METRO

Municipality of Metropolitan Seattle
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December 15, 1993

Ed Abbasi, Permit Manager
Washington Department of Ecology
3190 160th Avenue S.E.
Bellevue, WA 98008-5442

Dear Mr. Abbasi:

Enclosed is Metro's Annual Combined Sewer Overflow (CSO) Control Report prepared in accordance with the requirements established within NPDES Permit No. WA-002918-1(M), S11.C.2 and WAC 173-245-090. The report contains:

- An overview of Metro's CSO Control Program
- The status of the CSO control program
- 1992/1993 overflow volume and frequency summaries
- An overview of Metro's CSO Monitoring Program

Total combined sewer overflow volumes and events were significantly below baseline levels for the 1992/1993 reporting period. While the reduction in CSOs is partially a result of below average rainfall and low-intensity storm events, completion or partial completion of several CSO control projects have also contributed significantly. Reduction benefits from the completion of Hanford/Bayview/Lander Separation, Fort Lawton Parallel Tunnel, and University Regulator Sewer Separation are reflected in the low overflow volumes and frequencies. Since February 1993, the Predictive Control System developed for CATAD has been operational and successfully controlling CSOs using the conveyance system's available in-line storage. Greater CSO reductions are expected to occur with the West Point Secondary Treatment Plant Upgrade, Carkeek Transfer/Stormweather Treatment, Alki Transfer/Stormweather Treatment, and Kingdome/Industrial Area Storage. Metro is confident that it will attain the goal of 75 percent CSO reduction by the year 2005 through the completion of these and other CSO control projects.

Please call me at 684-1236 or Laura Wharton at 684-1238 if you have any questions or concerns.

Sincerely,

Elsie Hulsizer

Elsie Hulsizer
Acting Supervisor, Facilities Planning Section

Enclosure

cc: Laura Wharton
Karen Huber
Susan Rosenberg

ANNUAL CSO REPORT

1992/1993

METRO

DECEMBER 1993

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SECTION 1

CSO CONTROL PROGRAM IMPLEMENTATION

CSO CONTROL PROGRAM IMPLEMENTATION

Introduction

Since the 1960s, Metro has been conducting CSO control projects in order to improve water quality in the Seattle-King County area. Metro's CSO program was first formalized in 1979 with the development of the *1979 Combined Sewer Overflow Control Program*, which identified nine projects to control CSO events into fresh water areas (e.g., Lake Washington, Lake Union, and the Ship Canal). In 1985, new legislation introduced by the Washington Department of Ecology (Ecology) required all municipalities with CSOs to develop plans for "the greatest reasonable reduction at the earliest possible date." Metro's 1986 *Plan for Secondary Treatment Facilities and Combined Sewer Overflow Control* met this state requirement. In the 1986 Plan, Metro evaluated CSO control projects based on the "knee-of-the-cost/benefit curve." The "knee-of-the-cost/benefit curve" is a type of cost-benefit analysis in which CSO control efforts are carried out until the costs rise disproportionately to the CSO reduction that could be achieved. Before the 1986 plan was implemented, new regulations were promulgated by Ecology. Ecology's new regulation defined "greatest reasonable reduction" as a level of control such that an average of one untreated discharge per outfall may occur per year. Metro's response was the *Final 1988 Combined Sewer Overflow Control Plan*, which addressed control alternatives for remaining CSOs in the Ship Canal, Duwamish River and Elliott Bay. The 1988 Plan identified eleven separate CSO control projects and an implementation schedule to achieve a 75 percent CSO volume reduction systemwide by the year 2005. Since the 1988 Plan, other CSO projects have been identified, including Brandon Storage and Separation, North Beach Storage/Pumping Station Upgrade and Henderson Pump Station/MLK Way. Table 1 identifies the current schedule for Metro's CSO control projects. Descriptions and the status of these projects are given below.

Table 1: CSO Control Program Schedule

Project	Year Design Initiated	Year On-Line
Hanford/Bayview/Lander Sewer Separation		
- Hanford	1986	1991
- Bayview/Lander	1988	1992
CATAD Modifications	1986	1993
Fort Lawton Tunnel	1987	1991
University Regulator Separation	1987	1994
Carkeek Transfer/Stormweather Treatment	1988	1996
Alki Transfer/Stormweather Treatment	1989	1996
Michigan Separation	1991	2003
Brandon Storage and Separation	1991	2004
Kingdome/Industrial Area Storage and Separation	1991	2006
North Beach Storage/Pump Station Upgrade	1993	2003
Denny Way CSO Control	1994	1999
Henderson Pump Station/MLK Way	1996	1996
Diagonal Sewer Separation	1996	1999

Status of CSO Control Projects

Hanford/Bayview/Lander Sewer Separation

-Scope

This project consists of partial separation of the Lander and Hanford drainage basins and activation of the previously abandoned Bayview tunnel. These projects were a joint effort by Metro and the City of Seattle.

Hanford

The South Hanford Street Tunnel Separation Project removed street storm drains from the sanitary system, partially separating about 1,132 acres of combined sewer upstream of the existing Hanford tunnel. The project also included installation of a new 36-inch sanitary sewer line inside the existing 108-inch Hanford tunnel. The 36-inch line is used for sanitary flow to the Elliott Bay Interceptor and the tunnel itself is used to transport separated stormwater to the Diagonal Way storm drain and then to the Duwamish River. The project eliminated the Hanford No. 1 Regulator and the corresponding CSOs.

Bayview/Lander

The Lander Separation Project was conducted in two phases. Phase I provided partial separation of the Lander basin through the installation of a new 96-inch sanitary trunk line and conversion of the existing 84-inch line to convey stormwater. The new 96-inch line provides about 1.4 million gallons of storage capacity. Phase II of the project required installation of a new stormwater collection system in the Lander basin to complete the partial flow separation. The Bayview tunnel has been reconditioned and reactivated to divert sanitary flows from the Hanford basin to the Lander system. Overflows have been reduced at Lander as a result of the project. The components of Phases I and II are as follows:

Phase I:

- 96-inch Lander sanitary trunk.
- New Lander regulator station.
- Elliott Bay interceptor connection.
- Bayview diversion structure.
- New stormwater collection system from existing 84-inch Lander trunk to the limits of the Lander Street right-of-way.
- Connection of existing combined collection system to new 96-inch sanitary trunk through drop manhole structures.

Phase II:

- New stormwater conveyance lines in Lander basin.
- Connection of existing street drainage and parking lots to new stormwater collection pipeline within right-of-way limits.

-Status

The Hanford Separation Project was completed by the City of Seattle in October 1987. Construction for Bayview/Lander was completed for Phase I and II in January 1992. Project closeout will be completed in December 1993. Negotiations are continuing between the City of Seattle and Metro to determine which agency is responsible for operation and maintenance of the stormwater conveyance line.

CATAD Modifications

-Scope

The Computer Augmented Treatment and Disposal System (CATAD) controls the West Division collection system. Modifications of the CATAD system are designed to improve system efficiency by increasing utilization of storage capacity in existing sewers.

The previous computer control system utilized 17-28 million gallons (MG) or 28-47 percent of storage within the system's estimated 60 MG capacity. Initial estimates projected that improvements to the system would reduce CSO volumes by 150 million gallons per year. Off-line testing has revealed that a reduction of more than 200 million gallons a year can be achieved as a result of control system improvements.

-Status

Project Elements:

- Hydraulic and hydrological models were completed in 1987.
- Flow forecast programs were completed in 1988.
- Predictive Control testing and tuning began in October 1991 and was completed in February 1993. The system has been operational since February 1993.
- Five new depth sensors were purchased and installed at selected sites in 1991 to increase collection system flow information. Sensor installation was completed in June 1991.
- Five new rain gauges were installed in 1991 to more effectively measure rainfall in the West Point Service Area. These were activated in September 1991.
- Facilities Planning System (FPS) was completed and documented in 1991. The FPS package allows Metro staff to utilize models and programs developed for the Predictive Control System.

