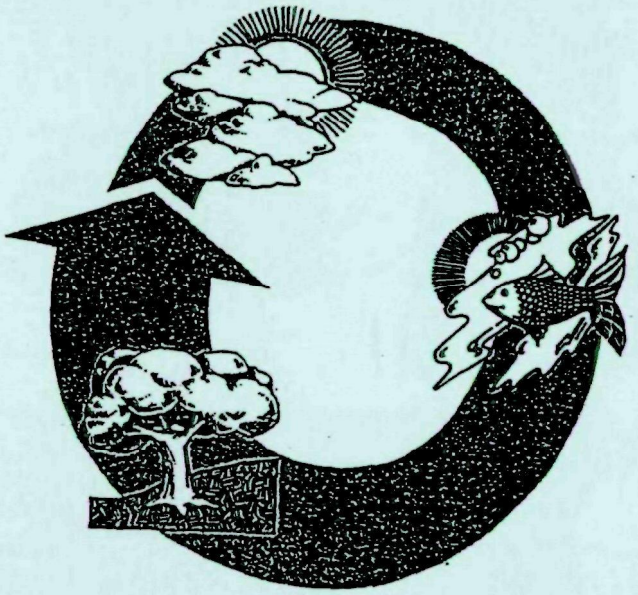
THE SOUTH BAY PILOT PROJECT: POLLUTION PREVENTION EFFORTS IN THE SOUTH SAN FRANCISCO BAY AREA



A Report by the
U.S. Environmental Protection Agency
Region IX
75 Hawthorne Street
San Francisco, CA 94105-3901

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This report has been developed as part of EPA's pollution prevention efforts to help states, cities, and POTWs develop pollution prevention policies and programs.

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EXECUTIVE SUMMARY
SOUTH BAY PILOT PROJECT REPORT

The South Bay Pilot Project represents an innovative approach to reducing water pollution. Through the cooperative efforts of federal and state environmental agencies and three publicly owned treatment works (POTWs), pollution prevention measures were identified and implemented.[1] These measures helped Palo Alto Regional Water Quality Control Plant, San Jose/Santa Clara Water Pollution Control Plant, and Sunnyvale Water Pollution Control Plant comply with strict discharge requirements.

BACKGROUND

In the late 1980s, high concentrations of heavy metals were found in the San Francisco Bay, just south of the Dumbarton Bridge. The high concentrations of these pollutants were due to a combination of factors, including urban runoff, discharges from three publicly owned treatment works, and poor dilution from tidal or freshwater flows to the Bay.

The water quality in this part of the San Francisco Bay was of such concern that it was included in the Environmental Protection Agency's (EPA) list of California's impacted waters. As the State had been delegated the responsibility to determine how the San Francisco Bay water quality could be improved, the California Regional Water Quality Control Board - San Francisco Bay Region (RWQCB) attempted to solve this problem by addressing the quality of the POTWs' influent.

ROLES/RESPONSIBILITIES OF PROJECT PARTICIPANTS

Through amended discharge permits, RWQCB required that the three South Bay POTWs complete two studies: 1) source identification studies to identify the origin of the pollutants of primary concern (copper, lead, nickel, zinc, cyanide, and silver); and 2) waste minimization studies to identify possible mitigation projects.

In response to these requirements, Palo Alto developed a pollution prevention program that targeted silver dischargers (primarily photoprocessors and x-ray labs); San Jose/Santa Clara

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[1] The EPA defines pollution prevention as "the use of materials, processes, or practices that reduce or eliminate the creation of pollutants or wastes at the source. This includes practices that reduce the use of hazardous materials, energy, water or other resources, and practices that protect natural resources through conservation or more efficient use."

targeted industries that discharged copper, zinc, and lead (primarily radiator shops and auto parts cleaning shops); and Sunnyvale focused on industries that were sources of nickel, copper, and lead (electroplaters and metal finishers).

EPA Region 9 joined forces with the RWQCB, anticipating an opportunity to promote pollution prevention measures. EPA assisted RWQCB by reviewing the POTWs' source identification studies and waste minimization plans. In addition, EPA conducted pollution prevention training courses and workshops for inspectors.

SOURCE IDENTIFICATION STUDIES

In their source identification studies, the POTWs found that:

1. Commercial sources, including unregulated/unpermitted industries, accounted for a significant percentage of metal loadings. All POTWs found that photoprocessors were major sources for silver, while automotive industries were major sources for lead. In addition, some of the POTWs found that photoprocessors and automotive industries were sources for copper and nickel.

2. Industrial sources accounted for a significant percentage of the copper, lead, nickel, and silver coming into the POTWs. Sunnyvale estimated that over one half of the copper and nickel contributed by industry came from a handful of large electroplaters and a metal finishing facility.

3. The water supplied by the Santa Clara Valley Water District accounted for up to 90% of the zinc found in the POTWs' influent.

WASTE MINIMIZATION STUDIES

In their waste minimization studies, the POTWs found that:

1. The most likely sources to target for waste minimization efforts were those that used photographic processes and automobile repair shops (including radiator repair shops).

2. Fifty percent of the cyanide used in electroplating and metal finishing could be reduced through product substitution. Fifteen to twenty percent of the industrial contribution of metals could be reduced through waste minimization.

3. Proposed zinc levels would not be met by their waste reduction efforts unless zinc levels in the water

supply were reduced.

PERMIT REQUIREMENTS

The RWQCB and EPA reviewed the source identification and waste minimization studies, and the RWQCB modified the POTWs' discharge permits. The RWQCB then required the POTWs to implement additional pretreatment and waste minimization measures which are summarized below:

- require target industries to measure their flows;
- regulate auto repair and photoprocessing firms;
- increase enforcement and inspection activities;
- implement industry specific pollution prevention programs;
- provide public education;
- keep the other POTWs updated on progress; and
- submit progress reports.

The POTWs took steps to meet the more stringent permit requirements through various means. They now:

- Measure wastewater flows of over 37% of the industrial users in their service areas and nearly all of their targeted industrial users.
- Permit, and have written Best Management Practices for, auto repair facilities and photoprocessors in their service areas.
- Implement rigorous pollution prevention programs for their targeted industries (Palo Alto - photoprocessors, San Jose/Santa Clara - auto repair shops, and Sunnyvale - metal finishers and electroplaters).
- Require many of their significant industrial users to submit waste minimization plans, so that the POTWs can identify the most feasible pollution prevention options for their facility.
- Conduct workshops in their communities to increase the public's knowledge of waste generation.
- Develop options for reducing pollution.

PROJECT SUCCESSES AND BARRIERS TO POLLUTION PREVENTION

To measure the success of the South Bay Project, EPA interviewed representatives of metal plating and photoprocessing businesses in the South Bay area. The metal plating shops had implemented numerous low technology waste reduction measures such as using spray rinses and air knives, and returning drag out to plating baths. Additionally, they implemented a number of water conservation measures (e.g. use of conductivity controlled flow restrictors, counter flow rinses, aerated rinses, and allowing water to flow in the rinse tanks only when needed). The photoprocessing laboratories now use less silver in their film; they have stopped using cyanide as a complexing agent in their bleaches; and, reportedly, they are saving over one million gallons of water per year.

Despite their successes, the industry representatives expressed concern about several barriers that impeded them from implementing additional pollution prevention measures. They noted that companies were restricted from making environmentally beneficial changes, because:

1. smaller companies do not always have the capital available;

2. management is not always committed;

3. there is a lack of on-site technical assistance; and

4. some regulations limit the pollution prevention options available to industry.

RESULTS AND RECOMMENDATIONS

As a result of their efforts, the POTWs have made significant progress toward reducing metal concentrations in their influent. They have promoted greater public awareness of pollution prevention opportunities in their service areas and have successfully assisted local industries in making beneficial changes. For example, many radiator repair shops have decided to stop discharging wastes into the sewer systems rather than adding treatment. The Santa Clara Valley Water District conducted research to reduce zinc in the water supply and has now found a successful method. Finally, many companies in the POTWs' service areas have reported that pollution prevention measures have led to significant reductions in pollutant discharges.

Pollution prevention techniques have helped South Bay POTWs make significant progress towards meeting stringent permit limits. Although the sensitive waters of the South Bay were the driving force of the South Bay Pilot Project, the tools developed here can be used by any POTW. The following recommendations are based on the successes and problems encountered during the South

Bay Pilot Project:

1. Water quality standards should be more fully utilized to provide impetus for pollution prevention initiatives.

2. All POTWs can benefit from pollution prevention and should consider implementing programs.

3. POTWs should examine mass-based limits as a way to minimize water use and to set precise discharge limits. Although mass-based limits are conducive to water conservation, there are problems with this approach (e.g. measuring flow, establishing flows for an industry, evaluating increased allocations based on production increases).

4. POTWs and industries should have access to non-regulatory assistance.

5. To have successful pollution prevention programs, company management must be willing to commit the necessary resources.

6. Small businesses should be given economic incentives to encourage them to implement pollution prevention measures.

7. Source reduction and recycling offer the best means of insuring overall waste reductions. Pollution prevention efforts must take a cross-media approach so that **total** waste generation is minimized.

8. The fact should be emphasized that pollution prevention measures often offer long-term savings to companies.

The South Bay Pilot Project has affirmed that POTWs can help reduce impacts to the environment if they implement pollution prevention programs. Although the impetus for this project was regulatory, its success demonstrates that cost-effective technologies and practices that reduce pollutants at the source are available. The benefits of source reduction include reduced treatment costs, improved operations and productivity, and better water quality.

POTWs elsewhere should promote similar pollution prevention programs in their service areas for a number of reasons. First, improved influent wastewater quality will enable POTWs to more easily comply with water quality standards, air emission requirements, and sludge disposal requirements, and to maintain compliance with these regulations despite population growth. Second, reduced wastewater flow and loading can help extend the useful lives of POTWs. Third, it is less expensive to institute pollution prevention practices than to install new treatment

systems. Fourth, treatment plant workers would be exposed to less hazardous conditions. Finally, and perhaps the most compelling reason of all, POTWs would be meeting the public's demand for a cleaner environment.

SOUTH BAY PILOT PROJECT

TABLE OF CONTENTS

I. INTRODUCTION

In the late 1980s, high concentrations of heavy metals were found in the San Francisco Bay, just south of the Dumbarton Bridge. The high concentrations of these pollutants were due to a combination of factors, including urban runoff, discharges from three publicly owned treatment works (POTWs), and poor dilution from tidal flows or freshwater inflow to the Bay. Two water quality reports documented the concentrations of the pollutants of concern (see Appendix A).

The three publicly owned treatment works (POTWs) that discharge effluent into the South Bay are: the Palo Alto Regional Water Quality Control Plant, the San Jose/Santa Clara Water Pollution Control Plant, and the Sunnyvale Water Pollution Control Plant (see Figure 1). For all three POTWs, copper, lead, nickel, and zinc were the pollutants of concern. In addition, chromium in Sunnyvale, and cyanide and silver in San Jose and Palo Alto were the pollutants of concern.

To address this problem, the California Regional Water Quality Control Board (RWQCB) amended the discharge permits of the three POTWs. The permits stipulated that the POTWs conduct studies to identify the origin of the metals and potential mitigation projects. Anticipating an opportunity to promote pollution prevention measures, EPA Region 9 joined forces with the RWQCB and provided technical assistance.

Definitions of Pollution Prevention Terms

A national policy for pollution prevention was established in the Pollution Prevention Act of 1990. In the Act, Congress declared that henceforth, America's first priority should be to prevent or reduce pollution at the source wherever possible. Pollution that cannot be prevented should be recycled in an environmentally safe manner. If prevention or recycling is not possible, pollution should be treated. Disposal or other release into the environment should be used only as a last resort.

The Act defines **source reduction** "as any practice which (1) reduces the amount of any hazardous substances, pollutant, or contaminant entering any waste [pollutant] stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment, and disposal; and (2) reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants. The term includes equipment or technology modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control." Source reduction does not entail any form of waste management (e.g. recycling and treatment). The Act excludes from the definition of source reduction "any practice which alters the physical, chemical, or

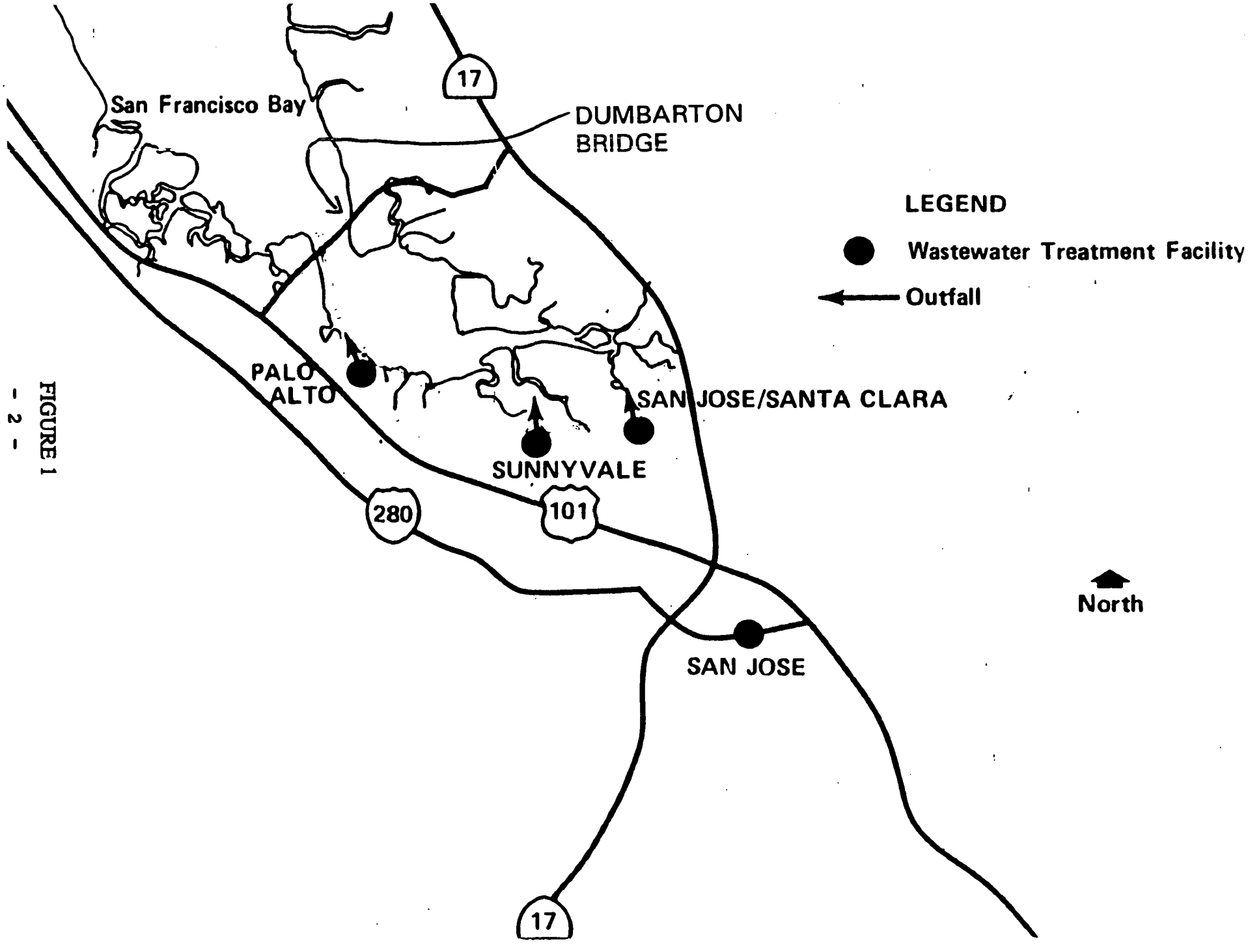
San Francisco Bay
17
DUMBARTON
BRIDGE
LEGEND
Wastewater Treatment Facility
Outfall
PALO
ALTO
SAN JOSE/SANTA CLARA
SUNNYVALE
280
101
North
SAN JOSE
17

FIGURE 1

biological characteristics or volume of a hazardous substance, pollutant, or contaminant through a process or activity which itself is not integral to and necessary for the production of a product or the providing of a service."

