CITY OF FORTUNA
TOM COOKE MEMORIAL WASTEWATER TREATMENT PLANT
2009 ANNUAL REPORT

1/28/2010

1. INTRODUCTION

This report is a summary of plant operation and performance in 2009. In addition to a discussion of effluent quality and the plant's success in meeting treatment objectives, the report contains summaries of 2009 plant operations, maintenance, chemicals, and human resources.

The plant generally operated very well throughout the entire year. The aeration basins and liquid treatment stream have been operating well as reflected by the laboratory data. By removing one aeration blower from service, we were able to help improve dissolved oxygen transfer in our aeration basins and reduce electrical utility consumption by relieving pressure on our membrane style diffusers. We have also successfully maintained our target mixed liquor solids and Mean Cell Residence Time. During the period from June 15th to December 31, the plant operated under the management of a contract operator, Michael Fritschi, WWTPO-V.

The January report to your office inadvertently stated that our chlorine contact basin residual was <1.5 on January 14th, when in fact our laboratory staff had recorded it as >1.5 for that day. We have endeavored to reduce the use of < and > symbols in the lab to prevent occurrences of this type of error in the future.

On February 16th, and again on February 18th, the percolation ponds overflowed into the dry creek bed between the facility and the percolation ponds due to extremely high river levels. The overflow was minimal, and did not appear to contact the Eel River.

On April 3rd, chlorine was detected in the effluent discharged to Strong's Creek and on four separate occasions in May (May 5th, 7th, 8th, and 21st) the contact basin residuals fell below the permit requirement of 1.5 mg/L due to fluctuations in secondary effluent ammonia content. To address the issue, we implemented an aggressive program to attain and maintain conditions of nitrification in the secondary system since June, and have not experienced a problem with widely fluctuating chlorine demand since that time.

On April 15th, the variations in chlorine demand caused over feeding of Sulfur Dioxide which resulted in a discharge pH below permit requirements. On June 10th, we had a mechanical problem with the caustic feed pump used for alkalinity adjustment and our effluent fell below the 6.0 pH requirement of our discharge permit. The problem was immediately corrected and process monitoring procedures were implemented to insure prompt response to equipment failures.

During the last two weeks in May and the first three weeks in June, we were unable to obtain a measurement of our effluent Biochemical Oxygen Demand (BOD) due to lab errors caused by contaminated reagents. This resulted in our reporting an 84% removal of BOD on May 27th, and reporting no result for BOD removal on June 3rd and 10th. Other lab accidents affected our effluent BOD results one week in February and we experienced a similar lab accident preventing our effluent coliform results one week December. Our new Laboratory Director has implemented Quality Control/ Quality Assurance procedures which were not in use in prior years to reduce the occurrence of such lab accidents.

Additionally, we have passed the chronic toxicity testing performed in May 2009, and will be retesting soon. We hope to confirm that the four unsatisfactory chronic toxicity test results obtained in 2008 were adversely influenced by our dechlorination system. To that end, we have installed a new automatic dechlorination system that we feel will provide continuous protection against chlorine discharge and limit effluent toxicity due to Sulfur Dioxide residuals. In addition to automated control, operations staff has been trained by a factory certified technician during chlorination and dechlorination equipment repair and maintenance rehabilitation.

We have developed and implemented facility Standard Operating Procedures and an improved operator training program which has allowed the plant to accomplish two primary operational goals this year. We were able to achieve and maintain nitrification and we were successful in achieving operational control and standardizing process parameters for the anaerobic digester.

A significant effort has been extended to optimize solids processing and the systems associated with them. We have completed our Biosolids Management Plan (BMP) and Report of Waste Discharge for land application of composted biosolids. We have recently submitted the BMP for Regional Board approval. We successfully composted over two years of stored biosolids to Exceptional Quality Class A standards and implemented a program to allow the public to obtain the final product at a limit of one pick-up truck load per physical address.

Other major challenges include complete implementation of all the new requirements in our discharge permit. These include flow dilution studies in Strong's Creek and testing to evaluate the performance of the dry weather percolation ponds.

2. OPERATIONS

a. Influent Quality

The plant operates at an average dry weather flow of 1.0 Million Gallons per Day (MGD), and during wet weather can experience flows above 5.0 MGD. During high flow periods, plant influent is partially diverted to flow equalization ponds to allow the plant flow to remain at a controlled uniform rate.

A summary of annual flow and influent parameter concentrations for the past two years is shown in Table 1. The plant experienced an 11% increase in influent flow from 2008 to 2009.

Table 1: Influent Parameters

Year	2008	2009
Mean Influent Flow, MGD	**1.03**	**1.15**
Total Annual Flow, MG	**379.2**	**421.1**
Mean Influent SS, mg/L	**183**	**348**
Mean Influent BOD_5, mg/L	**284**	**311**

b. Preliminary Treatment

Wastewater enters the headworks, which provides a grit and screenings removal operation. There is one automatic stair stepper type bar screen. This screening machine removes rags and large pieces of debris from the wastewater. Grit channels located downstream of the screen remove sand, gravel and similar heavy inorganic material by gravity separation. The grit channel operates at a lower velocity than standard because organics allowed to fall out of the waste stream are separated by a cyclone grit classifier and returned to the plan influent. The grit and screenings are collected and hauled to a sanitary landfill site.

The quantity of grit and screenings removed by the grit channels and mechanical bar screen averaged approximately 2.5ft^3/day in 2009.

c. Primary Treatment

After the grit channels, the next step in the wastewater treatment process is primary sedimentation where the velocity of flow entering the clarifier tanks is reduced, allowing the heavier solids in the wastewater to settle to the bottom by gravity. Sludge collectors in the tanks sweep the settled sludge (primary sludge) into a sludge hopper located on the bottom of the tank, from where the sludge is pumped to the anaerobic digester. There are three circular primary clarifiers.

Table 2 contains a summary of key primary treatment effluent parameter concentrations over the previous two years.

Table 2: Primary Treatment Effluent Parameters

Year	2008	2009
Mean Primary Effluent SS, mg/L	**84**	**63**
Mean Primary Effluent BOD_5, mg/L	**122.6**	**98.2**

d. Secondary Treatment

In the activated sludge process, effluent from the primary clarifiers is mixed with Return Activated Sludge (RAS) from final clarifiers and is aerated in aeration basins. The activated sludge is made up of micro-organisms, which are a natural part of wastewater and are used to break down the organic solids in the wastewater. Micro-organism are monitored microscopically weekly by operations and laboratory staff. There are three aeration basins.

The mixed liquor from the aeration basins flows to final clarifiers where the activated sludge is allowed to settle. A controlled quantity of this sludge is "returned" to the aeration basins to repeat the treatment process, and excess quantities are removed as waste activated sludge to the waste activated sludge holding tank.

