



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

March 5, 2010

In Reply Refer To: WTR-7

Ray Headings
Environmental, Health & Safety Facilities Manager
Microsemi Corporation
8700 East Thomas Road
Scottsdale, Arizona 85251

Re: September 22, 2009 Clean Water Act Inspection

Dear Mr. Headings:

Enclosed is the March 5, 2010 report for our September 22, 2009 inspection of Microsemi Corporation. Please submit a short response to the findings in Sections 2 through 5, to EPA, Scottsdale, and ADEQ, by **May 30, 2010**. The main findings are summarized below:

- 1** Microsemi qualifies as both a new source metal finisher under 40 CFR 413 and a new source semiconductor wafer fabrication operation under 40 CFR 469 Subpart A.
- 2** The weak strength of the wastewaters from wafer fabrication and small parts metal finishing allows Microsemi to consistently comply with Federal standards without model best-available-technology treatment in-place, but rather through targeted cyanide treatment and source controls for metals and toxic organics. A few isolated violations of copper and lead limits were corrected through added source controls. In addition, pH neutralization has proven effective, though undersized, with multistage reactor tanks, multiple equalization tanks, and comprehensive pH in-line monitoring.
- 3** The self-monitoring is representative over the sampling day and the reporting period. Most pollutants could be self-monitored and city-monitored less frequently because of low levels in the discharge.

I appreciate your helpfulness extended to me during this inspection. I remain available to the City of Scottsdale, 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.

Sincerely,

Original signed by:

Greg V. Arthur
CWA Compliance Office

Enclosure

cc: Bill Hurd, Pretreatment Coordinator, City of Scottsdale
Gregory Frech, WQ Compliance, ADEQ



U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION 9

CLEAN WATER ACT COMPLIANCE OFFICE

NPDES COMPLIANCE EVALUATION INSPECTION REPORT

Industrial User: Microsemi Corporation
8700 East Thomas, Scottsdale, Arizona 85251
New Source Metal Finishing (40 CFR 433)
Electrical & Electronic Components – Semiconductor (40 CFR 469A)

Treatment Works: City of Phoenix
91st Avenue Wastewater Treatment Plant
NPDES Permit No. AZ0020524

Pretreatment Program: City of Scottsdale

Date of Inspection: September 22, 2009

Inspection Participants:

US EPA: Greg V. Arthur, Region 9, CWA Compliance Office, (415) 972-3504

Arizona DEQ: None

City of Scottsdale: Bill Hurd, Pretreatment Coordinator, (480) 312-8795

Microsemi: Ray Headings, Envr Health & Safety Facilities Mgr, (480) 941-6300
David Strang, Jr., Engineering Tech, (480) 941-6300
Tony Digiacomio, Military & High-Rel Processor Mgr, (480) 941-6300

Report Prepared By: Greg V. Arthur, Environmental Engineer
March 5, 2010



1.0 Scope and Purpose

On September 22, 2010, EPA and the City of Scottsdale conducted a compliance evaluation inspection of Microsemi Coordinator, in Scottsdale, Arizona. 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.

Microsemi is a significant industrial user (“SIU”) within sewer service areas administered by the City of Scottsdale 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.

See Appendix 1 on page 16 for a schematic of the layout and configuration of wastewater handling, and for a waste and wastewater inventory. Photo documentation of this inspection follows in Section 1.6 on page 4.

1.1 Process Description

Microsemi manufactures solid-state semiconductor diodes. The production-related operations involve the semiconductor die fabrication, tungsten slug fabrication, assembly and glass sleeve sealing, and diode testing. Support operations include fume scrubbing, cooling tower chillers, plant wash down, and deionized water generation.

- Die Fabrication (purchased silicon wafers) – epitaxial implantation (B, P), oven hydrogen reduction to remove moisture, chemical acid etching (HNO₃-HF), photolithography (H₂SO₄, naphthalene), diode die sawing, die testing.
- Tungsten Slug Fabrication (under fume hood) – etching (HF-acid), Watts nickel plating, curing oven, cyanide-silver plating.
- Assembly (slug-die-slug) – heat curing assembly, glass sleeve sealing, heat curing, brazing copper contacts, copper lead wire deoxidation, dye penetrant diode testing.
- Support Operations – cooling towers (isothiazolin biocides, KOH, H₂O₂, H₂SO₄), plant and equipment wash down (H₂O₂) on Sundays, fume wet-scrubber blowdown, and deionized water production.

Microsemi owns the diodes fabricated on-site. The operations have been reconfigured after 1984. Microsemi discharges non-domestic wastewaters to the Tempe domestic sewers through a single sewer connection under Scottsdale permit A-03-Microsemi. Domestic sewage discharges downstream of the industrial wastewater connection.



1.2 Facility SIC Code

Microsemi is assigned the SIC code for semiconductors and related devices including solid state diodes (SIC 3674).

1.3 Facility Process Wastewater Handling

Sources – Semiconductor diode fabrication and the supporting operations generate (1) fluoride-bearing acidic spents, and rinses, (2) acidic and alkaline spent etchants, cleaners, and rinses, (3) cyanide-bearing spents, and rinses, (4) plant and equipment wash down, (5) fume scrubber blowdown, (6) cooling water and bleeds, (7) DI reject water, (8) sink wash, and (9) residuals. These process-related wastewaters would be expected to contain copper, nickel, silver, fluoride, cyanide, acidity, solvents, surfactants, cooling tower biocides and additives, and the trace minerals entrained in the water supply. The wastewaters generated on-site and found during this inspection are listed in Appendix 1 on page 16 of this report.