The EPA defines **pollution prevention** as "the use of materials, processes, or practices that reduce or eliminate the creation of pollutants or wastes at the source. [It] includes practices that reduce the use of hazardous materials, energy, water or other resources, and practices that protect natural resources through conservation or more efficient use."

For the purposes of this report, **waste minimization** focuses specifically on reducing the quantity of toxic pollutants released to waters by major municipal and industrial dischargers. It emphasizes source reduction, but also includes improved water and petroleum product use, wastewater treatment and expanded pretreatment programs. Waste minimization techniques will allow for the protection of surface and ground water, and include material recycling and reuse, water and material conservation, material substitution, product substitution, and process modifications.

II. ROLES/RESPONSIBILITIES OF PROJECT PARTICIPANTS

There were a member of agencies that were involved in the South Bay Pilot Project. The roles and responsibilities of the various regulatory agencies and POTWs are described in this section.

A. REGULATORY AGENCIES

Regional Water Quality Control Board (RWQCB)

The Clean Water Act protects beneficial uses of water bodies by requiring the State and EPA to set water quality standards based on these beneficial uses. In California, the Regional Water Quality Control Board (RWQCB) sets these standards in Basin Plans. Because of the lack of dilution from tidal action or freshwater inflow to South San Francisco Bay, the Basin Plan developed for the Bay prohibited discharges south of the Dumbarton Bridge, and did not set water quality standards. Exceptions to this prohibition were available where the discharger could demonstrate a net environmental benefit and water quality enhancement resulting from the discharge.

The Palo Alto, San Jose/Santa Clara, and Sunnyvale POTWs petitioned for an exception from the discharge prohibition, and submitted a five-year monitoring study to support their petition. The RWQCB issued a regional order stating that the study did not support a finding of net environmental benefit and water quality enhancement. Nevertheless, the RWQCB determined that the POTWs could continue to discharge into the South Bay as long as they: a) submitted studies to determine the origin of the potentially harmful pollutants; b) implemented mitigation projects; c) developed source pollution minimization programs; and d) evaluated waste reduction alternatives. After the POTWs complied with the conditions of the RWQCB order, they had to implement specific waste minimization projects, as defined in their amended discharge permits.

Environmental Protection Agency (EPA)

Under the Clean Water Act, EPA is authorized to set site-specific limits for POTWs. These limits are addressed in NPDES permits.

In an effort to reduce metal loadings to the Bay, EPA Region 9 helped RWQCB review the POTWs' studies of pollutant origins and possible waste minimization programs.

In addition, EPA assisted the RWQCB in promoting pollution prevention in the following ways:

Training. EPA conducted a training course titled "Introduction to Pollution Prevention for Inspectors." The one-day course covered significant legislation, and included agency and industry examples of pollution prevention. Vendors supplied information about equipment and technologies available. The course had a multimedia focus and allowed for interaction between inspectors from numerous regulatory agencies and media programs in the Bay Area.

Workshops. EPA, in conjunction with the County of Santa Clara, conducted two workshops on waste reduction techniques for the metal finishing industry. The first workshop emphasized rinse process modifications and the second addressed procedures for reclaiming metals from concentrated solutions.

Coordination. EPA assisted the POTWs when they did research for their source identification and waste minimization studies. EPA led meetings that were attended by the three POTWs to ensure that each POTW was aware of the findings of the others, and did not duplicate the efforts of any other POTW.

Video. EPA sponsored the production of a video entitled "Rinsing Process Modifications for Metal Finishers."

B. POTWs

Palo Alto Regional Water Quality Control Plant

The Palo Alto Regional Water Quality Control Plant treats an average of 23.1 mgd of wastewater from six different communities. The water supply for the Palo Alto service area comes from Hetch Hetchy (82% of total), groundwater (10%), and the Santa Clara Valley Water District (8%). Before the initiation of the South Bay Pilot Project, Palo Alto regulated 59 industrial sites in their pretreatment program.

Initially, Palo Alto was required to conduct source identification and waste minimization studies. These studies were also required of the two other POTWs that discharged effluent into the South Bay. When the discharge permits were amended, Palo Alto was required to make pretreatment program improvements and implement a pollution prevention program that targeted silver dischargers (primarily photoprocessors and x-ray labs).

San Jose/Santa Clara Water Pollution Control Plant

The San Jose/Santa Clara (SJ/SC) Water Pollution Control Plant treats an average dry weather flow of 119 mgd wastewater from eight different communities. The water supply for the service area comes from groundwater (49% of total), surface water (11%), and the Santa Clara Valley Water District (40%). The POTW's pretreatment program issued permits for 352 industrial sites before the initiation of the South Bay Pilot Project.

Like Palo Alto, SJ/SC had to complete the preliminary source identification and waste minimization studies. In the amended NPDES permits, SJ/SC also had to make pretreatment program improvements and implement pollution prevention programs that targeted industries that discharged copper, zinc, and lead (primarily radiator repair shops and auto parts cleaning shops).

Sunnyvale Water Pollution Control Plant

The Sunnyvale Water Pollution Control Plant treats an average of 13.8 mgd of wastewater. The water supply for the service area comes from three different sources. The contributions of the sources varies during the year, but the average contributions are approximately 40% Hetch Hetchy, 15% groundwater, and 45% from the Santa Clara Valley Water District.

Sunnyvale has a four-group permit system. Before initiation of the South Bay Pilot Project, Sunnyvale regulated 74 industrial sites in the Main Contributing Industries and Intermediate Industries groups (both groups containing federal categorical and non-regulated categorical industries subject to local limits). They also regulated 46 industries in the Small Industry group (including radiator shops, chemical companies, electronics firms, laboratories, etc.), and 1,730 A-Z Industry/Commercial Establishments (including auto shops machine shops, photoprocessors, printers, cleaners, restaurants, etc.).

Sunnyvale was required to perform source identification and waste minimization studies and to identify implementation measures to reduce metals in its effluent. Based upon these studies, the amended permit required Sunnyvale to: 1) improve its pretreatment program; 2) implement a pilot waste minimization program focusing on industries that were sources of nickel, copper, and lead (electroplaters and metal finishers); and 3) conduct a public education and outreach program for communities to reduce nickel, copper and lead in residential wastewater.

In addition to conducting source identification and waste minimization studies, Sunnyvale was required to improve their pretreatment program and implement pollution prevention programs focusing on industries that discharged nickel, copper, and lead (primarily electroplaters and metal finishers).

III. SOURCE IDENTIFICATION STUDIES

In response to the RWQCB's order, the South Bay POTWs conducted studies to determine if all controllable sources of pollutants had been identified and regulated. These studies were to address, at a minimum: chromium, copper, silver, lead, nickel, zinc, and cyanide. These pollutants were chosen because some effluent values had exceeded Basin Plan limits.

In their studies, the POTWs used the following categories to classify the origin of pollutants: water supply, regulated industries, unregulated/unpermitted industries, commercial facilities, and residential areas. The findings of these studies are summarized below.

A. Palo Alto Source Study

Palo Alto conducted an industrial user survey for potential unregulated sources of metals, and then initiated a sampling program. The sampling was necessary to estimate the amount of metals coming from the potable water supply, as well as regulated, unregulated/commercial, and residential sources.

The industrial user survey was conducted using telephone directories, numerous business directories, records of other regulatory agencies, water use records, etc. Numerous potential dischargers were identified. The report indicated that substantial effort was still needed (site visits or phone calls) to determine which user actually discharged contaminants of concern to the sewer. Palo Alto now estimates that there are 375 photoprocessors and 350 auto repair facilities in their service area.

To estimate the amount of metals coming from the potable water supply, Palo Alto took several samples. The samples were necessary to verify the historical data provided by the water purveyors. The sample data confirmed that the water purveyors do have accurate data and, therefore, the historical data should be used to determine the average metals contribution of the water supply.

Palo Alto sampled ten percent of the regulated facilities to verify industrial waste contributions as measured by the industrial pretreatment program. This sampling found lower concentration and flow rates than previously estimated. Therefore, the data from the industrial pretreatment program was considered a conservative estimate of the regulated industries' metals contribution.

Palo Alto (along with the two other POTWs) estimated commercial and unregulated industrial concentrations by averaging the results of trunk sewer sampling of nine different businesses. These included retail outlets, radiator repair shops,

TABLE 1

AVERAGE SOUTH BAY UNREGULATED INDUSTRIAL/COMMERCIAL LOADINGS

	Element	Contribution (pounds per day)
1.	Arsenic	0.03
2.	Cadmium	0.49
3.	Chromium	0.57
4.	Copper	4.61
5.	Cyanide	1.41
6.	Lead	2.06
7.	Mercury	0.
8.	Nickel	6.51
9.	Selenium	0.
10.	Silver	5.2
11.	Zinc	20.65

From Table 7-9 of Palo Alto's Metals Source Identification Study.

photoprocessing shops, machine shops, print shops, and a dental facility. The resulting loadings are shown in Table 1. The contribution levels shown in Table 1 were calculated by multiplying concentration data by the estimated flow rate, 6.5 mgd (described above).

Palo Alto also conducted water sampling at five unregulated industrial/commercial operations to get an idea of how many pounds of pollutants per day were discharged by various businesses. The results of this sampling are shown in Table 2. The results shown in Table 2 were not used in determining the commercial or unregulated industrial contribution of metals to the sewer.

Residential concentrations were calculated using trunk sewer sampling results from all three POTWs. Palo Alto conducted sampling of two residential areas for seven days. One of these areas was a high density residential area, and the other was a neighborhood of single family dwellings. The resulting data from the sampling efforts of all three POTWs were combined to increase the data base and the results were averaged. These results are summarized in Table 3.

TABLE 2

UNREGULATED INDUSTRIAL/COMMERCIAL OPERATIONS (PALO ALTO SAMPLE RESULTS)

	Element	Industry: (in μg/l) A	B	C	D	E	F
1.	Arsenic	14.	4.	7.	<4.	<4.	<4.
2.	Cadmium	4.	<1.	1.4	<1.	<1.	<1.
3.	Chromium	<2.	<2.	<2.	<2.	<2.	<2.
4.	Copper	10.	19.	64.	29.	26.	59.
5.	Cyanide	<10.	<13.	14.	478.	<10.	25.
6.	Lead	312.	<2.	13.	5.	<2.	34.
7.	Mercury	2.	6.	8.	5.	3.	3.
8.	Nickel	9.	110.	159.	6.	9.	7.
9.	Selenium	<10.	<10.	<10.	<10.	<10.	<10.
10.	Silver	197.	96,558.	9,526.	74.	11.	5.
11.	Zinc	273.	420.	1,138.	160.	70.	249.

A. Dental X-Ray Lab
B. Photo-Processing "Small," Pretreatment
C. Photo-Processing "Small," Post-Treatment
D. Photo-Processing "Large"
E. Printing/Lithographic
F. Laundromat

From Table 6-11 of Palo Alto's **Metals Source Identification Study**.

After concentration values were derived, loadings were calculated using estimated flow rates. These rates were estimated using the water use records for industrial, commercial, and residential zones, with an adjustment for water used for irrigation purposes. The flow rates for the regulated industries (from the pretreatment program database) were subtracted from the water use records for the industrial zone, and the balance of the industrial flow (from unregulated industry) was added to the commercial zone flow to derive the following flow rates for the categories: regulated industry (2.5 mgd), unregulated industrial/commercial (6.5 mgd), and residential (14.1 mgd).

Contributions of metals from the four categories are shown in Figure 2. In the figure, the contribution of a given pollutant for each source is compared to the total amount

TABLE 3

AVERAGE SOUTH BAY RESIDENTIAL WASTEWATER CONCENTRATIONS

	Element	Concentration(μg/l)
1.	Arsenic	<4
2.	Cadmium	<2
3.	Chromium	<3
4.	Copper	50
5.	Cyanide	16
6.	Lead	7
7.	Mercury	<1
8.	Nickel	5
9.	Selenium	<8
10.	Silver	12
11.	Zinc	98

From Table 6-8 of Palo Alto's Metals Source Identification Study.

entering the POTW on a percentage basis. Therefore, when the total source contribution is 50%, only half of the sources of a pollutant have been accounted for. If the total source contribution is over 100%, then the estimates of source contributions were too high. Results reported below detection limits (the lowest detectable concentration) are reported as zero. The true values for the undetected metals obviously lie somewhere between zero and the detection limit.