- Level sensors have been checked for proper operation and calibration throughout 1993. Repairs and corrections are being made to improve the accuracy of overflow information reported by the CATAD system.

Fort Lawton Parallel Tunnel

-Scope

The Fort Lawton Parallel Tunnel Project involved building a new 12-foot diameter tunnel to help reduce CSOs in the West Point service area. The new tunnel provides a reliable influent line to the existing primary treatment plant at West Point, increases capacity of the system to accommodate projected flows, and has allowed for the rehabilitation of the existing tunnel. The two tunnels will be operated in parallel to convey combined sewer flows up to 440 million gallons per day (MGD). This entire capacity will be fully utilized upon completion of the West Point upgrade to secondary treatment.

-Status

Construction was completed in the summer of 1991 and the new tunnel was activated in November 1991. Together the tunnels can convey up to 440 MGD once West Point has been upgraded in 1996.

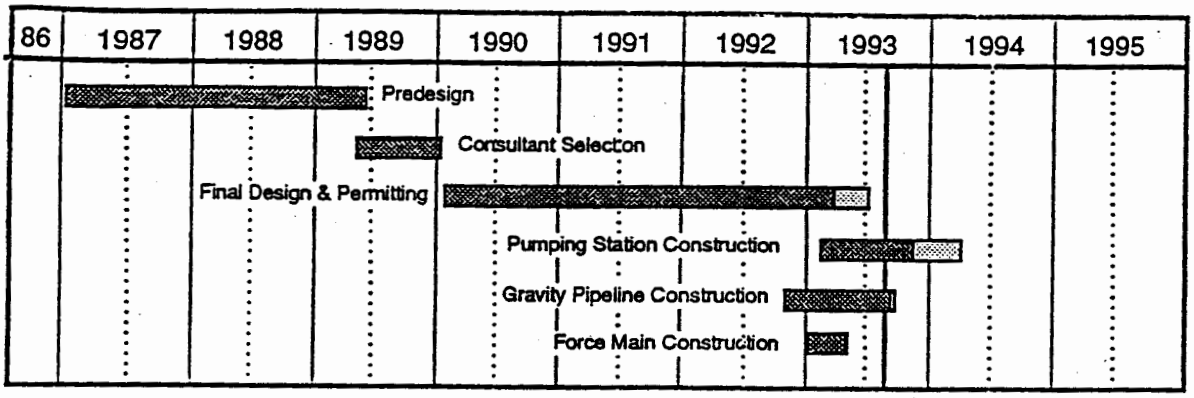
University Regulator Separation

-Scope

As a result of the University Regulator Separation Project, storm runoff from the Densmore drain, Interstate-5, and outflow from Green Lake will be diverted from Metro's north interceptor sanitary sewer system to a new storm drain which directs the flows to an outfall located in Lake Union. The new storm drainage system consists of a gravity pipeline, force main, and outfall pipeline. To facilitate flow through the force main, a pump station is also required. CSOs into Portage Bay will be reduced significantly after the project is completed.

-Status

The following schedule depicts 1987-1994 project tasks:



Final design and permitting were completed in 1993. Notice to proceed for pump station construction was given in October 1992. Actual construction was delayed until February 1993 and will continue through the first quarter of 1994. Major structural construction for the pump station is complete. Construction of the gravity pipeline and force main began in November 1992 and is substantially complete.

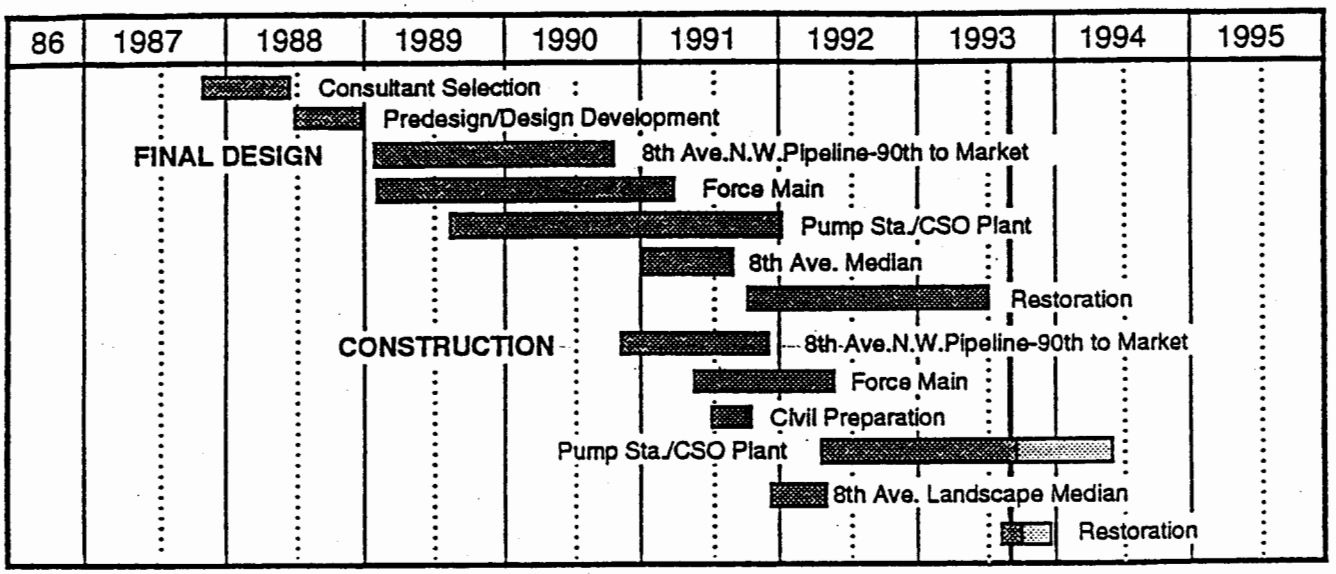
Carkeek Transfer/Stormweather Treatment Facility

-Scope

The Carkeek project is designed to transfer flows up to 8.4 MGD (2.25 x Average Wet Weather Flows (AWWF)) from the Carkeek drainage basin to the West Point plant for secondary treatment. Flows above this level, to a maximum of 20 MGD, will receive primary treatment and disinfection at the existing Carkeek Treatment Plant and be discharged through the existing outfall. The existing facility will undergo minor modifications to allow treatment of peak storm-related flows up to 20 MGD. Specific permit conditions for operation of the Carkeek facility have been negotiated with Ecology.

-Status

The following schedule depicts 1987-1994 project tasks:



Final design of all project elements was completed by the end of 1991. Start-up of the pump station was initiated in October 1993. Modifications to the existing CSO plant are expected to be completed in June 1994. Full utilization of this project is contingent on West Point being on-line in 1996.

