



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION IX  
75 Hawthorne Street  
San Francisco, CA 94105

April 30, 2009

In Reply Refer To: WTR-7

Robert Hayden, Chief Financial Officer  
Industrial Metal Finishing  
1085 North Parker Street  
Orange, California 92867

**Re: September 11, 2008 Clean Water Act Inspection**

Dear Mr. Hayden:

Enclosed is the April 30, 2009 report for our September 11, 2008 inspection of Industrial Metal Finishing. Please submit a short response to the findings in Sections 2 through 5 of this report, to EPA, the Orange County Sanitation Districts, and the Regional Water Quality Control Board, by **June 30, 2009**.

The main findings are summarized below:

- 1 Industrial Metal Finishing does not qualify as metal finisher regulated under the Federal regulations in 40 CFR 433. Therefore the OCSD permit must be modified.
- 2 The limited volume of wastewater and the on-site batch treatment now results in consistent compliance with all applicable local limits. Past performance was less consistent in particular for oil and grease. However, the frequent violations for oil and grease ended in 2006, and the two isolated violations for metals last occurred in 2007.
- 3 The quarterly self-monitoring is representative over the sampling day and the six-month reporting period. Some locally-limited pollutants found always at or near their detection limits could be sampled less or not at all.

I appreciate your helpfulness extended to me during this inspection. I remain available to the Orange County Sanitation Districts, and to you to assist in any way. Please do not hesitate to call me at (415) 972-3504 or e-mail at [arthur.greg@epa.gov](mailto:arthur.greg@epa.gov).

Sincerely,

Greg V. Arthur  
CWA Compliance Office

Enclosure

cc: Roya Sohanaki, OCSD  
Julio Lara, RWQCB-Santa Ana



**U.S. ENVIRONMENTAL PROTECTION AGENCY**

**REGION 9**

**CLEAN WATER ACT COMPLIANCE OFFICE**

**NPDES COMPLIANCE EVALUATION INSPECTION REPORT**

Industrial User: Industrial Metal Finishing  
1085 North Parker Street, Orange, California 92867  
Non-Categorical Industrial User

Treatment Works: Orange County Sanitation Districts  
Fountain Valley Wastewater Treatment Plant No.1 and  
Huntington Beach Wastewater Treatment Plant No.2  
NPDES Permit CA0110604 - California WDRs R8-2004-0062

Pretreatment Program: Orange County Sanitation Districts

Date of Inspection: September 11, 2008

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Inspection Participants:

US EPA: Greg V. Arthur, Region 9, CWA Compliance Office, (415) 972-3504  
Howard Kahan, Region 9, Los Angeles Office, (213) 244-1819

RWQCB-Los Angeles: None

Orange County SD: Dave Yager, Source Control Inspector, (714) 719-3830  
Mila Kleinbergs, Associate Engineer, (714) 593-7403

Industrial Metal Finishing: Robert Hayden, Chief Financial Officer, (714) 628-8808

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Report Prepared By: Greg V. Arthur, Environmental Engineer  
April 30, 2009



## **1.0 Scope and Purpose**

On September 11, 2008, EPA and the Orange County Sanitation Districts (OCSD) conducted a compliance evaluation inspection of Industrial Metal Finishing in Orange, California. The purpose was to ensure compliance with the Federal regulations covering the discharge of non-domestic wastewaters into the sewers. In particular, it was to ensure:

- Classification in the proper Federal categories;
- Application of the correct standards at the correct sampling points;
- Consistent compliance with the standards; and
- Fulfillment of Federal self-monitoring requirements.

Industrial Metal Finishing was listed as a significant industrial user (“SIU”) within sewer service areas administered by the OCSD whose compliance was assessed as part of an on-going EPA evaluation of industrial users in EPA Region 9 by sector. The inspection participants are listed on the title page. Arthur conducted the inspection on September 11, 2008.

## **1.1 Process Description**

Industrial Metal Finishing is a shot-peening job-shop for the strengthening and annealing of titanium parts for medical products and of carbon steel parts for oil industry drilling. The shot peening involves the pressure delivery of micron-sized carbon steel or glass bead shot. The associated steps include alkaline soap ultrasonic cleaning, high-energy deburring followed by hand washing, and final vapor blasting. Industrial metal Finishing does not own the parts it finishes. Operations began in 1996.