Figure 2 illustrates that regulated industry represents a large percentage of the copper, lead, nickel, and silver loadings. Unregulated industry/commercial facilities are found to contribute most to the copper, lead, silver, and zinc loadings. Residential loadings of copper, lead, and zinc are the highest.

B. San Jose/Santa Clara Source Study

SJ/SC, unlike Palo Alto, did not complete an industrial use survey for potential unregulated source metals. The POTW services a much larger and more industrial area, and a comprehensive survey would have been far more difficult. Instead, SJ/SC conducted a literature review and determined that potential commercial contributors of metals were medical and

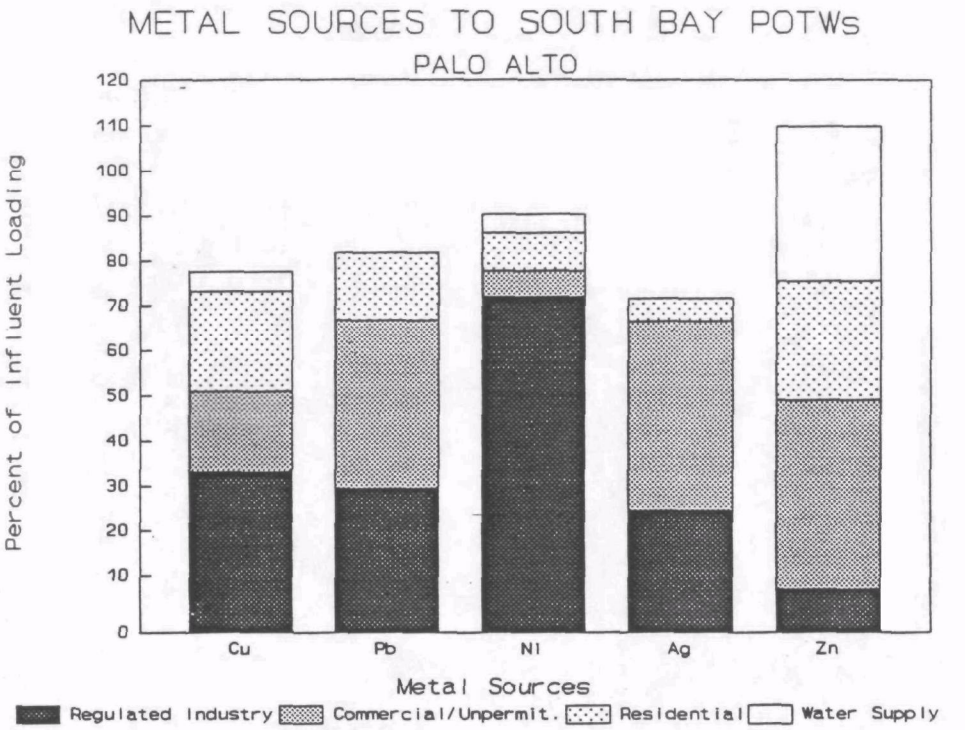

FIGURE 2

dental offices and laboratories, auto repair shops, car and truck washes, photoprocessors, dry cleaners, laundries, and printing/ publishing facilities.

SJ/SC used Santa Clara County Business Patterns data to estimate the number of such facilities in their service area. They assumed that 70% of the County's commercial facilities were within the service area of the SJ/SC plant, since the plant serves 70% of the population of the County. The resulting numbers of commercial facilities are listed in Table 4.

The composition of the water supply was estimated using a combination of historical data from water purveyors, field sampling, and the other two POTWs. Data for flow rates were obtained from the water purveyors.

SJ/SC attempted to verify flow data from self monitoring reports with data from the water suppliers. They found that the water company records averaged about 20% higher than flow rates described in the self monitoring reports. This is probably due to sanitary and irrigation flow rates. Although many of the industries do not have flow meters, and some used their permitted capacity as their actual flow in their self monitoring reports, SJ/SC decided to use the self monitoring reports instead of the water company records. These reports seemed to be as close of an estimate as the water company records, and were much easier to

TABLE 4

APPROXIMATE NUMBER OF COMMERCIAL GROUPS IN SJ/SC SERVICE AREA

Business Type	Number[a]	Number Permitted[b]	Metals of Concern[c]
1. Hospitals/Clinics/Labs	164	0	Ag,Cd,Cu,Cr,Hg,Pb,Zn
2. Automotive Repair	489	0	Cu,Pb,Zn
3. Car/Truck Washes	22	3	Cu,Pb,Zn
4. Photo processors	111	7	Ag
5. Dry Cleaners	65	0	Cu,Zn
6. Laundries	36	6	Cu,Cr,Pb,Zn
7. Printing/Publishing	289	4	Ag,Cu,CN,Cr,Ni,Zn

a Data from U.S. Department of Commerce, Bureau of the Census, **County Business Patterns 1986**

b Data from SJ/SC Water Pollution Control Plant

c Data from U.S. EPA, **Domestic/Commercial Loading Case Study**, March 1989, Draft Report

From SJ/SC's **Pollutant Sources Evaluation Report.**

obtain. Therefore, these values were used for calculating the mass balances.

Like Palo Alto, ten percent of the regulated industries were sampled for verification of industrial contributions. SJ/SC also found lower concentration and flow rates than historically found. They thought this might be due to the lower detection limits used, or the success of the pretreatment program to affect reductions. For loading calculations, SJ/SC used the data available for the 35 facilities involved in the verification sampling, and the historical data for 90% of the other industries.

Residential and commercial concentrations were calculated by averaging the results of sewer sampling by all three POTWs. SJ/SC conducted sampling of five sites. Two sites were mixed residential/commercial and three were purely residential. To calculate commercial contributions, the residential results were subtracted from the results for the mixed areas. The values obtained by the averaging of unregulated industrial loadings are shown in Table 1. The values from the averaging of residential

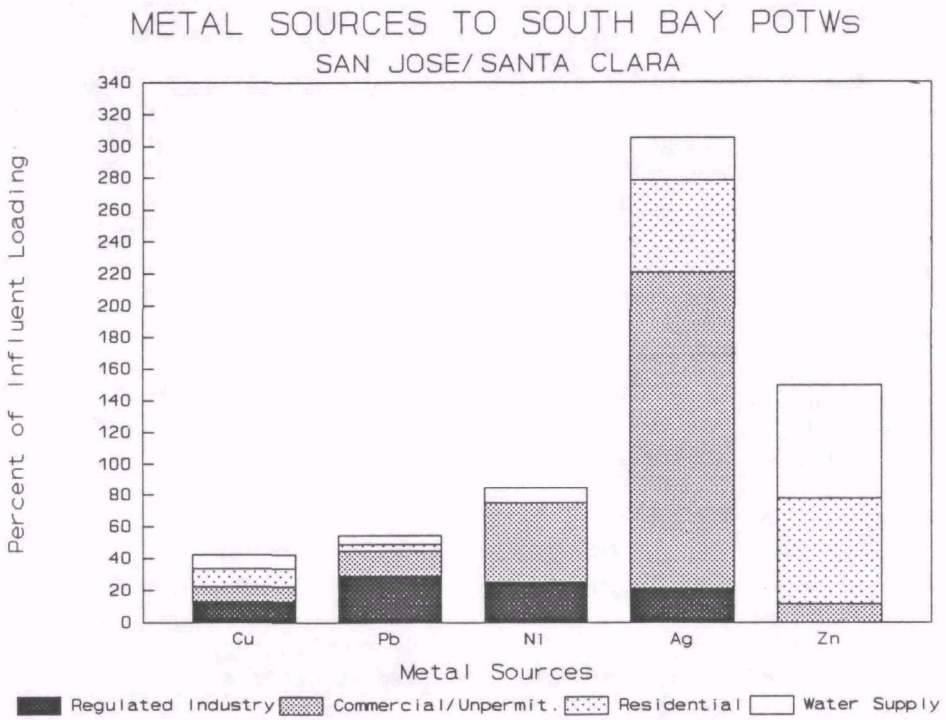

FIGURE 3

loadings are shown in Table 3.

Loadings of metals from the four categories are shown in Figure 3. Data in this figure was calculated using values below the detection limit as equal to the detection limit. Mass balances for copper, lead, and silver are particularly poor. SJ/SC concluded that the metals unaccounted for (approximately 55% and 40% for copper and lead respectively) may have come from batch discharges from industries, radiator repair shops, or auto repair shops. Silver amounts were estimated to be three times higher than the actual influent loadings, as can be seen by the figure.

This data shows that regulated industry is responsible for a large percentage of the accounted metal loadings. The commercial sector is responsible for a large percentage of the nickel and silver loading, and, to a lesser degree, lead.

C. Sunnyvale Source Study

Source water samples were taken to determine water supply contributions. These results were combined with some of the results from the other two POTWs and from historic data for Hetch Hetchy water. Historic data for Santa Clara Valley Water

District water was not used, because the detection limits used for this data were too high. Weighted averages of the three sources were calculated, using the detection limit value rather than zero if the result was less than the detection limit.

To confirm historical data, verification sampling was conducted at the seven industrial sites which contribute 40% of the industrial flow to the plant. Separate estimates were made for process and sanitary loadings. Sunnyvale also took samples from 13 of the smaller industries (which contribute 20% of the industrial flow to the plant) to increase the data base. The results of this sampling indicate that mass loading estimates of nickel and mercury were much higher in the verification sampling. But, for most metals of concern, the verification results are not far from the historical data. Therefore, Sunnyvale used the verification sampling data to determine the mass and percent loadings.

Sunnyvale used the data collected and pooled by the three POTWs to estimate commercial and unpermitted industrial concentrations. As mentioned before, these concentrations were calculated by averaging the results of trunk sewer sampling of nine different areas. These areas included retail outlets, radiator repair shops, photoprocessing shops, machine shops, print shops, and a dental facility. The results are shown in Table 1.

Sunnyvale also conducted individual commercial samplings at the request of the RWQCB in order to sample for suspected sources of metals in Sunnyvale's influent. The commercial establishments sampled included a medical/dental complex, an automobile service station, four car dealerships, and a drive-through carwash. Sunnyvale also reviewed historical data for a large radiator shop.

The results of the medical/dental complex sampling showed that higher-than-expected levels of chromium and lead were detected at photoprocessing operations, although local limits were met. This sample data also verified that this category was a potential source of silver, although the levels measured were not excessively high.

The results of the automotive industry samplings indicated relatively high concentrations of copper, chromium, lead, and zinc. The radiator repair shop showed levels of lead and copper in sewer discharges, even though dip tank discharge was prohibited. The carwash sampling indicated that this was not a serious source of the metals of concern.

Sunnyvale did not use the individual commercial sampling results to determine the actual commercial or unpermitted industrial contributions of metals to the sewer, but used them to

make recommendations for program changes in their waste minimization study.

Residential concentrations were calculated using trunk sewer sampling results from all three POTWs. Sunnyvale conducted sampling of three solely residential areas. As with Palo Alto, these areas were chosen to represent different densities, ranging from apartments to single family homes. The resulting data from the sampling efforts of all three POTWs were combined to increase the sample size and were then averaged. These results are summarized in Table 3.

After concentration values were derived, loadings were calculated using estimated flow rates. These rates were estimated using the water use records for industrial, commercial, and residential zones. The rates were adjusted to account for water used for irrigation purposes and lowered by 8% to match the influent flow rate to the plant. The flow rates for the permitted industries (from the pretreatment program database) were subtracted from the combined flows for industrial and commercial categories to derive the flow rate for the commercial category.

Contributions of metals from the four source categories are shown in Figure 4. Values below detection limits were assumed to

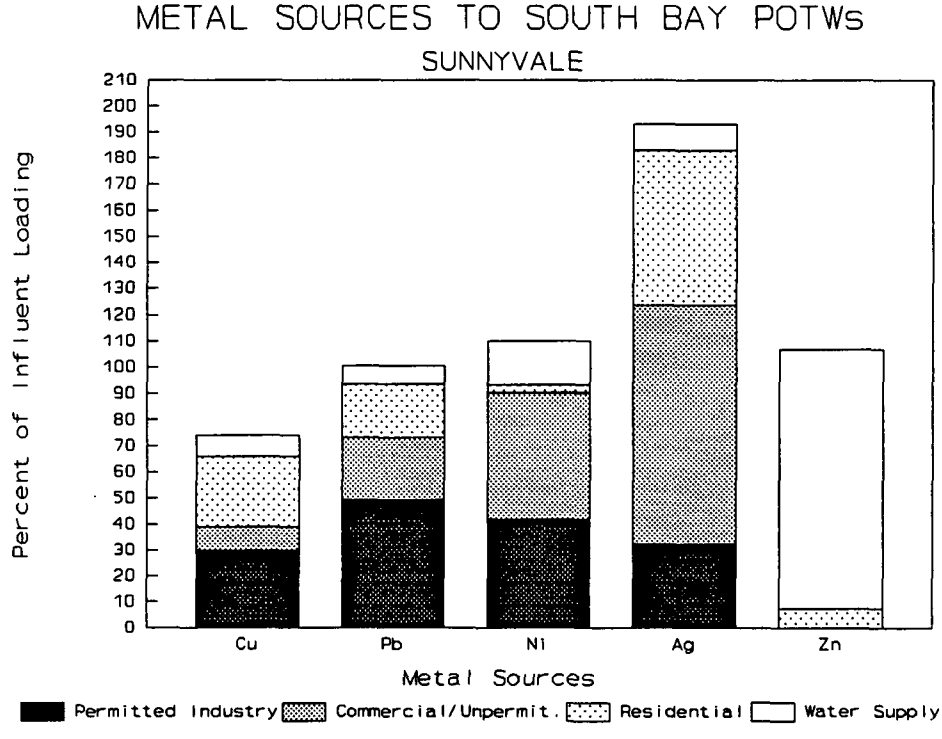

FIGURE 4

equal the detection limit. Sunnyvale achieved a relatively good mass balance for loading, except for silver which, as SJ/SC found, has an average influent loading much lower than the sum of the contributing loads. This may be due to the outliers in the commercial sampling data.