Discharge – All process wastewaters discharges from Microsemi discharged to the Scottsdale domestic sewers through a final Parshall flume, identified in the 2009 Scottsdale permit as the outfall 001 final compliance sample point. The permit also identifies an internal outfall 002 just after cyanide destruction as the Federal cyanide sampling point. These sampling points are designated in this report after the permit outfall numbers as IWD-A03.1 and IWD-A03.2. The permit limits peak discharges to the sewers to 180,000 gpd. Effluent metering averaged 120,000 gpd since 2007. *See* Photo #4 in Section 1.6 on page 4.

Delivery – Most of the wastewaters are hard-plumbed to the IWTP. Selected spent solutions are collected into barrels for off-site disposal. The wastewaters are segregated by treatability into separate piping systems for delivery to five dedicated equalization tanks: (1) Tank 1 - 2000 gals for cooling tower bleeds, (2) Tank 2 - 3700 gals for acids, (3) Tank 3 – 4260 for general flows, (4) Tank 5 - 500 gals for cyanide-bearing from slug silver plating, and (5) Tank 10 - 500 gals for cyanide-bearing from wafer silver plating.

Treatment – The IWTP provides cyanide destruction and ion exchange for cyanide-bearing silver plating rinses and scrubber blowdown, and 3-stage pH adjustment. The IWTP also employs multi-staged influent, effluent, and emergency equalization. Wafer silver plating wastes are collected in a holding tank for off-site disposal as hazardous, along with other collected spents. Ion exchange resins are regenerated off-site. *See* Appendix 1 on page 16 of this report for the configuration and lay-out of the wastewater handling on-site. *Also see* Sections 3.2 on page 11, and Photos #1 to #3 in Section 1.6 of this report on page 4.

1.4 Sampling Record

Microsemi self-monitors daily for discharge flow rate, quarterly for arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, cyanide, and pH, and semi-annually for toxic organics. The City of Scottsdale collects its own samples quarterly.



1.5 POTW Legal Authorities

The City of Scottsdale has enacted an ordinance to implement a pretreatment program within the city limits which is sewered to Phoenix's 91st Avenue Wastewater Treatment Plant. Under this authority, in Chapter 49 of the Scottsdale City Code, the City issued permit A-03 authorizing discharge of non-domestic wastewater from Microsemi to the sewers.

1.6 Photo Documentation

The four photographs taken during this inspection are depicted below and saved as *microsemi-01.jpg through -04.jpg*.



Photo #1: IWTP EQ Tanks T1, T2, T3
Taken By: Greg V. Arthur
Date: 09/22/09



Photo #2: IWTP CN-Destruct / pH Adjust / IX
Taken By: Greg V. Arthur
Date: 09/22/09



Photo #3: Influent / Effluent Continuous pH Meters
Taken By: Greg V. Arthur
Date: 09/22/09

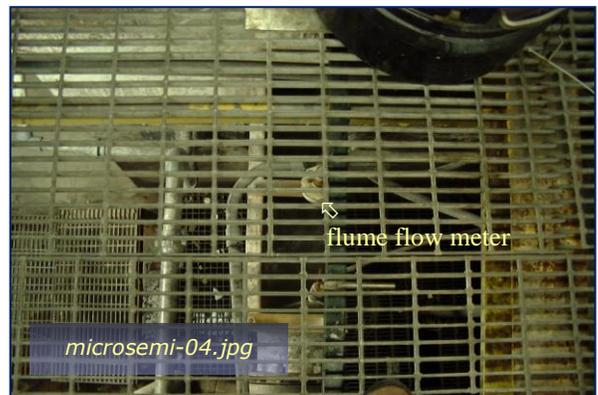


Photo #4: Final Discharge Flume, IWD-A03.1
Taken By: Greg V. Arthur
Date: 09/22/09



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

Microsemi qualifies for regulation under 40 CFR 469 Subpart A for new source electrical and electronic components manufacturing of semiconductors and 40 CFR 433 for new source metal finishing. Microsemi does not qualify for regulation under 40 CFR 469 Subpart B for electronic crystals manufacturing, 40 CFR 469 Subpart C for cathode ray tubes, or 40 CFR 469 Subpart D for luminescent materials manufacturing. The Scottsdale permit applied the local limits and the Federal standards for metal finishing, and thus does not accurately state the discharge requirements for Microsemi. The application of Federal categorical standards, national prohibitions, and local limits was determined through visual inspection. *See* Appendix 2 on page 17 of this report for the permit limits.

Requirements

- Federal standards for both metal finishing and electrical and electronic component manufacturing must be applied to the discharges using the combined wastestream formula.
- The combined Federal standards must be adjusted to account for dilution from non-contact cooling waters.
- The permit must prohibit dilution as a substitute for treatment necessary to comply with Federal standards.

Recommendations

- Microsemi should determine the percentage of the discharges that are (1) regulated under 40 CFR 469A, (2) regulated under 40 CFR 433, and (3) unregulated as dilution waters.