Industrial Metal Finishing discharges non-domestic wastewaters to the OCSD domestic sewers through a single sewer connection designated in this report by permit number as IWD-521771. Domestic sewage discharges through separate connections downstream of the industrial wastewater connection.

## **1.2 Facility NAICS Code**

Industrial Metal Finishing is assigned the NAICS code for shot peening metal and metal products for trade (NAICS 332811).

## **1.3 Facility Wastewater Sources**

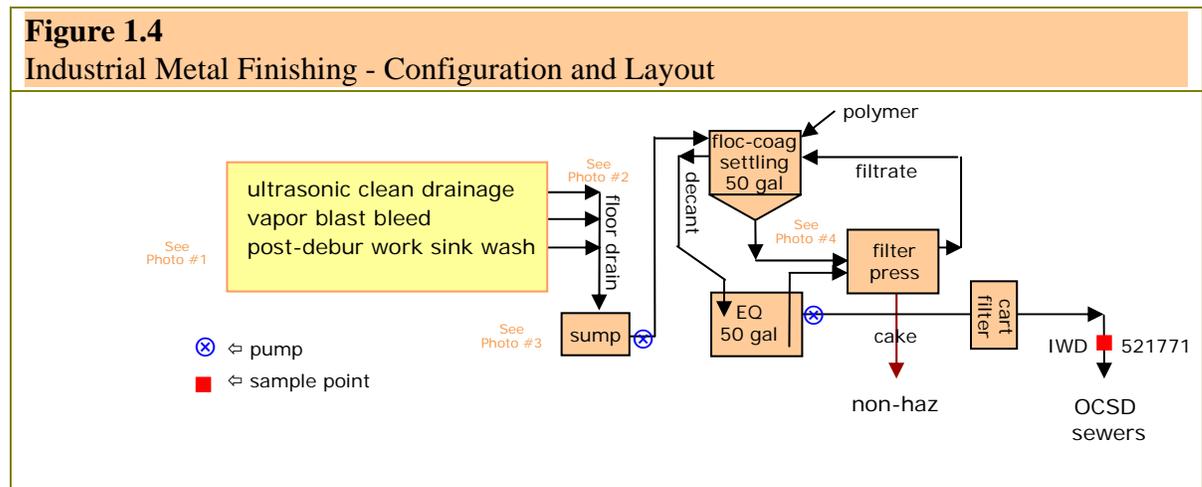
The operations generate very little wastewater. There are only three sources all of which discharge to the sewers. First, ultrasonic cleaning generates roughly 40 gallons per week or less of spent soap solution for discharge to a floor drain. Second, deburred parts are washed by hand in a sink to a floor drain. Third, vapor blasting generates roughly 100 gallons per week of alkaline wash slurry bleed through a small bucket to a floor drain. Industrial Metal



Finishing also has second closed-loop ultrasonic cleaning station, which was not in service on the date of this inspection. The floor drains lead to a small industrial wastewater treatment unit, which generates solids for non-hazardous disposal. There is a single non-domestic connection to the sewers that receives contributions from the industrial wastewater treatment unit as its only source. The July 8, 2008 OCSD permit identifies the sewer sampling point as a sample box in the restroom. This compliance sample point is designated as IWD-521771 for the purposes of this report. *See* Photos #1 and #2 on page 4.

## 1.4 Facility Process Wastewater Handling

**Discharge** - Treated process wastewaters batch discharge to the sewers through a single connection. The permit lists the average discharge flow as less than 5,000 gallons per day. *See* the photos in Section 1.7 on page 4.



**Composition** - The process-related wastewaters listed in section 1.3 above would be expected to contain the base materials of aluminum, iron, including their chromium, nickel, copper, and zinc alloys, as well as oil & grease, salts, surfactants, and other pollutants in the surface grime cleaned off of parts, and the minerals entrained in the water supply.

**Delivery** - The wash waters drain by gravity through the floor drains to a sump for hard-piped pump delivery up into the treatment unit.