Figure 4 includes the pollutants that Sunnyvale would have been discharging in violation of the Basin Plan limits, if those limits had been in effect at the time. On the Sunnyvale graph, chromium was inadvertently left out. Estimates accounted for only 36% of the total chromium loading. This is apparently due to one very high chromium value measured in the influent. The largest source of chromium was the water supply, and the next largest source was industry.

Sunnyvale concluded that the water supply was probably the primary source of arsenic, cadmium, chromium, mercury, and zinc. Permitted industries were the primary source of lead, and were also important sources of nickel and copper, with over half the loading of nickel and copper coming from a handful of electroplaters and one metal finisher. Key contributors of lead were a metal finisher, a local (non-categorical) industry, and two large government facilities with a large combined flow. The commercial sector identified as the primary source of nickel and silver. The residential sector was identified as the primary source of copper and selenium.

Sunnyvale expressed concern that chromium, copper, mercury, nickel, and zinc were found in the water supply in levels which usually exceeded the Basin Plan limits for effluent concentrations.

IV. WASTE MINIMIZATION STUDIES

In addition to source identification studies, RWQCB's order also required that each of the POTWs submit reports identifying feasible waste minimization measures to reduce or eliminate toxic loadings. The results of these three reports are summarized below.

A. Palo Alto Waste Minimization Study

Palo Alto evaluated measures to reduce cyanide, copper, lead, nickel, silver, and zinc, since these contaminants needed to be reduced to meet the RWQCB's Basin Plan limits. Palo Alto calculated the range of influent loading values for these pollutants by using existing plant removal rates, and rates calculated using a linear correlation between influent and effluent metals concentrations (although, only weak correlations were found). Palo Alto then evaluated whether waste minimization measures could be successful in meeting these loading values.

The study found that significant reductions in copper, lead, nickel, and silver from regulated industry and from unregulated/ commercial facilities were required to meet the Basin Plan limits. To meet the zinc limit, reductions from all categories were needed. The report also stated, however, that waste minimization may not ever be enough to reduce the metals to the Basin Plan limits, because:

1. unaccounted for contributions of chromium, copper, and lead are almost enough by themselves to reach the Basin Plan limits, and it is difficult to identify waste minimization measures for unaccounted for sources; and

2. the amounts of influent metals and plant removal rates fluctuate, making it difficult to set useful limits.

Some of the unaccounted for metals could have come from spills or batch discharges from regulated industry, which could be controlled through the implementation of waste minimization programs.

Palo Alto conducted interviews at three facilities, a large photo finisher, an electroplater, and a metal finisher, to determine the potential for reducing cyanide and metals in industry. Using the results of these interviews and knowledge of the local industrial make-up, Palo Alto estimated that 50% of the cyanide used in electroplating and metal finishing could be reduced through product substitution. Moreover, 15 to 20 percent of the industrial contribution of metals could be reduced through waste minimization.

Palo Alto also conducted interviews with representatives of three unregulated commercial operations: a photoprocessing shop,

a commercial printer, and a radiator repair shop. Feasible waste minimization measures were only identified for the photoprocessing shop.

Palo Alto listed the following as residential waste minimization measures: increasing public awareness, providing alternative disposal methods, and product bans or substitutions. Palo Alto's review of the Gurnham study "Control of Heavy Metal Content of Municipal Wastewater Sludge" (1979) led them to conclude that product ban or substitution was not warranted at the time, because typical household products did not appear to be major contributors of metals. (However, Palo Alto has since banned the use of copper sulfate for control of root growth in sewer lines.)

B. San Jose/Santa Clara Waste Minimization Study

SJ/SC focused on reducing the levels of copper, lead, nickel, silver, and zinc in wastewater, to meet Basin Plan limits.

SJ/SC proposed to address water supply loadings by supporting, subsidizing, and/or requiring changes in the zinc-based corrosion inhibitor used by the Santa Clara Valley Water District (SCVWD). Residential loading was found to be primarily a concern for copper, lead, silver, and zinc. SJ/SC planned to conduct public awareness programs and to develop a comprehensive household waste collection program and a public education program. If data were available to demonstrate a need, product bans or enforced reformulations would be considered.

SJ/SC evaluated the current waste minimization efforts of industries of concern by distributing questionnaires and conducting eight case studies. Out of 67 responses to the questionnaires, 40 industries responded that they had conducted waste minimization studies. The eight case studies demonstrated that, in general, the most affordable and effective measures had been implemented.

SJ/SC listed their alternatives for reducing industrial loading as: lowering discharge limits, improving compliance, regulating or permitting additional industrial generators of metals of concern (including auto repair, radiator repair shops, photoprocessors), promoting waste minimization by providing technical assistance, and requiring waste minimization audits. The report stated that the commercial categories with the greatest impact for metals reduction were photoprocessors and radiator/auto repair shops.

C. Sunnyvale Waste Minimization Study

In 1989, Sunnyvale was unable to meet Basin Plan limits for chromium, copper, lead, nickel, and zinc. Sunnyvale determined

that local waste minimization efforts should focus on these metals and silver. They concluded that the primary industrial sources of copper and nickel were electroplaters and metal finishers. Therefore, waste minimization efforts should focus on these industries.

In their waste minimization study, Sunnyvale found that the water supply was the primary source of zinc. Sunnyvale indicated that it was also a key contributor of nickel. Sunnyvale stated in their report that they would encourage SCVWD to work on finding an alternative corrosion inhibitor to reduce the zinc loading.

Commercial sources were identified as a significant source of silver, nickel, and lead. Commercial photoprocessors and printers were suspected to be the primary sources of silver and, possibly, lead. Further study was recommended to identify the source of nickel from the commercial sector. The study suggested that auto repair shops may be good targets, since processes which generate metals are limited.

Sunnyvale concluded that the residential sector was a significant source of copper, silver, and lead. Results of sampling at the tap indicated that the copper and lead primarily came from residential plumbing. Silver could come from household products and home photoprocessing operations.

Sunnyvale estimated that, since the pretreatment program had already significantly reduced metals loading, additional decreases as a result of a waste minimization program would probably range from 10 to 15 percent for specific metals (copper, lead, nickel, and silver). They expressed concern that this amount may be masked by the variability of the influent wastewater. Another concern was that the nonlinear relationship between metals in the influent and the effluent may result in the reduction of metals leaving the plant in sludge, and not in wastewater.

Survey questionnaires (see Appendix B) were developed and sent to industries to determine what existing waste minimization measures were being employed by industry, and to identify industries to interview. One of the two surveys used was sent to all permitted industrial sites and the other was sent to the smaller unpermitted industrial sites. With an 82% response rate, the results indicated that a fair number of these industrial sites have implemented some type of waste minimization measures. The majority responded that these measures were implemented to meet pretreatment limits or to reduce hazardous wastes hauled off-site.

Sunnyvale conducted interviews with representatives from seven facilities. The intent of the interviews was to gain more insight into existing waste minimization techniques employed by

industry. Most of these facilities had conducted formal waste minimization audits. They all had instituted worker education programs in waste minimization practices and they declared that these programs were essential to the success of their programs.

The study suggested a waste minimization program for Sunnyvale which would include educational and regulatory components. The educational component would include developing and distributing educational materials, compiling reference lists of information to make available to industry, and increasing efforts on the part of the pretreatment staff. This staff effort would include presenting talks, assisting with household collection days, and coordinating more closely with the city's hazardous materials programs on routine inspections, spills, etc.

Further, the study suggested that the regulatory aspect of the program include the following: 1) requiring more accurate metering of process streams; 2) enforcing mandatory waste minimization measures for industrial dischargers who fail to comply with discharge limits; and 3) increasing inspections and monitoring of automotive repair shops and photoprocessors for compliance with existing requirements. The study also recommended a modification to the sewer ordinance so that the POTW can require preparation and implementation of waste minimization plans. The study suggested that this authority be used for industries that are out of compliance with their pretreatment limits.

V. PERMIT REQUIREMENTS

After the RWQCB and EPA reviewed the POTWs' source identification and waste minimization studies, the permits were modified to require each POTW to implement additional pretreatment and waste minimization measures. These requirements are summarized in Table 5. The permit language for each of the POTWs was very similar.

TABLE 5

PERMIT AMENDMENTS FOR ADDITIONAL SOURCE CONTROLS

A. Pretreatment Program Improvements:

1. Implement system to require permitted firms to accurately measure their process-waste flows to the sewer.
2. Regulate auto repair and photo-processing firms.
3. Implement more frequent inspections and more aggressive enforcement actions.

B. Pilot Waste Minimization Program:

1. Target efforts toward the following businesses:
   a. Palo Alto - photo-processors, x-ray labs, and other important silver dischargers.
   b. Sunnyvale - electroplaters and metal finishers, and other potentially important sources of Ni, Cu, and Pb.
   c. San Jose - radiator repair shops, auto parts cleaning shops, and other important sources of Cu, Zn, and Pb.
2. Implement a public education effort.
3. Develop a set of best management practices and waste minimization alternatives, provide technical assistance.
4. Require industries to submit waste minimization plans.
5. Coordinate further program development with other POTWs.

C. Submit Progress and Status Reports

Since the flow monitoring capabilities of many facilities is limited, it is too difficult to measure accurately the pollutant contributions from the industrial sources. Therefore, the POTWs are required to ensure that 35% of permitted industries and 100%

of "targeted industries" accurately measure their process flow rates to the sewer.

After reviewing the source identification and waste minimization studies, RWQCB and EPA concluded that auto repair shops (including radiator repair shops) and photoprocessing shops were potentially significant sources of metals. The permits, therefore, were amended to require the POTWs to regulate these facilities, increase the number of inspections, and take more aggressive enforcement actions.

The permits also require the development and implementation of pilot waste minimization programs. Each POTW must target a different industry and dischargers of specific metals, as described below. These programs need to include the development of best management practices (BMPs) and waste minimization alternatives for each industry. Additionally, the programs must require that some facilities develop and implement waste minimization plans. The POTWs are also required to provide technical advice to industries, and direct public education efforts toward reducing the disposal of metals into the sewers.

In addition, the POTWs are required to coordinate their efforts with each other and, after completion of the pilot programs, must expand their programs to address other categories of industry. Lastly, the POTWs are required to submit progress reports to the RWQCB. Their progress, and that of the Santa Clara Valley Water District, is discussed below.

A. Palo Alto Permit

Palo Alto has developed a phased approach to reduce the metals loading to the treatment plant. Phase I includes the activities required by their NPDES permit: developing base industrial waste program enhancements, a photoprocessing control plan, and an automotive repair control plan. Phase II through IV expands these activities in anticipation of receiving more stringent metals limits and includes: developing BMPs for additional commercial sectors, developing recommendations and restrictions for the use of chemicals and products, requiring additional industries to develop waste minimization plans, and developing mass-based local limits. A schedule for Phases I and II is shown in Table 6.

Base Industrial Waste Program Enhancements

Palo Alto has adopted a Waste Minimization Resolution to notify dischargers of their commitment to source reduction. As with each POTW program, Palo Alto has required flow monitoring of all "targeted industries" (in this case, the six largest silver dischargers), and now monitors 37% of their permitted facilities. Palo Alto recognizes the need for accurate meters to control and track metal loadings, and will make installation of meters a

TABLE 6

PALO ALTO REGIONAL WATER QUALITY CONTROL PLANT
SCHEDULE OF PHASE I AND PHASE II

Task	Approximate Completion Date
PHASE I	
A. GENERAL	
A.1 Adopt waste minimization resolution	09/89
B. BASE INDUSTRIAL WASTE PROGRAM ENHANCEMENTS	
B.1a Require flow monitoring of targeted industries	12/90
B.1b Require flow monitoring at permitted industries	02/91
B.1c Flow monitoring inspection and verification	08/91
B.2a Increase industrial self-monitoring to monthly	09/89
B.2b Increase industrial self-monitoring frequency	02/90
B.3 Increase documented inspections from 1 to 2 per year	01/91
B.4 Adopt & implement administrative penalty procedures	01/90
B.5 Decrease local limit for zinc	09/90
B.6 Establish technically-based local limit for Pb, Zn, Cu, & Ni	06/92
B.7 Adopt mass-based discharge fees for metals	07/90
B.8a Adopt ordinance requiring WM studies	09/89
B.8b Develop silver pilot prioritization scheme	02/90
B.8c Require WM studies w/ enforcement orders or permits	06/90
B.8d Establish consultant contract to review studies	09/90
B.8e Review WM studies from targeted silver sources	10/91
B.8f Review WM studies from Tier I industries	08/91
B.9a Establish detailed document tracking system	07/91
B.9b Establish computerized data management system	09/91
C. PHOTOPROCESSING CONTROL PLAN	
C.1a Initial source identification	04/90
C.1b Conduct letter survey	05/90
C.1c Establish technically-based local limit for silver	09/90
C.1d Develop draft ordinance	05/90
C.1e Complete workshops on draft ordinance	08/90
C.1f Adopt ordinance by all jurisdictions in service area	10/90
C.1g Send informational compliance packets	12/90
C.1h Conduct informational workshops on ordinance	03/91
C.1i Receive hauling/treatment compliance plans	04/91
C.1j Review plans for businesses choosing treatment	06/91
C.1k Issue short form permits	06/91
C.1l Evaluate & enter self-monitoring data	07/91
C.1m Modify appropriate industrial permits	07/91
C.1n Inspect photoprocessing facilities	09/91
C.1o Issue warning letters and enforcement orders	09/91
C.1p Review annual reports of those hauling waste	02/92
C.1q Prepare quarterly noncompliance reports	09/91

From Table 4-1 of Palo Alto's Progress Report

TABLE 6 (continued)

Task	Approximate Completion Date
C.2a Public education for photoprocessors	09/91
C.2b Technical assistance for photoprocessors	12/91
C.2c Support of A.B. 646 Legislation	07/91
C.2d Coordinate w/State and County programs	Ongoing
C.2e Decide on city-sponsored hauling programs	12/90
C.2f Implement hauling program or other assistance	06/91
D. AUTOMOTIVE REPAIR CONTROL PLAN	
D.1 Conduct inspections at sample ARFs	01/91
D.2 Develop inventory and facilities mailing list	04/91
D.3 Develop informational request/permit application form	04/91
D.4 Develop initial draft BMPs	03/91
D.5 Form ARF subcommittee of Metals Advisory Group	03/91
D.6 Develop model permit for discharging facilities	05/91
D.7 Receive BMPs from San Jose and SCVWD	06/91
D.8 Finalize BMPs	08/91
D.9 Develop draft ordinance	07/91
D.10 Adopt ordinance for all jurisdictions	11/91
D.11 Send informational compliance packets	12/91
D.12 Conduct informational workshops on ordinance	02/92
D.13 Issue permits for discharging facilities	04/92
D.14 Conduct inspections	08/92
D.15 Commence enforcement actions	08/92
E. OTHER ENHANCEMENT ACTIVITIES	
E.1 Coordinate program w/ other 2 South Bay dischargers	Ongoing
E.2a Submit progress report by 12/1/90	12/90
E.2b Submit status report by 8/1/91	08/91
PHASE II	
F. ENHANCEMENT OF INDUSTRIAL SOURCE REDUCTION	
G. ENHANCEMENT OF COMMERCIAL SOURCE REDUCTION	
G.1 Implement reduction program for laboratories	01/91
G.1a Establish laboratory subcommittee of MAG	01/91
G.1b Develop BMPs for laboratories	07/91
H. IMPLEMENTATION OF RESIDENTIAL SOURCE REDUCTION	
H.1 Identify residential product groups of concern	
H.2 Implement reduction program for copper	01/91
H.2a Identify copper sources and pathways	02/91
H.2b Investigate major copper sources	05/91
H.2c Commence copper reduction measures	02/91
H.3 Investigate impacts of drain-clearing chemicals	
H.3a Conduct bench-scale testing	
H.4 Support control programs for water treatment chemicals	08/90
H.5 Evaluate additional products and control measures	Ongoing

requirement for all major dischargers through the permit renewal process.

