VIII. Discussion of Results.

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A. Plant Facility Operation Report

POINT LOMA 2001 ANNUAL FACILITY REPORT
Prepared under the direction of Plant Superintendent Joe A. Cordova.

The facility reports address Process Control concerns and considerations, and summarize Plant Operations, Engineering, Maintenance, and the Gas Utilization Facility activities.

PROCESS CONTROL: FACTORS IMPACTING PLANT PERFORMANCE 2001

The following information is being reported in an effort to identify some of the factors, operational and otherwise, that may have impacted plant performance during 2001. Much of the information contained herein is based on assumptions regarding plant performance for this period. The main point of this effort is to continue identifying possible factors influencing plant performance which in turn will help to more effectively operate this facility. The information is presented in chronological order when possible. **Please note that the numerical values used here are largely based on analysis performed by Plant staff at the Process Laboratory and have not always been validated for official reporting purposes.**

Areas that will be covered include: rainfall, sludge blanket levels in the sedimentation basins and raw sludge pumping volumes, coagulation chemical application, influent temperature and seasonal impacts, and plant performance related to unknown variables.

RAINFALL
During the period between January 1 and March 31, 2001, the number and severity of rain storms were normal to slightly above normal and this was reflected in increased plant influent flow rates.

Rainfall for the period from January 1 through March 31.
- Total rainfall for 1999 = 3.35 inches
- Total rainfall for 2000 = 8.76 inches
- Total rainfall for 2001 = 6.39 inches

Average daily flow for the period from January 1 through March 31.
- ADF 1999 = 178.4 MGD
- ADF 2000 = 176.8 MGD
- ADF 2001 = 183.0 MGD

The increase in the average daily flow can be attributed to the frequency of rainy days during this reporting period. This wet season caused no plant upsets.

SLUDGE BLANKET LEVELS AND RAW SLUDGE PUMPING VOLUMES
In most circumstances it is assumed that maintaining lower sludge blanket levels in sedimentation basins and increased raw sludge pumping will produce a plant effluent with a lower total suspended solids (TSS) concentration. Review of data, for daily average sludge blanket levels and daily average total raw sludge pumped, shows that the averages for the two years were so close as to prevent drawing any conclusions as to the validity of the above assumption.

The average effluent TSS concentration was calculated for 2000 and 2001. This average was then compared to the average sludge blanket level, for all basins in operation, and the average daily raw sludge pumping volume for this same period. The information below reflects the data gathered for this comparison.

- Average Effluent TSS Concentration (2000) = 37.3 mg/L
- Average Daily Sludge Blanket Level (2000) = 149.36 inches
- Average Daily Raw Sludge Pumping Volume (2000) = 1.01 MGD

- Average Effluent TSS Concentration (2001) = 42.3 mg/L

- Average Daily Sludge Blanket Level (2001) = 151.3 inches
- Average Daily Raw Sludge Pumping Volume (2001) = 1.04 MGD

COAGULATION CHEMICAL APPLICATION

Data for ferric chloride and anionic polymer doses was reviewed to determine the impact that rates of product application have on plant performance. The average daily dose for each chemical was calculated for the same time period as above and compared to the TSS and BOD concentrations and removal rates.

- Average Daily Dose, Ferric Chloride (2000) = 24.7 mg/L
- Average Daily Dose, Anionic Polymer (2000) = 0.16 mg/L
- Average Daily Dose, Ferric Chloride (2001) = 24.2 mg/L
- Average Daily Dose, Anionic Polymer (2001) = 0.15 mg/L

- Average Effluent TSS Concentration (2000) = 37.3 mg/L
- Average Effluent TSS Removal Rate (2000) = 86.5%
- Average Effluent TSS Concentration (2001) = 42.3 mg/L
- Average Effluent TSS Removal Rate (2001) = 84.6%

- Average Effluent BOD Concentration (2000) = 93.5 mg/L
- Average Effluent BOD Removal Rate (2000) = 60.1%
- Average Effluent BOD Concentration (2001) = 93.6 mg/L
- Average Effluent BOD Removal Rate (2001) = 63.1%

The improvements shown in the year 2001, for BOD, are due to a change in the polymer and its vendor, mainly, as well as a minimization of construction-related impacts and diligent efforts on the part of the PLWWTP staff to ensure all permit requirements are met on a daily basis. The slight decrease in TSS removal is believed to be a result of the polymer change - which was very beneficial to BOD removal but slightly detrimental to TSS removal.

INFLUENT TEMPERATURE AND SEASONAL IMPACTS

Influent temperature variations at the Point Loma Facility are usually very slight throughout the year. The temperature of the influent flow, for 2001, ranged from 65.5 to 82.6 degrees Fahrenheit. Typically the influent temperature changes are very subtle as each season progresses. The most pronounced changes in this parameter occur during the winter, after the rainy season begins and during the summer, after periods of sustained warm weather. Temperature changes, related to rain storms, were normal in 2001 as it was basically a normal winter. The effect of these temperature changes is difficult to judge due to the number of variables affected by the rainfall. The average daily influent temperature was calculated for the same period of time seen previously in this report, and the results are recorded below.

- Average Daily Influent Temperature (2000) = 76.9 degrees Fahrenheit
- Average Daily Influent Temperature (2001) = 75.1 degrees Fahrenheit

PLANT PERFORMANCE RELATED TO UNKNOWN VARIABLES

BOD removal was quite consistently high, so the facility staff was more concerned with maintaining the proper TSS removal rate, though there were only a few short periods where it was a real concern. The new polymer had an impact, in addition to construction activities, though the level of construction activity has decreased considerably. In addition, there exists a fine balance now between three facilities, and the startup or cessation of certain activities at either of the upstream or downstream facilities can have a major impact on the PLWWTP.

Turbidity testing, at the sedimentation basin effluents, continued in 2001 on a regular basis. This has continued to help identify basins where mechanical or other problems are occurring. Analysis of 24 hour discrete effluent samples, for TSS concentration, has continued on an as-needed basis and is providing data on diurnal variations in plant performance. Data from this analytical work has been and will be used to help develop more effective chemical dosing strategies in the plant. Plant Operations Staff has continued to provide weekly analysis of the plant influent for sulfide content. This information has been very beneficial in determining the effectiveness of upstream ferric chloride application and its associated impact on the sulfide content of the influent waste stream.

