text{Total P } L_{CONTRIB} = (\text{ MAIL} = 49 \text{ \#/d }) * (1 - 20\% \text{ FS})$$
$$= 39 \text{ pounds per day Total P}$$

The four specific contributing SIC industries discharge a total flow of approximately 27,700 gpd to the POTW system. Each of the contributing SIC industries can be assigned a proportionate share of the total P load to their proportional flows, as follows:

SIC 3471 (Duralectra-CHN LLC):

Q_X = 17,400 gpd (nominal)
L_X = 39 #/d * (17,400 gpd / 27,700 gpd) = 24 pounds per day P

SIC 4953 (Stericycle):

Q_X = 7,800 gpd (nominal)
L_X = 39 #/d * (7,800 gpd / 27,700 gpd) = 11 pounds per day Total P

SIC 3611/3676 (Honeywell):

Q_X = 1,800 gpd (nominal)
L_X = 39 #/d * (1,800 gpd / 27,700 gpd) = 3 pounds per day Total P

SIC 0241 (Wright's Dairy Farm):

Q_X = 700 gpd (nominal)
L_X = 39 #/d * (700 gpd / 27,700 gpd) = 1 pounds per day Total P

Based on these calculations, the four specific SIC industries contributing Total P will be assigned mass load limits as maximum day limits, beyond the 25 mg/l uniform concentration surcharge level.

8 SUMMARY OF RECOMMENDATIONS

The following recommendations were developed based upon: each pollutants' maximum allowable headworks loading; a uniformly applied maximum allowable industrial loading; consideration of potential impacts to the industrial users; considerations of potential impacts to the sludge disposal facility; historical compliance with regulatory effluent limits; and plant performance and the existing local limits.

Supplemental load allocations to address industry specific waste characteristic defined and implemented through the City's Industrial pretreatment program/ordinance for certain non-metal POC's are also recommended, as detailed in Section 7 of this report.

These local limit recommendations are intended to be complementary to the categorical standards developed by the EPA. Local limits do not relieve any industrial user from meeting the applicable categorical standards. As appropriate the more stringent of the local limits and categorical standards govern.

Arsenic

There previously was no local limit on the concentration of arsenic. It is recommended that a local limit for arsenic of 0.381 mg/l be established and implemented as a daily maximum. Since arsenic is not a regulated pollutant of concern by the existing local limits program, as it has not been identified to cause adverse impact at the WWTF nor be the cause for any effluent water quality violations. Accordingly, there has not been a need to sample arsenic at any of the SIUs and as such there is no historic IPP monitoring data available to determine if any of the existing SIUs will be impacted by the new local limit. Furthermore, Arsenic was sampled at the WWTF raw influent and within the collection system as part of the previously identified supplemental sampling program presented in the January 2011 Local Limits Workplan and in both instances arsenic was not identified to be problematic. Although arsenic is not regulated by the current local limits nor identified to cause adverse impact on current WWTF operations and performance, it is considered a priority pollutant to be included in any local limits evaluations per USEPA and RIDEM. Implementation of a technically-based local limit for arsenic establishes an appropriate detection limit for the City to ensure proper WWTF performance in the future.

Cadmium

The existing local limits established a daily limit of 0.11 mg/l and monthly average limit of 0.07 mg/l. It is recommended that a revised local limit for cadmium of 0.055 mg/l be established and implemented as a daily maximum. Based on the available IPP monitoring data, it appears that none of the existing SIUs will be impacted under the new limit.

Chromium

The existing local limits established a daily limit of 2.77 mg/l and monthly average limit of 1.71 mg/l. It is recommended that the local limit for chromium of 2.77 mg/l be maintained and implemented as a daily maximum. Based on the available IPP monitoring data, it appears that none of the existing SIUs will be impacted under the new limit.

Copper

The existing local limits established a daily limit of 3.38 mg/l and monthly average limit of 2.07 mg/l. It is recommended that the local limit for copper of 3.38 mg/l be maintained and implemented as a daily maximum. Based on the available IPP monitoring data, it appears that none of the existing SIUs will be impacted under the new limit.

Lead

The existing local limits established a daily limit of 0.69 mg/l and monthly average limit of 0.43 mg/l. It is recommended that the local limit for lead of 0.69 mg/l be maintained and implemented as a daily maximum. Based on the available IPP monitoring data, it appears that none of the existing SIUs will be impacted under the new limit. Based on available data, it also appears that the sludge disposal facility will likely not be impacted.

Mercury

There previously was no local limit on the concentration of mercury. It is recommended that a local limit for mercury of 0.002 mg/l be established and implemented as a daily maximum. Mercury is not a regulated pollutant of concern by the existing local limits program, as it has not been identified to cause adverse impact at the WWTF nor be the cause for any effluent water quality violations. Accordingly, there has not been a need to sample mercury at any of the SIUs and as such there is no historic IPP monitoring data available to determine if any of the existing SIUs will be impacted by the new local limit. Furthermore, mercury was sampled at the WWTF raw influent and within the collection system as part of the previously identified supplemental sampling program presented in the *January 2011 Local Limits Workplan* and in both instances mercury was not identified to be problematic. Although mercury is not regulated by the current local limits nor identified to cause adverse impact on current WWTF operations and performance, it is considered a priority pollutant to be included in any local limits evaluations per USEPA and RIDEM. Implementation of a technically-based local limit for mercury establishes an appropriate detection limit for the City to ensure proper WWTF performance in the future.

