FINAL

U.S. IBWC
South Bay International Wastewater Treatment Plant
Maximum Allowable Headworks Allocations

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Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
AHL	allowable headworks loading
CAAA	Clean Air Act Amendments
CCR	California Code of Regulations
BOD5	5-day biochemical oxygen demand
DAF	dissolved air flotation
DDT	dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
EQ	equalization
EL	effluent limit
Guidance Manual	EPA Local Limits Development Guidance (2004)
HAP	hazardous air pollutant
lbs/day	pounds per day
MACT	maximum achievable control technology
MAHA	maximum allowable headworks allocation
MAHL	maximum allowable headworks loading
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/m^3	milligrams per cubic meter
mg/L	milligrams per liter
µg/L	micrograms per liter
MG	million gallons
MGD	million gallons per day
NPDES	National Pollutant Discharge Elimination System
PCB	polychlorinated biphenyl
pg/L	picograms per liter
POC	pollutant of concern
PST	primary sedimentation tank
RAS	return activated sludge
SBIWTP	South Bay International Wastewater Treatment Plant
SBOO	South Bay Ocean Outfall

SST	secondary sedimentation tank
STLC	soluble threshold limit concentration
TCLP	toxicity characteristic leaching procedure
TKN	Total Kjehldahl Nitrogen
tpy	tons per year
TSS	total suspended solids
TTLC	total threshold limit concentration
TTO	total toxic organics
USIBWC	United Stated Section, International Boundary and Water Commission
USST	unstabilized sludge storage tank
VOC	volatile organic compound
WAS	waste activated sludge

EXECUTIVE SUMMARY

The South Bay International Wastewater Treatment Plant (SBIWTP), with an average design capacity of twenty-five (25) million gallons per day (MGD), treats mostly domestic wastewater from the City of Tijuana with some contribution from commercial and industrial facilities. The plant utilizes chemically assisted primary sedimentation, followed by conventional activated sludge, and final clarification before the final plant effluent is discharged to Pacific Ocean via the South Bay Ocean Outfall (SBOO). The primary sludge from the primary sedimentation tanks (PSTs) and the waste activated sludge (WAS) from the secondary sedimentation tanks (SSTs) are blended at the unstabilized sludge tanks. Then, the unstabilized sludge goes through lime stabilization, followed by dewatering. The dewatered sludge is trucked to Mexico for final disposal.

The SBIWTP is operated under the National Pollutant Discharge Elimination System (NPDES) permit issued by the California Regional Water Quality Control Board, San Diego Region. The current permit was issued on June 26, 2014 with a permit effective date of August 1, 2014. One of the requirements in Section VI.C.5.a. for the newly issued permit is to develop and comply with mass emission rates and concentration limitations for the influent to the SBIWTP facility or Maximum Allowable Headworks Allocations (MAHA) for pollutants that may cause or contribute to interferences, pass through, or the problems described in the Federal Pretreatment Program (40 CFR 403). Also, the influent limitations shall prevent violations of the NPDES permit. This report presents the development of new Maximum Allowable Headworks Loadings (MAHLs) to satisfy the requirement of the newly issued NPDES permit.

The overall approach used in developing the new MAHLs follows procedures outlined in the EPA Local Limits Guidance Manual (2004) (Guidance Manual) and consists of the following major steps:

1. **Identification of Applicable Criteria/Standards**: A review of the U.S. Federal, State of California, and Mexican regulations and an identification of standards and criteria applicable to the SBIWTP operation were completed. These criteria/standards are discussed and summarized in **Section 2** of this report.
2. **Identification of Pollutants of Concern (POCs)**: The existing plant influent data for the last two (2) years were analyzed, and potential POCs were identified for the SBIWTP. The MAHLs for all POCs identified for the plant must be developed. **Section 3** of this report provides the summary of all POCs for the plant. A total of 22 pollutants were identified as potential POCs for the SBIWTP.
3. **Calculations of Removal Efficiencies**: The plant influent and effluent data for all of the POCs (except molybdenum) for the last two (2) years were analyzed, and overall removal efficiencies were calculated. Due to a lack of existing data on molybdenum, additional tests were conducted to collect three (3) pairs of influent and effluent data, and the overall removal efficiency was calculated. Since the plant did not have data on the primary effluent, the removal efficiencies by primary treatment were not possible. The removal efficiencies by primary treatment data published in the Guidance Manual were used for the MAHLs calculations. Where the removal efficiency for a POC was not reported in

the Guidance Manual, it was assumed to be zero (0). This assumption was the most conservative, which yielded the smallest MAHL.

4. **Development of MAHLs for POCs**: MAHLs were calculated for the 22 POCs identified for the SBIWTP. These included: antimony, arsenic, cadmium, chromium (total), copper, cyanide, lead, mercury, molybdenum, nickel, selenium, silver, thallium, zinc, phenol, toluene, chloroform, dibromochloromethane, 5-day biochemical oxygen demand (BOD5), total suspended solids (TSS), ammonia, and TCDD equivalents. The MAHLs were based on meeting NPDES permit requirements, biological process inhibition criteria, and sludge disposal criteria.
5. **Conclusions**: A total of 22 pollutants were identified as POCs for the SBIWTP based on the screening criteria described in the Guidance Manual. The MAHLs were calculated for these POCs and compared to their respective present influent loadings. A comparison of the proposed MAHLs to the present loadings demonstrated that the headworks loadings for arsenic, selenium, zinc xceeded their respective MAHLs. The results indicate that reductions in the discharge of arsenic, selenium, and zinc to the sewerage system may be required in the future. The high present loadings for BOD5, TSS, and ammonia are mainly due to higher strength concentrations of these three (3) pollutants in the wastewater. The plant is able to handle these slightly higher present loadings for these three (3) pollutants.

Table ES-1 summarizes the results of MAHLs for all the POCs identified at the SBIWTP.

Table ES-1. Summary of MAHLs

Pollutants	Regulations Yielding MAHLs	MAHLs (lbs/day) Assessed based on average monthly limitation	MAHLs w/ 25% Safety Factor (lbs/day)	Present Influent Loadings (lbs/day)	Comments
Metals					
Antimony	CA Title 22 Hazardous Waste Regulations	122	**92**	24.4	Present Influent loading < MAHL
Arsenic	EPA 503 Sludge Regulations	11.2	**8.41**	18.5	Present Influent loading > MAHL
Cadmium	EPA 503 Sludge Regulations	4.59	**3.44**	1.4	Present Influent loading < MAHL
Chromium, Total	Biological Process Inhibition	71.4	**53.6**	5.1	Present Influent loading < MAHL
Copper	Biological Process Inhibition	13.4	**10.0**	10.0	Present loading = MAHL
Cyanide	Biological Process Inhibition	28.6	**21.4**	0.004	Present Influent loading < MAHL
Lead	EPA 503 Sludge Regulations	72.0	**54.0**	33.4	Present Influent loading < MAHL
Mercury	CA Title 22 Hazardous Waste Regulations	1.03	**0.77**	0.73	Present Influent loading < MAHL
Molybdenum	EPA 503 Sludge Regulations	93.6	**70.2**	0.83	Present Influent loading < MAHL
Nickel	Biological Process Inhibition	60.6	**45.5**	4.32	Present Influent loading < MAHL
Selenium	EPA 503 Sludge Regulations	5.79	**4.34**	14.9	Present Influent loading > MAHL
Silver	CA Title 22 Hazardous Waste Regulations	25.5	**19.1**	0.71	Present Influent loading < MAHL
Thallium, Total	CA Title 22 Hazardous Waste Regulations	58.9	**44.2**	26.7	Present Influent loading < MAHL
Zinc	Biological Process Inhibition	22.8	**17.1**	71.3	Present Influent loading > MAHL
Organics					

Chlorodibromomethane (Dibromochloromethane)	NPDES Permit	726	**545**	0.75	Present Influent loading < MAHL
Chloroform	CA Title 22 Hazardous Waste Regulations	3.21	**2.41**	1.33	Present Influent loading < MAHL
Phenol	Biological Process Inhibition	907	**680**	1.19	Present Influent loading < MAHL
TCDD Equivalents	NPDES Permit	6.48.E-06	**4.86E-06**	4.44E-07	Present Influent loading < MAHL
Toluene	Biological Process Inhibition	41,700	**31,275**	1.24	Present Influent loading < MAHL
Conventional					
Ammonia	Plant Performance Data	277,419	**208,064**	7,298	Present Influent loading < MAHL
BOD5	Plant Performance Data	178,434	**133,825**	81,941	Present Influent loading < MAHL
TSS	Plant Performance Data	216,652	**162,489**	80,064	Present Influent loading < MAHL

RESUMEN EJECUTIVO

La Planta Internacional de la Bahia Sur para Tratamiento de Aguas Residuales (South Bay International Wastewater Treatment Plant [SBIWTP]), con una capacidad media de diseño de veinticinco (25) millones de galones por día (MGD), trata mayormente las aguas residuales domésticas de la ciudad de Tijuana, con alguna contribución de instalaciones comerciales e industriales. La planta utiliza primeramente la sedimentación asistida por químicos, seguido de lodos activados y una aclaración final antes de la descarga final del efluente al Océano Pacífico a través del Emisario terrestre de la Bahia Sur (South Bay Ocean Land Outfall [SBLO]) y de Océano Emisario de la Bahia Sur (South Bay Ocean Outfall [SBOO]). El lodo primario de los tanques de sedimentación primarios (PST) y lodos activados de residuos (WAS) de los tanques de sedimentación secundarios (SSTs) se mezclan en los tanques de lodos no estabilizados. El lodo no estabilizado pasa por un proceso de estabilización con cal, seguido por un proceso de secado. El producto final de lodo se transporta a México para su disposición final.