CONCLUSIONS

The year of 2001 was a good one, with excellent removal rates. Various previously discussed factors contributed to this result.

The focus of the staff, at the Point Loma Facility, for 2002, will be to continue maintaining as high a quality effluent as is possible while incurring the lowest possible chemical costs. During the first quarter of 2002, particular attention will be given to the digester chemistry, and appropriate actions will be taken in order to prevent any digester upsets. In addition, the upgrades to the polymer and ferric chloride chemical delivery systems should be completed and testing and fine-tuning of these systems should occur - possibly having a slightly negative effect on the removal results until the fine-tuning is completed. The future effect of these upgrades should be more efficient use of chemicals so as to sustain excellent treatment and plant performance while saving money.

OPERATIONS REPORT 2001

Contract related activities

- C 12/01 - Contractor identified 2 pipe supports as the problem causing Digester 7 mixing pump vibration. Plant welders will stiffen these 2 supports.
- C 11/01 - Consultant conducted vibration tests on Dig. 7 large mixing pumps.
- C 11/01 - Completed satisfactory personnel training for the Polymer facility.
- C 10/01 - Pump Energy Recovery Project (PERP) 66 inch upstream Isolation Knife Gate leak repaired.
- • 09/01 - Basins 9 & 10 turned over to Contractor-11 & 12 back on line.
- C 08/01 - Leak found in the PERP 66 inch upstream Isolation Knife Gate.
- C 08/01 - Raw sludge screens where placed into service as part of the new digester feed and withdrawal operations strategy.
- • 06/01 - Started power production at the rehabilitated Hydroelectric Power Plant (PERP).
- • 06/01 - New Central Boiler Facility (CBF) boilers back on line.
- • 05/01 - Contractor began demolition for digester C1/C2 rehabilition.
- • 02/01 - Contractor began demolition on CBF/Gallery piping.
- • 01/01 - CBF/Gallery piping issue-back on old boilers.
- • 01/01 - Both Gas Utilization Facility (GUF) engines on line.

01/01 - 12/01 - Contractor performed various tasks on the sedimentation basins and Odor Removal Systems i.e., sandblasting and coating of the decks of the former and concrete restoration in the latter.

Operations activities

- C 12/01 - Westinghouse reprogrammed DPU #20-program upgrade.
- • 12/01 - South Effluent Outfall Channel (SEOC) taken out of service for contractor work on effluent channel; concrete restoration.
- C 11/01 - West influent channel stop log removed to allow divers to assess grit buildup after completion of east and west influent tunnel flushing procedure.
- C 10/01 - North Effluent Outfall Channel (NEOC) secured for penstock inspection. Maintenance repaired leak in the hydroelectric facility's upstream knife gate valve.
- C 10/01 - Communications problems between the valves and valve master station resulted in loss of Distributed Control System (DCS) automatic/manual control. All valves on the sludge pipeline were placed in local/manual/open.
- C 09/01 - Raw sludge screen rotation initiated to prevent unit seizing associated with drying of the screen back pressure plug.
- C 09/01 - Heightened security measures implemented at Fort Rosecrans as a result of the terrorist attacks in New York and Washington, D.C.
- C 08/01 - Operations increased digester detention time to meet Class "B" standards.
- C 07/01 - Suction side of pipeline ruptured when testing triggered an emergency shutdown. Maintenance repaired the rupture; system back in service in 6 hours.
- C 06/01 - PERP operating schedule modified to prevent hydraulic problems during low flow; secured from 0100 to 0900 hours.
- C 06/01 - CBF hot water system placed on line, old boilers taken out of service.
- C 04/01 - New version of CBF and digester feed and sludge withdrawal strategies loaded onto the DCS.
- • 03/01 - New polymer grinders placed in service.

- 03/01 - Began feeding sodium hypochlorite at Odor Towers 2, 3, 4, 5, 7 & 8.
- 03/01 - Contractor installed a rupture diaphragm isolation valve on the sludge pipeline at the south end of the pipe gallery.
- 02/01 - Converted chemical delivery piping.
- 01/01 - Installed ferric chloride delivery piping in the S1 and S2 grit system influent channels.

01/01 - 12/01 - Ongoing control/communication problems with the sludge pipeline to the Metropolitan Biosolids Center (MBC).

ENGINEERING REPORT 2001

The following major projects were in construction at the Point Loma Wastewater facility during 2001:

DIGESTER 7 & 8

This project provided for two new digesters, control room and three new digester gas flares. In addition, a large earth berm was constructed at the south end of the plant to mitigate visual impacts to Cabrillo National Monument. The project was complete in September 2000, but plant staff was unable to put the digesters in service due to other project being delayed. Digester 7 was put in operation in 2001 and digester 8 will be brought on line in the first half of 2002. Construction cost was over $22 million.

CENTRAL BOILER FACILITY AND GALLERY PIPING

The project provides a central boiler facility to heat sludge in the digesters and upgrades the piping in the main pipe gallery. The facility is complete but the distribution piping is not complete. There was a major problem with some of the distribution pipe coating which caused over a nine month delay in this project. The pipe had to be dug up and replaced. This project will be in operation in early 2002. Construction cost is over $9 million.

HEADWORKS/ODOR/SCREENINGS IMPROVEMENT PROJECT

This project provides for new influent screens, screenings compaction, improved odor control systems and the facilities to switch from hydrogen peroxide to sodium hypochlorite for odor control. Construction was complete in 2001. Construction cost was over $9 million.

STORM DRAIN LOW FLOW DIVERSION STRUCTURES

This project provides the structures necessary to capture low flow and spill flow that enters the plant's storm drain system before they are discharged into the ocean. Construction cost is over $700,000. Construction was completed in 2001.

MAINTENANCE BUILDING EXPANSION

This project adds additional office space, showers and library area for the maintenance personnel. Plant staff has moved into the expansion and final construction was completed in 2001. Construction cost is over $1 million.

ENGINEERING BUILDING

The project refurbishes the old Administration/Lab building and provides office, meeting and project documentation storage areas for both plant engineering and project managers, construction managers from MWWD downtown. This project began in mid year and should be complete by June 2002. The estimated cost of this project is $600,000.

DIGESTER C1/C2 REHABILITATION

This project completely rehabilitates these two digesters. The roofs, digester mixing and heating systems

are being replaced with current designs, wall and coating repairs are also being done. This project should be complete in 2002 at an estimated cost of $9 million dollars.