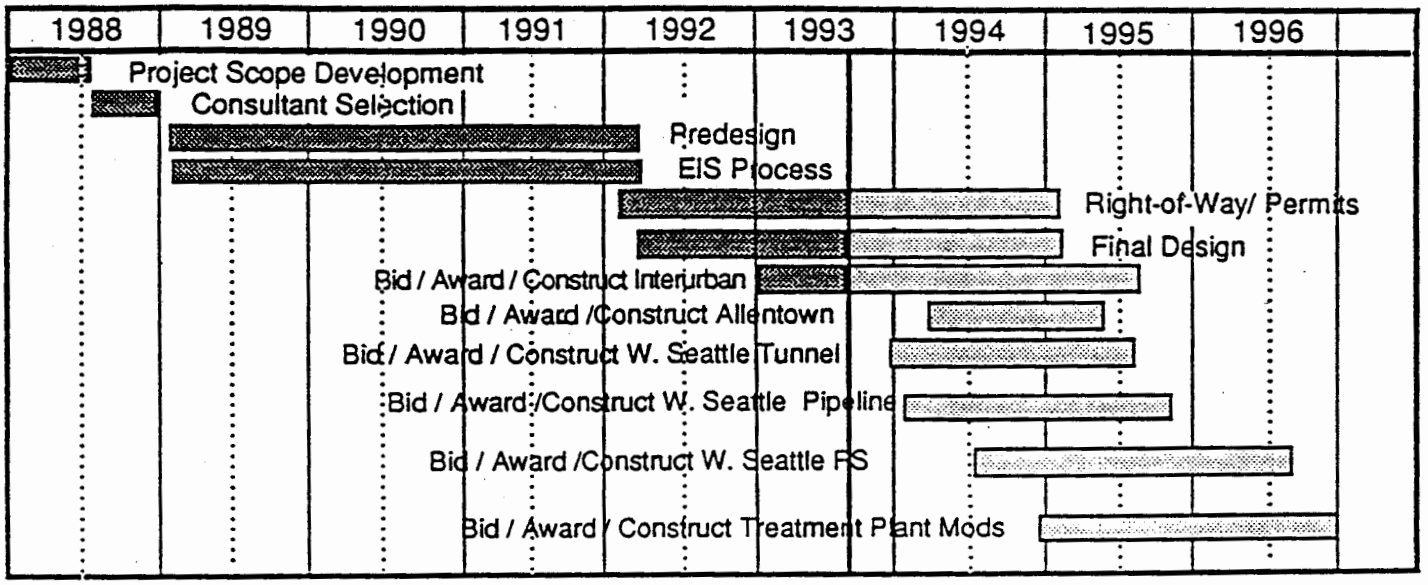
Alki Transfer/Stormweather Treatment Facility

-Scope

The Alki project is designed to transfer flows up to 18.9 MGD (2.25 x AWWF) from the Alki drainage basin to the West Point plant for secondary treatment. Flows above this level, to a maximum of 74 MGD, will receive primary treatment and disinfection at Alki. The existing facility will be modified to permit intermittent discharges from the existing outfall. To offset the added Alki flows sent to West Point, pipeline routes are being constructed to transfer a corresponding amount of flow, via the Elliott Bay Interceptor, from the Norfolk regulator station south to the East Division Reclamation Plant in Renton. The components of the Alki transfer system include the following: West Seattle tunnel, West Seattle pump station, West Seattle force main, Alki Treatment Plant modifications, Allentown trunk, and Interurban pump station and force main.

-Status

The following schedule depicts 1988-1996 project tasks:



Advertisement of the Allentown trunk contract has been delayed until approximately March 1994 due to Burlington Northern Railroad's refusal to grant Metro a right-of-entry on Burlington's hub property for construction of the West Seattle pipeline. Design of the treatment plant modifications will start in March 1994 and are expected to be completed in September 1994. Construction of the West Seattle tunnel and West Seattle pump station will occur between 1994 and 1996. The treatment plant modifications will be implemented between 1995 and 1996. Full utilization of Alki is contingent on West Point being on-line in 1996. Specific permit conditions for operation of the Alki facility have been negotiated with Ecology.

Michigan Separation

-Scope

The Preliminary Design Report for the Michigan Storage and Separation Project recommended the following activities for the Michigan regulator basin: installation of approximately 3,430 feet of sanitary trunk sewer in South Michigan Street/Corson Avenue South; separation of industrial areas identified in the basin; construction of a new regulator station; and a 4.2 MG storage tank. The project includes separation of sanitary and storm sewers in 238 acres served by combined sewers.

-Status

The Michigan predesign report was completed in March 1992. The schedule for design activities at the First Avenue South Bridge has been accelerated to coordinate Metro's efforts with the Department of Transportation's (DOT) design of the bridge. Metro will wait until 1995 to begin final design for other phases of the project.

Brandon Separation

-Scope

The separation of sanitary and storm sewers for the Brandon basin will require the separation of approximately 1,640 feet of sanitary trunk, partial separation of 52 acres, construction of a new regulator station, and 4.7 MG of off-line storage to reduce CSOs.

-Status

The Preliminary Design Report for the Brandon Separation Project was completed in March 1992, as part of the Michigan predesign report. The design schedule for the Brandon Street Separation Project has been accelerated by Metro in conjunction with the Michigan Street Separation Project. As mentionned above, the design schedule for the Michigan Separation Project has been accelerated to allow for coordination with the design effort underway for the First Avenue South Bridge improvements. The proposed First Avenue South Bridge improvements could potentially affect the Brandon Separation Project as well, if the transfer of CSOs from the Brandon basin to the Michigan basin is necessary to meet CSO requirements. Final design is scheduled to begin in 1998.

Kingdome/Industrial Area Storage and Separation

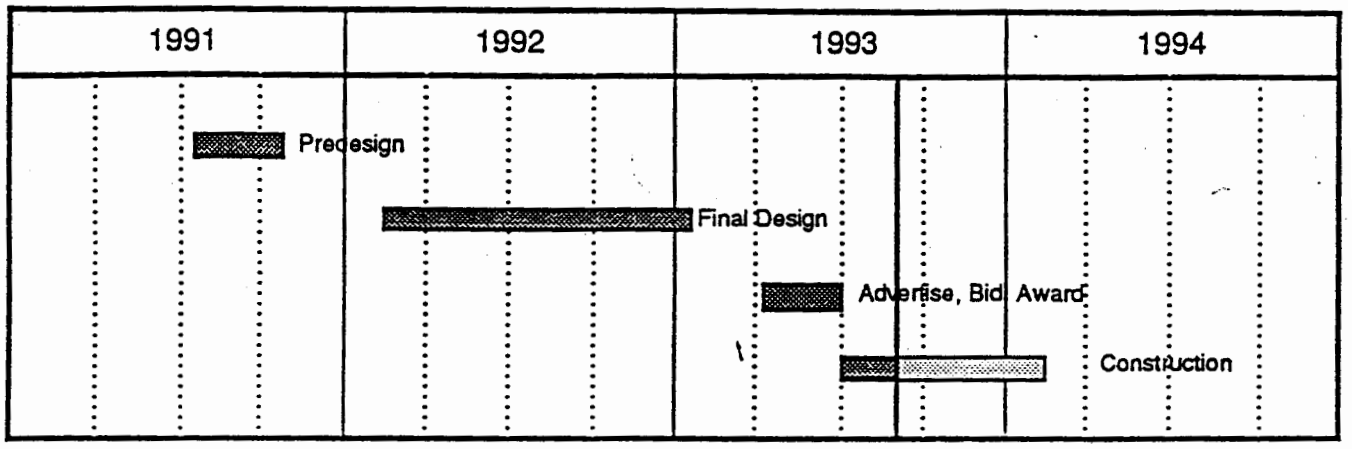
-Scope

As part of the 1988 CSO Control Plan, this project included total separation of the Kingdome parking lot and the industrial area south of the boundary of the Lander project. Predesign of the project indicated that total separation via a new sanitary line was not cost-effective, considering the need to work on private property to disconnect building drains and the limited capacity of the existing combined sewers to convey storm water.

As a result of predesign, the Kingdome project includes partial separation of the industrial area to remove street drainage and removal of Kingdome parking lot runoff via new storm drains. A new 96-inch storm water trunk in Royal Brougham Way, 11.3 million gallons of off-line storage, and a new regulator station and connection to the Elliott Bay Interceptor are included in the predesign.

-Status

The following schedule depicts 1991-1994 tasks:



The project was originally scheduled for design initiation in the year 2000. In order to coordinate with construction of the new Interstate 5 interchange at this location, however, it was decided to install a portion of the 96-inch line immediately and use it for storage of combined flows. Final design of the storage trunk was completed in February of 1993. Permitting and bidding was completed in June 1993. Construction for Phase I is scheduled to take place from June 1993 to March 1994. The remainder of the project, including new off-line storage and partial separation, will be reviewed and scheduled as part of the on-going CSO Contorl Plan Five-Year Update.