2.1 Classification by Federal Point Source Category

Microsemi qualifies for regulation under 40 CFR 469 Subpart A for semiconductor wafer fabrication and 40 CFR 433 for metal finishing. The Scottsdale permit only applied the existing source standards for metal finishing. Federal standards are self-implementing which means they apply to regulated wastestreams whether or not they are implemented in a local permit. The Federal rules in 40 CFR 403.6 define domestic sewage and non-contact waters as dilution waters.

Microsemi does not qualify for regulation under 40 CFR 469 Subpart B for electrical and electronic components manufacturing of electronic crystals because the operations involve the use but not the manufacturing of silicon electronic crystals. Microsemi also does not



qualify for regulation under 40 CFR 469 Subpart C for cathode ray tube manufacturing or under 40 CFR 469 Subpart D for luminescent materials manufacturing.

New or Existing Sources – In 40 CFR 403.3(k), a metal finishing process constructed after August 31, 1982, and an electrical and electronic components process constructed after July 1, 1984 are new sources (1) if it entirely replaces a process which caused a discharge from an existing source or (2) if it is substantially independent of the existing sources on-site. The preamble to the 1988 Federal rule states that new source standards apply when “an existing source undertakes major construction that legitimately provides it with the opportunity to install the best and most efficient production process and wastewater treatment technologies” (*Fed Register, Vol.53, No.200, October 17, 1988, p.40601*). So after the 1982 and 1984 deadlines, the new source standards apply to new installations of metal finishing and wafer fabrication lines, rebuilt or moved lines, lines temporarily removed to install secondary containment, or existing lines converted to do new operations. New source standards generally do not apply to the piecemeal replacement of tanks in otherwise intact lines.

Microsemi staff indicated that the facility has reconfigured its operations since 1984. As a result, Microsemi would qualify as a new source.

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 Scottsdale local limits apply to non-domestic discharges in the service areas. Scottsdale adopted the local limits developed and implemented by the City of Phoenix.

2.3 Federal Categorical Pretreatment Standards Electrical & Electronic Components, Semiconductor - 40 CFR 469 Subpart A

40 CFR 469.18	TTO
daily-maximum (mg/l)	1.37

Applicability - The Federal semiconductor standards apply to the fabrication of solid-state semiconductor electrical devices beginning with semiconductor crystal wafers and ending before wafer assembly and packaging. The wafer fabrication steps regulated under 40 CFR 469 Subpart A include wafer preparation (polishing, chemical etching, ultrasonic cleaning), oxidation (steam, dry gas), lithography (optical, electron beam, x-ray), etching (chemical, plasma), doping (ion implantation), layering (epitaxial deposition, sputtering, dielectric film deposition), and lead bump connection points (electroplating). The Federal semiconductor



standards apply to all wastewaters associated with these wafer fabrication steps including those from equipment cleaning (crucibles, glassware), and fume scrubber blowdown.

The semiconductor device fabrication steps not regulated under 40 CFR 469 Subpart A include backside preparation (wafer thinning both physical and chemical, gold sputtering, evaporation), wafer separation (sawing, scribing), packaging (adhesion, wire bonding, trimming), and package lead (electroplating, soldering, wave soldering). These steps following wafer fabrication are regulated under the Federal metal finishing standards in 40 CFR 433. In addition, manufacturing steps involved in the growth of semiconductor crystals prior to wafer fabrication are regulated under the Federal electronic crystal standards in 40 CFR 469 Subpart B. *See* the April 21, 1998 EPA Memo - Permitting Guidance for Semiconductor Manufacturing Facilities; Pendergast and Frace, Office of Water to Regional Water Management Division Directors. www.epa.gov/npdes/pubs/owm0145.pdf

Under 40 CFR 469.12(b)(c), at Microsemi, the Federal electrical and electronic components standards for semiconductors in 40 CFR 469.18 apply to diode die fabrication because it involves the fabrication of a “solid-state electrical device” such as diodes, transistors, integrated circuits, LEDs, and LCDs “beginning with the use of crystal wafers”. The semiconductor standards do not apply to wafer sawing or the processes related to slug fabrication, assembly, glass sleeve sealing, contact plating, or copper leads because all of these steps follow wafer fabrication. The fume scrubbing and plant and equipment washdown are associated with the all of the operations, those regulated under 40 CFR 469 (*diode die*), and those unregulated under 40 CFR 469 (*slug, sealing, plating, leads*). See Appendix 1 on page 16 of this report for the list of process operations and the applicable Federal categorical standards.

Basis of the Standards – The electrical and electronic device standards for semiconductors were based on source control of toxic organics. The best-available-technology standards for new sources were set where existing semiconductor wafer fabrication facilities with solvent management practices in-place operated at a long-term average and variability that achieved a compliance rate of 99% (1 in 100 chance of violation).

Compliance Deadline – New source electrical and electronic component manufacturers were required to comply upon commencement of discharge.