**Treatment** – Industrial Metal Finishing provides batch treatment to remove solids from the wastewaters for discharge to the sewers. The batch treatment involves chemical-aided settling (coagulation, flocculation), cartridge filtering, effluent equalization, and a filter press. The batch treatment is operated twice per week.

## 1.5 POTW Legal Authorities

**Orange County Sanitation Districts** - OCSD administers the pretreatment program in sewer districts serviced by the OCSD Fountain Valley wastewater treatment plant. This facility



operates under the requirements of the State of California, Santa Ana RWQCB's Waste Discharge Requirements, R8-2004-0062, issued in 2004. The WDRs, which also function as NPDES permit No. CA0110604, require the implementation of an approved pretreatment program throughout the sewer service area. Under this authority, OCS&D issued permit No.52-1-771 authorizing the discharge of non-domestic wastewater the sewers.

## 1.6 Sampling Record

Industrial Metal Finishing self-monitors metals quarterly, oil and grease monthly, and cyanide and toxic organics semi-annually as required by the OCS&D permit. OCS&D also collects its own samples quarterly.

## 1.7 Photo Documentation

The four photographs taken during this inspection are depicted below and saved as *indmetfin-1.jpg* through *indmetfin-4.jpg*.



Photo #1: Post-debur work sink to floor drain  
Taken By: Greg V. Arthur  
Date: 09/11/08

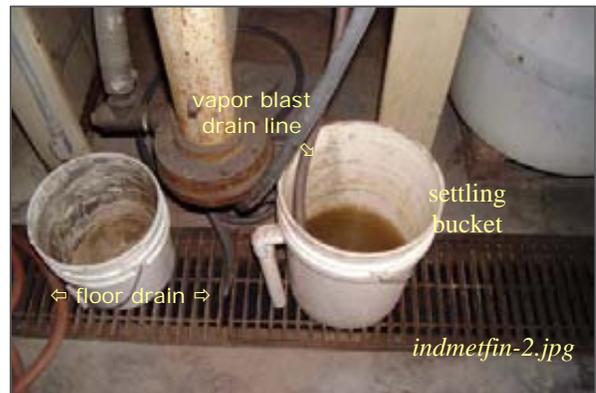


Photo #2: Vapor blast bleed drain to floor drain  
Taken By: Greg V. Arthur  
Date: 09/11/08

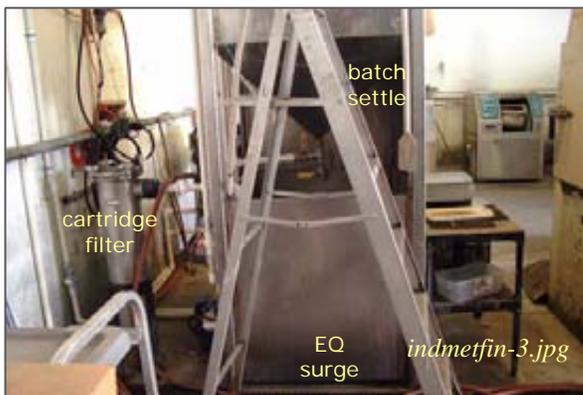


Photo #3: Industrial Wastewater Treatment Unit  
Taken By: Greg V. Arthur  
Date: 09/11/08



Photo #4: Floor drain into delivery sump  
Taken By: Greg V. Arthur  
Date: 09/11/08



## 2.0 Sewer Discharge Standards and Limits

*Federal categorical pretreatment standards (where they exist), national prohibitions, State groundwater, and the local limits (where they exist) must be applied to the sewer discharges from industrial users. (40 CFR 403.5 and 403.6).*

### **Summary**

Only OCSD local limits and the national prohibitions apply to the discharges to the sewers. The Federal standards in 40 CFR 433 for new source metal finishers do not apply because Industrial Metal Finishing does not perform any of the regulated processes. Therefore the OCSD permit incorrectly applied Federal standards but correctly advances the local limits. The application of Federal standards, national prohibitions, and local limits was determined through visual inspection. *See* Appendix 1 on page 12 of this report for the permit limits.

### **Requirements**

- The OCSD permit must not apply the Federal metal finishing standards.

### **Recommendations**

- None.