El SBIWTP es operado bajo el Sistema Nacional de Eliminación y Descarga de Contaminantes (National Pollution Discharge Elimination System [NPDES]) con permiso expedido por el Consejo de Calidad de Aguas Regionales de California, región de San Diego (California Regional Water Quality Control Board, San Diego Region). El permiso actual se emitió el 26 de Junio del 2014, con una fecha de vigencia del permiso del 1o de agosto del 2014. Uno de los requisitos en la Sección VI.C.5.a. sobre el permiso recién emitido es desarrollar y cumplir con tasas de emisión masiva y limitaciones de concentración para el afluente a la planta SBIWTP o asignaciones de tamizado permisible máxima (Maximum Allowable Headworks Allocations [MAHA]) para los contaminantes que pueden causar o contribuir a las interferencias, pasar a través de, o los problemas descritos en el Programa de Pre tratamiento Federal (Federal Pretreatment Program [40 CFR 403]). Además, las limitaciones influyentes deberán impedir las violaciones del permiso NPDES. Este informe presenta el desarrollo de los nuevos máximos permitidos de cargas tamizadas (Maximum Allowable Headworks Loadings [MAHLs]) para satisfacer el requisito del permiso NPDES recién emitido.

El enfoque general utilizado en el desarrollo de los nuevos MAHLs sigue los procedimientos descritos por la Agencia de Protección Medioambiental (Environmental Protection Agnecy [EPA]) en el Manual de Dirección para Límites locales (2004) (Manual de Dirección) y consta de los siguientes pasos principales:

1. **Identificación de criterios/normas aplicables**: se cumplió una revisión de las regulaciones federales de los Estados Unidos, el estado de California y la República Mexicana y una identificación de las normas y criterios aplicables a la operación de SBIWTP. Estos criterios y normas se discuten y se resumen en la **Sección 2** de este informe.
2. **Identificación de contaminantes de preocupación (POC)**: se analizaron los datos existentes de esta planta sobre afluentes de los últimos dos (2) años, y se identificaron los POC potenciales para la SBIWTP. Los MAHLs para todos los POC identificados para la planta deben ser desarrollados. **Sección 3** de este informe proporciona el resumen de todos los POC de la planta. Un total de 22 contaminantes fueron identificados como posibles POC para el SBIWTP.

3. **Cálculo de eficiencias de eliminación**: se analizaron los datos de influentes y efluentes de la planta para todos los POCs (excepto molibdeno) de los últimos dos (2) años, y se calcularon las eficiencias de eliminación total. Debido a la falta de datos existentes sobre molibdeno, se llevaron a cabo pruebas adicionales para capturar tres (3) pares de datos de afluentes y efluentes, y se calculó la eficiencia de eliminación total. Puesto que la planta no tenía datos sobre el efluente primario, las eficiencias de eliminación por el tratamiento primario no era posible. Los datos publicados de las eficiencias de eliminación por tratamiento primario en el Manual de guía fueron utilizadas para los cálculos de MAHLs. Cuando no se informó de la eficacia de eliminación para un POC en el Manual de guía, que se supone que es cero (0). Este supuesto fue el más conservador, que cedió el MAHL más pequeño.
4. **Desarrollo de MAHLs para POCs**: se calcularon MAHLs para los 22 POCs identificados para la SBIWTP. Estos incluyen: antimonio, arsénico, cadmio, cromo (total), cobre, cianuro, plomo, mercurio, molibdeno, níquel, selenio, plata, talio, zinc, fenol, tolueno, cloroformo, dibromoclorometano, demanda bioquímica de oxígeno de 5 días (BOD5), sólidos suspendidos totales (TSS), amoníaco y equivalentes de TCDD. Los MAHLs se basan en el cumplimiento de los requisitos del permiso NPDES, criterios de inhibición de procesos biológicos y criterios de eliminación de lodos.
5. **Conclusiones**: se identificó un total de 22 contaminantes como POC para el SBIWTP en base a los criterios de selección descritos en el Manual de guía. Se calcularon los MAHLs para estos POC y se comparan con sus respectivas cargas afluentes. Una comparación de los MAHLs propuestas a las cargas presentes demostró que las cargas de tamizado para arsénico, selenio, zinc superaron sus respectivos MAHLs por márgenes amplios. Los resultados indican que serán necesarias reducciones en la descarga de arsénico, selenio, y zinc al sistema de alcantarillado en el futuro. Las mayores cargas presentes para BOD5, TSS, y el amoníaco se debieron principalmente a mayores concentraciones actuales de estos tres (3) contaminantes. La planta debe ser capaz de manejar un poco más altas cargas presentes para estos tres (3) contaminantes.

Tabla ES-1 resume los resultados de MAHLs para todos los POCs identificados en el SBIWTP.

Tabla ES-1. Resumen de MAHLs

Contaminantes	Normas de rendimiento MAHLs	MAHLs (lbs/día)	MAHLs con 25% Factor de seguridad (lbs/día)	Presentan cargas de influente (lbs/día)	Comentarios
Metales					
Antimonio	Reglamentos de residuos peligrosos del título 22 de CA	122	**92**	24.4	Carga afluente actual < MAHL
Arsénico	Reglamento de lodos 503 de USEPA	11.2	**8.41**	18.5	Carga afluente actual > MAHL
Cadmio	Reglamento de lodos 503 de USEPA	4.59	**3.44**	1.4	Carga afluente actual < MAHL
Cromo Total	Inhibición del proceso biológico	71.4	**53.6**	5.1	Carga afluente actual < MAHL
Cobre	Inhibición del proceso biológico	13.4	**10.0**	10.0	Carga presente = MAHL
Cianuro de	Inhibición del proceso biológico	28.6	**21.4**	0.004	Carga afluente actual < MAHL
Plomo	Reglamento de lodos 503 de USEPA	72.0	**54.0**	33.4	Carga afluente actual < MAHL
Mercurio	Reglamentos de residuos peligrosos del título 22 de CA	1.03	**0.77**	0.73	Carga afluente actual < MAHL
Molibdeno	Reglamento de lodos 503 de USEPA	93.6	**70.2**	0.83	Carga afluente actual < MAHL
Níquel	Inhibición del proceso biológico	60.6	**45.5**	4.32	Carga afluente actual < MAHL
Selenio	Reglamento de lodos 503 de USEPA	5.79	**4.34**	14.9	Carga afluente actual > MAHL
Plata	Reglamentos de residuos peligrosos del título 22 de CA	25.5	**19.1**	0.71	Carga afluente actual < MAHL
Talio, Total	Reglamentos de residuos peligrosos del título 22 de CA	58.9	**44.2**	26.7	Carga afluente actual < MAHL
Cinc	Inhibición del proceso biológico	22.8	**17.1**	71.3	Carga afluente actual > MAHL
Materia orgánica					
Clorodibromometano (dibromoclorometano)	Permiso de NPDES	726	**545**	0.75	Carga afluente actual < MAHL
Cloroformo	Reglamentos de residuos peligrosos del título 22 de CA	3.21	**2.41**	1.33	Carga afluente actual < MAHL
Fenol	Inhibición del proceso biológico	907	**680**	1.19	Carga afluente actual < MAHL
TCDD equivalente	Permiso de NPDES	6.48E-06	**4.86E-06**	4.44E-07	Carga afluente actual < MAHL
Tolueno	Inhibición del proceso biológico	41700	**31275**	1.24	Carga afluente actual < MAHL
Convencional					
Amoniaco	Datos de rendimiento de la planta	277419	**208,064**	7298	Carga afluente actual < MAHL
DBO5	Datos de rendimiento de la planta	178,434	**133,825**	81941	Carga afluente actual < MAHL
TSS	Datos de rendimiento de la planta	216,652	**162,489**	80064	Carga afluente actual < MAHL

1.0 INTRODUCTION

1.1 Project Background

The South Bay International Wastewater Treatment Plant (SBIWTP) is located near the United States – Mexico border on a 100-acre site in San Ysidro, a community of San Diego, California. The SBIWTP is located at 2415 Dairy Mart Road, near the Interstate 5 border crossing adjacent to the Tijuana River. The U.S. Section of the International Boundary and Water Commission (USIBWC) owns the plant; however, Veolia Water North America (Veolia) operates and maintains the plant under a contract with the USIBWC.

The SBIWTP treats wastewater from Tijuana, Mexico and the surrounding areas. Wastewater currently flows via several pump stations and a 96-inch diameter pipe to the plant. The SBIWTP was constructed in two (2) major phases: Phase I and Phase II. Constructed in 1996, the Phase I project included screening, grit removal, chemically assisted primary sedimentation, chlorination, unstabilized sludge storage, lime stabilization of sludge, sludge dewatering, and dewatered sludge truck-loading facilities. The design capacity of the Phase I plant is 25 million gallons per day (MGD) with a peak capacity of 75 MGD.

The Phase II project was constructed in 2011 and upgraded the original plant by adding secondary treatment facilities. The secondary treatment facilities included aeration tanks, secondary sedimentation tanks (SSTs), dissolved air flotation (DAF) units, unstabilized sludge storage tanks (USSTs), and miscellaneous ancillary facilities. The average design capacity of the secondary treatment facilities is 25 MGD with a peak capacity of 48.75 MGD.