CONCRETE RESTORATION ON SEDIMENTATION BASIN 9-12

This project repairs the concrete and lining in these four basins and the adjacent effluent channel. This action prolongs the life and reliability of these structures. The work began in 2001 and should be complete by June 2002. The estimated cost for this work is $800,000.

CHEMICAL FEED SYSTEMS UPGRADE

This projects upgrade the storage and delivery of our process chemicals, ferric chloride and polymer, and provides for more reliability and control. The project began January 2000 and will be complete in 2002. The cost for this work is $2.6 million

MAINTENANCE REPORT 2001

General:

18,097 Total work orders completed within the year.

- 15,791 Preventive Maintenance (Insp. Lub. Rep.) work orders. (87.3%)
- 50 Proactive work orders other than PM. (.3%)
- 314 Emergency-Corrective Unplanned work orders. (1.7%)
- 346 Routine Repair-Corrective work orders. (1.9%)
- 22 Safety-Corrective work orders. (.1%)
- 5 Miscellaneous.
- 1,569 Central Support Facility work orders. (8.7%)
  - 786 Preventive Maintenance (Insp. Rep.) work orders. (50.1%)
  - 197 Proactive work orders other than PM. (12.6%)
  - 62 Emergency-Corrective Unplanned work orders. (3.9%)
  - 524 Repair-Corrective work orders. (33.4%)

Highlights:

- PM program for facility continues to be highly successful.
- PM program for Odor Towers continues to be highly successful.
- Completed Annual Certification program for plant influent flume flow meters.
- Upgraded the sump pumps at the hydroelectric generator building.
- Replaced the float switches on sump pumps by scum concentrator and GUF basement.
- Rerouted the (engine radiator) overflow drain at GUF, from Hydro road to building basement sump pump, to minimize spills into receiving waters at the SEOC shore line area.
- Replaced burnt wires and repaired broken conduit for street lights at second street.
- Replaced motor on sludge recirculating pump on digester #8.

Fabrication/Rebuilds

- Rebuilt Odor Tower blowers 2, 3, and 4.
- Influent channel blower rebuilt by contractor.
- Rebuilt or made corrective repairs on the following sedimentation tanks; 1, 8, 9, 10, 11, and 12.

Electrical/Electronic

- Installed emergency shut off to gas mixing compressors 1 and 2 to digester # 8.
- Installed disconnect handles (with lock loop to isolate the units individually and install lock for lock-out / tag-out safety program) on control panel for digester #8 gas mixing compressors.
- Installed float switches in the digester dome water seal J-Tube to prevent gas from escaping into the atmosphere on digesters N-1, 7 and 8.

- Wired alarm circuits on Odor Tower 1A & 1B for caustic recirculating pumps to provide notification to Operations if equipment fails.
- Rewired safety control for influent screening screw conveyor to prevent one from running when the other loses power.
- Replaced main feed breaker at PC7 to MCC3&4.
- Replaced motor and modified the motor base for #1 channel aeration blower.
- Upgraded the fuse block from 30 to 60 amps for scum concentrator heaters. System amperage requirement resulted in the need to upgrade circuit.
- Rewired scrubber and carbon blower motor for Odor Tower #5 as part of the rehabilitation program.
- Replaced discharge valves on sludge disposal pumps #1, 2, & 3; reconnected the DCS controlled actuators.
- Replaced Veri-flame and UV scanner for Waste Gas Burner #4 as part of maintenance upgrade.
- Calibrated five flow meters for the Ferric Chloride Delivery system. Contractor needed verification of flow.

Plant Maintenance and Equipment Repair

- Rebuilt Influent climber screen #5 and replaced reciprocating rake.
- Replaced shaftless conveyor screw liners at the Influent screening conveyor system.
- Repaired leak at the 66" upstream knife gate valve to the NEOC Hydroelectric Generator.
- Made corrective repairs and performed routine maintenance on sludge disposal pumps.
- Unclogged snail and tea cup grit removal system.
- Central Support Facility personnel conducting vibration analysis on plant equipment; program is working.

GAS UTILIZATION FACILITY REPORT 2001

Emergency generator is on line parallel with the Utility due to ISO stage 3 alert condition.

Major work at the GUF

1) Conducted scheduled planned maintenance.
2) Repaired cooling tower; system overheating;- replaced pump.
3) The 124 volt DC system failed due to battery charger malfunction.
4) Accelerated effluent heat exchanger maintenance due to frequent clog.
5) Replaced turbo chargers.
6) Caterpillar representatives re-mapped the engine personality control modules.
7) Replaced cylinder head #6 on unit 1 due high valve recission.
8) Replaced cylinder head #1, 6, 11, & 12 on unit 2 due burned exhaust valve.
9) Replaced shorted current transformer on #1 generator.
10) Exhaust heat recovery system was placed in service while the jacket water and lube oil heat recovery system was still not operational; temperature controller installation delays by the contractor.

Hawthorne Power System representatives repaired the following (Warranty repair)
1) Defective circuit breaker for unit 2.

Central Boiler Facility

Vendor started re-commissioning of boilers. Testing of DCS controls; system placed on line.

Gas compressors

Compressor #4 was reinstalled by vendor after warranty repair.
Gas chiller was installed and placed in service.
Compressor #1 oiler defective; repaired.
Relocated discharge temperature sensor away from the common header.
The oil and water separator system malfunctioned resulting in the passage of a considerable amount of oily water in the dollinger filters to the engine. Furthermore, this caused malfunction of spark plugs and fuel check valves.
Isolated drain lines to correct the back pressure problem and reinstalled a separate automatic drain system.

PERP

Completed major overhaul work on PERP. Tested and was placed on line. Facility operated on a daily basis from 0900 to 0100 hours.

, Total power produced in KWH
- No.1 engine--------17,024,430
- No.2 engine--------17,699,847
- Perp (hydro)--------3,727,761

38,452,038

, Total power used in KWH
- Point Loma---------17,169,620

, Total power sold in KWH
- SDG\E----------21,554,657

, Total digester gas used:
- No.1 engine--------314,428,144 cubic feet
- No.2 engine--------321,289,404 cubic feet

635,717,548 cubic feet

, Total natural gas used:
- No. 1 engine-------2162 cubic feet
- No. 2 engine-------2024 cubic feet

4186 cubic feet

, Total work orders completed at the GUF: 3253

B. Correlation of Results to Plant Conditions.

Flow

Following is a table with past flows back to 1972. New Parshall flumes were installed and calibrated in 1985 and the bugs were worked out over the next year, this accounts for the major jump over the three year period from 1984 to 1986. From 1986 on multiple meters on the flumes have been calibrated yearly and fairly closely match Venturi meter data at Pump Station II (see tables in the Plant Operations section).