North Beach Storage/Pump Station Upgrade

-Scope

North Beach was not included in the 1988 CSO Control Plan because it was believed that overflows in this location were at the one per year level or better. Overflows from the North Beach pump station were discovered during the Carkeek predesign effort. Metro completed a separate predesign study for North Beach in July 1993. The predesign report recommended that overflows at the North Beach pump station be controlled by a combination of improvements including constructing a storage basin at the site, upgrading the pump station to increase its capacity, and constructing a new pipeline in Carkeek Park to reroute flows from two City of Seattle gravity sewer lines that discharge directly to Metro's force main.

-Status

The predesign report was completed in July 1993. The schedule for implementing the recommended improvements and reducing overflows will be determined in the CSO Control Plan Five-Year Update.

Denny Way CSO Control

-Scope

The 1988 CSO Control Plan, adopted by the Metro Council in May 1988, recommended partial separation of 584 acres in the Denny/Lake Union and Denny Local drainage basins. The 1988 Plan originally scheduled Denny predesign to begin in 1993, and construction to end in 1999. Metro is reassessing the project and schedule in light of recent changes in the regulatory environment and progress made to date in the Metro CSO Control Program.

In late 1991, the Seattle Drainage and Wastewater Utility (DWU) requested that Metro participate in a joint CSO control alternatives analysis to find ways of controlling discharges into Lake Union from the Seattle system and into Elliott Bay from the Metro system at the Denny Way regulator station. In May 1992, Metro completed a feasibility study analyzing four project alternatives.

-Status

CSO control alternatives for the Denny Way project will be identified and developed in the context of the CSO Control Plan Five-Year Update and in coordination with the plans of Seattle DWU for controlling CSOs to Lake Union. This effort will be completed by summer 1994. Design for Phase I, a portion of a new conveyance line on the east side of Lake Union, has been initiated by the City of Seattle to control discharges into Lake Union. Assuming congressional authorization this spring, Metro will submit a Federal Title 2 construction grant application for $35 million in July 1994 to help fund the Denny Way CSO Control Project. Predesign for subsequent phases of the joint project is scheduled to begin in the third quarter of 1994. Assuming total project funding is approved, design for Metro's Phase III and IV will begin in the 2nd quarter of 1995. Construction for all phases of the project will be completed by April 1999.

Henderson Street Pump Station/Martin Luther King (MLK) Way

-Scope

Recent monitoring data have indicated overflows at the Henderson Street pump station and the MLK Way relief structure in excess of the Ecology requirement. These overflows were not considered in the 1988 CSO Control Plan since it was believed that previous partial separation projects had resulted in adequate CSO control. The Henderson Street Pump Station/MLK Way overflows may be related to the pump station operation and/or partial plugging of the lines.

-Status

In March 1990, a portable flow monitor was deployed upstream from the Henderson and MLK Way pump stations to accurately monitor overflows. Alternatives to reduce overflows at Henderson/MLK Way will be identified and developed in the context of the CSO Control Plan Five-Year Update.

Diagonal Separation

-Scope

The Diagonal Separation project would provide separation of sanitary and storm drainage by installing new sanitary sewers in about 720 acres of combined or partially-separated industrial area. This project would compliment the City of Seattle project that separated additional areas adjacent to Metro's Duwamish pump station.

-Status

Metro's Lander Sewer Separation project and the City of Seattle's Diagonal Separation project may have eliminated the need for the Diagonal Separation project identified in the 1988 CSO Control Plan. The CSO Control Plan Five-Year Update will re-examine the need for and feasibility of total separation, as well as other alternatives.

Related Work

CSO Control Plan Five-Year Update

-Scope

The CSO Control Plan Five-Year Update is required by the Department of Ecology. It will include a comprehensive review of CSOs systemwide and assess Metro's progress in achieving the goal of 75 percent volume reduction by 2006. In addition, the plan will identify new projects that may need to be completed to achieve the goal and address changes in the regulatory environment with regard to stormwater National Pollutant Discharge Elimination System (NPDES) permits. The plan will be coordinated with other long-range facilities plans currently underway at Metro and will utilize Metro's upgraded hydraulic system model for the analysis.

-Status

The project began in 1991 with preliminary project scoping. In the third quarter of 1992 a Request for Proposals (RFP) was issued and a consultant selected. The decision was made in the fourth quarter of 1992 to formally coordinate the update with other planning projects, that include Wastewater 2020 Plus, Biosolids Facilities Plan, and Wastewater Reuse Facilities Plan as part of Metro's Regional Wastewater Services Plan (RWSP). The notice to proceed for the update was issued in May 1993. The 1995 RWSP is scheduled for completion in February 1995.

1995 Regional Wastewater Services Plan

-Scope

The *Metropolitan Seattle Sewerage and Drainage Survey* was produced in 1958 to guide a long-range program of sewerage and drainage services for the metropolitan Seattle area. The original document was designed to provide a concise, up-to-date, central source of information regarding Metro's long-term plans. Since the plan's inception, numerous amendments and resolutions have been made to the original comprehensive plan. The *1995 Regional Wastewater Services Plan* (RWSP) will be an amendment to the comprehensive plan and will integrate long-range planning in the areas of treatment and conveyance, biosolids handling, CSO control, and wastewater reuse.

-Status

The project began in August 1992. Issuance of the Basis for Regional Planning in January 1994 will provide the context for the RWSP and direct the scope of work through 1994. Workshops, public hearings, and community meetings are scheduled throughout the RWSP planning process in order to engage the public, King County staff, City of Seattle staff, and other valuable participants. Project completion is expected in February 1995.

Denny Way Sediment Capping Project

-Scope

A sediment capping project was conducted in March 1990 offshore of the Denny Way CSO as an experimental demonstration project to evaluate the benefits of capping as a means of improving sediment quality in Elliott Bay. A total of 13 barge loads of clean, dredged sand were delivered and spread over a rectangular capping site (200 feet x 600 feet) in a cooperative effort between the City of Seattle, U.S. Army Corps of Engineers, and Metro. In support of the capping operation, Metro conducted pre-dredge testing of capping sediments; dissolved oxygen testing during cap placement; and took measurements at six diver-installed rods and plates to determine foundation settlement and cap thickness. Metro is currently conducting a five-year post-capping monitoring program that includes: 1) surface-grab sediment sampling to measure cap chemistry for recontamination and benthic taxonomy for recolonization evaluation; 2)video camera surveying to view overall bottom conditions; 3) coring with sediment chemical testing to determine cap effectiveness in isolating chemicals; and preparing reports during the monitoring period.

-Status

Sampling conducted in 1990 after cap placement provided baseline data that can be compared with future samples to document change. Additional sampling was conducted in 1991 and 1992 to document conditions one and two years after placement. Surface sediment chemistry measurements show a gradual recontamination of the cap. A draft report of 1990, 1991, and 1992 results is scheduled for completion by the end of 1993. Additional sampling is scheduled for 1994 with a five-year project review in 1995.

Michigan Source Control

-Scope

The Michigan Source Control Project was conducted by Metro's Industrial Waste Section to eliminate or minimize the discharge of pollutants to the Duwamish River from industrial, commercial, and residential sources in the Michigan Street basin. The project included the following elements: baseline sampling of stormwater discharges, surveys, inspections, educational outreach, and development of compliance and enforcement schedules. The source control project is a component of the Michigan Separation Project.

-Status

The final report, completed in March 1993, makes recommendations for furthering source control in the basin.

Lander Source Control

-Scope

This project has been developed, as a result of the Lander Sewer Separation Project, to monitor and inspect businesses in the Lander Street basin in order to locate sources of pollutants found in the sanitary and storm sewers. The project included the following elements: baseline sampling of stormwater discharges, surveys, inspections, educational outreach, and development of compliance and enforcement schedules. The source control project is a component of the Hanford/Bayview/Lander project.

-Status

The final report for the initial source control work was completed in June 1989 and focuses on how Metro worked to reduce pollutant loadings to both the storm and sanitary sewers in the Lander drainage basin. Metro is currently conducting educational outreach, on-site inspections, sampling, and compliance schedules.