**2.4 Federal Categorical Pretreatment Standards
 New Source Metal Finishing - 40 CFR 433.17**

40 CFR 433.17	Cd	Cr	Cu	Pb	Ni	Ag	Zn	CNt	CNa	TTO
daily-maximum (mg/l)	0.11	2.77	3.38	0.69	3.98	0.43	2.61	1.20	0.86	2.13
month-average (mg/l)	0.07	1.71	2.07	0.43	2.38	0.24	1.48	0.65	0.32	-

Applicability – Under 40 CFR 433.10(a), the metal finishing standards apply to the process wastewaters from metal finishing lines because the facility’s operations involve electroplating, chemical coating, and etching. The metal finishing standards "... apply to plants that perform ..." the core operations of electroplating, electroless plating, etching, anodizing,



chemical coating, or printed circuit board manufacturing and they extend to other on-site operations, such as cleaning, associated with metal finishing and specifically listed in 40 CFR 433.10(a). If any of the core operations are performed, the metal finishing standards apply to discharges from any of the core or associated operations. In addition, under 40 CFR 433.10(b), the metal finishing standards do not apply to wastewaters regulated under certain other Federal categorical standards, including 40 CFR 469 for electrical and electronic components manufacturing.

As a result, the metal finishing standards apply to all process wastewater discharges except those associated with diode die fabrication through IWD-A03.1. EPA estimates the Federally regulated wastewaters to qualify as roughly two-thirds metal finishing and one-third electrical and electronic components manufacturing.

Basis of the Standards – The new source metal finishing standards were based on a model pretreatment unit that comprises metals precipitation, settling, sludge removal, source control of toxic organics, no discharge of cadmium, and if necessary, cyanide destruction and chromium reduction. The best-available-technology standards were set where metal finishers with model treatment operated at a long-term average and variability that achieved a compliance rate of 99% (1 in 100 chance of violation).

Compliance Deadline – New sources were required to comply upon commencement of discharge.

2.5 Combined Federal Standards and Adjustments

Under 40 CFR 403.6(e), the Federal categorical pretreatment standards at Microsemi must be adjusted to account for both dilution and multiple categories, using the combined wastestream formula shown below. *See* Appendix 2 on page 17 of this report for the permit limits.

$$C_{A03.1} = \frac{C_{433} Q_{433} + C_{469} Q_{469}}{Q_{433} + Q_{469}} \left[\frac{Q_{total} - Q_{dilution}}{Q_{total}} \right]$$

- $C_{A03.1}$ = Combined Federal Standards at IWD-A03.1
- C_{433} = Federal Metal Finishing Standards from 40 CFR 433
- C_{469} = Federal Semiconductor Standards from 40 CFR 469A
- Q_{total} = Flow at IWD-A03.1
- Q_{433} = Flow Regulated by 40 CFR 433 (est 67% of 80% of Q_{total})
- Q_{469} = Flow Regulated by 40 CFR 469 (est 33% of 80% of Q_{total})
- $Q_{dilution}$ = Flow Classified as Dilution (est 20% of Q_{total})

Multiple Categories – The Federal standards in 40 CFR 433 for metal finishing and 40 CFR 469A for electrical and electronic components manufacturing must be mathematically combined to apply both sewer discharge points using the combined wastestream formula as specified in 40 CFR 403.6(e). Combined standards apply to the pollutants in intersection between Federal rules. As a result, for 40 CFR 433 and 40 CFR 469A, combined standards



need to be calculated only for total toxic organics. EPA rough estimates the composition of the Federally regulated wastewaters discharged through IWD-A03.1 to be two-thirds metal finishing and one-third electrical and electronic components, based solely on the observation that of the three main production lines, one qualifies under 40 CFR 469A (*diode die fabrication*), and two default to qualify under 40 CFR 433 (*slug fabrication, glass sealing*). At IWD-A03.1, fume scrubber waters and plant and equipment wash down are assumed to emanate from the same production lines in the same proportions. All of these estimates could be refined with better data.

Dilution – Under 40 CFR 403.6(d,e), Federal categorical pretreatment standards must be adjusted using the combined wastestream formula to account for any dilution from non-contact cooling waters, boiler blowdown, water preconditioning, and domestic sewage. Both non-contact cooling water bleeds and DI reject, which are specifically listed as dilution waters in 40 CFR 403.6(e), were identified during this inspection as discharging through IWD-A03.1. However, their proportions of the totals are also unknown but rough estimated for the purposes of this report to be 20% based solely on influent holding tank volumes. Again, these estimates could be refined with better data.

Cyanide Standards (IWD-A03.2) – All identified cyanide-bearing wastewaters are generated by metal finishing sources and treated through the cyanide destruction unit. The Scottsdale permit correctly assigns the Federal compliance sample point for cyanide after the last stage of cyanide destruction at the internal sample point, IWD-A03.2, and does not apply a Federal standard to the overall discharge to the sewer. The metal finishing standards also allow the application of either the total cyanide standards or alternate standards for cyanide amenable to alkaline chlorination. Under 40 CFR 433.12(c), the cyanide standards applied to IWD-A03.2 do not need to be adjusted to account for dilution from non-cyanide bearing waste streams, since all flows exiting the cyanide destruction unit are cyanide-bearing from silver plating.

Cyanide Standards (IWD-A03.1) – The standards applied to IWD-A03.2 immediately after cyanide treatment fulfills the objective of the Federal categorical pretreatment standards to ensure consistent performance of BAT treatment for cyanide. As long as there are no other untreated sources of cyanide in the final discharge, compliance at IWD-A03.2 after cyanide treatment accurately reflects facility compliance for cyanide. However, if there are cyanides in other waste streams, then combined adjusted-for-dilution standards for cyanide would apply at IWD-A03.1.