YEAR	FLOW (MGD)	YEAR	FLOW (MGD)
1972	95	1987	183
1973	100	1988	186
1974	104	1989	191
1975	107	1990	186
1976	118	1991	173
1977	115	1992	179
1978	127	1993	187
1979	128	1994	172
1980	130	1995	188
1981	131	1996	179
1982	132	1997	189
1983	138	1998	194
1984	140	1999	175
1985	156	2000	174
1986	177	2001	175

Historically flows have tended to increase 3 or 4 percent a year, with some apparent exceptions in past data probably more due to faulty calculations and metering than fact. It can be seen that this trend continues through 1989. Concern over the drought and the water conservation effort are apparent in the drop in flows in 1990, and especially in 1991, where the drop in flows of 8% was unprecedented as was a drop in flow two years in a row. If we are to assume that the growth of the City continues, then if we continued our past water use patterns, we would have anticipated our average flows would have increased about 3% each year to 197 MGD in 1990, 203 MGD in 1991, 209 MGD in 1992, 215 MGD in 1993, and 221 MGD in 1994. It is notable that the actual flows were reduced to close to the water conservation goals of the respective years. The 186 MGD average flow for 1990 represented a 6% reduction, a bit below the 10% conservation goal for much of that year, the 173 MGD average flow for 1991 was 17% below expected, and would have been even closer to the 20% conservation goal of that year were it not for the high inflow volumes from the heavy rains in March, which caused this to be a significantly above normal year for local rainfall (13.46 inches). The 179 MGD average flow for 1992 represents a 17% reduction from what would be expected, which is consistent with the same 20% conservation goal and a similarly heavy (12.72 inch) rain year. The flow of 187 MGD for 1993 was 15% less than the 215 MGD we would get from the long-term projection, but 4% more than the year before. The drop in flow in 1994 is exceptional. In 1992 and 1993, the historic increase of flow of 3% a year was maintained, but probably was more coincidental than the reflection of a continuation in growth, since San Diego was in an economic downturn with less than normal expansion and population growth. The flow in 1993 would have been boosted by a rainfall that was almost twice normal (17.3 inches) whereas in 1994, it was a near average 9.4 inches. The infiltration from the heavy storms that year probably obscured a major drop in flow from the Tijuana interceptor, which is very apparent in 1994. Since the International Boundary and Water Commission's (IBWC's) flow meter was put on line in June, 1994, it has recorded an average of 2.0 MGD. The City's meter showed 3.2 MGD for the year and 3.8 MGD for the June through December period, which includes flow from the San Ysidro line which joins before the City meter. Past flow readings have been notoriously bad, as mentioned in the Tijuana Interceptor sections of previous Annual Reports. The official City metered flow average for 1993 was 5.6 MGD, which would indicate about a 2 MGD drop in 1994, but the 1993 data is virtually worthless since flow was registered when the pipe was broken and observably dry. Several months had identical daily readings indicating a stuck meter, and the pipe was observed to be surcharged (being run under pressure, rather than as a gravity line, hence sending more flow than the meter was designed to record) when it was operating.

In 1992, an annual average flow of 10.1 MGD was recorded for the Tijuana interceptor by the City meter, so about 2

MGD of that would have been from San Ysidro. The annual average flow from Pump Station I, which received the sewage from the Southbay area, was 72.6 MGD. This was 40.5% of the total flow to Point Loma of 179.2 MGD. In 1993, as we mentioned previously, the City's flow meter for the Tijuana interceptor was not reliable, but the annual average flow through Pump Station I was 69.0 MGD or 36.8% of the flow. Either there was a very uneven distribution of stormwater inflow so that there was a much greater contribution to the northern part of the system, which is quite possible, or the contribution from the Tijuana interceptor dropped significantly. The 1994 flow data from the Tijuana interceptor is far more reliable and confirmed, within the 1 to 3 MGD contribution from the San Ysidro connector, by two meters. The 1994 figures show an annual average of 3.2 MGD from the Tijuana interceptor on the City meter (close to 2 MGD of which would be from the San Ysidro connector). The annual average flow at Pump Station I was 63.7 MGD or 37.1% of the total of 171.7 MGD. The difference between the 1992 and 1994 flows through Pump Station I is about the difference in the flow from the Tijuana Interceptor.

The 1995 average flow of 188 MGD was an increase of 9% above the 172 MGD average for 1994. Since the contribution from the Tijuana interceptor, averaging 1.8 MGD, using the IBWC's meter, or 3.6 MGD using the City's meter that includes about 2 MGD of San Ysidro flow, was inconsequential and similar to 1994, the difference must have come from somewhere else. The percentage of the total flow from the southern portion of the metro service area that goes through Pump Station I declined slightly to 36.1%, perhaps indicating growth in the northern part of the City.

The 1996 average flow of 179 MGD was a 9 MGD or 5% drop from 1995. The Tijuana interceptor flow averaged about the same (2.2 MGD IBWC meter, 4.0 MGD City meter) as 1995, and the average air temperature was unchanged at 64EF. The bulk of the difference can be attributed to the rainfall. The total for 1995 was 17.04 inches, for 1996, it was 7.27 inches, only 43% of 1995. If one drops the January, February and March flows, where 13.8 inches of rain fell, from the 1995 average it drops to 183 MGD. If April, with 0.96 inches more rain on saturated ground, were also dropped, the average is 182 MGD, the resulting 1.69% drop is not explained, but one could consider the flows unchanged within the tolerances of the meters.

The 1997 average flow of 189 MGD was 6% higher than 1996 but with a comparable rainfall of 7.00 inches. Within the tolerances of the meters, virtually all of the 10 MGD difference between the two years is attributable to the increase in average flow in the Tijuana interceptor from about 2 MGD in 1996 to about 11 MGD in 1997.