As required by their permit amendments, Palo Alto has increased industrial self monitoring, increased documented inspections, and implemented new administrative enforcement procedures. They have decreased the local discharge limit for zinc to the range of the other South Bay dischargers, from 5 mg/l to 2 mg/l. Silver limits have also been reduced, as discussed below. Palo Alto plans to establish technically-based local limits for metals after water quality-based limits are imposed on the POTW.

Palo Alto has directed its public education efforts toward household waste reduction. Specifically, Palo Alto has developed brochures targeting home photoprocessors. Palo Alto now operates a household hazardous waste collection facility on a quarterly basis, and is looking into the possibility of allowing small commercial facilities to use this service. Palo Alto also operates a drop-off facility for household silver-bearing wastes. They are also investigating alternatives to usage of copper sulfate to inhibit root growth in residential sewers.

As required by the permit, Palo Alto solicited waste minimization studies from their targeted industries (six facilities which discharge 97% of the industrial loading of silver). Palo Alto will be requiring all "Tier 1" facilities (facilities which contribute 80% of the loading of six other metals) to submit waste minimization plans in their renewed permits. The industrial waste program staff, with the assistance of a consultant, will review these studies and meet with the industries to agree upon an implementation plan.

In addition to required measures, Palo Alto revised sewer rate charges in July 1990 to include a discharge fee for metals as an incentive for waste reduction. This fee is $10,000 for 1,000 pounds of toxins (sum of Cr, Cu, CN, Pb, Ni, Ag, and Zn).

Photoprocessing Control Plan

In addition to their efforts with the major silver discharging industries, Palo Alto has launched a major effort targeting commercial dischargers of silver. These dischargers include those who use photographic, photostat, or x-ray processes (e.g. photoprocessors, research labs, printers, dentists, and hospitals). The program began with the development of a survey which was sent to 650 potential silver dischargers. Seventy percent of those contacted returned the forms, and 53% of those responding indicated that silver-bearing chemistries were being used.

Palo Alto then developed a technically-based local limit of 0.25 mg/l of silver. They used the Basin Plan limit of 2.3 μg/l

as a limit for the POTW. Palo Alto wrote a draft ordinance to set the limit for silver and formed a Metals Advisory Workgroup. Palo Alto also held five workshops for businesses to help carryout the new limits. After receiving comments, Palo Alto adopted a final ordinance that defined allowable silver levels. The local silver limits adopted are 0.25 mg/l for non-photoprocessing dischargers, 0.5 mg/l for photoprocessors, and 1.0 mg/l for any photoprocessors that have waterless systems, or water reuse systems. This approaches a mass-based limit which provides businesses with more incentive to reduce waste.

Palo Alto is providing, and will continue to provide, assistance to the regulated businesses. This will include additional workshops, information packages, press releases, and newsletters. Technical assistance to individual facilities will be provided upon request, with the understanding that only suggestions will be made and that the ultimate responsibility for compliance lies with the facility.

The program also includes standard pretreatment program components including: permitting, inspections, annual report submittals, and enforcement actions.

Auto Repair Control Program

Palo Alto has also developed a program targeting vehicle service facilities. The program includes education of facility staff, recognition of compliant facilities, and new requirements mandated in a recent ordinance. Palo Alto worked closely with San Jose and Santa Clara County to develop BMPs that included tips on cleaning up spills without water, preventing leaks, and eliminating discharges to the sewer and stormwater drains. The BMPs included a listing of the most preferred ways to store and dispose of the various liquid and solid wastes generated at automotive-related industries (for example, gear oil should be segregated, stored in a drum, and disposed of at an oil recycler).

B. San Jose/Santa Clara Permit

SJ/SC's permit requirements are virtually identical to Palo Alto's, except that the pilot waste minimization program is targeted toward radiator repair shops, auto parts cleaning shops, and any other groups identified as important target sources of copper, zinc, and lead. The status of their activities is summarized in Table 7, and is discussed below.

SJ/SC has made progress toward having industries monitor their own process flows. Forty-three percent of their permitted industrial wastewater dischargers monitor their flow. Like Palo Alto, they are surpassing permit requirements by requiring all 260 of their major dischargers to install flow meters as a condition of permit renewal. As part of the industrial permit

TABLE 7

SAN JOSE/SANTA CLARA WATER POLLUTION CONTROL PLANT
STATUS OF ACTIVITIES

RWQCB PERMIT PROVISION NUMBER	WASTE MINIMIZATION TASK
PRETREATMENT PROGRAM IMPROVEMENTS	
A.1. Implement Flow Measurement For Permitted Industries	o Install and Maintain Flow Measurement Equipment o Inspect and Approve Installations o Verify Data by Comparison with Water Use Data
A.2. Regulate Radiator Repair and Auto Parts Cleaning by August 1, 1991	o Pass Waste Minimization Resolutions o Establish Threshold Levels to Determine Which Shops to Regulate o Develop and Implement New Sewer Ordinances
A.3. Implement More Frequent Inspections and More Aggressive Enforcement	o Increase Sampling Frequency o Increase Inspection Frequency o Implement More Aggressive Enforcement o Involve City Attorney More Aggressively o Train WPC Inspectors to Collect Evidence o Use Toxicity Detection Unit o Document Success of Compliance
PILOT WASTE MINIMIZATION PROGRAM	
B.1. Target Cu, Zn, Pb B.2. Public Education Effort	o Form Task Force o Distribute Waste Minimization Information to Residential/Commercial Community o Conduct Industry Workshops to Distribute Waste Minimization Information
B.3. Pilot Waste Minimization Program for Auto Parts Cleaning and Radiator Repair	Waste Minimization for Radiator Repair o Identify Facilities o Establish Waste Minimization Alternatives o Establish Permitting Requirements o Provide Technical Assistance to Industries o Implement New Regulations Waste Minimization for Auto Parts Cleaning o Identify Facilities o Conduct Representative Site Visits o Establish Waste Minimization Alternatives o Provide Technical Assistance to Industries o Implement New Regulations
B.4. Require Waste Minimization Plans from Significant Violators or Large Dischargers	o Identify Significant Violators o Identify Major Metals Dischargers o Prepare Sample Waste Minimization Plans

From Table 1 of SJ/SC's Status Report

TABLE 7 (continued)

RWQCB PERMIT PROVISION NUMBER	WASTE MINIMIZATION TASK
B.4. (continued)	o Prepare "Best Management Practices" Guidelines o Revise Sewer Use Ordinance o Conduct Workshops in Waste Management Plans o Conduct Follow Up Inspections
B.5. Coordinate With Other Two South Bay Dischargers	o Meet Monthly with Representatives from Palo Alto and Sunnyvale
PROGRESS/STATUS REPORTS	
C.1. Submit Progress Report on December 1, 1990 and Status Report on August 1, 1991.	o Prepare Monthly Status Reports to City o Prepare Progress Report to RWQCB o Prepare Status Report to RWQCB

requirements, SJ/SC has ordered approximately 70 industries to complete waste minimization plans. Also, SJ/SC has developed a computer database management program that catalogs industrial user monitoring data and compliance history information.

SJ/SC is required to regulate auto repair and photoprocessing facilities. They have developed an auto repair program as part of their pilot waste minimization program and are permitting photoprocessing facilities. SJ/SC anticipates they will use the modified threshold limits and waste minimization alternatives developed by Palo Alto. In addition, they have increased inspection and enforcement activities which now include evening and weekend inspections. SJ/SC has also increased their budget to pay commercial laboratory and consultant services, and to fund a new inspection staff (which has increased from 9 in 1989, to 19 in 1992) and additional monitoring equipment. As part of their source control program, SJ/SC has increased the number of industries under permit or regulation from 360 in 1989, to 1420 in 1991.

The pilot waste minimization program for SJ/SC includes a public education effort. Their program will include direct mailings to residences, pamphlets included in utility bills, workshops for the residential and commercial sectors, billboard advertisements, and public service announcements on radio and television. Five workshops have already been provided to industries. These courses include workshops for plating, electronics, and printed circuit board industries, as well as workshops for small quantity generators and industries that need to submit waste minimization plans.

The pilot program for auto repair shops is directed toward two categories of shops that are considered to be the major sources of metals: radiator repair and auto parts cleaning shops. SJ/SC reviewed trade publications, and contacted manufacturers and industry sources to learn what options were available for reducing metals discharge. Two options were identified: either zero discharge to the sewer, or increased treatment at the facilities to meet discharge limits.

Twenty-seven radiator repair shops were identified. Eight of these were contacted to learn what means of information dissemination would work best. SJ/SC then mailed out a questionnaire and a letter describing the program. The letter notified the facilities of their options, gave them a timetable for compliance, and invited them to attend a workshop. Forty people, including representatives from 13 of the 27 shops, attended the workshop. All of the radiator repair shops are now regulated.

SJ/SC has identified 1,150 potential auto parts cleaning facilities in their service area. In order to determine how many are actually contributing metals to the POTW, SJ/SC developed a

questionnaire which was sent to all of the facilities. SJ/SC has begun developing discharge options for the affected industries, and will acquaint them with the requirements in a workshop.

SJ/SC has performed other tasks related to waste reduction that go beyond their NPDES permit requirements. These tasks include the development of a training manual for new inspectors on the history of the waste minimization program, the program goals, and implementation of the program.

C. Sunnyvale Permit

Sunnyvale has program requirements similar to those of Palo Alto and SJ/SC. An outline of Sunnyvale's current efforts and their future plans is included in Table 8.

Sunnyvale's status report documented compliance with the flow measurement requirement. The report stated that all permitted facilities have been required to verify their flow records since 1981. In addition, 49% of industrial users have been required to accurately measure process-waste flow to the sanitary sewer. If users do not measure process-waste flow, they must document the amount of their water usage, and list the estimated or measured sanitary and irrigated water usage.

Sunnyvale's commercial users have had to submit a permit application form. These records provide the City with good information on which of these facilities to target. Like Palo Alto and SJ/SC, Sunnyvale is required to regulate the photoprocessors and auto repair facilities. Sunnyvale incorporated the information and procedures that they deem appropriate into a regulatory program.

Sunnyvale's inspection and enforcement activities have helped produce a 90% compliance rate by their industrial users. Enforcement has included a $231,800 fine in civil penalties of a local company for dumping hazardous waste into the sewer. Sunnyvale's program improvements include an update of their database, and a change in laboratory procedures so that the detection limits for the industrial sample analyses can be lowered. Sunnyvale's active pretreatment program earned them the 1990 EPA National Pretreatment Award.

The pilot waste minimization program includes public education efforts. Letters summarizing the changes to the pretreatment program have been sent to local industry groups. The pretreatment staff has initiated a publicity campaign to inform industry groups about seminars and workshops on waste minimization. The staff has also made presentations at local schools and community events, established an environmental awards program, provided technical assistance, and worked with representatives of other cities and Santa Clara County to establish a reference library.