University Regulator Source Control

-Scope

This source control project has been carried out as part of the University Regulator Sewer Separation Project. As a result of the CSO project, stormwater runoff and outflow from Green Lake, which now enters the sanitary sewer, will be diverted and pumped to Lake Union. The source control project was undertaken to reduce the likelihood that polluted runoff from the

drainage area would enter Lake Union. The project includes the following elements: baseline sampling of stormwater discharges, surveys, inspections, educational outreach, and development of compliance and enforcement schedules.

-Status

In March 1991, Metro's Industrial Waste Section prepared a report on the initial source control program that focused on reducing water pollution for the Densmore area. A follow-up source control plan was developed and implemented in January 1993 to conduct source control and monitoring activities in the Densmore basin.

SECTION 2

1992/1993 CSO VOLUME AND FREQUENCY SUMMARY

1992/1993 CSO VOLUME AND FREQUENCY SUMMARY

Introduction

The volume and frequency of CSOs at 27 regulator and pump stations in the West Point System are monitored by Metro's CATAD System. Metro's West Point System is divided into the Northern Service Area (NSA) and the Southern Service Area (SSA). Figure 1 shows the location and magnitude of existing Metro and City of Seattle CSO discharges for these service areas. Overflow and rainfall reports are generated daily by the CATAD system, evaluated by staff, and archived for future use, including the annual CSO report. Metro deploys portable flow meters at six stations not currently monitored by CATAD. The six stations are located at Magnolia, East Ballard, MLK Way, North Beach, S.W. Alaska Street (Beach Drive), and Henderson Street.

Baseline Conditions

The volume and frequency of CSOs that occur during a year depend mostly upon the amount of annual rainfall. As the amount of annual rainfall changes, the volume and frequency of CSO discharges will change. In order to estimate the variability of CSO volume and frequency, 42 years of hourly rainfall data were entered into a model developed to predict CSOs from the Metro system. The model was used to calculate the annual CSO volume that would have occurred in the collection system as it existed in 1981-1983 for the average rainfall of 36 inches per year that occurred from 1943-1984. Ecology proposed 1981-1983 CSO conditions as a baseline for judging CSO control. It was found that the 1981-1983 CSO volume and frequency would be exceeded (even if the collection system and all other aspects of the regulators, CATAD, etc., remained unchanged) about once every five years because of year-to-year variations in rainfall. Thus, the baseline condition for 1981-1983 represents the physical characteristics of the collection and CATAD system during this time period, rather than a not-to-be-exceeded CSO volume.

The relationship between CSO volume and rainfall is approximated by the following formulas:

Baseline SSA

CSO Volume (in MG) = (66.7 x annual rainfall in inches) - 460

Baseline NSA

CSO Volume (in MG) = (19.3 x annual rainfall in inches) - 190

Baseline Total

Baseline Total = Baseline SSA + Baseline NSA

By entering the averaged historical annual rainfall of 36 inches into the formulas above, baseline conditions were calculated as follows:

Baseline SSA

CSO Volume = (19.3 X 36 inches) - 190 = 1,941 MG

Baseline NSA

CSO Volume = (66.7 X 36 inches) - 460 = 458 MG

Baseline Total = 2,399 MG

While the establishment of baseline conditions identifies average annual volume and frequencies of discharge, year-to-year comparisons to baseline conditions can be misleading. Yearly annual rainfall cannot indicate year-to-year variations in CSO volumes for individual basins, as rainfall can be extremely variable in the Seattle area. Individual storm events can disproportionately influence total overflow volume. High-intensity storm events may contribute significant rainfall accumulations in relatively short periods of time resulting in large overflow volume, just as storms of low intensity and long duration may be equated with overflows of a lesser volume.

CSO Volume Comparison to Baseline Conditions

CATAD recorded a total system overflow volume for the reporting period June 1992 through May 1993 of 666 MG. This is significantly less than the 2.4 billion-gallon baseline conditions reported in the 1988 CSO Plan. Based on recorded rainfall for the 1992/1993 recording period, total predicted overflow would be 1,586 MG. Predicted baseline overflows calculated with the formulas above are significantly higher than the actual overflow for 1992/1993. Table 2 summarizes the differences between baseline and actual CSO volumes in the West Point service areas.

Table 2
Baseline/Service Area CSO Volume Comparison

Service Area	1988 CSO Plan Baseline	1992/1993 Projected Baseline	1992/1993 Actual
SSA	1941 MG	1274 MG	648 MG
NSA	458 MG	312 MG	18 MG
TOTAL	2399 MG	1586 MG	666 MG

TABLE 3
1992/1993 RAINFALL - METRO'S GAUGES

STATION	Jun-92	Jul-92	Aug-92	Sep-92	Oct-92	Nov-92	Dec-92	Jan-93	Feb-93	Mar-93	Apr-93	May-93	TOTAL
King Street	0.68	1.02	0.54	1.55	1.25	4.67	3.66	2.13	0.24	3.22	3.80	2.17	24.93
Chelan	0.96	1.17	0.49	1.27	1.53	4.01	3.46	2.76	0.40	3.62	3.57	2.26	25.50
Denny Way Lake Union	0.68	1.41	0.64	1.83	1.43	4.36	3.13	1.68	0.29	2.87	3.45	2.15	23.92
Ballard	0.76	1.16	0.45	1.98	1.17	4.81	3.63	2.19	0.34	3.37	4.07	2.04	25.97
University	0.88	1.25	0.54	2.00	1.66	4.42	2.86	1.81	0.30	1.86	4.16	2.86	24.60
Hollywood	1.79	1.36	0.50	2.35	0.95	6.58	3.80	2.09	0.42	3.49	6.73	2.58	32.64
Rainier Avenue	0.82	1.33	0.47	1.40	1.91	4.51	3.41	2.80	0.41	3.46	3.69	2.48	26.69
E. Marginal	0.77	1.51	0.45	1.09	1.30	3.22	3.61	2.39	0.34	3.43	3.23	2.18	23.52
E. Pine	1.03	1.60	0.68	2.21	2.02	5.35	3.43	2.08	0.48	3.22	4.25	2.18	28.53
Matthews Park	1.36	1.36	0.49	2.06	1.77	5.45	3.17	1.98	0.36	3.27	5.46	2.60	29.33
Kenmore	1.35	1.23	0.47	2.43	1.28	5.19	3.03	1.65	0.40	2.27	3.44	1.58	24.32
AVERAGE	1.01	1.31	0.52	1.83	1.48	4.78	3.38	2.14	0.36	3.10	4.17	2.28	26.36

Total overflow volumes for the 1992/1993 reporting period were nearly 1,743 MG below 1988 CSO Control Plan baseline. Based on the recorded rainfall for this period, total predicted overflow for 1992/1993 would be 1586 MG. The calculated predicted overflow is considerably less than actual overflow conditions. The following factors may have influenced the actual overflow volumes for this reporting period:

Below-Average Rainfall

Precipitation for the 1992/1993 reporting period was significantly below the average annual level for the Seattle area. Approximately 26.4 inches of rain (Table 3) was recorded by Metro's rain gauges compared with a yearly average of 36 inches. (Rainfall data from two of the eight rain gauges were not included in Table 3 because of equipment malfunctions.) Below-average rainfall may explain the reduction in overflow volumes because less storm runoff entered the combined sewer system. A trend in lower average annual rainfall may have also contributed to the reduction in actual overflow volume. A ramification of this trend is a falling average ground water table which is expected to result in less ground water infiltration/inflow (I/I) to the conveyance line.

Short-Intensity Storm Events

Most storm events during the 1992/1993 reporting period were long-duration, low-intensity storms which generally prevail in the Seattle area. Low intensity storms may have resulted in lower overflow volumes. High-intensity storm events often contribute significantly to large overflow volumes in relatively short periods of time. Three storm events accounted for nearly half (46 percent) of the total overflow volume for the 1992/1993 reporting period. Table 4 lists the dates of these storm events and corresponding overflow volumes.