The 1998 average flow was less than 3% more than 1997, and the rainfall was over twice as high (16.05 inches). The Tijuana interceptor flow, as registered on the City's meter (including San Ysidro) was virtually unchanged (11.3 MGD in 1998 vs 11.4 MGD in 1977). The IBWC's (International Boundary and Water Commission's) meter showed an average flow of 8.8 MGD, the degree of difference expected to account for the San Ysidro flow. (The matching values in 1997 was an anomaly.) If one drops the flow from February, the highest (7.65 inches) rain month, from the average, the annual average flow drops to 189.4 MGD, virtually the same as 1997 (189.1 MGD). Basically, the flows were unchanged this year except for the exceptional inflows from the storms in February.

The average flow for 1999 of 175 MGD was a surprising 10% or 19 MGD drop from 1998's 194 MGD average. Considering that the flow for 1998 would have been 189 MGD if the exceptionally high rain month of February was dropped. This would still be a major drop of 15 MGD or 8% using that adjusted 1998 flow. The bulk of the drop, about 10MGD, would be due to the International Wastewater Treatment Plant (IWTP) diverting most of the sewage from the emergency connector. The Tijuana flow to the Point Loma Plant averaged about 11 MGD in 1998 and should have been about 1 MGD in 1999. That value was approximate since the International Boundary and Water Commission's meter was generally unmaintained and unreliable that year with long periods where it was not registering or pegged on maximum (0 or 20.888 MGD). The City's TJ1 meter showed an average flow of 2.26 MGD, but that includes a flow of generally over 1 MGD from San Ysidro. A meter, CW01, was installed and started reliable operation in June, measuring the San Ysidro flow. When that contribution was subtracted out, the interceptor flow from June on was 0.86 MGD. Hence 1 MGD is considered a reasonable year long estimate. In 1999 the City's North City Reclamation Plant (NCWRP) ran consistently producing an average of 1.8 MGD of reclaimed water, and 0.7 MGD of water used in the plant. This would account for a reduction of about 2 MGD seen at the Point Loma Plant. Sources of the remaining 3 MGD reduction are not known and reflect a change in water use that had led first to a drop in the annual increase in sewage production, then to the virtually unchanged (except for inflow) 1997-1998 period , and then to this drop.

The annual average flow for 2001 was 175 MGD, virtually unchanged for the past three years (2000, 174 MGD; 1999,

175 MGD). This reflects stable conditions, namely the Tijuana Interceptor was unused for this period[7], the reclaimed water (1.7 MGD in 2001, 1.8 MGD in 1999 and 2000) and plant water (0.6 MGD in 2001, 0.7 MGD in 1999 and 2000) removed from the system by the North City Water Reclamation Plant (NCWRP) remained basically the same, and the effects of development have been minor. The range in rainfall (5.43 inches, in 1997, 9.75 in. In 2000 and 8.47 in 2001) has shown some variation, but winter flows have not. Various pipeline rehabilitation projects and the dry year of 1999 would have reduced infiltration. The near average rain years of 200 and 2001 would not saturate the soil. In fact the narrow spread between the high and low monthly averages (14 MGD in 2001, about 10 MGD in 1999 & 2000) is notable this period. Although the highest flows were during the rainy season of January through March, there was not a direct correlation between a month's rainfall and flow.

2001 RAINFALL AND AVERAGE MONTHLY SEWAGE FLOW + AIR TEMPERATURE

MONTH 2000	Rainfall(inches)	Total Monthly Flow (MGD)	Average Daily Flow (MGD)	AIR TEMPERATURE (EF)
JAN	3.28	5,588	180.3	55.6
FEB	2.38	5,161	184.3	56.6
MAR	0.63	5,177	184.1	58.0
APR	0.76	5,247	174.9	60.3
MAY	0.01	5,130	171.3	62.5
JUN	0.00	4,760	170.6	65.2
JUL	T	5,326	171.8	68.8
AUG	0.00	5,376	173.4	70.2
SEP	0.00	5,004	172.6	69.0
OCT	0.00	5,275	170.2	65.2
NOV	0.95	5,156	171.9	60.8
DEC	0.46	5,321	171.6	57.0
Monthly Average	0.77	5,210	174.8	62.4
TOTAL	8.47	62,521		

T = Trace

Suspended Solids, Volatile Suspended Solids and Percent Suspended Solids Removal:

The influent suspended solids averaged 275 mg/L this year. Past data, as can be seen in the following table, has shown that influent concentrations tend to range from the mid-200's to around 300. (In the table there is more scatter in the data before 1980 because monthly averages were calculated using only the two suspended solids values done on "complete analysis" days, rather than averaging all of the daily test results).

[7] Except for 8 days in 2000, April 2-27, of about 10 MGD.

SUSPENDED SOLIDS TRENDS
AVERAGE DAILY SOLIDS

YEAR	Flow, Annual Average Daily (mgd)	Rainfall, Annual Total (inches)	TSS INFLUENT (mg/L)	TSS EFFLUENT (mg/L)	TSS % Removal	TSS Mass Emission (lbs/day)	TSS Mass Emission (metric tons /year)
1972	95		257	135	47	106,600	17,709
1973	100		310	154	50	127,947	21,197
1974	104		346	138	60	119,143	19,739
1975	107		215	115	46	103,135	17,087
1976	118		238	127	46	125,281	20,813
1977	115		273	128	53	123,277	20,424
1978	127		245	151	38	159,428	26,413
1979	128		248	143	43	150,933	25,006
1980	130		255	113	56	121,088	20,116
1981	131		289	114	61	122,705	20,329
1982	132		296	126	57	139,563	23,122
1983	138		310	98	68	110,789	18,355
1984	140		272	90	67	103,175	17,140
1985	156		251	70	72	91,190	15,108
1986	177		261	64	76	94,476	15,652
1987	183		289	67	77	102,257	16,941
1988	186		303	70	77	108,587	18,039
1989	191	3.8	305	60	80	95,576	15,834
1990	186	7.29	307	65	78	101,301	16,783
1991	173	13.46	295	81	73	116,810	19,352
1992	179	12.71	317	72	78	107,903	17,926
1993	187	17.26	298	55	82	88,724	14,699
1994	172	9.43	276	46	83	65,777	10,898
1995	188	17.04	289	43	85	67,492	11,182
1996	179	7.27	295	43	85	64,541	10,722
1997	189	7.00	284	39	86	61,923	10,259
1998	194	16.05	278	39	86	64,171	10,631
1999	175	5.43	273	38	86	55,130	9,134
2000	174	6.90	278	37	87	54,413	9,039
2001	175	8.45	275	43	85	61,931	10,260

For influent suspended solids from 1980 there was a trend upward that ended in 1984. From about mid-1984 through 1986, the values were lower. The closure of the tuna canneries at that time would be reflected in this drop. The higher annual averages in 1987 and 1988 appear to be due to a major increase in solids loading from the decant of the Fiesta Island Sludge drying facility. This effect was minor in 1989 and 1991, and almost non-existent in 1990, however, the solids levels remained high due to the concentration of the wastewater flow due to drought-induced water conservation. The solids return from Fiesta Island and stormwater sediments during the extremely wet winters of 1992 and 1993 caused the average influent solids values for each of those years to remain in the 300 range.