A summary of key aeration basin parameters for the previous two years is shown in Table 3.

Table 3: Secondary Treatment Process Parameters

Year	2008	2009
Aeration Loading, lb BOD_5/day	**1200**	**1400**
Mixed Liquor Suspended Solids, mg/L	**5600**	**3000**
F:M Ratio	**0.03**	**0.05**
Mean Cell Residence Time, days	**63**	**28**

e. Final Effluent Quality

Chlorine gas is used to disinfect the final effluent before it is discharged. In 2009, the plant continued to produce a high quality effluent. A summary of key final effluent parameters for 2009 is shown in Table 4. Details of the final effluent qualities are presented in graphical form in Appendix A.

Table 4: Treated Wastewater Parameters 2009

		JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
FLOW													
MAXIMUM	MGD	1.60	2.38	2.03	1.22	1.70	0.97	0.94	1.01	1.09	1.19	1.40	3.16
MEAN	MGD	1.08	1.52	1.49	0.96	0.94	0.86	0.80	0.83	0.82	0.84	0.94	1.14
INFLUENT													
BOD, MEAN	mg/L	293	212	255	331	336	277	281	296	336	406	399	311
TSS, MEAN	mg/L	225	183	234	390	259	261	244	249	439	436	1071	622
EFFLUENT BOD													
MAXIMUM	mg/L	8.7	>12.3[1]	7.0	11.3	>45.6[1]	>5.7[1]	4.6	5.8	8.1	7.5	5.6	6.2
MEAN	mg/L	7.1	8.3	5.8	5.3	2.7	5.1	7.1	4.7	6.3	6.5	4.2	5.4
EFFLUENT TSS													
MAXIMUM	mg/L	6.7	6.7	2.3	11.3	3.2	8.4	5.0	3.0	3.1	3.4	2.5	13.3
MEAN	mg/L	5.1	3.7	2.1	6.1	2.4	5.1	2.7	1.8	1.9	2.8	2.1	6.4
PERCENT REMOVAL													
BOD	%	98%	NA[1]	98%	98%	NA[1]	NA[1]	99%	98%	98%	98%	99%	98%
TSS	%	98%	98%	99%	98%	99%	98%	99%	99%	100%	99%	100%	98%
SETTLEABLE SOLIDS													
MAXIMUM	ml/L	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
MEAN	ml/L	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1

HYDROGEN ION

MAXIMUM	pH	**6.4**	**6.4**	**6.5**	**6.8**	**6.8**	**6.4**	**6.4**	**6.6**	**6.8**	**6.6**	**7.0**	**6.9**
MINIMUM	pH	**6.0**	**6.2**	**6.2**	**6.3[2]**	**6.3**	**5.9[2]**	**6.2**	**6.4**	**6.3**	**6.1**	**6.8**	**6.6**

COLIFORM

MAXIMUM	MPN	**50**	**23**	**2**	**11**	**23**	**13**	**2**	**2**	**11**	**4**	**7**	**17**
MEAN	MPN	**15**	**9**	**2**	**7**	**13**	**8**	**2**	**2**	**11**	**3**	**3**	**8**

CHLORINE RESIDUAL Effluent

MAXIMUM	mg/L	**perc**	**perc**	**perc**	**3.1[2]**	**perc**	**perc**	**perc**	**perc**	**perc**	**perc**	**perc**	**perc**
MEAN	mg/L	**pond**	**pond**	**pond**	**0.1**	**pond**	**pond**	**pond**	**pond**	**pond**	**pond**	**pond**	**pond**

CHLORINE RESIDUAL Disinfection

MINIMUM	mg/L	**1.9**	**3.5**	**4.5**	**1.5**	**0.8[2]**	**2.0**	**3.3**	**5.2**	**5.0**	**3.4**	**3.4**	**3.5**

f. *Solids Handling*

In 2009, an average of 31,600 lb/day of raw sludge from primary treatment was pumped to the anaerobic digesters for treatment. Average total solids (TS) concentration of raw sludge was 3.7% and total volatile solids content was 86.8% of TS. Waste activated sludge (WAS) was pumped to the anaerobic digester via the gravity belt thickener. In 2009, approximately 1300 lb/day of WAS was thickened and sent to the digester. The average thickened waste activated sludge (TWAS) total solids concentration was 5.7%.

The average hydraulic retention time of sludge in the anaerobic digesters was 64 days. The anaerobic digestion process reduces sludge volume and stabilizes the solids to form biosolids. In 2009, approximately 102 dry metric tons of biosolids were produced and composted to Class A Exceptional Quality standards.

3. MAINTENANCE

The WWTP performed a variety of scheduled, preventative, predictive and breakdown maintenance on a diverse spectrum of equipment. The main goal of maintenance activities is to ensure equipment availability to meet plant process operation requirements.

The following is a summary of significant maintenance accomplishments over the past year.

a. Flow Meter Calibration

Flow to the plant is measured at the headworks and chlorine contact basin effluent weir. The annual calibration of flow meter equipment was completed on October 17, 2009 and found to be within acceptable limits.

b. WWTP Maintenance

The WWTP maintenance included all major and auxiliary processes. The following maintenance was completed in 2009:

- Replaced labyrinth seals on aeration blowers #1 and #2.
- Replaced Belt Filter Press doctor blades.
- Replaced feedbox bearings on Belt Filter Press.
- Flushed and changed hydraulic oil on Gravity Belt Thickener.
- Repaired pressure belt seam on Belt Filter Press.
- Replaced polyethylene wearing shoes on grit collection flights.
- Replaced bearings on bio-filter fans.
- Replaced bearings on primary clarifier #2 drive system.
- Replaced hose and couplings on primary sludge peristaltic pump.
- Installed new bearings in #3 return activated sludge pump.
- Replaced bearing cap and oil seal on #2 return activated sludge pump.
- Installed new bearings in stair screen swivel joint and replaced all hoses.
- Retro-fitted digester sludge recirculation piping to eliminate air binding of pumps.
- Cleaned and serviced final clarifier #4.

4. CHEMICALS

Several chemicals are used for a variety of treatment processes at the plant. Major process chemicals are discussed below and include:

- Sodium Hydroxide (Nutrient Removal, pH adjustment)
- Chlorine gas (Disinfection)
- Sulfur Dioxide gas (Dechlorination)
- Cationic Emulsion Polymer (Coagulant)

a. Sodium Hydroxide for Nutrient Removal and pH Adjustment

Sodium Hydroxide consumption for nutrient removal (i.e. ammonia) during 2009 was approximately 40,000 lbs. Sodium Hydroxide is applied to the mixing box upstream of the aeration basins and, as necessary, prior to effluent discharge.

b. Chlorine for Disinfection

Chlorine is used for disinfection of the final effluent. In 2009, approximately 51,000 lbs. was consumed for this purpose.

c. Sulfur Dioxide for Dechlorination

Sulfur Dioxide is used for dechlorination of the final effluent prior to discharge to Strong's Creek. In 2009, approximately 4300 lbs. was consumed for this purpose.

d. Cationic Emulsion Polymer for Sludge thickening and Dewatering

Cationic Emulsion Polymer is used for thickening of the waste activated sludge prior to pumping to the anaerobic digester. Additionally, it is used to facilitate dewatering of the digested sludge prior to the composting process. In 2009, approximately 9000 lbs. was consumed for this purpose.