The USIBWC is currently in the process of adding two (2) off-line equalization (EQ) tanks and three (3) additional SSTs with the same size and shape as the existing SSTs. The purpose of these new additional treatment units is to prevent occasional violation of the NPDES TSS limits. These new facilities are expected to be online within the next 2 to 3 years.

The plant treats mostly domestic wastewater from Mexico and may contain storm water during rain events, and frequently, it receives slugs of industrial wastewater. The raw wastewater is treated first by a primary sedimentation process, followed by a conventional biological process and final sedimentation process. The final effluent is discharged to the Pacific Ocean via the SBLO and SBOO.

The sludge from the PSTs and SSTs are blended and dewatered. The dewatered sludge goes through a lime-stabilization process, followed by a dewatering process using belt filter presses. The dewatered sludge is trucked to Mexico for final disposal.

The SBIWTP plant utilizes a conventional biological process to meet the NPDES permit limits on 5-day Carbonaceous Biochemical Oxygen Demand (CBOD5), TSS, metals, and organics. Although the plant does not have a NPDES ammonia limit, the biological process does nitrify ammonia to a certain degree.

The SBIWTP is operated under the NPDES permit issued by the California Regional Water Quality Control Board, San Diego Region. The current permit was issued on June 26, 2014 with a permit effective date of August 1, 2014. One of the requirements in Section VI.C.5.a. for the newly issued permit was to develop and comply with mass emission rates and concentration limitations for the influent to the SBIWTP facility or MAHA for pollutants that may cause or contribute to interferences, pass through, or the problems described in the Federal Pretreatment Program (40 CFR 403). Also, the influent limitations shall prevent violations of the Ocean Plan and NPDES permit. This report presents the development of new MAHLs to satisfy the requirement of the newly issued NPDES permit.

The overall approach used in developing the new MAHLs follows procedures outlined in the Guidance Manual and consists of the following major steps:

1. Identify and summarize the U.S. Federal and State of California requirements/criteria applicable to the SBIWTP operation. These criteria/standards are discussed and summarized in **Section 2**.
2. Review plant influent data for the last two (2) years and identify potential POCs for the SBIWTP. The MAHLs for all POCs identified for the plant must be developed. **Section 3** provides the summary of all the POCs for the plant.
3. Gather plant influent and effluent data for all POCs identified, and calculate overall removal efficiencies. **Section 4** provides a list of all POCs identified for the plant.
4. Conduct additional tests and generate at least three (3) pairs of influent and effluent molybdenum data. This additional testing was required since the plant did not have existing data on molybdenum.
5. Calculate MAHLs for all POCs identified for the plant. **Section 4** details the calculations for the MAHLs.

1.2 Plant Process Diagram

Figure 1 (in **Appendix A**) shows the plant process diagram for the existing SBIWTP facility, with proposed additional treatment units. The USIBWC is in the process of adding two (2) off-line EQ tanks and three (3) additional SSTs with the same size and shape as the existing SSTs within the next 2 to 3 years. These proposed treatment units are shown in bold on the figure.

As shown on **Figure 1**, the raw sewage from the collection system is sent to the headworks junction structure. The headworks junction structure also receives recycle flows from the different sludge processing units and plant drain system. The combined wastewater then flows to the headworks by gravity. At the headworks facility, the wastewater is screened, followed by pumping to the PSTs.

After the primary sedimentation process, the primary effluent from the PSTs flows by gravity to the aeration tanks (ATs), where it is blended with the return activated sludge (RAS). The blended primary effluent and RAS are called "mixed liquor." The mixed liquor at the ASTs is aerated for biochemical removal of pollutants. The aerated mixed liquor then flows to the SSTs where solids are settled at the bottom and final effluent is collected at the top.

A majority of the settled sludge at the SSTs is returned to the ASTs as RAS. A portion of the RAS is wasted daily to the unstabilized sludge holding tanks where it is blended with the sludge from the PSTs. The blended sludge is then stabilized with lime, followed by dewatering using belt presses. The dewatered sludge is trucked to Mexico for final disposal.

1.3 Project Purpose

The purpose of this project is to identify the POCs applicable to the SBIWTP and develop MAHLs to prevent:

1. Worker health and safety problems at the plant.
2. Pollutants pass-through in the treatment plant that violate the effluent NPDES permit limits.
3. Biological process upsets and inhibitions.
4. Violations of sludge quality standards set by the EPA and the State of California.

To accomplish this, the U.S. Federal and State of California standards and criteria were evaluated, and applicable criteria were identified for the SBIWTP. The POCs were then identified, and MAHLs for these POCs were calculated.

This report describes the process followed for the development of MAHLs. Development of the MAHLs was performed in accordance with EPA procedures described in "USEPA Local Limit Development Guidance," July 2004.

Because the sludge is transported by truck into Mexico and disposed of in a landfill, Mexican sludge requirements were reviewed but not evaluated for this MAHA. The applicable laws governing the biosolids in the United States is 40 CFR Part 503 and the applicable law in Mexico is NOM-004-SEMARNAT-2002. A comparison of the sections governing biosolids are very similar and for the metals ceiling concentration limits are nearly identical. This means that for the portion of the MAHA handling US federal biolsolids criteria, the MAHA values are valid for Mexican federal criteria as well.

Below is an illustration comparing the standards for the US and for Mexico.

	40CFR503		NOM-004-SEMARMAT-2002	
Pollutant	Ceiling Concentration Limits for All Biosolids Applied to Land (milligrams per kilogram)	Pollutant Concentration Limits for EQ and PC Biosolids (mg/kg)	Maximum Permissible Concentration for metals in biosolids with Good rating (mg.kg)	Maximum Permissible Concentration for metals in biosolids with Excellent rating (mg.kg)
Arsenic	75	41	75	41
Cadmium	85	39	85	39
Chromium			3000	1200
Copper	4300	1500	4300	1500
Lead	840	300	840	300
Mercury	57	17	57	17
Molybdenum	75			
Nickel	420	420	420	420
Selenium	100	100		
Zinc	7500	2800	7500	2800

2.0 STANDARDS AND CRITERIA

The development of MAHLs is based upon the regulatory requirements to meet the discharge limitations, as well as the goals of preventing the inhibition of biological processes, protecting the health and safety of the facility employees, and preventing the contamination of biosolids/ sludge. The standards and criteria applicable to the SBIWTP and which served as the technical basis for identifying POCs and developing MAHLs include:

- NPDES Permit Effluent Limits;
- Process Inhibition Criteria;
- Sludge Disposal Criteria;
- Air Emission Criteria; and
- Vapor Toxicity Criteria.

These criteria are discussed in the following paragraphs.

2.1 NPDES Permit Effluent Limits

The SBIWTP operates under the NPDES permit for discharge of treated effluent to Pacific Ocean via one (1) outfall, SBOO. Effluent limits (ELs) established by the permit and detected in the influent during the last 2 years are summarized in **Tables 1 and 2**. In addition to parameters with discharge limitations, the NPDES permit includes parameters for which monitoring is required but no limits have been established. These parameters are called performance goal parameters and are assigned numerical performance goals. The MAHLs were calculated for those parameters that have ELs and identified as the POCs for the SBIWTP. Priority pollutants, tributyltin, benzidine, chlordane, dichlorodiphenyltrichloroethane (DDT), heptachlor epoxide, hexachlorobenzene, polychlorinated biphenyls (PCBs) and toxaphene have ELs in the permit; however, they were not identified as POCs because they were not detected in the influent for the last two (2) years. Therefore, the MAHLs were not calculated for these pollutants.

MAHLs were not calculated for the performance goal parameters as they have no numerical limits.

Table 1. NPDES Effluent Limits Based on Ocean Plan Objectives for Protection of Marine Aquatic Life

Pollutants	Units	6-Month Median	Maximum Daily	Instantaneous Maximum
Mercury, Total	µg/L	3.78	15.2	38.2
Zinc	µg/L	1160	6890	18400

Source: USIBWC NPDES Permit No. CA0108928.

Table 2. NPDES Effluent Limits Based on Ocean Plan Objectives for Protection of Human Health - Carcinogens

Pollutants	Units	30-Day Average
Thallium, Total	µg/L	191
Chlorodibromomethane (dibromochloromethane)	µg/L	822
TCDD Equivalents	µg/L	$3.73x\ 10^{-7}$

Source: USIBWC NPDES Permit No. CA0108928.

2.2 Biological Process Inhibition Criteria

The biological process employed at the SBIWTP is a "conventional activated sludge" with nitrification. The process uses both heterotrophic and nitrifying bacteria to treat the raw wastewater and meet the NPDES permit requirements. These bacteria are potentially subject to toxic inhibition. Therefore, MAHLs must be calculated based on minimum threshold inhibition levels for all POCs. Published threshold inhibition concentrations for the activated sludge process, as given in the Guidance Manual, are presented in **Table 3**. This table only lists pollutants that were identified as candidates for MAHLs limit development at the SBIWTP. If a range of values was given, the minimum value was used. The lower of the nitrification and activated sludge inhibition values was used.