The drop in influent suspended solids in 1994 is due to two factors. This was a fairly normal rain year with the rainfall distributed over the normal season so there was not a lot of sediment carried into the sanitary sewers from inflow. This is reflected in the consistently high monthly average influent volatile solids percentage. Sediments carried into the sewers lower the percent volatile content. The other factor was the control of the return stream solids from the Fiesta Island Sludge Drying Facility. The use of rental belt filter presses and the lack of heavy rain at the beginning of the year, which allowed staff to maintain good decant quality, kept the monthly average return

stream suspended solids between 2000 and 4000 mg/L. The new belt filter press facility was put on line in March, 1994, and, after its proper operation was developed by staff, the return stream suspended solids remained consistently low.

Of the increase in influent solids in 1995 over 1994, about 1% were due to additional decant solids. The solids handling system continued to work well, but increases in plant flow and treatment plant solids removal rates continued to put more solids into the system. The additional suspended solids representing a 3 to 4% (10 mg/L) increase over 1994 were within the normal annual variation one would expect. For 1996 and especially for 1997, the contribution of decant solids to the influent dropped. The fact that both were dry years and had high percent volatile solids indicate that the contribution of solids from storm runoff was negligible.

The influent suspended solids for 1998 averaged 278 mg/L, a 2% drop from 1997. Return stream flows from sludge processing contributed an average of 9.0 mg/L in 1997, and 7.6 mg/L in 1998 to the total influent solids, or less than 3%. The Fiesta Island Sludge Drying Facility (FI) was closed in February 1998, replaced by the Metropolitan Biosolids Center (MBC). Fiesta Island filter press squeezings continued through 2-18-98, centrate came from MBC on 2-6 and 10 (in addition to Fiesta Island "decant") and was the exclusive return stream starting on 2-19-98. For the first 6-months of 1999 the return stream from the MBC contributed almost 12 mg/L to the influent suspended solids. There were periods, especially in June, the month with the highest contributions of returned solids (26 mg/L) that the return stream included sludge from the North City Water Reclamation Plant (NCWRP), which was in the transition period of shifting from returning all of the solids it removed in reclaiming water to the sewer and sending the solids to the MBC for processing. During the second half of the year the system-wide solids removal calculation was expanded from just subtracting out the solids returned from the sludge handling facility to including the solids removed upstream by the NCWRP. The upstream solids removal could account for the slight reduction in influent suspended solids. The average influent suspended solids for 2001 was 275 mg/L, showing minimal change over the last 4 years, consistent with the minor changes in flow and stability in the treatment system. The average effluent suspended solids was up a bit from 37 mg/L in 2000 to 43 mg/L in 2001. This reflects the slight decrease in removal rate from 87% in 2000 to 84% in 2001 (as calculated using annual average values for influent and effluent suspended solids concentrations. Operations attributed this to the new anionic polymer flocculent that they used this year, that is more efficient at removing BOD and less efficient at removing suspended solids.

The most notable change in treatment this year was the increase in BOD removal rates. In the past, the removal rate has been close to the limit of 58% and closely tied to the rate of suspended solids removal. This year the solids removal rate went down somewhat and the BOD removal rate rose, largely due to considerably increased removal of soluble BOD at the Point Loma Plant, which jumped to 31% in 2001, well above the 18% of the preceding two years and any annual average before that. The reason for the removal of soluble BOD is not known, it was thought in the past that the portion of removed was due to adsorption on floc and oxidation by the ferric chloride used as a coagulant. Operations staff attributes the increase in BOD removal to a change in the polymer floculant used at the plant this year. It may be that it creates a floc with a greater adsorbant capacity for dissolved organic material.

The average influent BOD for 2001 was 254 mg/L, higher that in 2000(237 mg/L), which was in turn slightly lower (4%) than in 1999 (247 mg/L) and 1998 (246 mg/L). Half of the drop in influent BOD concentration in 1998 from 1997's 258 mg/L average was due to the exceptionally low influent BOD (184 mg/L) in the high rain, high flow (250 MGD) month of February where the domestic sewage was significantly diluted by inflow. This observation is supported by the low volatile solids concentration (72%) and the low influent soluble BOD (63 mg/L) that month. On the other hand 1999 was a dry year and the flows, like those in 2000, showed less variability than in most past years. The continuation of the dip in influent BOD in 1999, and the further small decrease in 2000 are mainly due to the upstream removal by the North City Water Reclamation Plant (NCWRP). That plant has been operating since 1997, but had returned its solids to the sewer along with over 90% of its treated effluent, so its effect on removing BOD would have been small, although one might expect a small drop downstream in the percentage of soluble BOD (since it would convert some to particulate BOD). However, starting intermittently in June of 1999, and consistently in July, the sludge from the NCWRP was sent to the Metropolitan Biosolids Center (MBC) for treatment. Since only about an average of 2 MGD of reclaimed and plant water are removed from the system at the NCWRP, one can back calculate from the systemwide removal solids what the influent concentrations at the PLWWTP would be if the NCWRP was not removing them. For 1999 it would have averaged 256 mg/L for the second half of the year, when sludge was sent to MBC, which would mean a 251 mg/L annual average. For the year 2000, where the NCWRP removals were in place all year, it would be 248 mg/L. These numbers are very close, and close to what 1997 was and what 1998 would have been without the dilution of the February storms

BOD Concentration mg/L

1995	Influent	Effluent	% Removal
Total	273	107	61%
Adjusted Total*	270	107	60%
Soluble	99	79	20%
1996			
Total	285	119	58%
Adjusted Total*	283	119	58%
Soluble	104	89	14%
1997			
Total	258	105	59%
Adjusted Total*	256	105	59%
Soluble	92	79	14%
1998			
Total	246	106	57%
Adjusted Total*	244	106	57%
Soluble	89	81	9%
1999			
Total	247	102	59%
System-wide Total	251	102	59%
Soluble	96	79	18%
2000			
Total	237	94	60%
System-wide Total	248	94	62%
Soluble	84	69	18%
2001			
Total	254	94	63%
System-wide Total	270	94	65%
Soluble	84	58	31%

*Adjusted by subtracting the contribution from the Fiesta Island decant or MBC centrate in previous years.