## 2.1 Classification by Federal Point Source Category

Industrial Metal Finishing does not qualify for regulation under any of the Federal categorical standards for the discharge of wastewaters to the sewer.

In particular, Industrial Metal Finishing does not qualify as a metal finisher subject to the Federal metal finishing standards in 40 CFR 433. Thus the OCSD permit incorrectly applies the Federal standards to the discharge from IWD-521771. Under 40 CFR 433.10(a), the metal finishing standards do not apply because Industrial Metal Finishing does not perform any of the core metal finishing operations. The metal finishing standards "... apply to plants that perform ..." the core operations of electroplating, electroless plating, etching, chemical coating, anodizing, or printed circuit board manufacturing and they extend to other on-site operations associated with metal finishing and specifically listed in 40 CFR 433.10(a), such as cleaning, machining, deburring, impact deformation, and abrasive jet blasting. However, if none of the core operations are performed, then the metal finishing standards do not apply to the discharges from any of the operations associated with metal finishing.

## 2.2 Local Limits and National Prohibitions

Local limits and the national prohibitions are meant to express the limitations on non-domestic discharges necessary to protect the sewers, treatment plants and their receiving waters from adverse impacts. In particular, they prohibit discharges that can cause the pass-



through of pollutants into the receiving waters or into reuse, the operational interference of the sewage treatment works, the contamination of the sewage sludge, sewer worker health and safety risks, fire or explosive risks, and corrosive damage to the sewers. The national prohibitions apply nationwide to all non-domestic sewer discharges. The OCSD local limits apply to non-domestic discharges in its service area.

## **2.4 Point(s) of Compliance**

The permit identifies the sample box within the restroom as the location of the secured sampling point, designated in this report as IWD-521771.

Federal Standards - Federal categorical pretreatment standards do not apply to the discharges to the sewers from Industrial Metal Finishing.

Local Limits - Local limits and the national prohibitions apply end-of-pipe to non-domestic flows. The sample point designated as IWD-521771 is a suitable end-of-pipe sample point representative of the day-to-day non-domestic wastewater discharges from Industrial Metal Finishing.

## **2.5 Compliance Sampling**

The local limits and national prohibitions are instantaneous-maximums and are comparable to samples of any length including single grab samples. The OCSD permit establishes these sampling protocols by specifying the type of sampling required by parameter (Permit Attachment A). *See* Section 5.0 of this report on page 11 and Appendix 1 on page 12.



### 3.0 Compliance with Federal Standards

*Industrial users must comply with the Federal categorical pretreatment standards that apply to their process wastewater discharges. 40 CFR 403.6(b).*

*Categorical industrial users must comply with the prohibition against dilution of the Federally-regulated waste streams as a substitute for treatment. 40 CFR 403.6(d).*

*Industrial users must comply with the provision restricting the bypass of treatment necessary to comply with any pretreatment standard or requirement. 40 CFR 403.17(d).*

No Federal categorical pretreatment standards apply to Industrial Metal Finishing. As a result, the Federal prohibitions against dilution as a substitute for treatment and the bypassing of treatment necessary to comply with Federal standards also do not apply. The OCS&D permit prohibits bypassing (Permit Part 2.II.A.2), and references a provision against dilution as a substitute for treatment (Permit Part 3.I.B), but these provisions apply strictly to the treatment installed to comply with local limits.

#### ***Requirements***

- None.

#### ***Recommendations***

- None.



#### 4.0 Compliance with Local Limits and National Prohibitions

*All non-domestic wastewater discharges to the sewers must comply with local limits and the national prohibitions. 40 CFR 403.5(a,b,d).*

*Industrial users must comply with the provision restricting the bypass of treatment necessary to comply with any pretreatment standard or requirement. 40 CFR 403.17(d).*

The sample record indicates that Industrial Metal Finishing now has achieved consistently compliance with all of its local limits for metals, cyanide, organics, pH, and sulfides, since mid-2007, but did not do so beforehand. There were numerous off-spec discharges in violation of local limits for oil and grease, the last of which occurred in 2006, and single violations of the chromium and lead limits in 2005 and 2007 respectively. The batch treatment of the small volumes of process-related wastewaters generated on-site is expected to result in the continued consistent compliance. *See* Table 3 on page 14 of this report.