5. HUMAN RESOURCES

a. Staffing

In 2009, the treatment plant had 9 employees. Plant Staffing is shown in Table 5.

Table 5: Plant Staffing

Chief Plant Operator (Contract Operator)	1
WWTP Operator	6
Plant Maintenance Technologist	1
Lab Director	1

b. Staff Training & Development

The WWTP has developed a comprehensive Operator Training Program that expands the abilities of the operational staff, resulting in better service to the public. WWTP operating staff attended the trainings.

The trainings in 2009 included:

- AED & CPR
- Chlorine Safety
- First Aid
- Coliform Testing
- Driver Safety
- Sludge Dewatering Systems

c. Operator Certification

The WWTP has incorporated two interim Shift Supervisor positions into the job profiles at the wastewater treatment facility.

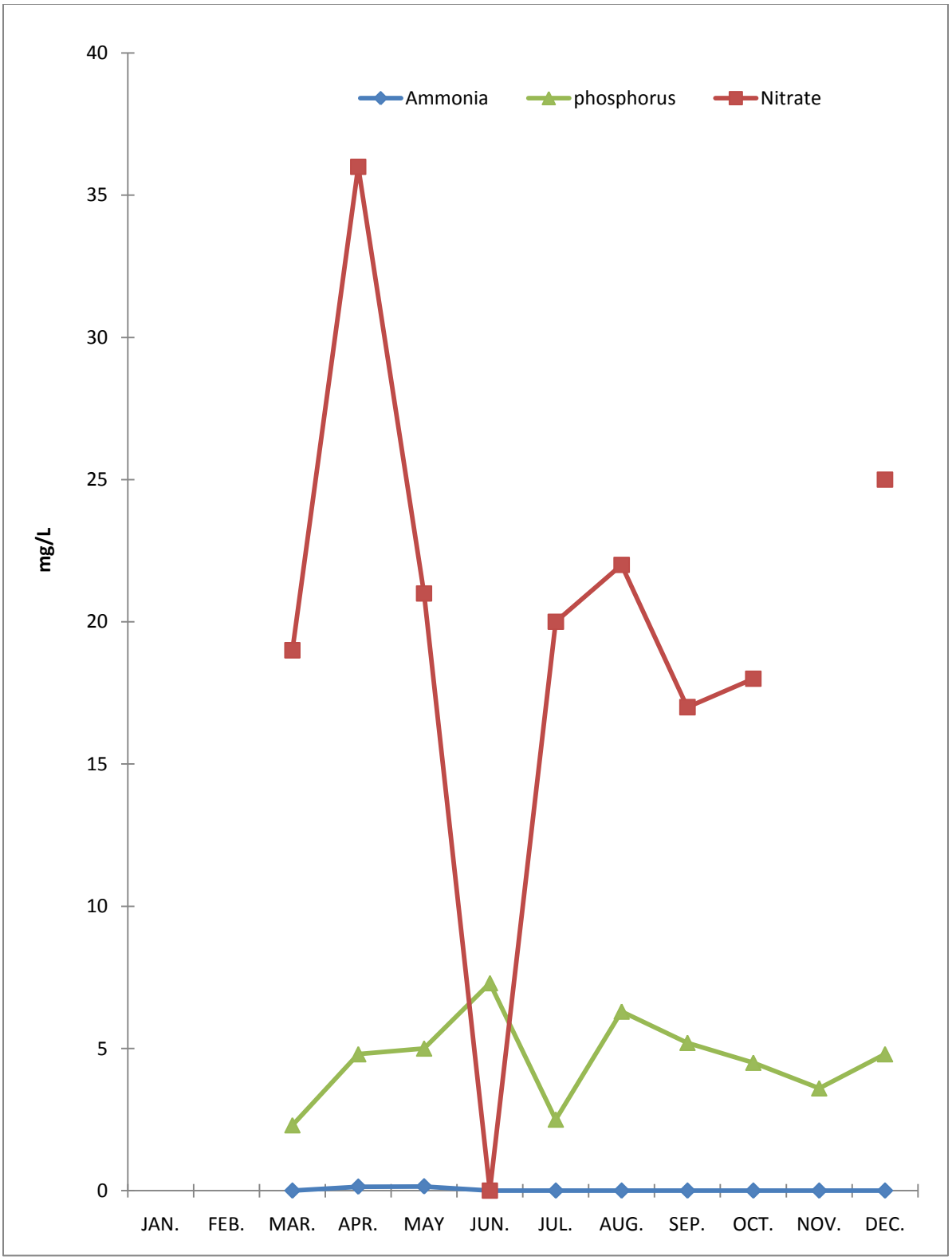
The following table summarizes the status of operator certification at the treatment plant for 2009.