Table 4
Peak Storm Events

Storm Date	Associated Overflow Volume
12/10/92-12/11/92	82.08 MG
3/15/93	71.32 MG
3/22/93-3/23/93	153.11 MG

Predictive Control System

The Predictive Control System developed for CATAD has been operational since February 1993. This system minimizes the overall volume of CSOs released from the conveyance system during storms by controlling wastewater flows and using the available in-line storage.

West Point Secondary Treatment Upgrade

West Point was operating at 50 percent capacity from June 15-Aug. 6, 1992. Only six out of 12 sedimentation tanks were in operation during this period. Overflow volumes resulting from storm events were exacerbated by West Point operating at half capacity during this period of time.

On Sept. 17, 1992, West Point was completely shut down for three hours due to secondary upgrade activities. This resulted in the generation of 3.59 MG of overflow. The overflows generated during the shut-down occurred during dry weather.

CATAD Power Supply

Overflow reports were not recorded or generated between March 11-15, 1993 due to a power supply problem. It was also determined that overflows were not recorded on March 22, 1993 from 9-9:30 a.m. and on March 23, 1993 from 8:15-8:30 a.m.. The Uninteruptible Power Supply (UPS) for CATAD was temporarily shut off while the batteries were replaced. Therefore, overflow volumes during this period may have been under-reported.

Metro CSO Control Projects

A significant number of CSO control projects have been completed or partially completed. Reduction benefits from Hanford/Bayview/Lander Separation, Fort Lawton Parallel Tunnel, and other CSO control projects are reflected in the overflow volumes and frequencies. As other CSO control projects are completed and operational, greater CSO reductions are expected to occur.

City of Seattle CSO Control Projects

Since the 1981 baseline period, the City of Seattle has constructed 29 storage projects (28 of which are associated with earlier separation projects), four storage and separation projects, and six stormwater separation projects. Model analysis was used to determine that the net impact of all City projects would be about a 75 million gallon per year reduction in Metro's annual CSO volume.

SSA Overflow Volume

Overflow volumes for 1992/1993 in the SSA were 1,293 MG under baseline conditions. The largest volume increases in comparison to baseline and 1991/1992 overflow volumes were experienced at Chelan and Norfolk. Large volume reductions occurred at Denny Way, Brandon Street, and Michigan. Monthly and total overflows and comparisons to the 1991/1992 reporting period and baseline conditions for each station are reported in Table 5.

Chelan overflowed 50 MG compared with a baseline of 25 MG. As a result of the trunk bubbler plugging, erroneously elevated level sensor readings caused the overflow gate at the station to be open for the days during the large storm that occurred between March 22-23, 1993. The bubbler was relocated away from sand build-up, and the overflow gate was closed manually on March 25. This equipment malfunction contributed to the exceedingly high overflow recorded for Chelan.

Norfolk experienced overflow volumes of 23 MG compared with a baseline of 4 MG. This also represents a significant fluctuation from last year's volume of 8 MG. Most of the overflow occurred during the large storm that occurred on March 22-23. Staff are currently investigating possible reasons for this fluctuation.

Denny Way overflowed 335 MG compared with a baseline of 370 MG. This is the first time overflows for Denny Way have been reported under baseline. Further reductions in overflow may occur at Denny Way for the next reporting period resulting from a project to increase pumping capacity at the Interbay pump station. In addition, the use of a pump-down mode at Interbay, in anticipation of storms, will continue to reduce CSOs at Denny Way.

Brandon experienced overflow volumes of 64 MG. Although this volume exceeds 35 MG for the baseline, the overflow was reduced from the 135 MG overflow reported for Brandon during the 1991/1992 reporting period.

Michigan had 31 MG of overflows compared with a baseline of 250 MG. In the 1991/1992 reporting period Michigan had 52 MG of overflows. It should be noted that there is a significant operating relationship between the Michigan and Brandon basins and flows can be readily transferred between basins. This may account for unusually high or low volumes and frequencies at either location. An assessment of the total volume at both regulator stations may more accurately reflect volume and frequency reductions.

Hanford had 16 MG of overflows compared with a baseline of 680 MG. This also represents a significant decrease from the 65 MG reported in 1991/1992. This is partially attributable to completion of the Hanford/Bayview Project. The reduction in overflows may also be a result of a low bubbler reading and consequently the overflow gate was opening late.

Overflows were not recorded for the new Lander station. The level sensor was broken and is now being repaired to accurately record overflow volumes.

The Duwamish Pump Station experienced no overflow volumes compared with a baseline of 130 MG. Overflow recordings are based on the wetwell levels at the pump station. Wet well levels have not risen above the level of the overflow weir and consequently no overflows have been recorded.

Overflow activity at S.W. Alaska Street has been included in the 1992/1993 Annual CSO Report as a result of Metro's new NPDES permit requirements. During the 1992/1993 reporting period, no overflows occurred at S.W. Alaska Street. The level of the overflow weir was recently raised during repair, and should result in infrequent overflows. Overflow data for S.W. Alaska Street will now be provided in future annual CSO reports.

Table 5
1992/1993 Volume Summary by Service Area

Station	Jun-92	Jul-92	Aug-92	Sep-92	Oct-92	Nov-92	Dec-92	Jan-93	Feb-93	Mar-93	Apr-93	May-93	1992/1993 Overflows	1988 CSO Plan Baseline	1991/1992 Overflows
SSA															
Denny Way	9.68	10.11	5.24	23.43	10.72	50.73	58.65	45.95	0.00	56.31	45.24	18.71	334.77	370.00	417.36
King St.	1.90	1.97	0.98	3.15	0.33	3.72	5.41	5.18	0.00	4.87	0.25	0.95	28.71	70.00	39.16
Connecticut	2.54	3.47	1.62	4.97	1.21	8.73	10.88	6.24	0.00	28.05	2.41	0.00	70.12	90.00	74.31
Hanford	0.00	0.33	0.79	1.05	0.00	0.10	5.24	0.00	0.00	7.49	0.00	0.82	15.82	680.00	65.33
Lander	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	215.00	2.58
Harbor Ave.	0.40	0.56	0.21	0.46	1.31	2.23	1.03	0.45	0.01	1.92	1.12	0.22	9.92	55.00	14.20
Chelan	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	49.51	0.00	0.00	49.54	25.00	1.94
West Michigan	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.06	0.00	0.03	0.10	2.00	0.02
8th Ave.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.65	0.00	0.00	5.65	15.00	2.28
Brandon St.	0.00	1.06	0.52	3.89	8.31	16.68	15.97	7.71	0.00	6.45	2.07	0.96	63.62	35.00	105.16
Michigan St.	0.00	1.09	0.26	4.17	1.74	9.47	4.75	0.00	0.00	8.90	0.00	0.16	30.54	250.00	52.26
Norfolk St.	0.00	0.25	0.00	0.17	0.00	1.64	3.91	0.84	0.00	15.66	0.39	0.11	22.97	4.00	8.00
Duamish P.S.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	130.00	0.00
Henderson *	0.00	0.05	0.54	0.00	0.00	0.00	0.00	0.39	0.00	9.39	0.57	0.69	11.63	0.00	11.91
MLK Way *	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.16	0.25	0.00	4.51	0.00	2.70
Rainier Ave.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E. Marginal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W. Marginal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S.W. Alaska St. (Beach Dr.)*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
												TOTAL SSA	647.90	1941.00	782.60
NSA															
Ballard	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	90.00	0.00
Dexter	0.00	0.19	0.00	1.38	0.53	0.70	0.00	0.00	0.00	0.00	0.47	0.00	3.27	12.00	4.66
University	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	211.00	62.28
Montlake	0.00	0.92	0.44	0.16	1.58	3.85	0.00	0.00	0.00	0.00	4.23	0.38	11.56	40.00	30.59
Canal St. (Lake City)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.55
Third Ave. W.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	105.00	6.32
E. Ballard *	0.00	0.15	0.01	0.43	0.00	0.00	0.00	0.00	0.00	0.33	0.02	0.26	1.20	0.00	5.18
Magnolia *	0.00	0.06	0.01	0.07	0.00	0.00	0.00	0.07	0.00	0.34	0.44	0.26	1.25	0.00	1.09
E. Pine St.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Belvoir	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Matthews Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30th Ave. N.E.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
North Beach *	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.14	0.01	0.36	0.00	1.78
												TOTAL NSA	17.70	468.00	109.58
TOTALS (NSA+SSA)	14.52	20.31	10.62	43.39	25.73	97.88	105.85	66.83	0.01	199.09	57.46	23.55	665.24	2409.00	892.18

*Portable flow meters; not currently monitored by CATAD

NSA Overflow Volume

Overflows in the NSA were approximately 487 MG under baseline conditions. Monthly and total overflows and comparisons to the 1991/1992 reporting period and baseline conditions for each station are reported in Table 5.