Table 3. Literature Inhibition Values from Guidance Manual for Biological Processes

Pollutants	Units	Activated Sludge Process - Inhibition Threshold Levels (mg/L)	Nitrification Process - Inhibition Threshold Levels (mg/L)	Selected Minimum Inhibition Threshold Levels for MAHL Limit Development	
				Minimum Inhibition Levels (mg/L)	Process Gives Minimum Inhibition Levels
Metals/Non-Metal Inorganics					
Ammonia	mg/L	480	NA *	480	Activated Sludge
Arsenic	mg/L	0.1	1.5	0.10	Activated Sludge
Cadmium	mg/L	1 - 10	5.2	1.00	Activated Sludge
Chromium VI	mg/L	1	1-10	1.00	Activated Sludge
Chromium III	mg/L	10 - 50	NA *	10.0	Activated Sludge
Chromium, Total	mg/L	1 - 100	0.25 - 1.9	0.25	Nitrification
Copper	mg/L	1	0.05 - 0.48	0.05	Nitrification
Cyanide	mg/L	0.1 - 5	0.34 - 0.5	0.10	Activated Sludge
Lead	mg/L	1.0 - 5.0	0.50	0.50	Nitrification
Nickel	mg/L	1.0 - 2.5	0.25 - 0.50	0.25	Nitrification
Zinc	mg/L	0.30 - 5	0.08 - 0.50	0.08	Nitrification
Organics					
Chloroform	mg/L	NA *	10	10.0	Nitrification
Phenol	mg/L	50-200	4-10	4.00	Nitrification
Toluene	mg/L	200	NA *	200	Activated Sludge

* NA = Threshold levels not available in EPA Local Limits Guidance Manual (2004).

2.3 Sludge Disposal Criteria

The final sludge (dewatered) is currently transported and disposed at a landfill in Mexico.

The NPDES permit for the SBIWTP (Section VI.C.5.d) states that "the handling, treatment, use, management, and disposal of sludge and solids derived from the wastewater treatment must comply with applicable provisions of Section 405 of the Clean Water Act (CWA) and EPA regulations at 40 CFR parts 257, 258, 501, and 503, including all monitoring, record keeping, and reporting requirements." The EPA regulation contained in 40 CFR 503 regulates arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc with ceiling and monthly average concentrations (mg/kg, dry weight) and annual and cumulative loading rates (mg/hectare). For molybdenum, the EPA suspended numerical criteria for the cumulative loading rate, the annual loading rate, and the monthly average concentration rate of 18 mg/kg; however, the ceiling concentration of 75 mg/kg has not been modified. The cumulative and annual loading rates for pollutants are not applicable since the sludge is not land applied in the U.S. Since the ceiling concentrations for the pollutants listed in 40 CFR 503 are higher than their respective monthly average concentrations, the monthly average concentrations were used in the calculations of the MAHLs, with the exception of molybdenum. For molybdenum, the ceiling concentration of 75 mg/kg was used for the MAHL limit calculation. The average concentrations for the pollutants listed in 40 CFR 503 is provided in **Table 4**.

Table 4. Sludge Disposal Criteria for SBIWTP

Pollutants	Pollutant Limits under EPA 503 Regulations (mg/kg, dry weight)	Pollutant Limits under CA Title 22 Hazardous Waste Regulations			Controlling Pollutant Limits under CA Title 22 Hazardous Waste Regulations, STLC X 10 (mg/kg , wet weight)
		TTLC [1] (mg/kg, wet weight)	STLC [2] (mg/L, wet weight)	STLC X 10 (mg/kg, wet weight)	
Metals					
Antimony	No Limit (NL)	500	5	50	50
Arsenic	41	500	5	50	50
Cadmium	39	100	1	10	10
Chromium, Total	1200	2500	25	250	250
Copper	1500	2500	25	250	250
Lead	300	1000	10	100	100
Mercury	17	20	0.2	2	2
Molybdenum	75	3500	35	350	350
Nickel	420	2000	20	200	200
Selenium	36	100	1	10	10
Silver	NL	500	5	50	50
Thallium	NL	700	7	70	70
Zinc	2800	5000	50	500	500
Organics					
Chloroform	NL	60	0.60	6.00	6.00
Phenol	NL	NL	NL	NL	NL
Toluene	NL	NL	NL	NL	NL

[1] TTLC = Total Threshold Limit Concentration; [2] STLC = Soluble Threshold Limit Concentration

The NPDES permit, Section VI.C.5.d.x (d) and (e) state that "samples of sludge shall be collected according to the procedures for compositing samples outlined in *Test Methods for Evaluating Solid Waste Physical/Chemical Methods* (EPA Publication SW-846, Second Edition, as updated). Samples shall be split, and a portion of the sample preserved, in the event that the results show concentrations of waste constituents that exceed 10 times the Soluble Threshold Limit Concentration (STLC) listed in Title 22 CCR *(California Code of Regulations)*. Results of analyses shall be reported in mg/kg, wet weight and 100 percent dry weight. If the results indicate that the total concentration of any waste constituent is greater than 10 times the STLC value for the constituent listed in title 22 CCR, then the Discharger shall also perform a Waste Extraction Test on the sludge sample pursuant to Title 22 CCR requirements."

Both Total Threshold Limit Concentration (TTLC) and STLC are used to determine if the sludge is hazardous. For MAHLs calculations, STLC x 10 was expressed as mg/kg (wet weight) because these STLC x 10 values are smaller than the TTLC limit values. **Table 4** provides the TTLC limits as well as STLC x 10 limits for pollutants listed in Title 22 CCR. The STLC x 10 limits are the most stringent and therefore are the control limits for sludge disposal criteria.

Per the California Regional Water Quality Control Board, San Diego Region, the final sludge from the SBIWTP is subject to the regulations contained in 40 CFR 503 and Title 22 CCR even though the final sludge is currently transported to Mexico for landfilling. The rationale for application of these regulations is that if the transportation of the final sludge to Mexico is disrupted, USIBWC is very likely to store and/or dispose of the sludge in the U.S.

2.4 Air Emission Criteria

Toxic air emissions at wastewater treatment facilities are regulated under the Federal Clean Air Act Amendments (CAAA) of 1990. Four titles under the CAAA of 1990 may apply to wastewater treatment facilities, but only one (Title III) has potential ramifications for developing and setting MAHLs. Title III requires implementation of maximum achievable control technology (MACT) for major sources of hazardous air pollutants (HAP) at wastewater treatment plants. Major sources are defined as those having the potential to emit at least 10 tons per year (tpy) of any individual HAP, or 25 tpy total HAPs. EPA designated 189 compounds and elements as federal HAPs; approximately 26 of these have been detected at wastewater treatment facilities. For practical purposes, the conventional priority pollutant scans address the HAPs of concern at wastewater treatment facilities.

EPA issued guidance to assist in determining whether a wastewater treatment facility is a major source of HAPs, and therefore, subject to implementation of MACT. Under this guidance, a wastewater treatment facility would be subject to installing MACT if it met two (2) of the following criteria:

- Has a capacity greater than 50 MGD;
- Accepts more than 30% industrial waste contribution; and
- Has influent priority pollutant volatile organic compound (VOC) concentrations greater than 5 mg/L.

The SBIWTP does not meet these criteria, and therefore, is not subject to Title III of the CAAA of 1990.

2.5 Vapor Toxicity Criteria

Discharges to sewers of toxic volatile pollutants can create hazardous conditions for workers who must enter the sewer system or work around open basins. The American Conference of Governmental Industrial Hygienists (ACGIH) developed exposure limits for VOCs in 2002. Likewise, EPA developed wastewater screening levels based on these exposure limits, assuming equilibrium conditions between the wastewater and atmosphere as presented in **Table 5**.

Table 5. Discharge Screening Levels Based on Vapor Toxicity

Pollutant	Exposure Limit [a] (mg/m^3)	Henry's Law Constant ($mg/m^3/mg/L$)	Discharge Screening Level (mg/L)
Acrolein	0.23	4.9	0.047
Acrylonitrile	21.7	4.5	4.822
Benzene	3.19	228	0.014
Bromoform	5.17	22.8	0.227
Carbon Tetrachloride	12.58	1185	0.011
Chlorobenzene	345.75	151	2.29
Chloroethane	2,640	449	5.88
Chloroform	9.76	163.5	0.06
1,1-Dichloroethane	405	240.4	1.685
1,2-Dichloroethane	8.1	48.1	0.168
1,1-Dichloroethylene	19.8	1202.1	0.016
Trans-1,2-Dichloroethylene	794	389.3	2.04
1,2-Dichloropropane	508.2	118.5	4.289
Ethylbenzene	542.5	327	1.659
Hydrogen cyanide	5.17	4.5	1.149
Hydrogen sulfide	14	414.4	0.034
Methyl bromide	77.8	255.5	0.305
Methyl chloride	207	371.6	0.557
Methylene chloride	433.75	104.8	4.139
1,1,2,2-Tetrachloroethane	34.35	18.6	1.847
Tetrachloroethylene	678	717.1	0.945
Toluene	565	272.5	2.075
1,1,2-Trichloroethane	54.6	34.1	1.601
1,1,1-Trichloroethane	1911	692.7	2.759
Trichloroethylene	10.74	408.7	0.026
Vinyl Chloride	12.8	1048	0.012

[a] Exposure limits are the lowest of acute toxicity data presented in Appendix J of the EPA Guidance Manual (2004).
mg/m^3 = milligrams per cubic meter

2.6 Other Considerations

2.6.1 Corrosivity

The EPA's General Pretreatment Regulations prohibit any discharge with a pH lower than 5.0 because it may cause corrosive structural damage to sewers or treatment facilities. Besides the low-end pH limit specified in the General Pretreatment Regulations, the Guidance Manual recommends an upper pH limit of 12.5 because wastewater with a pH greater than 12.5 meets the definition of a hazardous waste under 40 CFR 261.22.