##### ***Requirements***

- None.

##### ***Recommendations***

- None.

#### 4.1 National Objectives

The general pretreatment regulations were promulgated in order to fulfill the national objectives to prevent the introduction of pollutants that:

- (1) cause operational interference with sewage treatment or sludge disposal,
- (2) pass-through sewage treatment into the receiving waters or sludge,
- (3) are in any way incompatible with the sewerage works, or
- (4) do not improve the opportunities to recycle municipal wastewaters and sludge.

This inspection did not include an evaluation of whether achievement of the national objectives in 40 CFR 403.2 have been demonstrated by the OCDS wastewater treatment plants through consistent compliance with its sludge and discharge limits.

#### 4.2 Sampling Results

The 2005-2009 sample record for Industrial Metal Finishing collected from the secured sampling point consists of self-monitoring quarterly for cadmium, chromium, copper, lead, nickel, silver, and zinc, monthly for oil and grease, and semi-annually for cyanide and toxic organics, as well as sampling collected by OCSD quarterly for metals and cyanide. All



metals samples were 24-hour composites. The cyanide, oil and grease, and toxic organics samples were grabs. *See* Appendix 2 on page 13 for a summary of the compliance sampling.

Over the past four fiscal years beginning in July 2005, Industrial Metal Finishing now has achieved or nearly achieved consistent compliance with the local limits. The oil and grease samples collected through October 2006 often violated local limits, resulting in calculated average and 99th% peak concentrations of 139.2 and 566.3 mg/l. However, after October 2006, there were no subsequent oil and grease violations with the calculated average and 99th% peak concentrations steeply dropping to 3.9 and 17.0 mg/l. In addition, the 30+ metals samples once each exceeded local limits for chromium and lead, resulting in calculated average and 99th% peak concentrations of 0.429 and 1.846 mg/l chromium, and 0.420 and 3.027 mg/l lead. Samples for the other pollutants always met the local limits with average and calculated 99th% peak concentrations of 0.018 and 0.078 mg/l cadmium, 0.194 and 0.992 mg/l copper, 1.061 and 3.436 mg/l nickel, <0.020 mg/l silver, 0.517 and 1.442 mg/l zinc, 0.006 and 0.028 mg/l total cyanide, and <0.010 mg/l total toxic organics.

- Oil and Grease – The statistical probability of violating the local limits for oil and grease was roughly 60% per sampling event before November 2006 but essentially 0% after. The steep drop in oil and grease concentrations after November 2006 and the resulting consistent compliance should be maintained by the batch treatment of the now small volumes of process-related wastewaters generated on-site. *See* Section 5.0 on page 11.
- Metals – The statistical probability of violating local limits for metals is not zero but somewhere less than 8% per sampling event. Over the past four fiscal years, the two samples in the record out of 33 that resulted in violations occurred by July 2007. Since then there been over 15 straight samples for metals in compliance. These sampling results indicate recent consistent compliance with the local limits for metals.
- Cyanide and Toxic Organics – The statistical probability of violating the local limits for cyanide and toxic organics is essentially 0% per sample.

### **4.3 Local Limits for Oxygen Demanding Pollutants and The National Prohibition Against Interference**

High-Strength Organics - The process-related wastewaters discharged to the sewers are not expected to be high enough in organics strength to pose a risk of interference, with the organics strength significantly less than domestic sewage.

Oil and Grease – There were numerous violations of the local limits all before November 2006 but no evidence that these violations resulted in or contributed to any interference in the operations of the OCSD sewer system and wastewater treatment plants.

Metals and Cyanide – There were single violations of the local limits for chromium and lead, all before July 2007, but no violations of any other local limit. These violations did not result in or contribute to any interference in the operations of the OCSD sewer system and wastewater treatment plants. There are consistent chromium levels well above the detection



limit for chromium but just two samples taken two days apart with lead levels more than an order of magnitude over the lead detection limits. This indicates the one-time unexpected or inadvertent release of lead that should be preventable through identification and elimination of the source.