Table 6: Wastewater Treatment Certificates

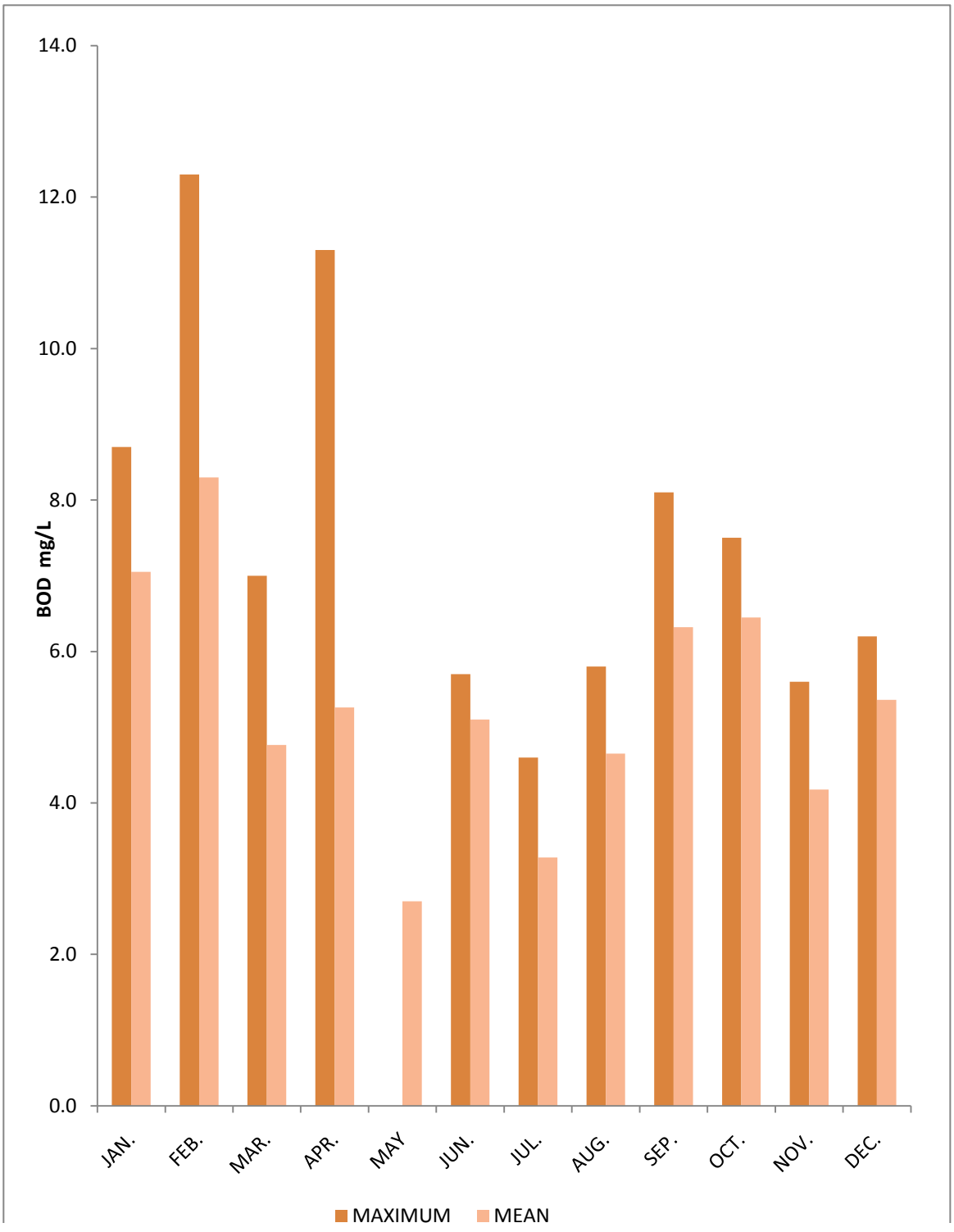
Grade V	1
Grade III	1
Grade II	5
O.I.T.	2