Toxic Organics Standards – The Federal standards in 40 CFR 433.12 and 40 CFR 469.13 also allow facilities with an approved toxic organics management plan to certify instead of sample for toxic organics. The combined standards apply the combined lists from both categories in 40 CFR 433.11(e) and 40 CFR 469.12(a). With an approved toxics organics management plan, Microsemi could certify the non-existence or the physical barrier to discharge over a full or partial list of the regulated toxic organics, and thus shorten or eliminate the list of pollutants self-monitored and sampled by Scottsdale.



2.6 Federal Prohibitions

The Federal standards in 40 CFR 403.6(d) and 403.17(d) prohibit dilution as a substitute for treatment, and the bypassing of any on-site treatment necessary to comply with standards, respectively. The Scottsdale permit does not establish the prohibition against the dilution as a substitute for treatment although the Scottsdale Revised Code does reference the prohibition (Sec 49.166.7). The permit does establish the prohibition against bypassing treatment necessary to comply (Parts II§D and IV§M).

2.7 Compliance Sampling and Point(s) of Compliance

The permit designates the final Parshall flume inside the facility as the location of the compliance sampling point following industrial wastewater treatment for all facility wastewaters (designated in this report as IWD-A03.1). The permit also designates the discharge from the cyanide destruction unit as the internal Federal cyanide sampling point (designated in this report as IWD-A03.2).

Federal Standards - Federal categorical pretreatment standards apply end-of-process-after-treatment to all Federally-regulated discharges to the sewers. Sample point IWD-A03.1, is a suitable end-of-process-after-treatment sample point representative of the day-to-day discharge of Federally-regulated wastewaters from Microsemi. The internal sample point for cyanide, IWD-A03.2 is also a suitable end-of-process-after-treatment sample point representative of the day-to-day discharge of cyanide-bearing wastewaters from Microsemi, as long as there are no other untreated cyanide-bearing flows discharging to the sewers.

Local Limits - Local limits and the national prohibitions apply end-of-pipe to non-domestic flows. The sample point IWD-A03.1 is a suitable end-of-pipe sample point representative of the day-to-day non-domestic wastewater discharges from Microsemi.

Sampling Protocols – The national prohibitions are instantaneous-maximums comparable to samples of any length. Federal categorical pretreatment standards are daily-maximums comparable to 24-hour composites. The 24-hour composites can be replaced with single grabs or manually-composited grabs representative of the sampling day's discharge. The Scottsdale permit specifies these sampling protocols by parameter (Part I§B). *See* Section 4.0 on page 13 and Appendix 2 on page 17.



3.0 Compliance with Federal Categorical 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).

Microsemi for the most part, has consistently complied with Federal standards, even though there is no treatment on-site equivalent to the models used in originally setting the standards. Instead, Microsemi provides cyanide treatment for a small cyanide-bearing side stream and relies solely on facility-wide source controls for metals and toxic organics. Metals treatment has proven unnecessary because of the weak nature of the wafer fabrication flows and the small size of the parts processed through the metal finishing steps. Separate handling of all copper-bearing wastewaters would further reduce the violation risks. *See* Section 2.0 on page 5 of this report. *Also* see Appendix 3 on pages 18 of this report for a summary of the compliance sampling.

Requirements

- None.

Recommendations

- Copper-bearing deoxidation spents and rinses should be collected either for separate treatment to remove copper or for off-site hauling.

3.1 Sampling Results

The two-year sample record consists of quarterly to semiannual self-monitoring (depending on pollutant), and quarterly sampling collected by Scottsdale. Nearly all samples collected of the discharge through IWD-A03.1 were 24-hour composites.

3.2 Best-Available-Technology Treatment

All process-related wastewaters generated by Microsemi, an average of 120,000 gpd, discharge from the industrial wastewater treatment plant through the sewer connection. Microsemi is designed and operated without best-available-technology (“BAT”) model treatment for these discharges. Nevertheless, the sampling results for IWD-A03.1 and A03.2 consistently comply with Federal standards, with average and calculated 99th% peak concentrations of 0.003 and 0.008 mg/l cadmium, 0.013 and 0.043 mg/l chromium, 0.479



and 3.402 mg/l copper, 0.108 and 0.383 mg/l lead, 0.166 and 0.350 mg/l nickel, 0.031 and 0.110 mg/l silver, 0.094 and 0.203 mg/l zinc, 0.043 and 0.470 mg/l total cyanide, and 0.014 and 0.030 mg/l total toxic organics.

These sampling results indicate that the statistical probabilities of violating any of the Federal standards were ~4% for any sampling day or any monthly-average for the treated discharge through IWD-A03.1. Microsemi explained that the violations (all for copper) were from dumping leads deoxidation spents into the in-plant sewers and DI water recycling through copper tubing. Both of these copper-bearing wastestreams are no longer discharged. Overall observed improvements (+) and deficiencies (-) in the design and operation observed during this inspection are listed below.

- + Segregated treatment of cyanide-bearing wastewaters through cyanide destruction.
- + Elimination of molybdenum-bearing cooling tower conditioners.
- + Multistage pH adjustment with multiple equalization steps, reaction end-point metering.
- + Comprehensive secondary containment.
- Small capacity pH adjustment.