C. Discussion of Compliance Record

The annual average systemwide BOD removal rate was 65%, well above the 58% limit, and the highest rate yet achieved. The annual average systemwide total suspended solids (TSS) removal rate was 85%, also well above the limit of 80%. The TSS mass emissions to the ocean was 10,392 metric tons, calculated using the year's average effluent TSS concentration, and the annual average daily flow rate, or 10,260 based on the average of the 12 monthly averages of daily mass emissions, both values are well below the limit of 13,995 metric tons per year. All of the other chemical and physical parameters in the permit where below discharge limits throughout the course of the year, although there were some questionable dioxin results.

There were two cases, one in February and one in July when one of the two duplicate effluent samples appeared to have dioxin in concentrations that would put us out of compliance. In each case the other sample showed no dioxin isomers. In the February sample the spike showed high concentrations of "native" dioxin isomers, well above those levels in the effluent sample where dioxin was found. There was no usable data from the raw sample. In the July sample there was not any "native" dioxin in the spiked effluent sample, and none in the raw. There was, however, a bit of one isomer in the trip blank, where there should have been none. This random pattern of "hits" are characteristic of glassware contamination. In both instances we sent archived samples of effluent for the appropriate months, which were analyzed in a different batch. In both instances no dioxin was found in the re-analysis, confirming the conclusion of contamination.

It is worth commenting on this particular test. A survey of test methods and reporting levels done in 2000 by the Southern California Coastal Waters Research Project (SCCWRP) found that at that time, San Diego was the only one of the 5 large Southern California dischargers to have dioxin tested to the parts per quadrillion level by the high-resolution EPA 1613 method. All had similar discharge limits but others tested at levels of parts per trillion or parts per billion, that is at detection levels one thousand to one million times higher than we do. They would not see any violations if they had them. The reason for the higher detection limits are basically practical and economic. Only a few specialized laboratories can run the low level tests. They cannot be run in normal commercial laboratories or by the discharger's in-house laboratories. They also cost about $1200 per sample.

The test itself tends to false positives due to the probability of interference at such low levels, and of the statistical probability of false positives at or near any detection limit. Also, to allow the test to reach levels a thousand times or more lower than was possible for other trace organic compounds at the time this test was developed, the quality control limits were loosened to a level that very marginal results are still acceptable according to the test protocol. To help compensate for this, we pay full sample cost to have duplicate samples and field blanks added to the test batches.

Over the years we have found that glassware contamination has been a big problem with our contract laboratories. We have tried to shop around and tightened the bid specifications. However, it seems to be an inherent problem for laboratories that specialize in dioxin. Since they get samples of heavily contaminated materials, these contaminate their equipment to a level that interferes with the environmental samples where any dioxin would be at or around the detection level.

We have tried to compensate for contaminated batches, not only by the addition of quality assurance samples we send in to detect marginal batches, but by collecting large samples and archiving refrigerated aliquots so that we can have samples re-run in different batches when we get questionable results. The additional quality assurance and backup samples we have paid for has again shown that what at first could appear to be dioxin contamination, was definitely only analytical artifacts.

Toxicity Testing

RESULTS & DISCUSSION (excerpt from Section 2., E. of this report)

Acute Bioassays

Fathead minnows (*Pimephales promelas*) and freshwater water fleas (*Ceriodaphnia dubia*) were screened in February 2001 to verify test species sensitivity. The results demonstrated *Ceriodaphnia* to be the most sensitive test species (Table T.1). The City continued to perform toxicity test using both species, since fathead minnows had been the most sensitive test species until recent years. The toxic unit acute (TUa) values for the fathead minnows averaged 1.2 TUa and, with one exception, were within established NPDES limits throughout 2001 (Table T.2). In contrast, the *Ceriodaphnia* tests averaged 1.5 TUa for the year and exceeded the NPDES permit limits on a number of occasions, most notably in the 30-day average category (Table T.3). During calendar year 2001, the *Ceriodaphnia* acute toxicity tests were conducted on a weekly basis to better characterize the persistence and source of toxicity. The increased test frequency did not produce a discernable pattern of toxicity as the incidences of toxicity were clearly sporadic and short-lived.

As stated in the City's 2000 receiving water monitoring report (City of San Diego 2001), the State of California has revised acute testing procedures for ocean dischargers. The new California Ocean Plan (COP) requires utilization of marine species instead of freshwater species. The document was approved by the Office of Administrative Law (OAL) and the EPA in December of 2001.

The City initiated monthly testing using the new procedures and two marine species (i.e., the topsmelt, *Atherinops affinis* and mysid, *Mysidopsis bahia*) in December 2000. The average TUa value for both the topsmelt and mysid was 2.6, and the results for each test demonstrated complete compliance with the new standards (Table T.4).

Chronic Bioassays

An annual screening of three species was conducted to verify sensitivity of the selected test organisms to Point Loma effluent. Giant kelp (*Macrocystis pyrifera),* red abalone (*Haliotis rufescens*), and topsmelt (*Atherinops affinis*) were screened and the results of these comparative bioassays are summarized in Table T.1. The results indicated that giant kelp was the most sensitive to effluent from the Point Loma Wastewater Treatment Plant. However, the City has also continued to use red abalone as a routine test organism due to its ecological importance to the region. Consequently, monthly chronic bioassays on effluent samples were conducted using both kelp and abalone.

The giant kelp and red abalone chronic toxicity tests conducted during 2001 are summarized in Table T.5. These results indicated that, with one exception, all bioassays were within established NPDES permit limits throughout the year.

D. Report of Operator Certification.

The following list includes all Wastewater Treatment Plant Operators working for the Metropolitan Wastewater Department and their California State certification status as of **January 2002.**

Operator Certifications:

The following lists all Wastewater Treatment Plant Operators working for the Operating Units of the Metropolitan Wastewater Department and their California State certification status as of January 2002. Name, Certification Grade, Certification Number, and expiration date are shown for each operator. The listing is by facility and classification.