Appendix A

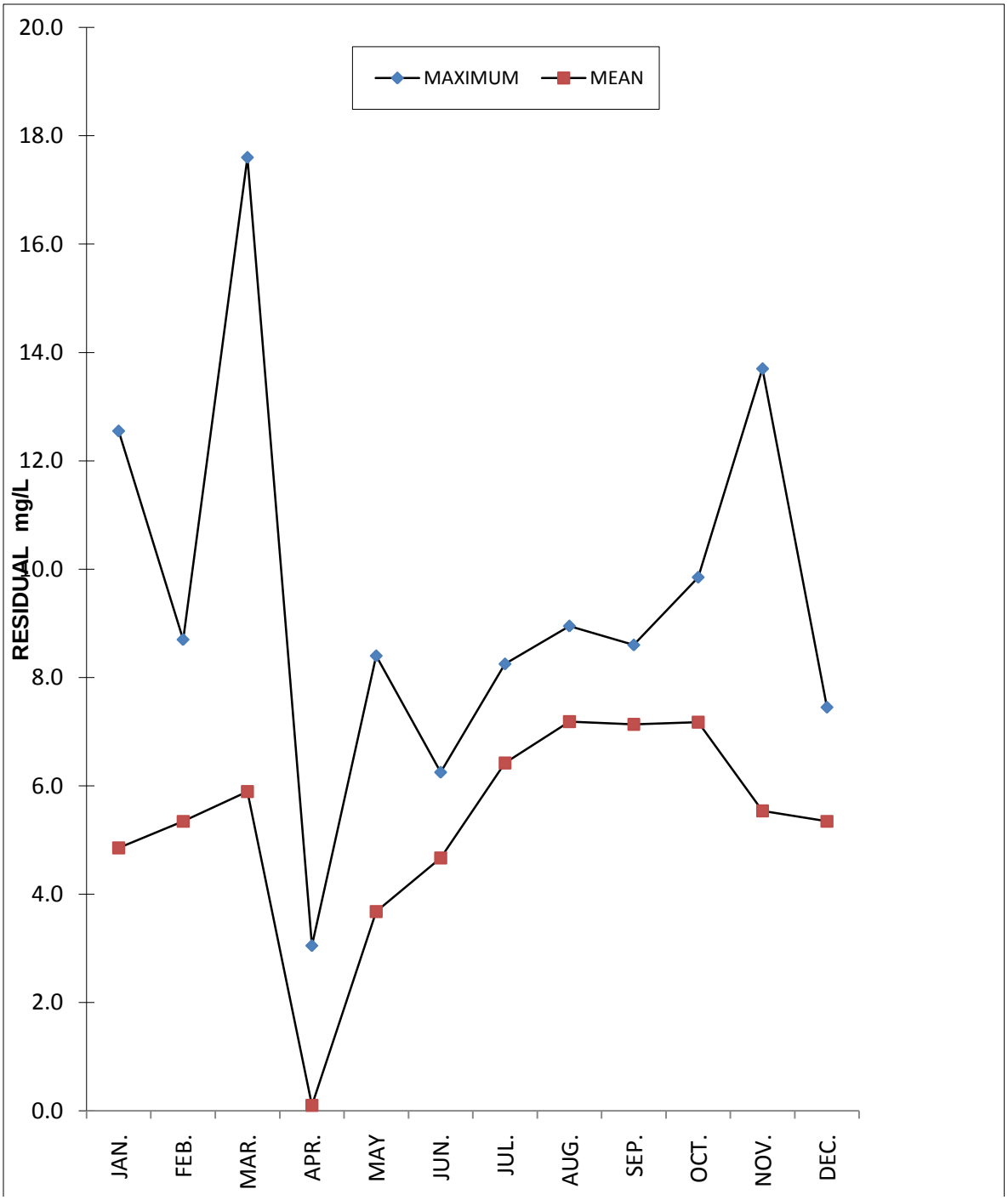
Performance Charts



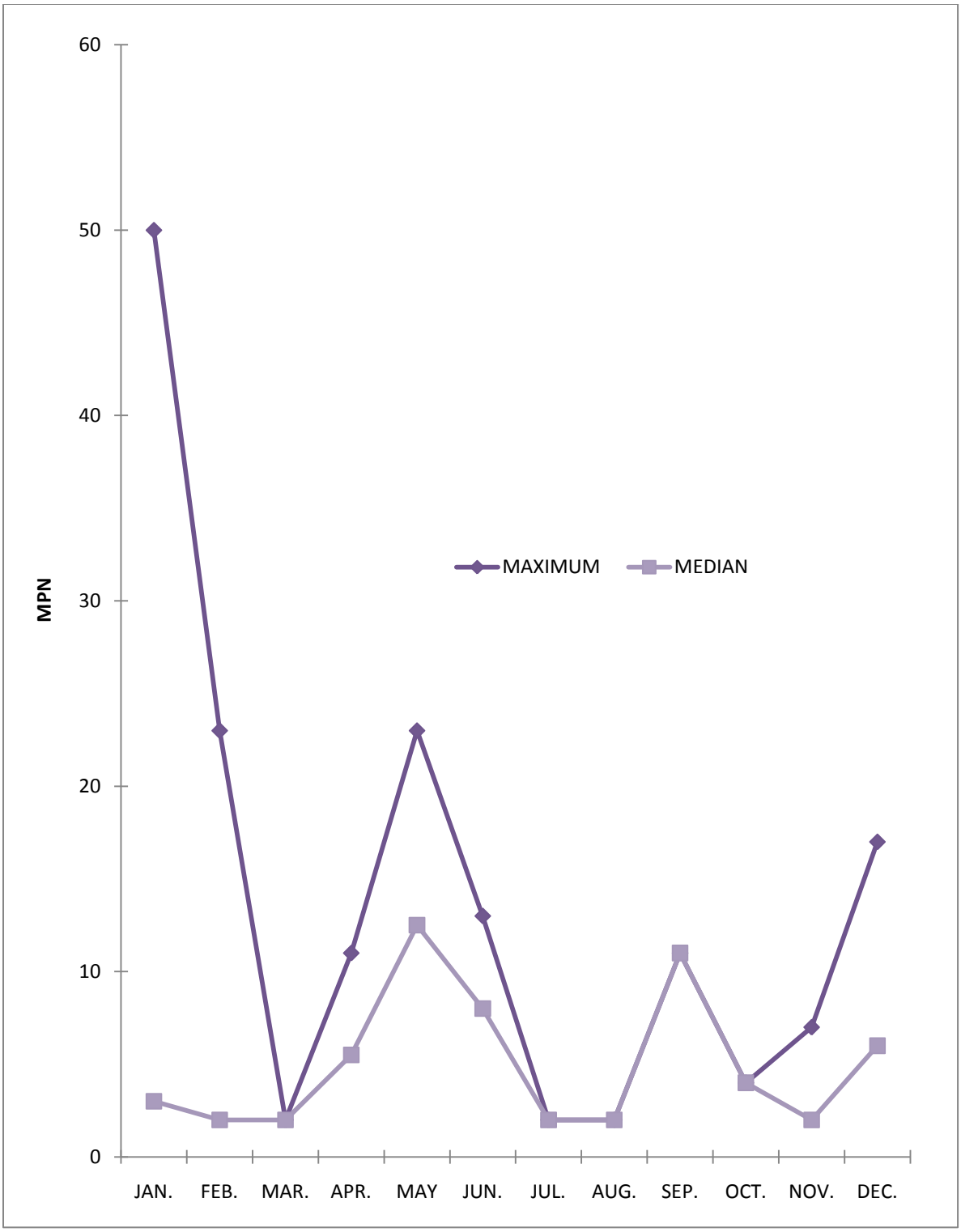
Effluent Nutrients



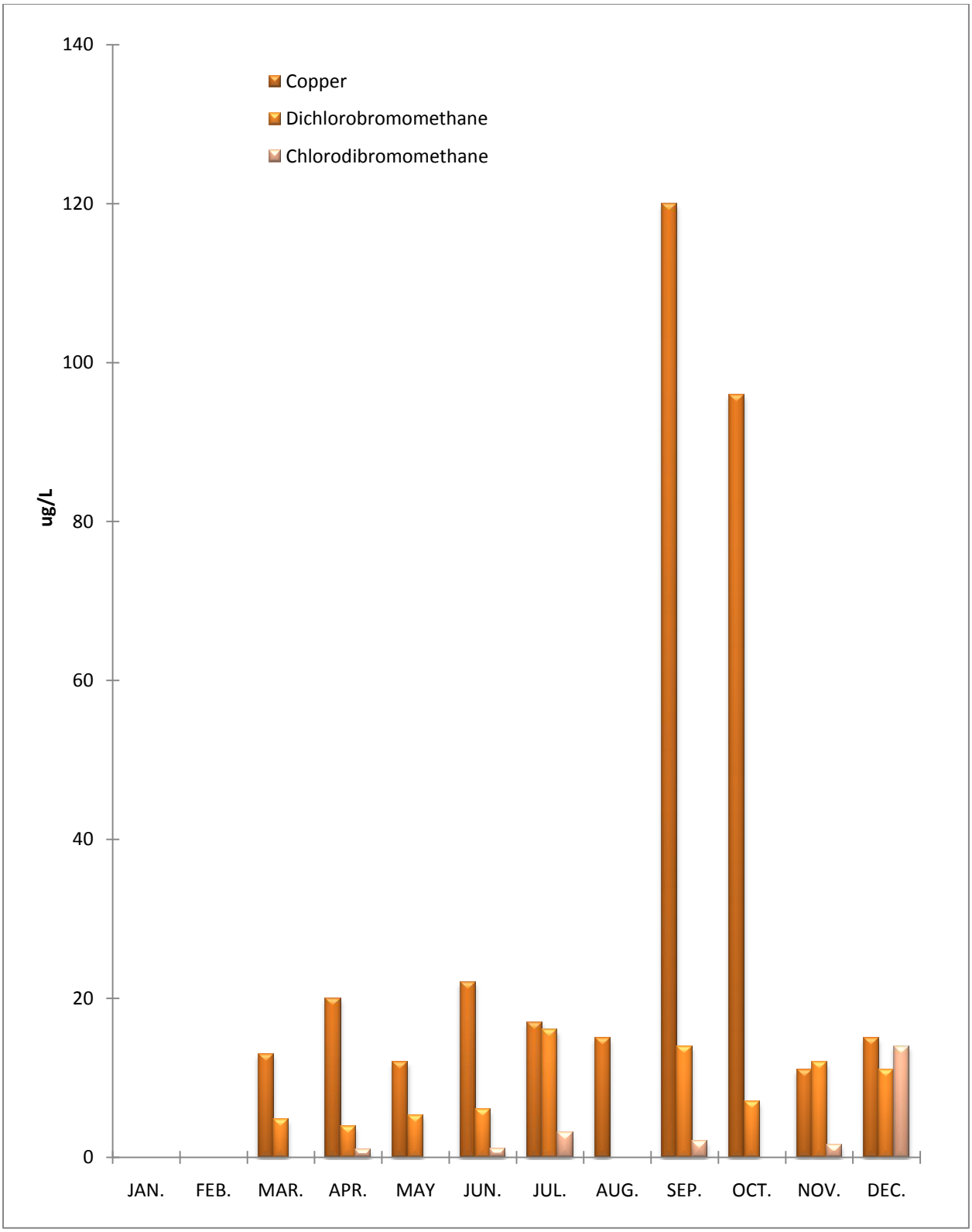