East Ballard had 1 MG of overflows compared with a baseline of 0 MG.

All other stations registered overflow volumes below baseline. Dexter (3 MG compared with a baseline of 12 MG), Montlake (12 MG compared with a baseline of 40 MG), Third Avenue (0 MG compared with a baseline of 105 MG), and North Beach (0.4 MG compared with a baseline of 2 MG) all fall into this category.

University had 0.6 MG of overflows compared with a baseline of 211 MG. This represents a 62 MG decrease over 1991/1992 volumes despite similar rainfall for both reporting periods.

Ballard registered no overflows in comparison with a baseline of 90 MG. Low overflow volumes have been recorded for Ballard because the interceptor level sensor has been located in the Old Fort Lawton tunnel after the new tunnel was built. The old tunnel has been isolated for rehabilitation for much of the reporting year, making the level reading lower than normal. The location of the sensor in the original tunnel has caused the regulator gate to remain open. The interceptor level sensor has recently been moved upstream of the tunnels to correct this problem.

1992/1993 Frequency of CSO Events

In the 1992/1993 reporting period, 315 overflow events occurred compared to a baseline of 354 (see Table 6). This reduction from baseline appears to be a result of decreased average rainfall. Figures 2 and 3 graphically illustrate the relationship between rainfall, CSO events, and CSO volumes.

Frequency of events were higher than baseline at Connecticut (26 compared with a baseline of 25), Harbor Avenue (72 compared with a baseline of 46), West Michigan (13 compared with a baseline of 8), Brandon (42 compared with a baseline of 25), Norfolk (29 compared with a baseline of 7), and Dexter Avenue (6 compared to a baseline of 4).

Frequency of events were lower than baseline at Denny Way (37 compared with a baseline of 51), King Street (26 compared to a baseline of 31), Chelan (6 compared with a baseline of 16), Michigan (13 compared to a baseline of 31), and Montlake (11 compared with a baseline of 16).

TABLE 6

1992/1993 FREQUENCY OF EVENTS

Overflow Location	Jun-92	Jul-92	Aug-92	Sep-92	Oct-92	Nov-92	Dec-92	Jan-93	Feb-93	Mar-93	Apr-93	May-93	Total 1992/1993 Station Overflows	CSO Plan Baseline	At 75% Volume Reduction
SSA															
Denny Way	1	3	1	3	1	7	3	3	0	3	7	3	35	51	5-10
King St.	1	2	2	2	1	5	3	4	0	2	3	1	26	31	1
Connecticut	1	1	1	2	1	5	3	4	0	3	3	0	24	25	10-25
Hanford	0	1	1	1	0	2	1	0	0	1	0	1	8	23	10-25
Lander	0	0	0	0	0	0	0	0	0	0	0	0	0	19	10-19
Harbor Ave.	1	3	1	3	7	7	4	8	1	5	18	7	65	46	10-25
Chelan	0	0	0	1	0	1	1	0	0	1	0	0	4	16	2-5
W. Michigan	0	0	0	0	1	0	1	4	0	4	0	1	11	8	1
8th Ave.	0	0	0	0	0	0	0	0	0	1	0	0	1	12	2-5
Brandon St.	0	2	1	3	5	7	3	4	0	3	6	2	36	25	1-2
Michigan St.	0	1	1	1	2	5	1	0	0	1	0	1	13	31	1
Norfolk St.	0	1	0	1	0	5	2	1	4	2	3	1	20	7	1
Duamish P.S.	0	0	0	0	0	0	0	0	0	0	0	0	0	<1	1-2
Henderson P.S.	0	1	1	0	0	0	0	3	0	2	3	3	13	<1	<1
MLK Way	0	1	0	0	0	0	0	0	0	1	1	0	3	<1	<1
Rainier Ave.	0	0	0	0	0	0	0	0	0	0	0	0	0	<1	<1
E. Marginal	0	0	0	0	0	0	0	0	0	0	0	0	0	<1	<1
W. Marginal	0	0	0	0	0	0	0	0	0	0	0	0	0	<1	<1
S.W. Alaska St. (Beach Dr.)	0	0	0	0	0	0	0	0	0	0	0	0	0	<1	<1
NSA															
Ballard	0	0	0	0	0	0	0	0	0	1	0	0	1	13	1-2
Dexter	0	1	0	1	1	1	0	0	0	0	2	0	6	4	1-2
University	0	0	0	1	0	1	0	0	0	0	0	0	2	14	5-10
Montlake	0	1	1	1	1	3	0	0	0	0	1	2	10	16	5-10
Canal St. (Lake City)	0	0	0	0	0	0	0	0	0	0	0	0	0	**	<1
Third Ave. W.	0	0	0	0	0	0	0	0	0	0	0	0	0	**	1-2
E. Ballard	0	1	1	2	0	0	0	0	0	1	2	2	9	13	5-10
Magnolia	0	2	1	1	0	0	0	3	0	1	7	2	17	**	**
E. Pine St.	0	0	0	0	0	0	0	0	0	0	0	0	0	**	**
Belvoir	0	0	0	0	0	0	0	0	0	1	0	0	1	**	**
Matthews Park	0	0	0	0	0	0	0	0	0	0	0	0	0	**	**
30th Ave. N.E.	0	0	0	0	0	0	0	0	0	0	0	0	0	**	**
North Beach	0	1	0	0	0	0	0	0	0	1	1	1	4	**	**
TOTALS (NSA+SSA)	4	22	12	23	20	49	22	34	5	34	57	27	309	354	