#### **4.3 Local Limits for Toxic Metals, Cyanide, and Other Pollutants and The National Prohibition Against Pass-Through**

Metals and Cyanide – There is no evidence that the single violations of the local limits for chromium and lead resulted in or contributed to any pass-through of pollutants from the OCS&D wastewater treatment plants into the Pacific ocean or into the treatment plant sludge in violation of its NPDES permit.

Toxic Organics – There were no violations of the local limits for toxic organics.

Oil and Grease – There is no evidence that the numerous violations of the oil and grease local limits before November 2006 resulted in or contributed to any pass-through of pollutants from the OCS&D wastewater treatment plants into the Pacific ocean or into the treatment plant sludge in violation of its NPDES permit. There have been no violations of the oil and grease local limits since October 2006 with all samples falling well below the 100 mg/l limit.

#### **4.4 Local Limits for pH and Sulfides, and The National Prohibitions Against Safety Hazards and Corrosive Structural Damage**

Corrosion - Sewer collection system interferences related to the formation of hydrogen sulfide and the resulting acidic disintegration of the sewers are possible but not expected. The wastewaters discharged to the sewers are not high-strength in biodegradable organics nor acidic in nature. They also are expected to be neutral in strength, not needing treatment to remain within the upper and lower pH limits.

Flammability - Flammability would not be expected because sampling shows that the discharges to the sewer entrain negligible amounts of volatile organics.



## 5.0 Compliance with Federal Monitoring Requirements

*Significant industrial users must self-monitor for all regulated parameters at least twice per year unless the sewerage agency monitors in place of self-monitoring. 40 CFR 403.12(e) & 403.12(g).*

*Each sample must be representative of the sampling day's operations. Sampling must be representative of the conditions occurring during the reporting period. 40 CFR 403.12(g) and 403.12(h).*

Permit Requirements – Industrial Metals Finishing has successfully fulfilled the self-monitoring requirements set forth in the OCSD permit. Over the past four fiscal years, the sample record shows that Industrial Metal Finishing (1) submitted sample results for all permit listed parameters at the required frequency, (2) collected all samples from the designated compliance sampling point, (3) correctly obtained 24-hour composites for metals and grabs for the other pollutants, and (4) followed appropriate chain-of-custody procedures.

Representativeness - The sample record also appears representative of the discharge to the sewers over the sampling day and the six-month reporting period. Self-monitoring monthly for oil and grease and quarterly for metals of batch treated discharges properly ensures that the sample record accounts for the intermittent sources. Some pollutants now always present at concentrations well below the local limits do not need to be sampled as frequently as currently required by the permit.

### ***Requirements***

- *See* Appendix 1 on page 12 for the self-monitoring and OCSD monitoring requirements for IWD-521771 that would be considered to be representative of the discharge.

### ***Recommendations***

- Self-certification statements should include copies of the hazardous waste manifests documenting the off-hauling of spents, spent static rinses, and residuals.



**Appendix 1**

**Sewer Discharge Standards and Limits for Industrial Metals Finishing @ IWD-521771**

FEDERAL CATEGORICAL STANDARDS AND OCSD LOCAL LIMITS						
pollutants of concern (mg/l)	Fed stds d-max	Fed stds mo-avg	loc limits instant	loc limits d-max ④	monitoring frequency ②	
					discharger	district
flow (gpd)	-	-	-	-	1/day	-
arsenic	-	-	2.00	0.083	-	③
cadmium	-	-	1.00	0.005	none	1/year
chromium	-	-	2.00	0.083	quarterly	quarterly
copper	-	-	3.00	0.125	quarterly	quarterly
lead	-	-	2.00	0.029	quarterly	quarterly
mercury	-	-	0.030	0.001	-	③
nickel	-	-	10.00	0.166	quarterly	quarterly
silver	-	-	5.00	0.018	none	1/year
zinc	-	-	10.00	0.109	quarterly	quarterly
cyanide – total	-	-	5.00	0.050	none	1/year
cyanide - amenable	-	-	1.00	0.042	-	③
total toxic organics	-	-	0.58	-	none	1/year
oil+grease - mineral	-	-	100	-	quarterly	1/year
pH (s.u.)	-	-	6.0-12.0	-	quarterly	quarterly
biochem oxy demand	-	-	-	15000	-	③
total sulfides	-	-	5.00	-	-	1/year
dissolved sulfides	-	-	0.50	-	-	1/year
PCBs	-	-	0.010	-	-	③
pesticides	-	-	0.010	-	-	③
explosivity	-	-	①	-	-	③

- ① Narrative prohibition against the introduction of flammable or explosive substances
- ② Recommended **reductions in green**. Recommended **increases in red**.
- ③ As part of periodic priority pollutant scans in order to identify changes in discharge quality
- ④ Loading limits in lbs/day, based on baseline minimum flow rate of 5,000 gpd.