Effluent Biochemical Oxygen Demand



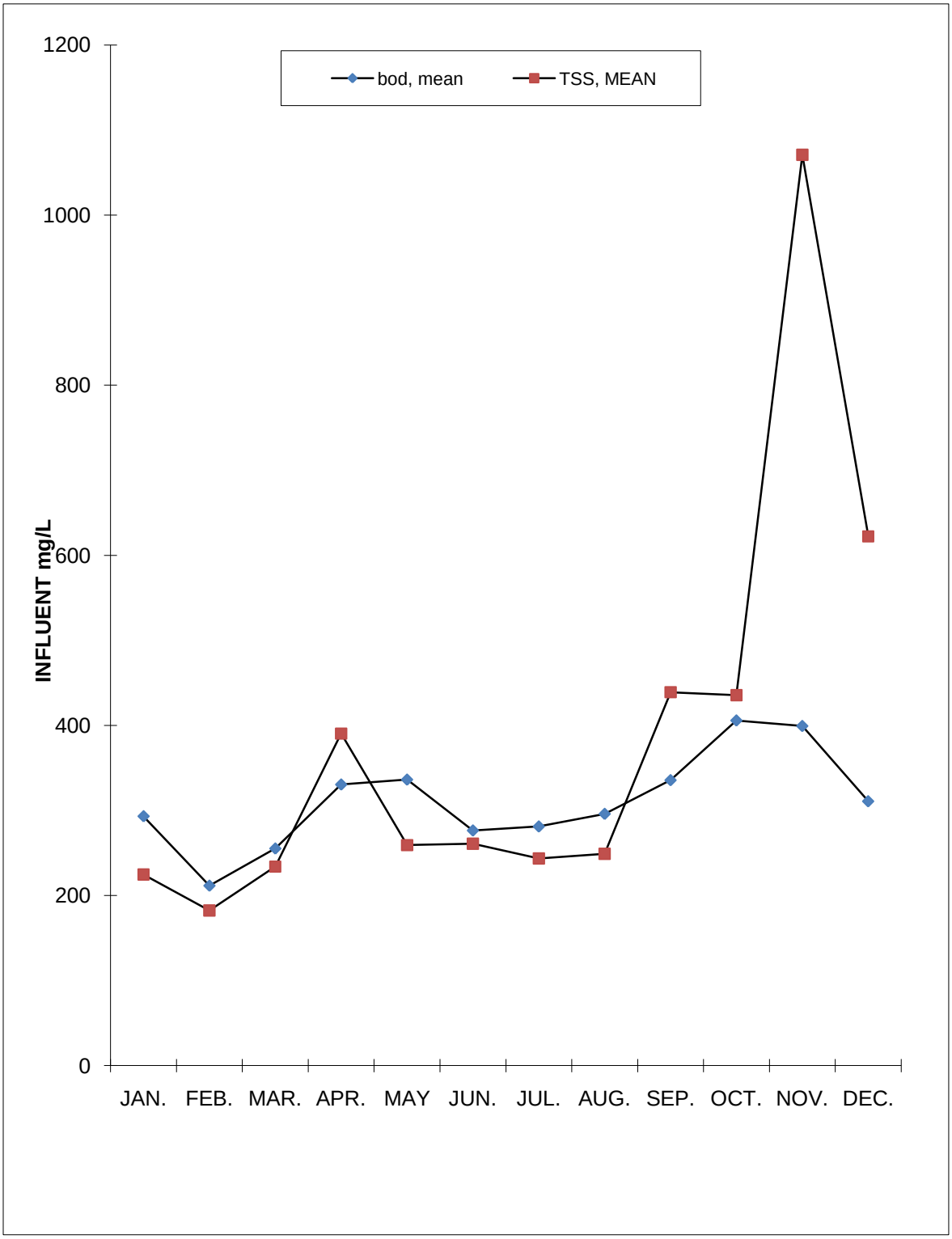
Effluent Chlorine Residual



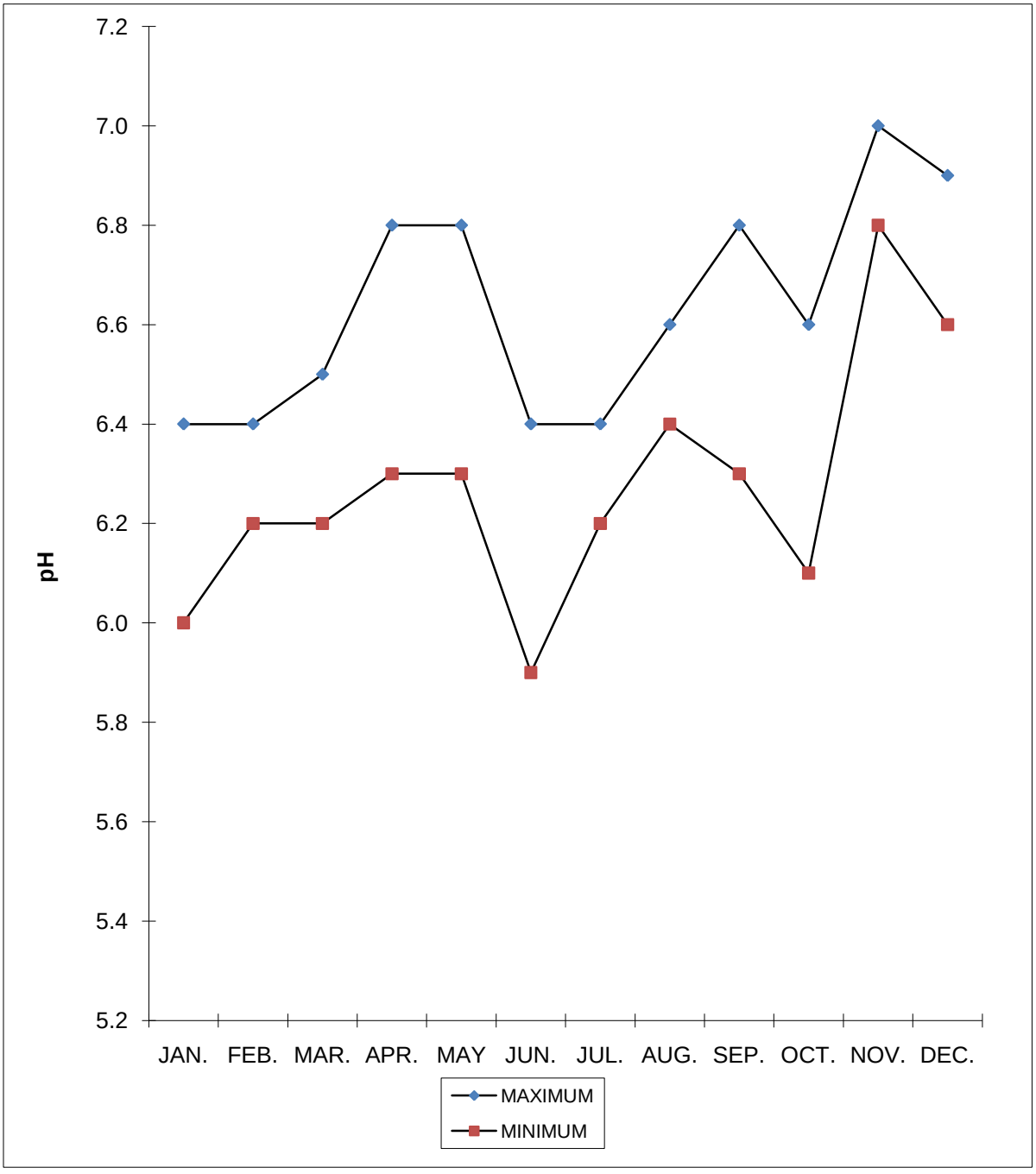
Effluent Coliform MPN



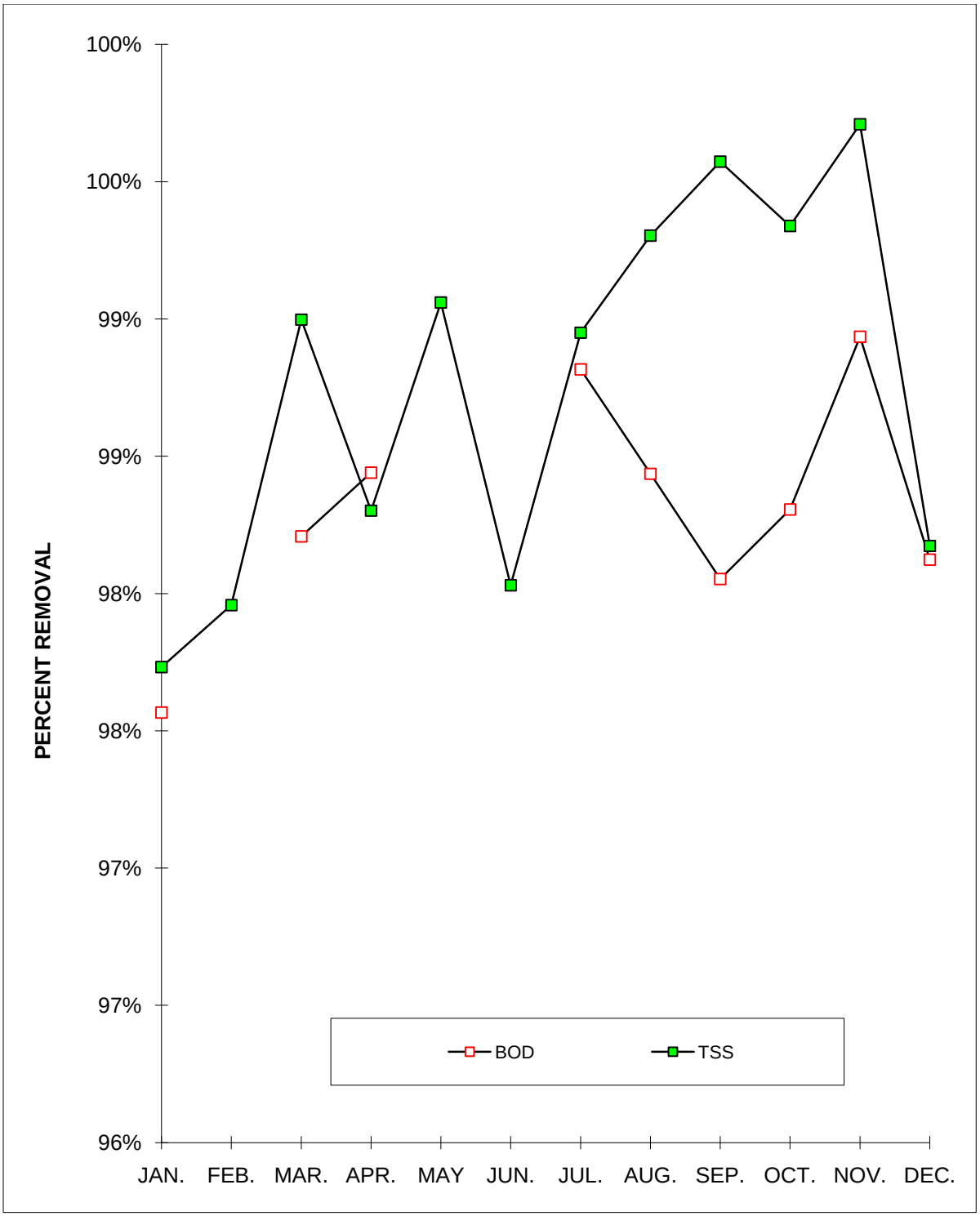