Figure 2
1992/1993 CSO Events vs. Rainfall

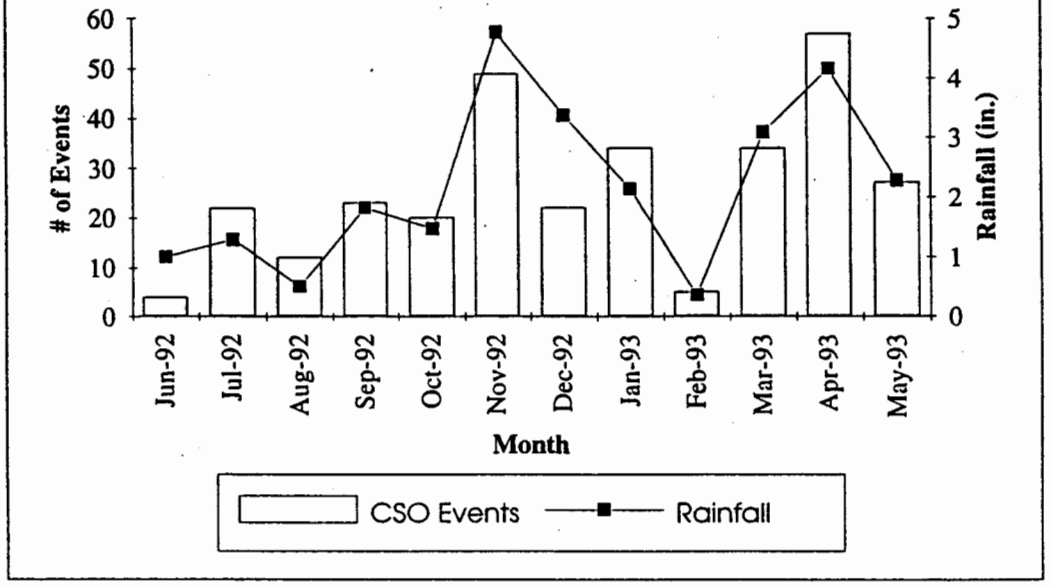
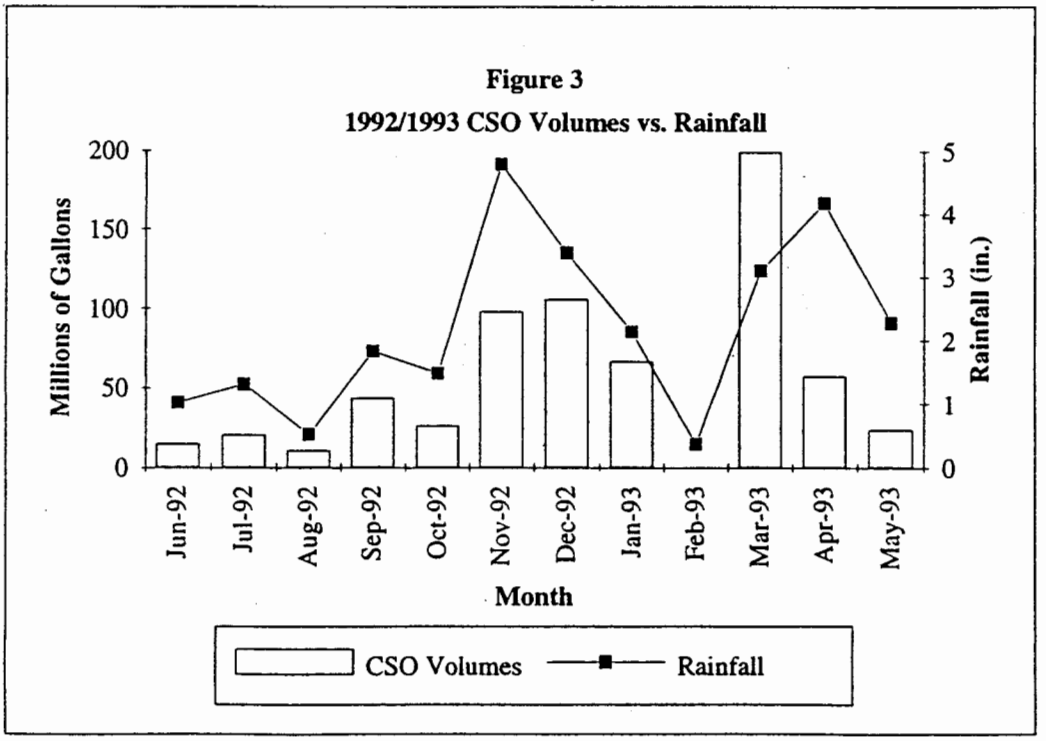


Figure 3
1992/1993 CSO Volumes vs. Rainfall



SECTION 3

1992/1993 CSO MONITORING PROGRAM

CSO MONITORING PROGRAM

Introduction

Metro's National Pollutant Discharge Elimination System (NPDES) CSO sampling program requires discharge and sediment sampling of five CSO sites annually through 1992 to meet requirements of WAC 173-245-040 (2) (a) (i) and condition S11.C1 of the West Point Treatment Plant's NPDES permit. Appendix A lists stations, sample numbers, dates when samples were taken, and the status of each site in the monitoring program. Nine stations were selected for sediment quality sampling and four discharge samples for each CSO under overflow conditions were to be collected to supplement previous monitoring efforts. Sediment sampling requirements were completed in 1990. Discharge sampling requirements remain for five discharge locations. Eighth Avenue (W040), Chelan Avenue (W036), and Dexter Avenue (W009) require all four samples be taken, while one sample remains for West Michigan (W042) and Montlake (W014).

1992/1993 Discharge Sampling Data

Successful sampling was inhibited during the 1992/93 reporting period due to inadequate storm events and equipment failures. Sampling attempts were not completed for West Michigan (W042), Eighth Avenue (W040), Chelan Avenue (W036), Montlake (W014), or Dexter Avenue (W009).

The CSO sampling program will be completed once samples are successfully collected for the five remaining CSO locations. Upon completion of Metro's sampling efforts, the data will be fully analyzed and consolidated as a complete report so that Metro can present a comprehensive overview of the results of the CSO sampling program.

TABLE 7

NPDES CSO MONITORING PROGRAM CHECKLIST

DISCHARGE MONITORING

CSO	SERIAL #	DATE	SAMPLE #	STATUS OF PROGRAM
MICHIGAN	W039	03/26/88	8800300	PERMIT REQUIREMENTS MET
LANDER	W030	03/26/88	8800301	PERMIT REQUIREMENTS MET
DENNY	W027	03/25/88	8800302	PERMIT REQUIREMENTS MET
E. BALLARD	W004	02/22/89	8900177	PERMIT REQUIREMENTS MET
		04/06/88	8800352	
		01/14/88	8800052	
		11/02/88	8802026	
3RD AVE. W.	W008	02/22/89	8900174	PERMIT REQUIREMENTS MET
		01/14/88	8800053	
		03/26/88	8800303	
		11/02/89	8802027	
BALLARD	W003	12/02/89	8909776	PERMIT REQUIREMENTS MET
		03/09/90	9000286	
		10/04/90	9000880	
		01/06/90	9000002	
CONNECTICUT	W029	08/22/89	8900832	PERMIT REQUIREMENTS MET
		10/22/89	8909698	
		04/23/90	9000394	
		02/07/90	9000215	
BRANDON ST.	W041	03/14/90	9000298	PERMIT REQUIREMENTS MET
		06/03/90	9000510	
		10/04/90	9000881	
		12/04/90	9010003	
NORFOLK ST.	W044	10/14/90	9000887	PERMIT REQUIREMENTS MET
		06/06/90	9000524	
		04/03/91	9100612	
		12/04/90	9010006	
EIGHTH AVE.	W040			SAMPLING IN 1993/1994
CHELAN AVE.	W036			SAMPLING IN 1993/1994
DEXTER AVE.	W009			SAMPLING IN 1993/1994
MONTLAKE	W014	04/03/91	9100609	ADDIT. SAMPLING 1993/1994
		12/04/90	9010009	
		02/21/92	9010006	
W. MICHIGAN	W042	01/12/91	9100012	ADDIT. SAMPLING 1993/1994
		04/03/91	9100613	
		01/28/92	9200134	

SEDIMENTS	SERIAL#	DATE	SAMPLE#	STATUS OF PROGRAM
BALLARD	W003	05/30/89	8900560	PERMIT REQUIREMENTS MET
E. BALLARD	W004	05/30/89	8900561	PERMIT REQUIREMENTS MET
3RD AVE. W.	W008	05/30/89	8900563	PERMIT REQUIREMENTS MET
DEXTER AVE.	W009	05/30/89	8900565	PERMIT REQUIREMENTS MET
MONTLAKE	W014	05/30/89	8900564	PERMIT REQUIREMENTS MET
EIGHTH AVE.	W040	05/23/90	9006690	PERMIT REQUIREMENTS MET

BRANDON ST.	W041	05/23/90	9006687	PERMIT REQUIREMENTS MET
MICHIGAN	W042	05/23/90	9006691	PERMIT REQUIREMENTS MET
NORFOLK ST.	W044	05/23/90	9006688	PERMIT REQUIREMENTS MET