2.6.2 Flow Obstructions

Most municipalities regulate discharges of oil and grease to reduce flow obstructions in the sewer system. However, a national, technically based grease standard for this purpose does not exist. Local limits for polar grease, including grease of animal or vegetable origin, are typically in the 100 to 200 mg/L range, which is approximately the background concentration in raw domestic sewage.

An EPA amendment to the General Pretreatment Regulations (Federal Register, July 24, 1990) requires municipalities operating pretreatment programs to develop a standard prohibiting "petroleum oil, non-biodegradable cutting oil or products of mineral oil origin in amounts that will cause interference or pass through." In developing this general prohibition for non-polar grease, EPA stated that sufficient information does not presently exist upon which to promulgate a specific numeric limit of national applicability. However, as preliminary guidance, the EPA suggested that a limit of 100 mg/L was frequently used by treatment plants for petroleum oils, non-biodegradable cutting oils or products of mineral oil origin, i.e., non-polar oil and grease.

3.0 POLLUTANTS OF CONCERN DETERMINATION

3.1 Existing Data Analysis

The SBIWTP has been testing and collecting monthly data on the plant influent, effluent, and final sludge per the NPDES permit requirements. The pollutants selected for testing included all 126 priority pollutants designated by the EPA. The EPA pretreatment regulations also require that the most recent plant data be used for the MAHLs development. Therefore, the plant influent data for the years 2013 and 2014 were analyzed to identify potential POCs applicable to the SBIWTP.

3.2 Criteria for Determining POCs

The EPA has provided guidance for identifying POCs, which is described in the EPA Guidance Manual (2004). A pollutant may be classified as a POC if it meets any one of the following screening criteria:

1. Is the concentration above the detection limit that might cause pass-through or interferences or cause problems in the collection system?
2. Is the pollutant on the EPA's list of 15 national POCs that a wastewater treatment facility should assume to be of concern?
3. Does it have a pre-existing MAHL?
4. Is it limited by a permit or applicable standards or criteria?
5. Has it caused operational problems in the past?
6. Does it have important implications for the protection of the treatment works, collection system, or the health and safety of POTW workers?

3.3 POCs Selection

3.3.1 National POCs

Following are the 15 national potential POCs recommended by the Guidance Manual. The MAHLs must be developed for these pollutants whether they are present in the plant influent or not.

- Arsenic
- Cadmium
- Chromium (total)
- Copper
- Cyanide
- Lead
- Mercury
- Molybdenum
- 5-day Biochemical Oxygen Demand
- Total Suspended Solids
- Ammonia
- Nickel
- Selenium
- Silver
- Zinc

3.3.2 Existing POCs

The newly issued NPDES permit for the SBIWTP sets interim influent limitations that were originally developed by the USIBWC. The interim influent limitations, NPDES Permit Section VI.C.5.a.ii, were set for the following parameters:

- Arsenic
- Beryllium
- Cadmium
- Chromium
- Copper
- Cyanide
- Lead
- Mercury
- Nickel
- Silver
- Zinc
- Total HCH (Lindane)

With the exception of beryllium and Total HCH (lindane), these pollutants are already in the national POCs, and therefore, the MAHLs must be developed for these pollutants. The MAHLs for beryllium and Total HCH were not developed in this project since the data for the last two (2) years reveal that influent concentrations for both pollutants were below their respective method detection limits (MDLs).

3.3.3 Permit and Criteria

If a pollutant is not in the national POCs list, but it is limited by a permit or some other criteria such as biological process inhibition, and this pollutant is present in the influent in a detectable concentration, it was identified as a potential POC for the SBIWTP. From this screening analysis, the following pollutants that are not included in the above criteria are identified as potential POCs:

- Antimony
- Thallium
- Chlorodibromomethane (Dibromochloromethane)
- Chloroform
- Phenol
- TCDDs Equivalents
- Toluene

3.3.4 Operational Issues

The following parameters have the potential to cause corrosion of the collection system (pH), obstruction of the flow in the collection system (oil and grease), and foaming at the plant and in the effluent (surfactants):

- pH;
- Oil and grease; and
- Surfactants.

Surfactants do not have a regulatory limit. Because of the nature of pH, oil and grease, and surfactants, these three (3) parameters are not amenable to analysis using the MAHL approach. Therefore, the MAHLs for these three (3) parameters will not be calculated using the EPA's recommended procedure. These parameters should be controlled by an industrial pretreatment ordinance.

3.3.5 Health and Safety Considerations

If a VOC is limited by the Vapor Toxicity Criteria (**Table 5**), and it is present in the influent in a detectable concentration, it was identified as a potential POC. Based on the data on the plant influent for the last two (2) years, only chloroform and toluene levels were found to be above their respective MDLs. However, their concentrations in the plant influent were well below their respective discharge screening levels per **Table 5**. Therefore, these two (2) VOCs are not hazardous to workers. They are considered POCs for the SBIWTP because each has a regulatory limit on the sludge and inhibition limit on the plant's biological process. No other VOCs were identified as potential POCs.

3.3.6 Pollutants without Standards or Criteria

No additional POCs were identified that would cause worker's health and safety, hinder treatment plant operation and inhibit the plant's biological processes.

3.3.7 Final Selection of POCs

Based on the preceding screening analysis, pollutants provided in **Table 6** were identified as potential POCs for the SBIWTP and selected for further evaluation.

Table 6. List of Potential POCs for SBIWTP

Nos.	Pollutants for MAHL Development	MDL*	Reasons for MAHL Limit Development
1	Antimony	4.7 µg/L	EPA priority pollutant; Detected on 1/1/13 and more days; limit on sludge
2	Arsenic	5 µg/L	National POC; must develop local limit whether detected on plant influent or not
3	Cadmium	0.3 µg/L	National POC; must develop local limit whether detected on plant influent or not
4	Chromium, Total	0.3 µg/L	National POC; must develop local limit whether detected on plant influent or not
5	Copper	0.24 µg/L	National POC; must develop local limit whether detected on plant influent or not
6	Cyanide	0.02 mg/L	National POC; must develop local limit whether detected on plant influent or not
7	Lead	3.6 µg/L	National POC; must develop local limit whether detected on plant influent or not
8	Mercury	0.021 µg/L	National POC; must develop local limit whether detected on plant influent or not
9	Molybdenum	3.00 µg/L	National POC; must develop local limit whether detected on plant influent or not
10	Nickel	1.9 µg/L	National POC; must develop local limit whether detected on plant influent or not
11	Selenium	5.2 µg/L	National POC; must develop local limit whether detected on plant influent or not

Nos.	Pollutants for MAHL Development	MDL*	Reasons for MAHL Limit Development
12	Silver	0.70 µg/L	National POC; must develop local limit whether detected on plant influent or not
13	Thallium	1.9 µg/L	EPA priority pollutant; Detected on 1/1/13 & more days' limit on NPDES permit
14	Zinc	4.8 µg/L	National POC; must develop local limit whether detected on plant influent or not
15	Phenol	0.36 µg/L	Detected on 1/1/13 & more days; has limits on sludge and biological process
16	Toluene	0.48 µg/L	Detected on 1/1/13 & more days; has limits on sludge and biological process
17	Chloroform	0.36 µg/L	EPA priority pollutant; Detected on 1/1/13 & more days; has limits on sludge & biological process
18	Dibromochloromethane (Chlorodibromomethane)	0.36 µg/L	EPA priority pollutant; Detected on 1/1/13 & more days; has NPDES limit
19	BOD5	2 mg/L	National POC; must develop local limit whether detected on plant influent or not
20	TSS	1 mg/L	National POC; must develop local limit whether detected on plant influent or not
21	Ammonia	0.1 mg/L	National POC; must develop local limit if plant is receiving ammonia from non-domestic sources
22	TCDD Equivalents	NA **	NPDES limit exists and presents in plant influent

* MDL = method detection limit.
** NA = Not applicable. It is calculated from individual components.

4.0 MAHL CALCULATIONS

4.1 Actual Plant Flow (Last 24-Month Data)

The monthly average plant influent and effluent flows over the last 24 months were obtained from the monthly operating records and analyzed. The monthly average flows obtained from the plant were from April 2013 to March 2015. **Table 7** provides a summary of average monthly flow rates and the annual average plant flow over the last two (2) years. Note however that the influent includes plant recycle flows and does not represent the actual influent. A meter being installed at the recycle will be used for influent flow determination when comparing the MAHA criterion to influent pollutant loadings. The projected completion date for the recycled flows meter is around the middle of January of 2018. After the recycled flows meter has been installed and actual influent data has been calculated, the MAHLs will be recalculated with the actual influent data.

Per **Table 7**, the annual average effluent flow for the last two (2) years is 24.45 MGD. The plant's permitted and designed annual average flow of 25 MGD was chosen to develop the MAHL since that represents the plant's maximum permitted annual average flow. When comparing the MAHA criterion to the influent loadings, the actual flow will be used to calculate the allowable loadings for the specific flow based on the MAHA criterion when at that flow.

Table 7 also provides monthly average of final sludge quantities from January 2013 to December 2014 and lists annual average sludge quantities for the last two (2) years, which is approximately 191 tons/year (wet weight).