Point Loma Wastewater Treatment Plant

Name	Grade	Cert. No.	Expiration Date
Point Loma Wastewater Treatment Plant Superintendent:			
Jesse Pagliaro (Jan. - June 2001)	V	06454	06-30-2002
Cordova, Joe A. (Nov.-Dec. 2001)	IV	05064	06-30-2002
Sr. Operations Supervisor:			
Cordova, Joe A. (Through Nov. 2001)	IV	05064	06-30-2002
Operation Supervisors:			
Peterson, Richard	III	02978	12-31-2002
Shankles, Doyle	III	07232	06-30-2002
Mickelson James	III	03790	12-31-2003
Leibenguth, Robert	III	06777	12-31-2003
Creaghe, Joe	III	07280	06-30-2003
Janowicz, Claude	III	05939	06-30-2002
Operators:			
Nguyen, Thanh	III	06637	06-30-2003
Parry, Thomas	III	03805	06-30-2003
Gayle D. Evans	III	09395	12-31-2003
Sanchez, Cesar	III	10083	12-31-2003
Nicholosi, John	II	06308	12-31-2002
Palestini, Anthony	II	08521	12-31-2003
Reynolds, Benjamin	II	06638	12-31-2003
Wade, Brian	II	09141	12-31-2002
Gross, Allen	II	09264	06-30-2002
Gutierrez, Marlene	II	09636	06-30-2003
Duhamel, Michael	II	09444	06-30-2002
Evans, Douglas	II	09844	06-30-2002
Pizarro, Emiliano	II	09863	06-30-2002
Smith, Dwight	II	09992	12-31-2002
Sackett, Robert	II	10084	06-30-2003
Castillo, Joe	II	09849	06-30-2002
Marlow, David	I-OIT	I	12-01-2002
Aldridge-Manson, Carol	I-OIT	I	12-01-2002
Saulog, Noel	I-OIT	I	12-01-2002
Process Control:			
Andrew Stoecker	V	08310	12-31-2003
Katherine C. Shankles	V	06975	12-30-2003
Mitch Dornfield	II	07678	12-31-2002

Metro Biosolids Center (MBC)

Name	Grade	Cert. No.	Expiration Date
MBC Superintendent:			
Jack Swerlein	V	5527	Jun 2002
Senior Operations Supervisors:			
Chuck Lockhart	V	4610	Dec 2002
Ernesto Molas	V	7227	Dec 2003
Operations Supervisors			
Jeff Sprueill	V	8251	Jun 2002
Carlos Cordova	III	5920	Dec 2003
Claude Lovelace	III	3952	Jun 2003
David Huntamer	V	8686	Jun 2003
Kermit Eugene	III	5681	Jun 2002
Warren Wazny	III	4583	Jun 2003
Barry Ayers	IV	9346	Jun 2002
Plant Operators:			
Randy Cook	II	6811	Dec 2003
Jeannie Dantzler	II	5235	Dec 2002
Roscoe Elkin	II	8428	Jun 2003
Maria LeSire	II	5445	Jun 2003
Javier Zavala	III	9635	Jun 2003
Sal Lopez	II	8476	Jun 2003
Shannon McKiernan	III	7465	Dec 2003
Albert Johnson	II	9636	Jun 2003
Carol Stacker	II	9383	Dec 2003
Robert Roderick	III	6169	Dec 2003
Larry Rodgers	II	10121	Dec 2003
George Wendorf	II	9774	Dec 2003
Trainees:			
Dedric Evans	II	OIT	Dec 2002
Barry Calton	II	OIT	Dec 2002

The following lists all Wastewater Treatment Plant Operators working for the NCWRP of the Metropolitan Wastewater Department and their California State certification status as of March 2001. Name, Certification Grade, Certification Number, and expiration date are shown for each operator. The listing is by facility and classification.

North City Water Reclamation Plant

Name	Grade	Cert. No.	Expiration Date
Water Reclamation Plant Superintendent:			
Roe, Michael	V	6298	06/30/2002
North City Sr. Operations Supervisor:			
Hernandez, Abel	V	2095	12/31/2002
Operations Supervisors:			
Blumer, Bruce	III	9347	12/31/2002
Cozad, John	III	7139	12/31/2003
Nunez, Carlos	III	7627	06/30/2002
Shimmin, John	IV	9144	06/30/2002
Hill, Adrian	III	7601	06/30/2002
Featherstone, Steve	III	7534	06/30/2003
Operators			
Moore, Terry	III	2309	12/31/2003
Abrahamsen, Robert	II	5659	06/30/2002
Culver, Chris	II	4403	12/31/2003
Rountree, Judith	II	5451	06/30/2002
Williams, Wesley	II	5932	06/30/2003
Millan, Romeo	II	9846	06/30/2002
Todd, Terry	II	9833	06/30/2002
Hill, Cardell	II	4041	06/30/2003
Process Control Sr. Supervisor:			
Pruett, Sam	V	7791	06/30/2003
Process ControlSupervisors			
Jewell, Dennis	V	4813	06/30/2002
Relph, Rob	III	6742	12/31/2002
Process Control			
Gipson, Bernie	II	5385	06/30/2003
Williams, Willie	II	8418	06/30/2003
Pitchford, Richard	II	9851	06/30/2002
Ayers, Barry	IV	9346	06/30/2002
Laboratory			
Konopka, Walter F., Jr	III	1793	06/30/2002

E. Status of the Operations and Maintenance Manual

Point Loma WWTP:

The implementation of the Environmental Management System, developed under the guidelines set forth by the International Organization for Standardization (ISO), element 14001, has helped to organize and consolidate facility Standard Operating Procedures (SOP). In addition, PLWTP Staff continues to work on the redevelopment of the Lock Out/Tag Out Manuals to reflect the changes that have occurred in the facility as a result of new construction and upgrades to various processes. Furthermore, Operations and Maintenance (O&M) Manuals are obtained for all new equipment installations and each process upgrade when project construction has been completed. PLWTP Staff generates Standard Operation and Maintenance Procedures for the systems and associated tasks which are outlined in the manuals.

F. Annual Flow Calibration Report.

The firm of Pountney & Associates completed the annual Gould Flow Metering System Certification in March 2002.

A copy of their findings, without appendices, follows. Not available on this electronic version.