TABLE 8

CITY OF SUNNYVALE WPCP PILOT WASTE MINIMIZATION PROGRAM

TASK DESCRIPTION	PRODUCT	COMPLETION DATE
TASK 1: IMPROVED PROCESS FLOW MEASUREMENTS (REQUIRES 0.8 FULL-TIME EMPLOYEES, FTE)		
1.1 Assessment of Existing Flow Monitoring Devices	SOP documenting assessment protocols flow monitoring assessment report	1/91
1.2 Requirement for Additional Flow Measurement Devices	documentation of flow monitoring	8/91
TASK 2: REGULATION OF AUTO REPAIR AND PHOTO PROCESSING FIRMS (REQUIRES 1.3 FTE)		
2.1 New Permitted Industries Auto Repair	documentation of categorization, new permits, updated inspection forms	categorization, characterization, waste min, NPS focus by 7/91
2.2 New Permitted Industries Photo Processing		inspection & monitoring started 7/91
2.3 Radiator Repair Shop Monitoring	sampling records	8/91
TASK 3: INSPECTION & ENFORCEMENT PROGRAM (REQUIRES 1.9 FTE)		
	records in IU files	8/91
TASK 4: ADMINISTRATIVE, LABORATORY, AND FIELD SAMPLING ACTIVITIES (REQUIRES 0.5 FTE)		
	database updates	1/92
	modified laboratory SOPs	12/90
	mass estimates	ongoing
	water audit verification summary reports	3/91

From Table 3 of Sunnyvale's Workplan for Implementation of Pretreatment and Pilot Waste Minimization Programs

TABLE 8 (continued)

TASK DESCRIPTION	PRODUCT	COMPLETION DATE
TASK 5: PUBLIC EDUCATION EFFORT FOR REDUCING Ni, Cu, & Pb DISCHARGES (REQUIRES 0.5 FTE)		
5.1 Outreach Program for the Communities	letter summarizing program for local industry groups	12/90
5.2 Identification & Education for Small Quantity Generators	develop library of resources	3/91
5.3 Seminars and Workshops on Waste Minimization		ongoing
TASK 6: TECHNICAL ASSISTANCE FOR TARGETED INDUSTRIES (REQUIRES 0.6 FTE)		
6.1 Develop List of Firms in the Targeted Categories	list of firms	8/90
6.2 Technical Assistance for Targeted Industries	technical information/library of resources	3/91
6.3 Waste Minimization Plans for Targeted Industries	waste minimization plans	3 complete by 8/91
TASK 7: ADDITIONAL STAFFING REQUIREMENTS		
	inspections	4/91
	field	12/90
	clerical	11/90
	lab	12/90
TASK 8: COORDINATION OF FURTHER PROGRAM DEVELOPMENT WITH OTHER SOUTH BAY POTWS		
	meetings with other dischargers	quarterly

Program coordination has included participation in the Bay Area Hazardous Waste Reduction Committee, the South Bay Workgroup, the Santa Clara County Tanner Technical Advisory Committee, and the Hazardous Waste Enforcement Group. The waste minimization efforts have been coordinated with the Nonpoint Source Project.

D. Santa Clara Valley Water District Progress

The Santa Clara Valley Water District (SCVWD) supplied a portion of the water to all three POTWs. They used zinc orthophosphate as a corrosion inhibitor; thus, a large percentage of the zinc for all of the POTWs came from the water supply.

The SCVWD played a significant role in minimizing metals discharge into the South Bay. They researched ways to reduce the amount of zinc that they added to the water supply. Historically, SCVWD used zinc orthophosphate as a corrosion inhibitor to ensure that metals, such as copper and lead, were not leached from pipelines in quantities harmful to human health and the environment. Zinc has been used because it is not harmful to human health in the dosages used. However, the zinc levels entering the Bay have been potentially dangerous to aquatic life.

SCVWD evaluated several alternatives to zinc orthophosphate. One common method of corrosion inhibition that SCVWD considered was increasing the pH of the water. However, SCVWD found that elevated pH levels increased the formation of trihalomethanes. They also tried, and later switched to, a zinc orthophosphate product with a zinc to phosphate ratio of 1:2 instead of the 1:1 ratio of the previous product. Because of this change, zinc concentrations in the SCVWD water supply have dropped from 0.8 mg/l to 0.4 mg/l.

VI. PROJECT SUCCESSES AND BARRIERS TO POLLUTION PREVENTION

To measure the success of the South Bay Project, EPA interviewed several industry representatives in the South Bay Area. They discussed pollution prevention achievements and barriers that industries experienced when trying to reduce pollutant discharge. The successes of metal plating shops and a photoprocessing laboratory are described below. Several barriers common to a variety of industries are also presented.

A. SUCCESSES

The results of the interviews demonstrated the importance of conducting a waste reduction assessment, maintaining management commitment, and training employees.

Metal Plating

EPA interviewed employees at three metal plating shops. These employees indicated that they had implemented a variety of source reduction measures such as: reduction in chemical use and chemical substitution, and water conservation.

Plating chemical usage was reduced by allowing parts to drip longer over plating baths, utilizing spray rinses, using air knives over the plating baths, returning drag out to plating baths, and reducing the amount of treatment chemicals used. Also, chemical use was minimized by increasing the life span of plating baths (by optimizing the addition of process chemicals), and by installing in-tank filter systems. In a large shop, electrolytic recovery was used to reclaim silver (although reverse osmosis had been considered for closed-loop recycling of silver). The shops made chemical substitutions for plating solutions that contained cyanides, and for chlorinated cleaning solvents.

Water conservation efforts included the use of conductivity controlled flow restrictors to minimize the flow of rinse water while still maintaining product quality, and installing counter flow rinses. Also, by prolonging dripping and spraying over the plating baths, and by using aerated rinses, the shops were able to increase the efficiency of the rinsing process and therefore reduce water usage. One of the surveyed shops estimated that they were able to cut water usage by a factor of ten.

The plating shops also reduced the amount of sludge they generated. They did this by reducing chemical and water usage, and sometimes by dewatering the sludge. Although the companies consider sludge dewatering as a type of waste minimization, it does not fit into the definition used in this report (it is not source reduction or recycling). Sludge dewatering does not result in a reduction in the amount of toxic material wasted, because the mass of metals remains the same (only the overall

volume of sludge decreases). Therefore, it is a form of treatment. However, the increased concentration of valuable metals in the sludge makes it more attractive to companies who purchase sludges for metal reclamation. Therefore, though sludge dewatering is considered a type of treatment, it can lead to recycling and can help eliminate land disposal practices.

Photoprocessing Laboratory

EPA also conducted an interview at a photoprocessing laboratory. The laboratory has saved approximately one million gallons of water per year by recycling wash water. And, because they recycle the heated wash water, they now reclaim additional silver (through ion exchange) and conserve energy, because less water is heated. Silver is also reclaimed electrolytically from the fix solutions.

Source reduction efforts include training employees to closely monitor process baths to optimize chemical usage. For further silver discharge reductions, film manufacturers must reduce silver content in film and paper. According to a Kodak lab manager, Kodak has adopted several source reduction technologies in their manufacturing processes. They have reduced the amount of silver in their film and are currently researching ways to further reduce the use of silver. In a new process (RA4), less silver is put in the paper and developing agents are added to reduce the need for processing chemicals. They have also substituted EDTA for cyanide as a complexing agent in the bleaches, thereby reducing the toxicity of the waste.

B. BARRIERS

Industry representatives mentioned several barriers to reducing pollutant discharge. They noted the following restrictions.

Economics

The size of the company also limits the capital available for recovery equipment. Smaller companies may not be able to afford the equipment necessary for processes such as reverse osmosis, ion exchange, or electrolytic recovery.

Management Commitment

Industry representatives noted that a lack of commitment from management represents a significant barrier to pollution prevention. Management must be willing to commit the time and resources necessary to improve process control, prevent waste generation, and avoid production problems while developing a new program. Commitment can be encouraged through publicizing successes and through technology transfer. Management will also be more inclined to implement waste minimization measures if they

believe that it will be economically beneficial. If the true costs of waste handling (e.g. treatment, disposal, liability, insurance) are emphasized, managers will see the advantages of source reduction and recycling.

Lack of On-Site Technical Assistance

Sources of technical assistance for industries include industry trade associations, consultants, regulatory agencies, and, in some states, nonregulatory assistance programs. Industry trade associations are beginning to become more involved in helping their members reduce the generation of their waste. In California, technical information is available from the Alternative Technology Division of the Department of Toxic Substances Control, and increasingly from local agencies such as the POTWs. However, unlike other states, there is no nonregulatory technical assistance program in California that provides on-site assistance to industries that cannot afford consulting fees. Without this assistance, smaller companies may not always be able to properly identify and implement beneficial waste minimization measures.

Regulatory Barriers

Regulations, that require facilities to pay fees to receive permits for on-site treatment, discourage businesses from treating wastes and promote disposal or transportation of wastes off-site. This has happened in California with the Permit-by-Rule regulations. These regulations require industries to pay administrative costs for P.E. certification and remedial action plans. In addition, they must pay a set fee of $1000 to do treatment on-site. While this cost may be trivial to larger facilities, smaller sites are now more inclined to haul waste off-site rather than pay the permit fees.

VII. RESULTS AND RECOMMENDATIONS

The goal of the South Bay Pilot Project was to encourage the use of pollution prevention to help meet more stringent permit limits. The RWQCB revised the permits for the South Bay POTWs and required them to submit source identification and waste minimization studies. RWQCB also required the POTWs to improve their pretreatment programs and to develop and implement waste minimization programs.

Source identification studies showed significant contributions of metals from: the water supply, residential sources, commercial sources, and industrial sources. The water supply was a significant source of zinc (which is an ingredient of the corrosion inhibitor). Residential wastewater was a substantial contributor of copper and lead. And commercial dischargers were significant sources of silver (mostly from facilities with photographic processes), copper, and nickel. Finally, industries accounted for significant portions of copper, lead, nickel, and silver.

The POTWs' reports all concluded that it is cost effective to implement waste minimization programs. One POTW estimated that 50% of the cyanide used by metal finishing industries could be reduced through product substitution, and 15 to 20 percent of the industrial contribution of metals could be reduced through a variety of waste minimization measures. All three POTWs identified commercial facilities using photographic processes and auto repair shops as the most likely commercial sources to target for initial efforts.

Waste minimization measures were identified and are being implemented by the water supplier and the POTWs. One water supplier, SCVWD, has evaluated alternative corrosion inhibitors and has chosen a new one that reduces zinc concentrations by 50%.

Current efforts underway include educational activities to reduce residential contributions. At least one POTW is evaluating the option of product bans to reduce metal loadings to the plant. There are workshops and new regulatory programs for commercial and industrial dischargers (e.g. photoprocessing facilities and auto repair shops) that have not been regulated in the past. And regulated industries are being required to develop and implement waste minimization plans.

The goal of the waste minimization programs is to improve the quality of Bay water. In evaluating progress towards achieving this goal, we must ensure that pollution prevention measures are truly responsible for the reductions. Although any reduction in metals discharge to the Bay will be beneficial, measures which are not truly pollution prevention measures may achieve this reduction by transferring pollutants from the sewers to the air or landfills. It is important to be aware of this and

to ensure that other current education programs, such as hazardous waste programs and underground injection programs, encourage source reduction and not just transfer pollution to other media.

The successes of the POTW programs in implementing waste minimization programs and coordinating their efforts should be apparent. The South Bay POTWs have started to notice drops in concentrations of some of the metals reaching their plants. Palo Alto has shown measurable success in their efforts directed toward the photoprocessors in their service area and has seen a sharp drop in influent silver concentrations. In addition, silver concentrations in the clams near Palo Alto's outfall have steadily decreased. Unfortunately, it will take many years before most statistically meaningful effluent decreases will be apparent. This is true even though metal concentrations in the influent have decreased. The reason is that a much higher percentage of the influent metals end up in the sludge rather than the effluent, and the effluent concentration does not seem to be proportional to influent concentrations.

All three POTWs have discovered that many companies (including most radiator repair shops) find it most feasible to go to zero discharge rather than implement a treatment option. Successes of industries can be further evaluated by reviewing the implementation of specific industrial users' waste minimization plans.

The following recommendations are based on successes and problems encountered during the South Bay Pilot Project. These recommendations are meant to help facilitate implementation of additional pollution prevention projects:

1. **Water Quality Standards.** These standards should be more fully utilized to provide impetus for pollution prevention activities. The South Bay Pilot Project provides an excellent model to accomplish this. In fact, to facilitate further progress with POTW pollution prevention programs, the San Francisco Region of the RWQCB added a new waste minimization requirement in the December 1991 Basin Plan requiring that waste minimization programs be carried out at all POTWs with pretreatment programs. Other RWQCBs should consider this approach (see Appendix C).

2. **POTW Sponsored Programs.** POTWs are in an excellent position to implement local pollution prevention programs. Although the sensitive waters of the South Bay were the driving force of the South Bay Pilot Project, the tools described in this report can be used by any POTW. There are enough environmental and economic benefits of pollution prevention to make it attractive anywhere. References such as Reducing Industrial Wastes and Discharges, The Role of POTWs,

published by the Local Government Commission of Sacramento, California, can help POTWs organize successful programs.

3. **Pollution Prevention Hierarchy.** The hierarchy of waste management practices should be followed. Source reduction and recycling alternatives are more desirable than treatment and disposal. Activities that promote the substitution of practices that are higher up on the hierarchy should be encouraged. Also, it is important that pollution prevention efforts take a cross-media approach so that **total** waste generation is minimized.

4. **Emphasize Monetary Benefits.** There are many economic benefits associated with pollution prevention. A few reasons why companies should consider pollution prevention are: savings due to reduced chemical costs, reduced liability, and higher production efficiency. And in the South San Francisco Bay, it is often cheaper for radiator repair shops to go to zero-discharge rather than install costly new treatment systems. To help encourage industries to implement pollution prevention programs, monetary benefits should be stressed. Benefits are further described in the Local Government Commission report referenced above.

5. **Publicize Successes.** Public, private, and government organizations will be more willing to implement pollution prevention programs if they receive positive reinforcement. If the pollution prevention successes are well publicized, people will be more inclined to begin their own programs.

6. **Management Commitment.** Industry management must be committed to their companies' waste minimization programs. If a company's program is to have any success, management must support the time and resources needed to identify and implement possible pollution prevention measures. Agencies and trade associations should promote successful waste minimization measures that may convince managers that pollution prevention is not only beneficial to the environment, but can also improve community relations, increase employee safety, and save money.

7. **Mass-Based Limits.** POTWs should examine mass-based limits as a way to minimize water use and set precise discharge limits. Although mass-based limits are conducive to waste conservation, there are problems with this approach (e.g. measuring flow, establishing flows for an industry, evaluating increased allocations based on production increases).

8. **Small Business Incentives.** Some monetary incentives should be available for smaller businesses to implement waste minimization measures. Small businesses are frequently impeded from making environmentally beneficial changes,

because of the amount of capital involved. Therefore, government organizations should consider offering incentives (e.g. grants, rebates, or tax credits) to encourage companies to install environmentally useful equipment that they would otherwise not be able to afford.