Nickel

The existing local limits established a daily limit of 3.98 mg/l and monthly average limit of 2.38 mg/l. It is recommended that the local limit for nickel of 3.98 mg/l be maintained and implemented as a daily maximum. Based on the available IPP monitoring data, it appears that none of the existing SIUs will be impacted under the new limit.

Silver

The existing local limits established a daily limit of 0.43 mg/l and monthly average limit of 0.24 mg/l. It is recommended that a revised local limit for silver of 0.186 mg/l be established and implemented as a daily maximum. Based on the available IPP monitoring data, it appears that one existing industry will most likely be impacted under the new limit. This industry has had problems meeting the previous limit.

Zinc

The existing local limits established a daily limit of 2.61 mg/l and monthly average limit of 1.48 mg/l. It is recommended that the local limit for zinc of 2.61 mg/l be maintained and implemented as a daily maximum. Based on the available IPP monitoring data, it appears that none of the existing SIUs will be impacted under the new limit.

Cyanide

The existing local limits established a daily limit of 1.20 mg/l and monthly average limit of 1.48 mg/l. It is recommended that the local limit for cyanide of 1.20 mg/l be maintained and implemented as a daily maximum. Based on the available IPP monitoring data, it appears that none of the existing SIUs will be impacted under the new limit.

Biochemical Oxygen Demand (BOD)

The existing local limits established a daily limit of 250 mg/l. It is recommended that a revised local limit for BOD_5 of 500 mg/l be established and implemented as a daily maximum. Based on the available IPP monitoring data, it appears that two existing SIUs will most likely be impacted under the new limit. Supplemental load allocations for certain specific industrial uses have been calculated in Section 7 of this report.

Chemical Oxygen Demand (COD)

The existing local limits established a daily limit of 750 mg/l. Local limits recommendations for COD were developed using the historical COD to BOD, ratio at the WWTF, of 1.86 to 1. Using this ratio, it is recommended that a revised local limit

for COD of 930 mg/l be established and implemented as a daily maximum. Based on the available IPP monitoring data, it appears that two existing SIUs will most likely be impacted under the new limit. Supplemental load allocations for certain specific industrial uses have been calculated in Section 7 of this report.

Total Suspended Solids (TSS)

The existing local limits established a daily limit of 300 mg/l. It is recommended that a local limit for TSS of 300 mg/l be maintained and implemented as a daily maximum. Based on the available IPP monitoring data, it appears that two existing SIUs will most likely be impacted under this limit. Supplemental load allocations for certain specific industrial uses have been calculated in Section 7 of this report.

Total Nitrogen

There previously was no local limit on the concentration of total nitrogen. It is recommended that a local limit for total nitrogen of 50 mg/l be established and implemented as a daily maximum. Limited IPP monitoring data is available to determine if any SIUs will be impacted under the new limit. However, preliminary testing results indicate that two existing SIUs are likely to be impacted under the new limit. Supplemental load allocations for certain specific industrial uses have been calculated in Section 7 of this report.

Ammonia

There previously was no local limit on the concentration of ammonia. It is recommended that a local limit for ammonia of 30 mg/l be established and implemented as a daily maximum. Limited IPP monitoring data is available to determine if any SIUs will be impacted under the new limit. However, preliminary testing results indicate that two existing SIUs are likely to be impacted under the new limit. Supplemental load allocations for certain specific industrial uses have been calculated in Section 7 of this report.

Total Phosphorus

There previously was no local limit on the concentration of total phosphorus. It is recommended that an absolute local limit for total phosphorus of 25 mg/l be established and implemented as a daily maximum. Limited IPP monitoring data is available to determine if any SIUs will be impacted under the new limit. However, preliminary testing results indicate that three to four SIUs may be impacted under the new absolute limit. Supplemental load allocations for certain specific industrial uses have been calculated in Section 7 of this report.

Total Toxic Organics

The existing local limits established a daily limit of 2.13 mg/l. It is recommended that the local limit for TTO of 2.13 mg/l be maintained and implemented as a daily maximum. Based on the available IPP monitoring data, it appears that none of the existing SIUs will be impacted under the new limit.

Oil & Grease

The existing local limits established a daily limit of 100 mg/l. It is recommended that the local limit for Oil & Grease of 100 mg/l be maintained and implemented as a daily maximum. Based on the available IPP monitoring data, it appears that none of the existing SIUs will be impacted under the new limit.

pH

The existing local limits established a daily limit range of $5.0 \leq pH \leq 11.0$. To be considered a violation the pH must be outside of the local limit range for a period greater than 15 minutes. It is recommended that the local limit range for pH of $5.0 \leq pH \leq 11.0$ be maintained, along with the associated time constraints, and implemented as a daily maximum. Based on the available IPP monitoring data, it appears that none of the existing SIUs will be impacted under the new limit.

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