Table 7. Summary of Daily Average Plant Influent, Effluent and Sludge Flows

Year	Month	Plant Influent Flow (MGD)	Plant Effluent Flow (MGD)	Final Sludge Trucked to Mexico (tons/day*)
2013	January	-		198
	February	-		218
	March	-		227
	April	28.87	24.20	203
	May	28.79	24.28	208
	June	29.34	24.75	230
	July	29.05	24.83	205
	August	29.21	25.00	192
	September	28.62	24.57	175
	October	28.76	24.66	202
	November	27.97	24.11	193
	December	28.89	24.45	203
2014	January	29.03	24.78	192
	February	28.92	24.68	190
	March	27.99	24.03	197
	April	28.84	24.42	181
	May	29.50	24.80	174
	June	28.68	24.70	190
	July	28.82	24.74	162
	August	28.81	24.42	176

Year	Month	Plant Influent Flow (MGD)	Plant Effluent Flow (MGD)	Final Sludge Trucked to Mexico (tons/day*)
	September	28.97	24.86	155
	October	28.93	24.61	170
	November	29.40	24.75	168
	December	27.11	22.72	185
2015	January	28.45	24.11	-
	February	28.30	23.94	-
	March	28.93	24.49	-
Annual Average =		28.76	24.45	**191**

* Wet tons

4.2 Removal Efficiency Determination

4.2.1 Removal Efficiency through Primary Treatment

To calculate MAHLs based on the biological process inhibition, it is necessary to determine the removal efficiencies across the PSTs for the POCs that are potentially toxic to the plant's biological process. Since the plant is not required to collect data on the primary effluent, the removal efficiency determination across the primary treatment process was not possible. Instead, we used the removal efficiencies through the primary treatment from the Guidance Manual. **Table 8** provides the removal efficiencies from the Guidance Manual. As provided in **Table 8**, the removal efficiencies for ammonia, arsenic, and toluene were assumed to be zero (0) since the Guidance Manual did not provide removal efficiencies for these pollutants. This assumption is conservative as it produces lower MAHLs values. USIBWC is working on gathering primary effluent data to calculate site-specific primary removal efficiencies and will recalculate Table 8 in the future.

Table 8. Summary of Removal Efficiencies Across Primary Treatment for POCs

Metals/Organics	Overall Median Efficiency from EPA Manual (%)	Comments
Ammonia	0.0 *	*No EPA published data. Efficiency assumed zero
Arsenic	0.0 *	*No EPA published data. Efficiency assumed zero
Cadmium	15.0 **	**Median efficiency from EPA manual
Chromium, Total	27.0 **	**Median efficiency from EPA manual
Copper	22.0 **	**Median efficiency from EPA manual
Cyanide	27.0 **	**Median efficiency from EPA manual
Lead	57.0 **	**Median efficiency from EPA manual
Nickel	14.0 **	**Median efficiency from EPA manual
Zinc	27.0 **	**Median efficiency from EPA manual
Chloroform	14.0 **	**Median efficiency from EPA manual
Phenol	8.0 **	**Median efficiency from EPA manual
Toluene	0.0 *	*No EPA published data. Efficiency assumed zero

Appendix B provides a copy of the EPA's published efficiencies through the primary treatment process.

4.2.2 Overall Removal Efficiency

The USIBWC provided plant influent and effluent data for the last five (5) years. However, the Guidance Manual recommends that the most recent data be used for MAHLs development. Therefore, the data collected over the last two (2) years were analyzed, and overall efficiencies were determined for the POCs applicable to the SBIWTP. The influent and effluent data collected from January 2013 to December 2014 were used. For CBOD, TSS, and Ammonia, plant removal efficiency was determined using data for the entire year of 2016. The overall efficiency for each POC was calculated using the following formula:

$$R_{plant} = \frac{(C_{inf} - C_{eff}) \times 100}{C_{inf}}$$

Where:

C_{inf} = Influent Concentration (mg/L or µg/L or pg/L);
C_{eff} = Effluent Concentration (mg/L or µg/L or pg/L); and
R_{plant} = Overall plant removal efficiency (%).

Table 9 provides the calculated overall efficiencies based on the plant's influent and effluent data. A detailed calculation of overall removal efficiencies for all potential POCs to the SBIWTP is provided in **Appendix C**. The table also lists median overall efficiencies from the Guidance Manual for comparative purposes. **Appendix B** provides a copy of the published overall efficiency for the activated sludge process.

Table 9. Summary of Overall Removal Efficiencies for POCs

Metals/Organics	Units	Average (2013-2014) Plant Influent Conc.	Average (2013-2014) Plant Effluent Conc.	Overall Efficiency from Plant Data (%)	Overall Median Efficiency from EPA Manual (%)	Selected Overall Efficiency for MAHL Calculation (%)
Antimony	µg/L	117	98.5	15.6	NR	15.6 *
Arsenic	µg/L	88.7	58.3	34.2	45.0	34.2 *
Cadmium	µg/L	6.60	1.35	79.5	67.0	79.5 *
Chromium	µg/L	24.4	23.1	5.35	82.0	82.0 **
Copper	µg/L	48.1	2.38	95.0	86.0	95.0 *
Cyanide	µg/L	<0.02	<0.02	UD	69.0	69.0 **
Lead	µg/L	160	98	39.0	61.0	39.0 *
Mercury	µg/L	3.49	0.91	74.0	60.0	74.0 *
Molybdenum	µg/L	4.00	3.70	7.50	NR	7.5 *
Nickel	µg/L	20.7	17.6	15.3	42.0	15.3 *
Selenium	µg/L	71.50	29.90	58.2	50.0	58.2 *
Silver	µg/L	3.40	2.75	19.1	75.0	75.0 **
Thallium	µg/L	128	70	45.5	NR	45.5 *
Zinc	µg/L	342	146	57.2	79.0	57.2 *
Phenol	µg/L	5.71	0.43	92.5	90.0	92.5 *
Toluene	µg/L	5.94	0.54	91.0	93.0	91.0 *
Chloroform	µg/L	6.40	1.83	71.4	67.0	71.4 *

Dibromochloromethane (Chlorodibromomethane)	µg/L	3.59	0.85	76.4	NR	76.4 *
CBOD	mg/L	395	15.7	97.1	NR	97.1*
TSS	mg/L	384	14	97.1	NR	97.1*
Ammonia	mg/L	49.6	7.27	82.8	NR	82.8 *
TCDD Equivalents	pg/L	2.1313	0.0249	98.8	NR	98.8 *

NR = Data not reported in Guidance Manual (2004) UD = Undetermined
* From Plant Data ** Median Efficiency from Guidance Manual.

In determining the overall removal efficiencies, the following inconsistencies/anomalies were found and resolved:

1. The concentrations of cyanide in the plant influent and effluent were below the MDL. Therefore, the determination of overall efficiency was not possible from the plant data. The overall removal efficiency for cyanide was taken from the Guidance Manual. The Guidance Manual provides a range of removal efficiencies as well as the median overall removal efficiency for cyanide. The median overall efficiency was chosen to be used for cyanide MAHL development.
2. For chromium, the overall removal efficiency determined from the plant data was 5.35%, which is well below the EPA's published median overall removal efficiency of 82%. A closer review of the plant data revealed that a majority of effluent chromium concentrations were below the MDL (1.2 µg/L). In calculating the overall removal efficiency, we used effluent concentrations at the MDL for all the effluent concentrations reported below MDL, in accordance with the Guidance Manual. This assumption might have given us lower overall removal efficiency because the actual effluent concentrations could be closer to zero (0) instead of our assumed value of 1.20 µg/L. For this reason, the EPA's published overall median removal efficiency for chromium (82%) was used for the MAHLs development.
3. For silver, the overall removal efficiency determined from the plant data was 19.1%, which is also well below the EPA's published median overall removal efficiency of 75%. The calculated overall removal efficiency was based on four (4) pairs of influent and effluent data even though there were more than 100 pairs of influent and effluent data available for the analysis. We were not able to use the remaining pairs of influent and effluent data because they were below the MDL (0.7µg/L). Of those four (4) effluent data we analyzed for the overall efficiency determination, two (2) effluent concentrations were below the MDL, but we assumed concentrations at the MDL for these two (2) effluent data per the Guidance Manual. For these reasons, the calculated overall removal efficiency for silver based on the plant data may not be accurate. Therefore, the EPA's published overall median removal efficiency for silver (75%) was used for the MAHLs development.

The treatment plant is currently undergoing additional construction improvements to decrease hydraulic loading and increase settling capacity in the secondary settling tanks. This construction is slated to be completed at the early in 2018. This will improve the overall removal efficiencies of the plant and therefore, overall removal efficiencies will be performed after at least 1 year of data collection, preferably 2 years.

4.3 Calculation of MAHLs Based on NPDES Permit Limitation

The MAHLs based on the NPDES effluent permit limits were calculated by the following equation:

$$AHL_{eff} = \frac{8.34 \times C_{eff} \times Q_{plant}}{1 - R_{plant}}$$

Where:

AHL_{eff} = Allowable headworks loadings based on NPDES permit limitation (lbs/day);
C_{eff} = Effluent discharge criteria (mg/L);
Q_{plant} = Average daily treatment plant flow (MGD); and
R_{plant} = Overall plant removal efficiency in decimal.