**Appendix 2**  
**Wastewater Discharge Quality for Industrial Metal Finishing from July 2005 - March 2009**

SAMPLE RECORD SUMMARY							
pollutants (µg/l)	effluent sampling results				violation rate		sample count
	mean	99th%	min	max	sample	period	
cadmium	17.8	78.0	<7	100	0/33	-	33
chromium	429.4	1846.2	<7	2870	1/33	-	33
copper	194.3	992.1	<10	1750	0/33	-	33
lead	419.6	4829.7	<2	10800	1/33	-	33
nickel	1060.5	3436.1	100	4400	0/33	-	33
silver	<2	3.0	<2	6	0/33	-	33
zinc	517.0	1441.7	30	1780	0/33	-	33
total cyanide	6.4	28.3	<20	40	0/16	-	16
total toxic organics	<10	<10	<10	<10	0/7	-	7
oil+grease (mg/l) ③	139.2	566.3	<0.7	800	7/22	-	22
oil+grease (mg/l) ④	3.9	17.0	<0.7	20	1/36	-	36
flow (gpd)	645	3192	100	6000	-	-	①
pH (s.u.)	⑤	-	-	-	②	-	0

- ① Continuous flow self-monitoring results reported for the day of sampling
- ② No sample results for these pollutants of concern - pH.
- ③ Sample results for oil and grease from July 2005 – October 2006
- ④ Sample results for oil and grease from November 2006 – March 2009
- ⑤ pH median

STATISTICAL PROBABILITY OF FUTURE VIOLATIONS					
violation probability by parameter	mean (µg/l)	std dev (µg/l)	statistical probability	percent	
local d-max– O&G (Jul05-Oct06)	µ = 139.2	σ = 183.3	a(100)	= 0.5847	~60%
local d-max– O&G (Nov06-Mar09)	µ = 3.9	σ = 5.6	a(100)	= 0.0000	~0%
local d-max - lead	µ = 419.6	σ = 1118.9	a(2000)	= 0.0789	~8%
local d-max - chromium	µ = 429.4	σ = 608.1	a(2000)	= 0.0049	~0%



**Appendix 3**  
**Industrial Metal Finishing Violations from July 2005 – March 2009**

FEDERAL STANDARD VIOLATIONS FOR METALS					
sample dates	type	sampler	Fed standards / local limits ①	violations	days
none					

FEDERAL STANDARD VIOLATIONS FOR CYANIDE					
sample dates	type	sampler	Fed standards / local limits ①	violations	days
none					

LOCAL LIMIT VIOLATIONS					
sample dates	type	sampler	Fed standards / local limits	violations	days
07/21/05	24-hour	IU	local instant - chrome 2.0 mg/l	2.87	1
07/21/05	grab	IU	local instant - oil+grease 100 mg/l	140	1
08/30/05	grab	IU	local instant - oil+grease 100 mg/l	290	1
09/20/05	grab	IU	local instant - oil+grease 100 mg/l	800	1
10/20/05	grab	IU	local instant - oil+grease 100 mg/l	320	1
11/15/05	grab	IU	local instant - oil+grease 100 mg/l	260	1
12/21/05	grab	IU	local instant - oil+grease 100 mg/l	250	1
05/24/06	grab	IU	local instant - oil+grease 100 mg/l	160	1
08/15/06	grab	IU	local instant - oil+grease 100 mg/l	300	1
07/17/07	24-hour	IU	local instant - lead 2.0 mg/l	10.8	1
07/17/07	24-hour	IU	local d-max load - lead 0.029 lb/d	0.063	1

① Monthly averages calculated by calendar month of all self-monitoring and OCSD sampling.