9. **Non-Regulatory Assistance.** There is a need for non-regulatory assistance for POTWs and industries in every State. Currently, some states (e.g. Minnesota, Tennessee, Nevada, and North Carolina) do have some type of assistance program available. These programs are typically affiliated with universities. Also, EPA Headquarters is considering the use of the Pollution Prevention Information Clearinghouse and electronic bulletin board as a forum to share information of specific interest to POTWs. If well advertised, this information should be of significant value to POTWs that are developing waste minimization programs.

10. **Agency Coordination.** There is a need for good coordination among public and private groups. Government agencies from each level (federal, state, and local), industries, and public interest groups must have clearly defined responsibilities to ensure a successful pollution prevention program. This is particularly important because there are, as of yet, few established procedures for pollution prevention programs.

11. **Regulatory Barriers.** Any law that impedes or restricts a business from choosing the most environmentally favorable waste management option should be re-evaluated and made as flexible as possible. There is a need for laws that promote waste management decisions which consider all media (air, water, and land), and allow the best options to be implemented.

12. **Household Hazardous Wastes.** Lastly, there is a need for more detailed research, and a repository for all gathered information on consumer products. The source identification studies conducted in the South Bay Area noted that residential areas were a significant source of many pollutants of concern. If information on consumer products is readily available, communities will be able to decide which products could be substituted for those that contain high amounts of pollutants of concern.

In conclusion, the South Bay Pilot Project has affirmed that POTWs can help reduce impacts to the environment if they implement pollution prevention programs. Although the impetus for this project was regulatory, its success demonstrates that cost-effective technologies and practices are available that can reduce pollutants at the source. The benefits of source reduction include reduced treatment costs, improved operations and productivity, and better water quality.

POTWs elsewhere should promote similar pollution prevention programs in their service areas for a number of reasons. First, improved influent wastewater quality will enable POTWs to more easily comply with water quality standards, air emission requirements, and sludge disposal requirements, and to maintain compliance with these regulations despite population growth. Second, reduced wastewater flow and loading can help extend the useful lives of POTWs. Third, it is less expensive to institute pollution prevention practices than to install new treatment systems. Fourth, treatment plant workers would be exposed to less hazardous conditions. Finally, and perhaps the most compelling reason of all, POTWs would be meeting the public's demand for a cleaner environment.

VIII. LIST OF ACRONYMS

1. AET - Apparent Effects Threshold
2. BMP - Best Management Practice
3. CN - Cyanide Compound
4. CBE - Citizens for a Better Environment
5. CWA - Clean Water Act
6. DHS - California Department of Health Services
7. EDTA - Ethylenediamine Tetraacetate Dihydrate
8. ICS - Individual Control Strategy
9. mg/L - Milligram Per Liter
10. NPDES - National Pollutant Discharge Elimination System
11. PPB - Part per Billion
12. PPD - Pollution Policy Document
13. PPM - Part per Million
14. POTW - Publicly Owned Treatment Works
15. RWQCB - California Regional Water Quality Control Board
16. SCCMG - Santa Clara County Manufacturing Group
17. SCVWD - Santa Clara Valley Water District
18. SJ/SC - San Jose/Santa Clara
19. TRI - Toxic Release Inventory
20. µg/l - Microgram Per Liter

IX. APPENDICES

APPENDIX A: Water Quality Documents

Two documents were reviewed to determine which pollutants were of concern in the South Bay. They are the State Water Resources Control Board's "Pollutant Policy Document" and the Citizens for a Better Environment's "Toxic Hot Spots in San Francisco Bay." The following is a discussion of the findings of the two reports.

Pollutant Policy Document

The State Water Resources Control Board's "Pollutant Policy Document" (PPD) assesses the effects of levels of pollutants found in the Bay water, fish and shellfish on human health and aquatic biota. The levels of pollutants are related to water quality criteria and shellfish tissue standards (including EPA and FDA criteria levels, DHS maximum contaminant and residue levels, Ocean Plan objectives, and Water Quality Control plans).

Although concentrations of pollutants in the sediments are listed, they are not evaluated in the PPD for potential toxic impacts (no federal or site-specific sediment quality criteria exist at present). The ability to completely assess the effects of these pollutants on aquatic life is hampered by this lack of sediment criteria, and by a lack of data on the synergistic and additive effects of the various pollutants.

A summary of the findings of the PPD for metals of particular concern in the South Bay POTW effluents is included below:

Cadmium - Higher dissolved cadmium concentrations are found in the South Bay than elsewhere in the Bay, with a high dissolved Cd concentration of 0.25 ppb. This is well below all state and federal criteria for freshwater or marine organisms. However, Cd is highly bioaccumulated and is found in Bay mussels and oysters at 1 ppm wet weight. This is a concern for humans and others who feed on these organisms.

Chromium - The PPD does not list any data for South Bay chromium concentrations in water. It does cite one study that found local sources in the South Bay did increase Cr levels in mollusks, and another study that did not result in the same finding. Apparently, most studies show tissue levels below the level of concern for human consumption.

Copper - Dissolved copper is found in the South Bay in concentrations ranging from 2.5 to 4.0 ppb. The upper end of this range exceeds EPA's marine acute and chronic copper criteria of 2.9 ppb. Copper-enriched sediments are also present in the South Bay. Some South Bay waterfowl liver tissue has been found to contain copper in levels equaling the median international

standard. The PPD concludes that this is not considered a human health problem.

Lead - According to the PPD, dissolved lead levels in the South Bay waters are higher than in the Central Bay, but do not exceed the EPA marine chronic criteria of 5.6 ppb. High levels of lead in mussel tissue have been detected, but apparently not in the South Bay.

Mercury - Apparently, little reliable data is available on concentrations of mercury in Bay Waters. But, sediment concentrations in the South Bay have reached 7.0 ppm dry weight compared to a high of 0.49 ppm dry weight in the Central Bay. The PPD indicates that mercury levels found in the tissues of South Bay mussels have reached the 0.5 ppm wet weight standard for human consumption.

Nickel - Nickel has been found in South Bay waters at 8.0 ppb which approaches the EPA marine chronic criteria of 8.3 ppb. Higher nickel levels in mussels have been found in other areas of the Bay.

Silver - Water concentrations of silver as high as 0.31 ppb have been found in the South Bay. This exceeds the EPA fresh water chronic criteria of 0.12 ppb. Silver levels in the sediment are also higher in the Palo Alto area (up to 4.0 ppm dry weight) than in most other parts of the Bay. Levels of silver found in shellfish tissue increase toward the south of the Bay, with the highest levels found seasonally at Palo Alto approaching 200 ppm dry weight. This amount is apparently not hazardous to humans.

Zinc - Some elevated levels of zinc have been detected in South Bay waters, but no samples have shown levels greater than the EPA freshwater or marine water quality criteria. Sediments close to the Palo Alto outfall have been found to exhibit high zinc concentrations. Zinc levels in mussels have been found at moderately elevated levels in some parts of the South Bay (47.5 ppm dry weight at the Dumbarton Bridge), but are below levels for human health concern.

Toxic Hot Spots

Another document which summarizes pollutant areas of concern is Citizens for a Better Environment's (CBE) Report entitled "Toxic Hot Spots in San Francisco Bay." In this study, the same shellfish standards are used as in the PPD. Unlike the PPD, the sediment pollutant levels were evaluated for potential toxicity using the Apparent Effects Thresholds (AETs) developed as type-specific sediment quality criteria for analysis of Puget Sound sediments. The resulting "Toxic Hot Spots" include the following areas, which receive discharges from the three South Bay POTWs: Coyote Creek, Guadalupe Slough, and Palo Alto Outfall.

Coyote Creek

The CBE report specifies that Coyote Creek (which receives the outfall *from* the San Jose/Santa Clara POTW) sediments contain levels of cadmium, chromium, silver, nickel, mercury and iron which exceed the Puget Sound AETs. The report also stated that shrimp from this area have contained levels of chromium which exceed chromium standards for edible shellfish.

Guadalupe Slough

According to the CBE report, the sediments in Guadalupe Slough, which receives effluent from the Sunnyvale POTW, have contained chromium, mercury, nickel and silver in levels exceeding those found to adversely affect aquatic life in Puget Sound.

Palo Alto Outfall

Silver levels in the sediments near the Palo Alto outfall exceed levels found to have adverse affects on aquatic life. Copper and silver have bioaccumulated in clams in this area to the highest levels ever reported. The copper levels exceed the median international standard for edible shellfish.

APPENDIX B

CITY OF SUNNYVALE WATER POLLUTION CONTROL PLANT
WASTE MINIMIZATION SURVEY QUESTIONNAIRE
(REDUCTION OF HEAVY METALS AND CYANIDE IN WASTEWATER)

(GROUP A)

Facility Name: _____

Facility Representative's Name: _____ Title: _____

Facility Street Address: _____

Type of Business: _____

Number of Employees: _____ Number of Years in Business Within the City of Sunnyvale: _____

1. Volume of Wastewater discharged to the sanitary sewer: Process Flow _____ gal/day; Total Flow _____ gal/day

   Hours in Operation: _____

   Days of the Week in Operation (circle): M T W TH F SAT SUN

2. List All Processes That Generate Heavy Metals and/or Cyanide That Are Discharged in Wastewater to the Sanitary Sewer: (e.g. Copper Plating, Photographic Processing, Silkscreening, Cooling Tower, Etching, etc.)

_____

_____

_____

_____

_____

_____

_____

_____

(Attach additional sheets for processes if necessary)

3. Do you keep an updated inventory list of chemicals stored and used at this facility?

   ☐ NO ☐ YES ☐ DON'T KNOW

4. Do you have a Hazardous Materials Storage Permit or a Spill Plan approved by the City of Sunnyvale Fire Prevention Department?

   ☐ NO ☐ YES ☐ DON'T KNOW

5. In the last three years, have you substituted chemical products in any processes that may have reduced the amount of metals and/or cyanides in process wastewaters? This should apply only to process wastewaters, with or without pretreatment, that was discharged to the sanitary sewer (e.g., substituting a chromic acid bright dip with one using sulfuric acid/hydrogen peroxide).

   ☐ NO ☐ YES, Briefly describe what was substituted: _____

   _____

6. If yes to question #5 above, was the chemical product substitution done:

   ☐ To meet the City's Pretreatment Requirements, ☐ To reduce the amount of hazardous waste disposed of off-site,

   ☐ Because your chemical supplier suggested it, ☐ Other, Briefly describe: _____

7. In the last three years, has your discharge of heavy metals and/or cyanide to the sanitary sewer changed?

   ☐ Decreased ☐ Increased ☐ No change ☐ Don't Know

   If the discharge decreased, was this due to one or more of the following: (check all that apply)

   ☐ A reduction in production, ☐ Implementation of waste minimization measures,

   ☐ Discontinuance or replacement of the process, ☐ To meet the City's Pretreatment Requirements,

   ☐ Other (please specify): _____

   If the discharge increased, was this due to:

   ☐ An increase in production, ☐ Other (please specify): _____

[NOTE: PLEASE FEEL FREE TO PROVIDE ADDITIONAL COMMENTS.] [EQA, Inc., Revised 8/4/89]

8. In the last three years, have you reduced or recycled any wastes or wastewaters resulting in less metals and/or cyanides in in wastewater discharges? (e.g. plating metal wastes in rinse water were reduced by decreasing drag-out time or by installing drag-out time or by installing drain boards; or wastes were recycled by regenerating spent cupric chloride etchant with a chlorine oxidizer; or using the first-stage rinse water as makeup for the process bath; or by installing a metal recovery unit

☐ NO. If no, please go on to question #9 below. ☐ DON'T KNOW, go on to question #9 below.

☐ YES. If yes, please check all of the following that apply to your facility.

A. We have undertaken the following measures in the last three years:

☐ Separate process wastestreams _____
☐ Use non-chelate process chemicals _____
☐ Use recyclable materials _____
☐ Spray rinse workpiece before tank rinse _____
☐ Static, multi-stage dip rinse tanks _____
☐ Countercurrent multi-stage rinse _____
☐ Move workpiece automatically in rinse tank _____
☐ Aerate rinse water _____
☐ Have drain boards between bath and rinse tanks _____
☐ Minimize process bath chemical concentration _____
☐ Maximize process bath temperature _____
☐ Use ion exchange to recover metals from rinse water _____
☐ Use electrolysis to recover metals from rinse water _____
☐ Periodic staff training on material and waste handling, process changes, and good housekeeping practices _____
☐ Other: _____

B. Please indicate with an asterisk (*) in #9.A. above which measures also resulted in a reduction in water usage, and provide an estimate, if known, of the percent (%) of total process water usage that was reduced
For example: Static, multi-stage dip rinse * 10% reduction

C. The following Material and/or Waste Recycling efforts have been used in the last three years:

☐ Spent etchant regeneration (decant/filter)
☐ Spent photoresist stripper regeneration
☐ Dragout water is used as bath makeup
☐ Evaporation is used to recycle process baths
☐ Recycling treated wastewater
☐ Use reverse osmosis to recover bath solution
☐ Use spent acid or alkaline cleaners as neutralizing chemicals in waste treatment
☐ Periodic staff training on recycling procedures
☐ Other: _____

D. If Wastewater Treatment Measures (or Pretreatment System) have been undertaken over the last three years to reduce discharges of heavy metals and/or cyanides to the sanitary sewer, briefly describe the measures:

_____

_____

9. Has your investment in equipment or materials for metals and cyanide reduction, recycling, or waste treatment measures been recovered in cost savings for waste disposal or material purchases?

☐ All Costs Recovered ☐ Some Costs Recovered ☐ No Costs Recovered ☐ DON'T KNOW

Comments: _____

10. If the City's local discharge standards for metals and cyanides were reduced to allow discharges no greater than 0.01 ppm of copper, 0.0023 ppm of lead, 0.0036 ppm of nickel, 0.0012 ppm of silver, 0.029 ppm of zinc, and 0.0125 ppm of cyanide what would you have to do in order to meet those standards? (Note: These values are based upon formal requests made by Regional Board staff, i.e. 50% of Basin Plan Table IV-1 discharge standards.)

_____

_____

_____

_____

(continue on reverse side, if necessary) [illegible], Inc., Revised 8/4/[illegible]

11. What do you estimate the annual cost would be to do the things in question #10 in order to meet the hypothetical discharge standards? (Amortize the capital costs over a ten year period.)