3.4 Dilution as a Substitute for Treatment

The Federal standards in 40 CFR 403.6(d) prohibit "dilution as a substitute for treatment" in order to prevent compromising BAT model treatment with dilute waste streams. In particular, this prohibition applies when sample results for a diluted waste stream are below the Federal standards and the apparent compliance is used to justify discharge without treatment. There are two conditions that need to be established in order to make a determination of non-compliance with this prohibition. First, some or all of the Federally-regulated wastewaters must discharge without undergoing BAT model treatment or its equivalent. Second, there must be some form of excess water usage within a Federally-regulated process.

There is no evidence of "dilution as a substitute for treatment" since the weak strength of the wastewaters make BAT model treatment or its equivalent unnecessary.

3.5 Bypass Provision

The Federal standards in 40 CFR 403.17 prohibit the bypassing of any on-site treatment necessary to comply with standards unless the bypass was unavoidable to prevent the loss of life, injury, or property damage, and there were no feasible alternatives. This provision explicitly prohibits bypasses that are the result of a short-sighted lack of back-up equipment for normal downtimes or preventive maintenance. It also explicitly prohibits bypasses that could be prevented through wastewater retention or the procurement of auxiliary equipment. It specifically allows bypasses that do not result in violations of the standards as long as there is prior notice and approval from the sewerage agency or State.

There were no observed methods of bypassing at Microsemi, in particular, since all wastestreams were delivered to treatment and discharge through the permitted sample point.



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 Microsemi consistently complies with its local limits for metals, cyanide, toxic organics, and pH. *See* Appendix 3 on page 18 of this report. *Also* see Sections 3.0 and 5.0 on pages 11 and 15 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 Phoenix 91st Avenue and 23rd Avenue wastewater treatment plants through consistent compliance with their sludge and discharge limits.

4.2 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.

Metals and Cyanide – For the discharge through IWD-A03.1, there were isolated violations of the local limits for just copper and lead. There were no violations of the local limits for arsenic, cadmium, mercury, selenium, silver, zinc, and cyanide. There is no evidence that



these discharges resulted in the operational interference of the Phoenix collection systems and wastewater treatment plants.

Discharge Flow Rates – The discharges at times have exceeded the permit limits. The extent of these violations was not determined as part of this inspection.

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

Metals and Cyanide – For the discharge through IWD-A03.1, there were isolated violations of the local limits for just copper and lead. There were no violations of the local limits for arsenic, cadmium, mercury, selenium, silver, zinc, and cyanide. There is no evidence that these discharges resulted in a pass-through of pollutants from the Phoenix wastewater treatment plants to the receiving waters.

Toxic Organics – For the discharge through IWD-A03.1, there were no violations of the local limits for benzene, chloroform, pesticides, and PCBs.

Oil and Grease – There are no local limits for oil and grease.

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. The combined discharge through IWD-A03.1 is well controlled for pH.

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 – Microsemi has successfully fulfilled the self-monitoring requirements set forth in the city permit. Over the a recent two year period, the sample record for the main discharge point, IWD-A03.1, and the internal cyanide treatment point, IWD-A03.2, shows that Microsemi (1) submitted sample results for all permit listed parameters at the frequencies set forth in the permit, (2) collected all samples from the designated compliance sampling points, and (3) correctly obtained 24-hour composites for metals and grabs for the other pollutants. It was not determined in this inspection whether appropriate chain-of-custody procedures were followed.

Representativeness – The sample records for IWD-A03.1 and IWD-A03.2 appear to be representative of the discharge to the sewers over the sampling day and the six-month reporting period. Some pollutants present at concentrations well below the Federal standards and local limits can be self-monitored less frequently even down to the Federal minimum level than set forth in the permit. The only recommended increase in monitoring involves added cyanide sampling at the final discharge point, IWD-A03.1, in order to verify that all cyanide-bearing wastewaters are treated and then monitored at the internal sample point, IWD-A03.2.