California Toxics Rule Testing



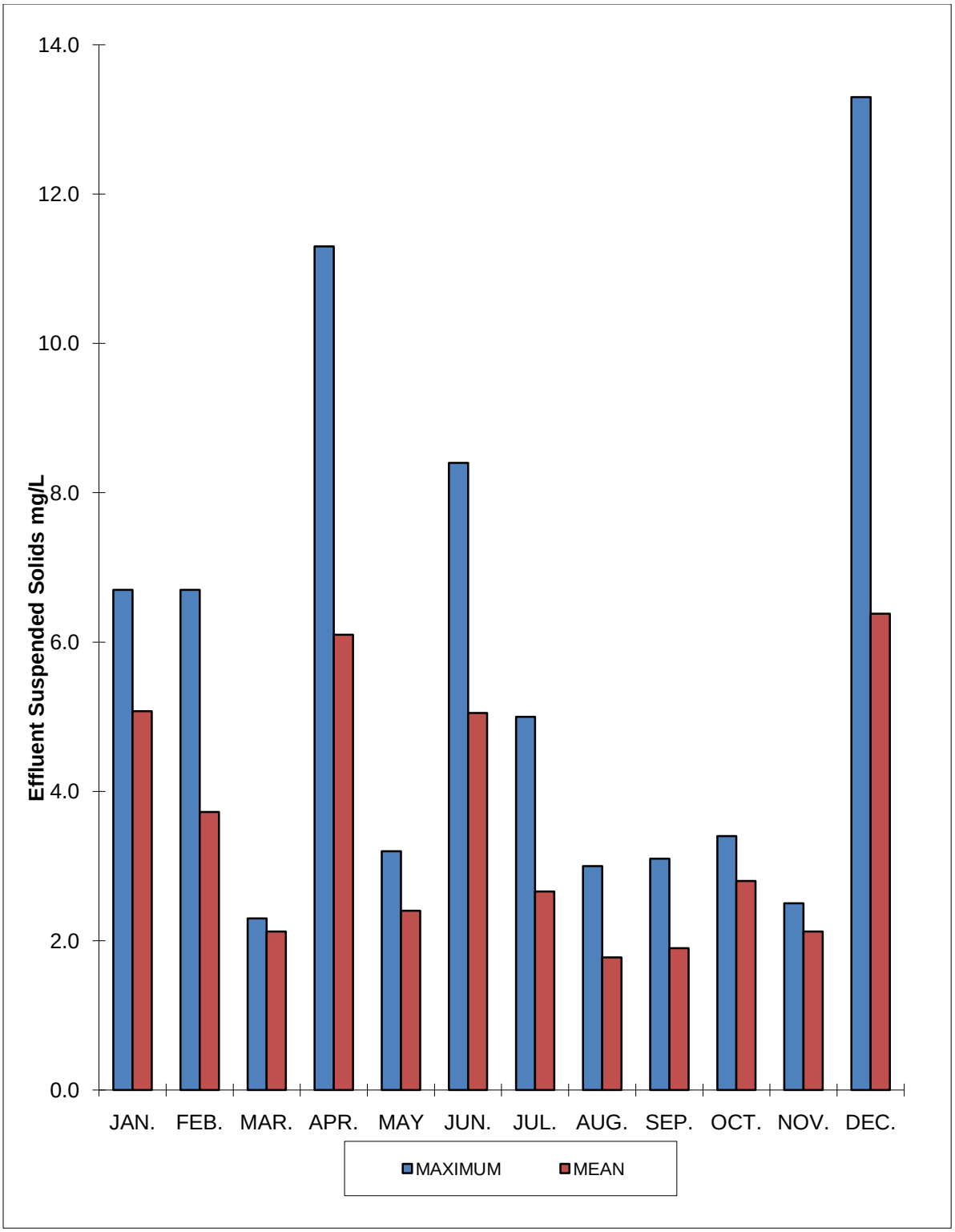
Influent Parameters


7.2
7.0
6.8
6.6
6.4
6.2
6.0
5.8
5.6
5.4
5.2
pH
JAN.
FEB.
MAR.
APR.
MAY
JUN.
JUL.
AUG.
SEP.
OCT.
NOV.