☐ < $1,000 ☐ $50,001 - $250,000 ☐ > $1,000,000
☐ $1,001 - $10,000 ☐ $251,001 - $500,000 ☐ Actual Estimate, If Available: _____
☐ $10,001 - $50,000 ☐ $500,001 - $1,000,000 ☐ DON'T KNOW

12. If the City's local discharge standards for metals and cyanide were reduced to require discharges no greater than the Regional Board's Basin Plan Table IV-1 limits (that is, 0.02 ppm of copper, 0.0056 ppm of lead, 0.0071 ppm of nickel, 0.0023 ppm of silver, 0.058 ppm of zinc, and 0.025 ppm of cyanide), what should you have to do in order to meet those standards? (Note: These values are what the City may have to meet in its Water Pollution Control Plant discharge.)

_____

_____

_____

_____

_____

. What do you estimate the annual cost would be to do the things in question #12 in order to meet the hypothetical discharge standards? (Amortize the capital costs over a ten year period.)

☐ < $1,000 ☐ $50,001 - $250,000 ☐ > $1,000,000
☐ $1,001 - $10,000 ☐ $251,001 - $500,000 ☐ Actual Estimate, If Available: _____
☐ $10,001 - $50,000 ☐ $500,001 - $1,000,000 ☐ DON'T KNOW

. Has your company performed a waste audit for wastewater or that included wastewater evaluations?

☐ NO. If no, go on to question #16. ☐ DON'T KNOW, go on to question #16.
☐ YES. If yes, was the audit done: ☐ By facility staff
☐ By a consultant
☐ More than once
☐ Other: _____

15. If you had an audit performed, did the results show that: (please check all that apply)

☐ Cost saving measures were identified.
☐ No cost saving measures were identified.
☐ No changes were made.
☐ Changes were made. Please describe: _____

_____

Comments: _____

16. Are you currently using the California Waste Exchange for wastewater treatment residues?

☐ NO ☐ YES ☐ DON'T KNOW

17. Would you or your staff be willing to discuss current or possible waste minimization practices and their associated costs with Sunnyvale's consultant?

☐ NO ☐ YES. If yes, please give Contact: _____

Title: _____

Phone: _____

[NOTE: PLEASE FEEL FREE TO PROVIDE ANY ADDITIONAL COMMENTS.]

[EOA, Inc., Revised 8/4/89]

CITY OF SUNNYVALE WATER POLLUTION CONTROL PLANT
WASTE MINIMIZATION SURVEY QUESTIONNAIRE
(REDUCTION OF HEAVY METALS AND CYANIDE IN WASTEWATER) (GROUP B)

Facility Name: _____

acility Representative's Name: _____ Title: _____

acility Street Address: _____

ype of Business: _____

tandard Industrial Code (SIC), if known: _____

Number of Employees: _____ Number of Years in Business Within the City of Sunnyvale: _____

1. Average amount of water purchased from City of Sunnyvale: ☐ Per water bill _____ ccf/month

☐ Don't Know, bill is paid by building owner

2. Estimated amount of water discharged into the sanitary sewer: _____ (50%, 90%, or other of amount purchased, or Don't Know

3. List All Processes That Generate Heavy Metals and/or Cyanide That Are Discharged in Wastewater to the Sanitary Sewer:
(e.g. Machining, Milling-contact cooling water, Boiler Blowdown, Radiator Repair, Gas Station, Auto Maintenance, Car/Truck Wash, Auto Body Repair/Painting, Laboratory-rinse water, Photographic Processing, Restaurant-washing, Restaurant-grease trap)

_____

_____

_____

_____

_____

_____

_____

(Attach additional sheets for processes if necessary)

Do you keep an updated inventory list of chemicals stored and used at this facility?

☐ NO ☐ YES ☐ DON'T KNOW

List all heavy metals or cyanides stored or used at this business. If you have an inventory list, please attach a copy.

_____

_____

_____

6. Do you know what waste minimization is?

☐ Never heard of it

☐ Have heard of it

☐ Have used or are using waste minimization practices

In the last three years, have you substituted chemical products in any processes that may have reduced the amount of metals or cyanide in process wastewaters that reached the sanitary sewer?

☐ NO

☐ YES; Briefly describe what was substituted: _____

☐ DON'T KNOW

If yes to question #7 above, was the chemical product substitution done:

☐ To meet the City's Pretreatment Requirements, ☐ To reduce the amount of hazardous waste disposed of off-site,

☐ Because your chemical supplier suggested it, ☐ Other, Briefly describe: _____

[NOTE: PLEASE FEEL FREE TO PROVIDE ADDITIONAL COMMENTS ON ANY OF THESE QUESTIONS.]

[EOA, Inc., Revised 8/4/[redacted]]

9. In the last three years, have you reduced your heavy metal or cyanide usage?

☐ NO

☐ YES. Briefly describe: _____

☐ DON'T KNOW

D. If yes to question #8 on the previous page, was the reduction in chemical usage done:

☐ To meet the City's Pretreatment Requirements, ☐ To reduce the amount of hazardous waste disposed off-site,

☐ Because the process was discontinued, ☐ Because the process was replaced; replaced by _____

☐ Other: _____

Y. If the City's local discharge standards for various metals and cyanides were reduced to the Regional Board's Basin Plan Table IV-1 limits (that is, no discharge greater than 0.02 ppm of copper, 0.0056 ppm of lead, 0.0071 ppm of nickel, 0.0023 ppm of silver, 0.058 ppm of zinc, and 0.025 ppm of cyanide), what would you have to do in order to meet those standards?

_____

_____

_____

P. What do you estimate the annual cost would be to do the things in question #10 above in order to meet the hypothethically more stringent standards?

☐ < $500 ☐ $10,001 - $50,000 ☐ $501,001 - $1,000,000 ☐ DON'T KNOW

☐ $501 - $1,000 ☐ $50,001 - $250,000 ☐ > $1,000,000

☐ $1,001 - $10,000 ☐ $250,001 - $500,000 ☐ Actual estimate, if known: _____

J. Has your company performed a waste audit for wastewater or that included a wastewater evaluation?

☐ NO. If no, go on to question #14. ☐ DON'T KNOW, go on to question #14.

☐ YES. If yes, was the audit done: ☐ By facility staff

☐ By a consultant

☐ More than once

☐ Other: _____

If you had an audit performed, did the results show that: (please check all that apply)

☐ Cost saving measures were identified.

☐ No cost saving measures were identified.

☐ No changes were made.

☐ Changes were made. Please describe: _____

Comments: _____

15. Are you currently using the California Waste Exchange for wastewater treatment residues?

☐ NO ☐ YES ☐ DON'T KNOW

B. Would you or your staff be willing to discuss current or possible waste minimization practices and their associated costs with Sunnyvale's consultant?

☐ NO ☐ YES. If yes, please give Contact: _____

Title: _____

Phone: _____

[NOTE: PLEASE FEEL FREE TO PROVIDE ANY ADDITIONAL COMMENTS.]

[EOA, Inc., Revised 8/4/89]

APPENDIX C

Waste Minimization Program
of the
California Regional Water Quality Control Board
San Francisco Bay Region

(From Basin Plan Dated 1/17/92)

WASTE MINIMIZATION

POLICY STATEMENT

For a Mass Emissions Strategy (MES), as called for in the State Water Resources Control Board's Pollutant Policy Document for the San Francisco Bay-Delta, a necessary component is a pretreatment and waste minimization program for point source discharges. The MES requires the Regional Board to develop limitations on the mass emissions of toxic pollutants to reduce the overall quantity of toxic emissions into the Region's watersheds. The Regional Board supports reducing toxic discharges through more efficient use, conservation, recycling, reuse, and waste reduction. The waste minimization program is a pollution prevention and source reduction measure designed to eliminate the discharge into water of toxic wastes from manufacturing processes, commercial facilities, and the community at large. Waste minimization will be increasingly demanded as alternative uses of wastewater such as reclamation are developed. Waste minimization techniques will allow for the protection of surface and ground water and include material recycling and reuse, water and material conservation, material substitution, product substitution, and process modifications. Waste minimizations applied here is focused specifically on reducing the quantity of toxic pollutants released to the waters of the basin by major municipal and industrial dischargers. It emphasizes source reduction but also includes improved water and petroleum product use, wastewater treatment and expanded pretreatment programs.

The San Francisco Bay Region's Waste Minimization Program will be a two-tiered program consisting of a targeted and general program. The Regional Board's source control program focuses on indirect discharges that are regulated through Publicly Owned Treatment Works (POTWs) and major industrial dischargers that discharge directly to surface water. These programs will take multimedia concerns into account by coordinating with other relevant regulatory programs related to air and land disposal.

TARGETED WASTE MINIMIZATION PROGRAM

The targeted waste minimization program will first identify pollutants and areas of concern in the Bay by identifying where numerical and narrative water quality objectives are exceeded and beneficial uses are impaired or threatened based on analysis of available data and data from regional and local monitoring program monitoring programs conducted by the Regional Board and other entities. Second, in those areas of the watershed or estuary system identified as having exceedances or impairments, point source dischargers will be identified and required to participate in a targeted waste minimization program. Through amendments to their NPDES permits, this program will be directed toward reducing the specific pollutants of concern. This step may necessitate further monitoring of water, sediment and biota by POTWs and direct dischargers at and near their discharge locations in order to determine the effects of particular discharges on the waters of the basin. Impacting point sources will be required, through amendments to their NPDES permits, to develop and implement a targeted waste minimization program that will reduced the identified pollutants of concern.

The targeted program will include all elements of the general program and may require other options such as performance-based effluent concnetration limits and mass limitations for the pollutants of concern, in order to attain water quality objectives in the receiving water body. Phased implementation of the program will be carried out in coordination with the development and implementation of other tasks of the Mass Emissions Strategy required in the Pollutant Policy Document.

POTW TARGETED PROGRAM

The POTW source reduction/waste minimization program will include

1) Determination of contributions of target metal and organic pollutants discharged to the POTW from (a) regulated industrial users, (b) commercial facilities, (c) water supplies, and (d) domestic sewage.

2) Enhancement of existing pretreatment programs through improved auditing, inspection, monitoring, enforcement, and information management. This would include a program of waste minimization audits for selected groups of significant industrial users (IU). Increased inspection and monitoring, of regulated IUs, increased enforcement for IU violation, improved process flow measurements, and improved information collection and management are other components that may be required in the target program.

3) Identification of previously unregulated industrial users and commercial facilities that discharge the pollutants of concern to the POTW. The Regional Board will assist in prioritizing currently unregulated categories of industry and development of technical assistance programs for local industries.

4) Public education and outreach including household hazardous waste collection programs, information on toxics disposal to POTW customers, and presenta

tions to industrial, commercial and residential dischargers.

5) Development of monitoring or other evaluation measures to gauge and document their effectiveness of the program.

DIRECT INDUSTRIAL DISCHARGER TARGETED PROGRAM

Similar to POTWs, priority direct dischargers will be identified from existing monitoring information on water quality of surface waterbodies in the Region. Direct dischargers may be required to conduct further monitoring. Those identified as impacting water quality will be required to carry out a waste minimization program. The program should reduce or eliminate the pollutants of concern to meet the water quality objectives of the Basin Plan. Programs will include all applicable elements of POTW programs. The program will also include investigation of upstream sources of pollutants of concern.

GENERAL WASTE MINIMIZATION PROGRAM

All major dischargers not required to implement targeted programs will be mandated to conduct a general program within their jurisdiction. In the first phase of the general program, all major industrial dischargers and POTWs not included in the targeted program, having approved pretreatment programs, and with an average dry weather discharge greater than 10 MGD will be required to prepare and submit a plan for a general waste minimization/source reduction program and for Regional Board approval. The plans are due on July 1, 1992. An interim progress report will be due from all POTWs on January 1, 1993 and July 1, 1993. Progress reports should have a detailed description of the program, including staffing, funding, and training for instituting the program.

POTW GENERAL PROGRAM

For POTWs included in the first phase, the general program will include identification of two industrial categories for expansion of regulatory measures. In the second phase, all other POTWs with pretreatment programs will be required to develop source reduction/waste minimization programs. The plan for the program will be due to the Regional Board on January 1, 1993, with progress reports on the program due by July 1, 1993 and December 31, 1993.

The general program for a POTW should contain all applicable elements from the targeted program (elements 2-5); the general program is designed to be more flexible and allow the individual POTWs to develop and direct their waste minimization efforts according to local needs. General programs should include the following elements:

1) Pretreatment program review for identification of opportunities for expansion and enhancement. This includes opportunities for incorporating waste reduction goals into inspections, enforcement, and permitting.

2) Waste minimization audits for industrial users on a priority determined by the POTW. Criteria for prioritization should include discharge of pollutants of concern, volume of flow, IU compliance, and opportunities for waste reduction.

3) Public outreach including education programs, advertisement in local media, mailers, and household hazardous waste programs.

4) Program expansion by developing a plan for increased regulation for at least two additional categories of sources that contribute pollutants of concern to the POTW influent. Examples of additional categories are waste oil disposal, household products, car and truck washing operations, medical and dental facilities, paint and related product disposal, dry cleaning facilities, and photofinishing laboratories.

5) Coordination with other programs involving recycling, reuse, and source reduction of toxic chemicals. This includes programs involving other media, air toxic, hazardous waste, and land disposal. This might include developing programs for joint inspections and sharing in enforcement activities.

6) A monitoring program specifically designed to measure the effectiveness of waste minimization activities in reducing toxic loads to the receiving watershed, air, or land via sludge disposal.

DIRECT INDUSTRIAL DISCHARGER GENERAL PROGRAM

The direct industrial discharger waste minimization program must ensure compliance with The Hazardous Waste Source and Management Review Act of 1989, SB14 (CRC Title 22, Ch 30, art 6.1) waste minimization program requirements as well as compliance with their NPDES permit effluent limitations.

The direct discharger source reduction/waste minimization program plans must include detailed descriptions of tasks and time schedules to investigate and implement various elements of waste minimization techniques. These techniques should include toxic reduction evaluations, material substitution, process modifications, water conservation, onsite and offsite recycling, and good housekeeping practices.