C_{eff} for various pollutants were taken from **Tables 1 and 2**. For mercury and zinc, the 6-month median limits were used for the MAHLs development. For thallium, chlorodibromomethane, and TCDD equivalents, the 30-day average limits were used for the MAHLs development. The plant influent flow, $Q_{plant,}$ was taken from **Table 7**. R_{plant} for various pollutants were taken from **Table 9**. As stated above, after the recycled flows meter has been installed and actual influent data has been calculated, the MAHLs will be recalculated with the actual influent data.

The calculated MAHLs based on the NPDES permit effluent limits for various POCs are provided in **Table 10**.

4.4 Calculation of MAHLs Based on Biological Process Inhibition

The MAHLs for various pollutants based on secondary and nitrification process inhibition were calculated using the following equation:

$$AHL_{inh} = \frac{8.34 \times C_{inh} \times Q_{plant}}{1 - R_{primary}}$$

Where:

AHL_{inh} = Allowable headworks loadings based on inhibition (lbs/day);
C_{inh} = Inhibition criteria (mg/L);
Q_{plant} = Average daily treatment plant flow (MGD); and
$R_{primary}$ = Removal efficiency across primary treatment in decimal.

The results of the MAHLs calculations for various pollutants based on the biological process inhibition are provided in **Table 11**. The minimum inhibition threshold levels for various pollutants as provided in **Table 3** were used for the MAHLs calculations. The removal efficiencies for various pollutants by primary treatment were obtained from **Table 8**.

4.5 Calculations of MAHLs Based on Sludge Disposal Criteria

There are two (2) sludge criteria that are applicable to sludge production at the SBIWTP and subsequent disposal in Mexico. These criteria are: 1) sludge criteria under EPA 40 CFR 503; and 2) sludge criteria under California Title 22 CCR.

Table 10. MAHLs Based on NPDES Permit Limits

Pollutants	Average Plant Flow (MGD)	NPDES Permit Limits (µg/L)				Overall Removal Efficiency (%)	Allowable Headworks Loadings (lbs/day)			
		Monthly / 30-Day Average	6-Month Median	Maximum Daily	Instantaneous Maximum		Monthly / 30-Day Average	6-Month Median	Maximum Daily	Instantaneous Maximum
Mercury, Total	25	-	3.78	15.2	38.2	74.0	-	3.03	12.19	30.63
Thallium, Total	25	191	-	-	-	45.5	73	-	-	-
Zinc	25	-	1,160	6,890	18,400	57.2	-	565	3,356	8,964
Chlorodibromomethane (Dibromochloromethane)	25	822	-	-	-	76.4	726	-	-	-
TCDD Equivalents	25	3.73E-07	-	-	-	98.8	6.48E-06	-	-	-

Table 11. MAHLs Based on Biological Process Inhibition

Pollutants	Average Plant Flow (MGD)	Minimum Inhibition Levels (mg/L)	Primary Treatment Removal Efficiency (%)	MAHLs (lbs/day)	Comments
Ammonia	25.0	480	0.0 *	100,080	* Efficiency assumed zero
Arsenic	25.0	0.10	0.0 *	20.9	* Efficiency assumed zero
Cadmium	25.0	1.00	15.0 **	245	** Efficiency from Guidance Manual
Chromium, Total	25.0	0.25	27.0 **	71.4	** Efficiency from Guidance Manual
Copper	25.0	0.05	22.0 **	13.4	** Efficiency from Guidance Manual
Cyanide	25.0	0.10	27.0 **	28.6	** Efficiency from Guidance Manual
Lead	25.0	0.50	57.0 **	242	** Efficiency from Guidance Manual
Nickel	25.0	0.25	14.0 **	60.6	** Efficiency from Guidance Manual
Zinc	25.0	0.08	27.0 **	22.8	** Efficiency from Guidance Manual
Chloroform	25.0	10.0	14.0 **	2,424	** Efficiency from Guidance Manual
Phenol	25.0	4.00	8.0 **	907	** Efficiency from Guidance Manual
Toluene	25.0	200	0.0 *	41,700	* Efficiency assumed zero

The MAHLs for various pollutants, based on the Title 22 CCR sludge criteria, were calculated using the following equation:

$$AHL_{solids} = \frac{C_{solids} \times M_{solids} \times 10^{-6}}{R_{plant}}$$

Where:

AHL_{solids} = Allowable headworks loadings based on sludge disposal criteria (lbs/day);
C_{solids} = STLC x 10, mg/kg (wet weight);
M_{solids} = Average daily sludge disposal rate, lbs/day (wet weight);
R_{plant} = % Overall plant removal efficiency in decimal; and
10^{-6} = A conversation factor to convert mg to kg.

The results of MAHLs for various pollutants, based on the Title 22 CCRs sludge criteria, are provided in **Table 12**. The Title 22 CCR sludge criteria (STLC x 10) for various pollutants were obtained from **Table 4**. The plant overall efficiencies were taken from **Table 9**. The average daily sludge quantity, 191 ton/day (wet ton), were obtained from **Table 7**.

Table 12. MAHLs Based on California Hazardous Waste Criteria

Pollutants	Plant Sludge Flow (lbs/day, wet weight)	STLC X 10 for MAHL Development (mg/kg) [1] (wet weight)	Overall Removal Efficiency (%)	MAHLs (lbs/day)
Metals				
Antimony	382,000	50	15.6	122
Arsenic	382,000	50	34.2	56
Cadmium	382,000	10	79.5	4.8
Chromium, Total	382,000	250	82.00 [2]	116
Copper	382,000	250	95.00	101
Lead	382,000	100	39.0	98
Mercury	382,000	2	74.0	1.0
Molybdenum	382,000	350	7.5	1,783
Nickel	382,000	200	15.3	499
Selenium	382,000	10	58.2	6.6
Silver	382,000	50	75.0 [2]	25
Thallium	382,000	70	45.4	59
Zinc	382,000	500	57.2	334
Organics				
Chloroform	382,000	6	71.4	3.21

[1] STLC = Soluble Threshold Limit Concentration per Chapter 1, Title 22 Code of California Regulations.
[2] Median Efficiency from Guidance Manual.

The MAHLs for various pollutants, based on the federal sludge criteria (40 CFR 503), were calculated using the following equation:

$$AHL_{solids} = \frac{C_{solids} \times M_{solids} \times TS \times 10^{-6}}{R_{plant}}$$

Where:

AHL_{solids} = Allowable headworks loadings based on sludge disposal criteria (lbs/day);
C_{solids} = 40 CFR 503 sludge limit, mg/kg (dry weight);
M_{solids} = Average daily sludge disposal rate, lbs/day (wet weight);
R_{plant} = Overall plant removal efficiency in decimal;
TS = % Total solids in sludge in decimal; and
10^{-6} = A conversation factor to convert mg to kg.

The results of MAHLs for various pollutants based on the Federal disposal criteria (40 CFR 503) are provided in **Table 13**. The Federal pollutant limits for various metals were obtained from **Table 4**. The plant overall efficiencies were taken from **Table 9**. The average daily sludge quantity of 191 tons/day (wet ton) was obtained from **Table 7**. The average percent total solid concentration in the final sludge was calculated to be 24.5%.

Table 13. MAHLs Based on Federal Sludge Criteria (40 CFR 503)

Pollutants	Plant Sludge Flow (lbs/day) (wet weight)	Plant Sludge Flow (lbs/day) (dry weight) [1]	Reg 503 Sludge Limit (mg/kg) (dry weight)	Overall Removal Efficiency (%)	MAHLs (lbs/day)
Arsenic	382,000	93,590	41	34.2	11.2
Cadmium	382,000	93,590	39	79.5	4.59
Chromium, Total	382,000	93,590	1,200	82.0 [2]	137
Copper	382,000	93,590	1,500	95.0	148
Lead	382,000	93,590	300	39.0	72
Mercury	382,000	93,590	17	74.0	2.15
Molybdenum	382,000	93,590	75	7.5	94
Nickel	382,000	93,590	420	15.3	257
Selenium	382,000	93,590	36	58.2	5.79
Zinc	382,000	93,590	2,800	57.2	458

[1] Dry Weight = Wet Weight x (% Solids/100); Average Solids in SBIWTP Sludge = 24.5%.
[2] Median Efficiency from Guidance Manual.

4.6 Calculations of MAHLs for BOD5, TSS, and Ammonia

The Guidance Manual recommends that conventional pollutants such as BOD5, TSS, and ammonia should be based on the treatment plant's rated average design capacity and should use a "monthly average" based on MAHLs. The average design capacities were taken from the report titled "Design Memorandum – Design Report on Design Update/Modifications for Secondary Treatment for South Bay International Wastewater Treatment Plant," March 28, 2008 by S&B Infrastructure Ltd. It is recommended that he MAHLs be re-evaluated once the proposed plant upgrades are completed. After the plant upgrades are operational, data can be collected to determine the new removal efficiency.

4.7 Selection of MAHLs for SBIWTP

The MAHLs for all potential POCs based on the NPDES permit limits, sludge process inhibition (secondary and nitrification), sludge disposal criteria, and plant process design capacity are tabulated in **Table 14**. The critical MAHL for each POC is the smallest value of all MAHLs derived from all four (4) bases.

The critical MAHLs were further reduced by a factor of safety of 25%. **Table 14** shows the MAHLs for all the POCs with 25% a factor of safety.