DEC.
MAXIMUM
MINIMUM

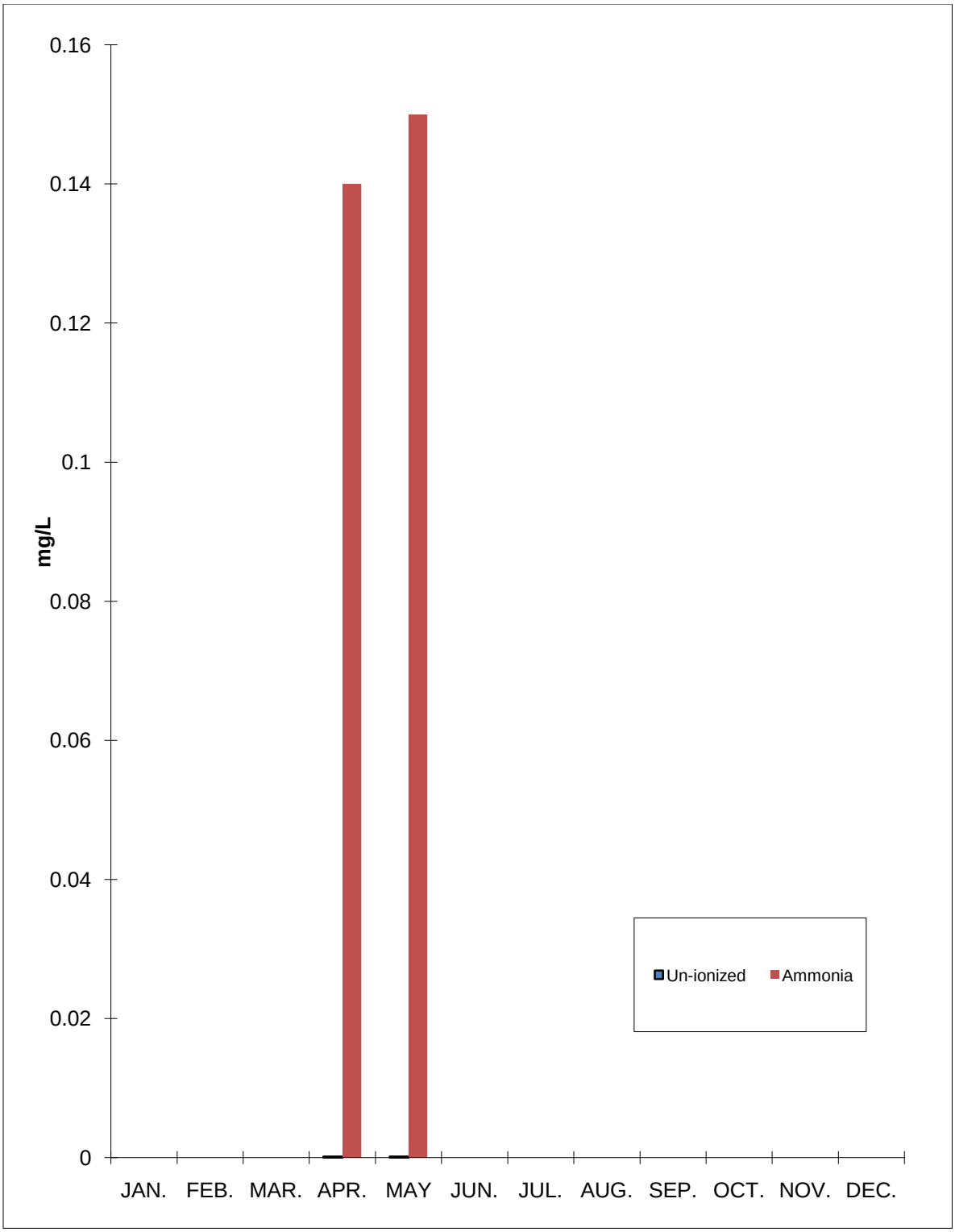
Effluent pH



Removal Efficiency



Effluent Suspended Solids



Ammonia and Un-ionized Ammonia

Appendix B

Biosolids Metals Analyses