Requirements

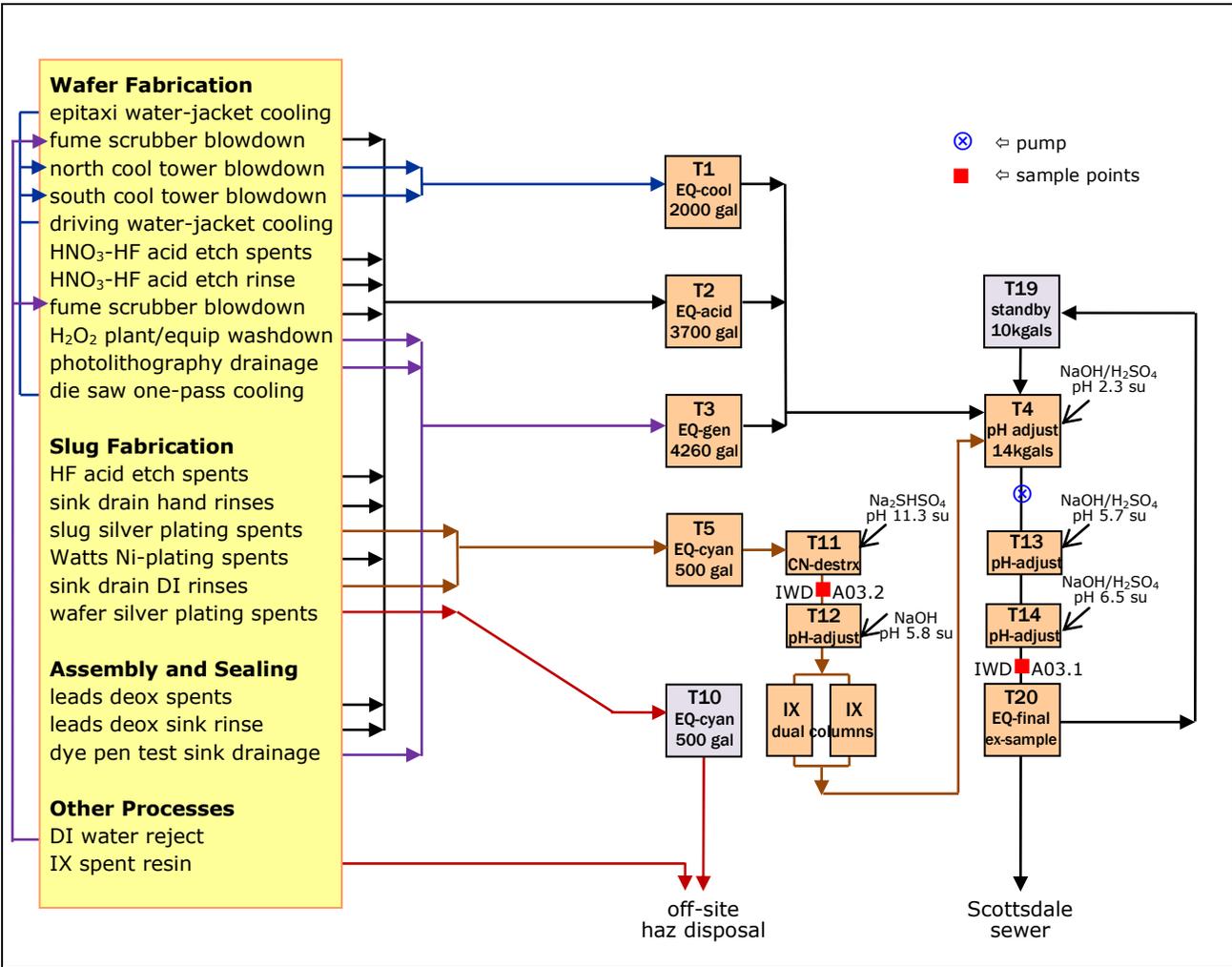
- *See* Appendix 2 on page 17 of this report for the self-monitoring and city monitoring requirements for that would be considered to be representative of the discharges.

Recommendations

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



Appendix 1
Microsemi - Configuration and Layout



Delivery of Generated Wastewater		FedCat	Delivery of Generated Wastewater		FedCat
Die Fabrication			Slug Fabrication		
IWTP	Epitaxial fume scrubber blowdown	469A	HAZ	Nickel plating spents	433
IWTP	Cooling tower bleeds	dilution	HAZ	Silver plating spents	433
IWTP	Chem etch HNO ₃ -HF spents	469A	CN	Silver plating DI sink rinse	433
IWTP	Chem etch HNO ₃ -HF cascade rinse	469A	IWTP	Fume scrubber blowdown	433
IWTP	Etch fume scrubber blowdown	469A	Assembly, Testing, Supporting Ops		
IWTP	Sawing one-pass contact cooling	433	HAZ	Copper leads deox spents	433
Slug Fabrication			IWTP	Copper leads deox sink rinse	433
IWTP	Slug etch HF spents	433	IWTP	Plant/equipment H ₂ O ₂ washdown	433/69
IWTP	Slug etch DI sink rinse	433	IWTP	Dye penetrant sink rinse	433

Federal Category Key		Delivery and Handling Key	
469A	Semiconductor	IWTP	Sewer lines to IWTP Influent - EQ Tanks 1/2/3
433	Metal Finishing <i>psns</i>	CN	Sewer lines to IWTP Influent - EQ Tanks 5/10
dilution	40 CFR 403.6(e)(1)(i)	HAZ	Collected to drums for off-site disposal as hazardous



Appendix 2
 Sewer Discharge Standards and Limits for Microsemi @ IWD-A03.1 and IWD-A03.2

Pollutants of Concern IWD-A03.1	Fed stds (d-max)	Fed stds (mo-avg)	nat'l pro (instant)	local lim (inst/dmax)	monitoring frequency ①	
					discharger	city
arsenic (mg/l)	-	-	-	0.13	⑧	1/year
cadmium (mg/l)	0.088	0.056	-	0.047	1/six-mos	1/quarter
chromium (mg/l)	2.22	1.37	-	-	1/six-mos	1/quarter
copper (mg/l)	2.70	1.66	-	1.5	2/quarter	1/quarter
lead (mg/l)	0.55	0.34	-	0.41	2/quarter	1/quarter
mercury (mg/l)	-	-	-	0.0023	⑧	1/year
molybdenum (mg/l)	-	-	-	-	⑧	1/year
nickel (mg/l)	3.18	1.90	-	-	1/six-mos	1/quarter
selenium (mg/l)	-	-	-	0.10	⑧	1/year
silver (mg/l)	0.34	0.19	-	1.2	2/quarter	1/quarter
zinc (mg/l)	2.09	1.18	-	3.5	1/six-mos	1/quarter
amenable cyanide (mg/l)	0.69 ③	0.26 ③	-	-	-	-
total cyanide (mg/l)	0.96 ③	0.52 ③	-	2.0	-	1/quarter
total toxic organics	1.50 ②	-	-	-	④ 1/six-mos	④ 1/year
benzene	-	-	-	0.035	⑧	1/year
chloroform	-	-	-	2.0	⑧	1/year
pesticides and PCBs	-	-	-	⑥	⑧	1/year
Fluoride	-	-	-	-	⑧	⑧
Sulfide	-	-	-	-	⑧	⑧
flow (gpd)	-	-	-	180,000	daily	n/a
pH (s.u.)	-	-	<5.0	5.0-10.5	daily	1/quarter
explosivity	-	-	<140°F ⑤	<10% LEL	⑧	⑧