4.8 Comparison of Proposed MAHLs to Existing Influent Loadings

The MAHL for each POC at the SBIWTP was compared to the present average loadings of the plant influent and is shown in **Table 15**. The current influent loadings limits from the NPDES permit were also tabulated in **Table 15**.

For the present influent loadings determination, the average concentration of each pollutant was multiplied by the plant's permitted annual average flow of 25 MGD and converted to pounds per day. The average pollutant concentration was taken from **Table 9**. As shown in **Table 15**, the present influent loadings for arsenic, selenium, zinc were all above their respective MAHLs proposed in this study.

The present influent loadings that exceeded proposed MAHLs for arsenic and selenium were derived from the EPA 503 Sludge Regulations. If not controlled at the source, these metals may cause violations of the EPA 503 Sludge Regulations.

The proposed MAHL for zinc was derived based on the plant's biological process inhibition. If zinc is not controlled or reduced at the source, it may cause biological process upset.

The present influent loadings for the conventional pollutants (BOD5, TSS, and ammonia) were recalculated using the most current data to determine removal efficiencies and MAHL’s based on United States EPA Local Limits Development Guidance, EPA 833-R-04-002A. The present loadings for BOD5, TSS, and ammonia are below the proposed MAHLs reduced by a safety of factor of 25%.

Table 14. Comparison of MAHLs of All Five Criteria and Critical MAHLs

	MAHL (lbs/day) for Plant Based on								
Pollutants	**30-Day Average NPDES Permit Limit**	**6-Month Median NPDES Permit Limit**	**Biological Process Inhibition**	**CA HW Sludge Criteria**	**Federal Sludge Criteria (40 CFR 503)**	**Plant Removal Efficiency**	**Critical MAHLs (lbs/day)**	**Critical MAHLs w/ 25% Safety Factor (lbs/day)**	**Regulations Yielding Critical MAHL**
Metals									
Antimony	-		-	122	-	-	122	**92**	CA Title 22 Hazardous Waste Regulations
Arsenic	-		20.9	56	11.2	-	11.22	**8.41**	EPA 503 Sludge Regulations
Cadmium	-		245	4.81	4.59	-	4.59	**3.44**	EPA 503 Sludge Regulations
Chromium, Total	-		71.4	116	137	-	71.4	**53.6**	Biological Process Inhibition
Copper	-		13.4	101	148	-	13.4	**10.0**	Biological Process Inhibition
Cyanide	-		28.6	-	-	-	28.6	**21.4**	Biological Process Inhibition
Lead	-		242	97.9	72.0	-	72.0	**54.0**	EPA 503 Sludge Regulations
Mercury	-	3.03	-	1.03	2.15	-	1.03	**0.77**	CA Title 22 Hazardous Waste Regulations
Molybdenum	-		-	1,783	93.6	-	93.6	**70.2**	EPA 503 Sludge Regulations
Nickel	-		60.6	499	257	-	60.6	**45.5**	Biological Process Inhibition
Selenium	-		-	6.56	5.79	-	5.79	**4.34**	EPA 503 Sludge Regulations
Silver	-	-	-	25.5			25.5	**19.1**	CA Title 22 Hazardous Waste Regulations
Thallium, Total	73.1		-	58.9	-	-	58.9	**44.2**	CA Title 22 Hazardous Waste Regulations
Zinc	-	565	22.8	333.9	458		22.8	**17.1**	Biological Process Inhibition
Organics									
Chlorodibromomethane (Dibromochloromethane)	726		-	-	-	-	726	**545**	NPDES Permit
Chloroform	-		2424	3.21		-	3.21	**2.41**	CA Title 22 Hazardous Waste Regulations
Phenol	-		907	-	-		907	**680**	Biological Process Inhibition
TCDD Equivalents	6.48E-06		-	-	-	-	6.48E-06	**4.86E-06**	NPDES Permit
Toluene	-		41,700	-	-	-	41,700	**31,275**	Biological Process Inhibition
Conventional									
Ammonia	-		-	-	-	277,419	277,419	**208,064**	Plant Removal Efficiency
BOD5	-		-	-	-	178,434	178,434	**133,825**	Plant Removal Efficiency
TSS	-		-	-	-	216,652	216,652	**162,489**	Plant Removal Efficiency

Table 15. Comparison of Proposed MAHLs to Existing MAHLs and Present Influent Loadings

Pollutants	Proposed MAHLs w/ 25% Safety Factor (lbs/day) [1]	Existing NPDES Permit Influent Loadings Limits (lbs/day)		Actual Influent Loadings (lbs/day)	Comments
		Monthly Average	6-Month Median		
Metals					
Antimony	92	NL	NL	24.4	OK. Actual Influent Loading < Proposed MAHLs
Arsenic	8.41	5.00	NL	18.5	Not OK. Actual Influent Loading> Proposed MAHLs
Beryllium	Not Developed	0.52	NL	<MDL[2]	
Cadmium	3.44	13.0	NL	1.4	OK. Actual Influent Loading < Proposed MAHLs
Chromium, Total	53.6	230	NL	5.1	OK. Actual Influent Loading < Proposed MAHLs
Copper	10.0	NL	32.0	10.0	OK. Actual Influent Loading = Proposed MAHLs
Cyanide	21.4	NL	16.0	0.004	OK. Actual Influent Loading < Proposed MAHLs
Lead	54.0	34.0	NL	33.4	OK. Actual Influent Loading < Proposed MAHLs
Mercury	0.77	NL	NL [3]	0.73	OK. Actual Influent Loading < Proposed MAHLs
Molybdenum	70.2	NL	NL	0.83	OK. Actual Influent Loading < Proposed MAHLs
Nickel	45.5	NL	93	4.32	OK. Actual Influent Loading < Proposed MAHLs
Selenium	4.34	NL	NL	14.9	Not OK. Actual Influent Loading> Proposed MAHLs
Silver	19.1	NL	11.0	0.71	OK. Actual Influent Loading < Proposed MAHLs
Thallium, Total	44.2	NL	NL	26.7	OK. Actual Influent Loading < Proposed MAHLs
Zinc	17.1	220	NL	71.3	Not OK. Actual Influent Loading> Proposed MAHLs
Organics					
Chlorodibromomethane (Dibromochloromethane)	545	NL	NL	0.75	OK. Actual Influent Loading < Proposed MAHLs
Chloroform	2.41	NL	NL	1.33	OK. Actual Influent Loading < Proposed MAHLs
Phenol	680	NL	NL	1.19	OK. Actual Influent Loading < Proposed MAHLs
TCDD Equivalents	4.86E-06	NL	NL	4.44E-07	OK. Actual Influent Loading < Proposed MAHLs
Toluene	31,275	NL	NL	1.24	OK. Actual Influent Loading < Proposed MAHLs
Conventional					
Ammonia	208,064	NL	NL	7,298	OK. Actual Influent Loading < Proposed MAHLs
BOD5	133,825	NL	NL	81,941	OK. Actual Influent Loading < Proposed MAHLs
TSS	162,489	NL	NL	80,064	OK. Actual Influent Loading < Proposed MAHLs

[1] Monthly average. [2] Influent concentration below MDL. [3] 1.1 lbs/day is instantaneous limit. NL = No limit

5.0 CONCLUSIONS

A total of 22 pollutants were identified as POCs for the SBIWTP based on screening criteria described in the EPA Guidance Manual. The MAHLs were calculated for these POCs, compared to the present influent loadings, and presented in **Table 15**.

A comparison of the proposed MAHLs to the present loadings demonstrated that the headworks loadings for arsenic, selenium, zinc exceeded their respective MAHLs. The results indicate that reductions in the discharge of arsenic, selenium, and zinc to the sewerage system is required.

The higher present loadings for BOD5, TSS, and ammonia were mainly due to slightly higher concentrations of these pollutants in the plant influent. The plant should be able to treat these three (3) conventional pollutants with the slightly higher present loadings. See the recommendations below regarding recalculating MAHLs after the new plant upgrades are in operation.

5.1 Recommendations

The following items are recommended for USIBWC's consideration:

- Recalculate the MAHLs after the plant is upgraded (with new Equalization Tank and three (3) SSTs) and is in operation for one (1) to two (2) years with the new plant removal efficiencies.
- Continue to monitor the POCs that were evaluated.
- Establish pretreatment limits using the uniform concentration method or contributory flow method and based on the revised MAHLs with new plant operations. Develop local limits for arsenic, selenium, and zinc using EPA's Guidance Manual (2004).
- Request through Mexican government that OOMAPAS conduct an industrial pretreatment survey in Tijuana, Baja California.

6.0 REFERENCES

"Technical Memorandum – Design Report on Design Update/Modification for Secondary Treatment at the South Bay International Wastewater Treatment Plant," March 26, 2008, by S& B Infrastructure Ltd.

"Local Limit Development Guidance", EPA 833-R-04-002A, July 2004, United States Environmental Protection Agency.

"Local Limits Development Guidance Appendices", EPA 833-R-04-002B, July 2004, United States Environmental Protection Agency.

"Waste Discharge Requirements for the United States Section of the International Boundary and Water Commission, South Bay Wastewater International Wastewater Treatment Plant, Discharge to the Pacific Ocean via the South Bay Ocean Outfall", Order No. R9-2014-0009, NPDES No. CA0108928, June 26, 2014, by California Regional Water Quality Control Board San Diego Region.

Mexican Nom for Solid Waste (Biosolids), NOM-004-SEMARNAT-2002.