Pollutants of Concern IWD-A03.2 ③	Fed stds (d-max)	Fed stds (mo-avg)	national (instant)	local lim (inst/dmax)	monitoring frequency ①	
					discharger	city
amenable cyanide	0.86 ⑦	0.32 ⑦	-	-	-	-
total cyanide	1.20 ⑦	0.65 ⑦	-	-	2/quarter	2/quarter

- ① Recommended **reductions in green**. Recommended **increases in red**.
- ② Concentration sum for all pollutants listed in both 40 CFR 433.11(e) and 469.12(a).
- ③ Compliance with the Federal cyanide standards determined at IWD-A03.2
- ④ Self-certification to following an approved toxic organics management plan is allowed in lieu of sampling. A City inspection could then qualify as an independent determination.
- ⑤ Closed-cup flashpoint
- ⑥ City ordinance prohibits the introduction of these pollutants in any amount.
- ⑦ Standards at IWD-A03.2 unadjusted since no non-cyanide-bearing waters were identified.
- ⑧ As part of periodic priority pollutant scans in order to identify changes in discharge quality



Appendix 3
Wastewater Discharge Quality for Microsemi @ IWD-A03.1, and A03.2

Sample Record Summary for IWD-A03.1 and IWD-A03.2 (01/01/07-09/30/09)								
pollutants (µg/l)	effluent sampling results				violation rate ① ②			sample count
	mean	99th%	min	max	d-max	mo-av	instant	
arsenic	<40	<40	<40	<100	n/a	n/a	0/21	23
cadmium	2.6	8.4	<1	4.7	0/31	0/11	0/31	33
chromium	13.2	42.9	<10	57	0/31	0/11	n/a	33
copper	479.1	3401.0	10	5550	2/31	0/11	2/31	37
lead	108.4	382.9	<15	480	0/37	0/11	1/37	39
mercury	<0.2	<0.2	<0.2	<0.6	n/a	n/a	0/23	23
molybdenum	<10	<10	<10	<10	n/a	n/a	n/a	14
nickel	166.6	350.2	28	430	0/31	0/11	0/31	33
selenium	<2	5.9	<2	5.1	n/a	n/a	0/21	23
silver	31.2	109.5	<10	177	0/31	0/11	0/31	33
zinc	94.4	203.3	22	146	0/31	0/11	0/31	33
total cyanide @ A03.2	43.4	470.1	<5	1200	0/37	0/12	0/44	44
total cyanide @ A03.1	-	-	-	-	n/a	n/a	n/a	0
total toxic organics	14.2	29.8	<10	26	0/9	n/a	0/9	9
fluoride (mg/l)	141.3	279.7	41.9	257	n/a	n/a	n/a	25
dissolved sulfides	<40	<40	<40	<100	n/a	n/a	n/a	16
flow (gpd)	121360	-	-	216930	n/a	n/a	28/365	1004 ③
pH (s.u.)	7.62 min - 9.83 median - 10.41 max				-	-	0/260	260

Federal Standard Violations (01/01/07-09/30/09)							
sample dates	type	sampler	Point	Fed standards / local limits ①	viols	days	
07/29/08	24-h	IU + POTW	A03.1	copper-Fed d-max 2.70 mg/l	2.77	1	
10/14/08	24-h	IU + POTW	A03.1	copper-Fed d-max 2.70 mg/l	3.78	1	
Local Limit Violations (01/01/07-09/30/09)							
10/14/08	24-h	IU + POTW	A03.1	copper-local instant 1.50 mg/l	3.78	-	
07/29/08	24-h	IU + POTW	A03.1	copper-local instant 1.50 mg/l	2.77	-	
05/08/07	24-h	IU	A03.1	lead-local instant 0.41 mg/l	0.48	1	
various	meter	IU	A03.1	discharge flow rate-local 180kgpd	various		③
total days of violation						3	

Statistical Violation Probabilities (01/01/07-09/30/09)				
violation probability ①	mean (µg/l)	std dev (µg/l)	statistical probability	percent
Fed - copper (d-max)	µ = 479.1	σ = 1270.4	α(2700) = 0.0402	~4%

- ① Monthly averages calculated by calendar month of both self-monitoring and Scottsdale sampling.
- ② Fed stds for metals compared only 24-hr composite samples. Local limits to all samples.
- ③ Daily flow results not reviewed. Violation rates reported in the Phoenix 2008 annual report.