CLEAN BEACHES INITIATIVE
DATE AVENUE LOW-FLOW
URBAN RUNOFF DIVERSION PROJECT
FINAL REPORT

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City of Imperial Beach

"Funding for this project has been provided in full or in part through a contract with the State Water Resources Control Board (SWRCB) pursuant to the Costa-Machado Water Act of 2000 (Proposition 13) and any amendments thereto for the implementation of California's Nonpoint Source Pollution Control Program. The contents of this document do not necessarily reflect the views and policies of the SWRCB, nor does mention of trade names or commercial products constitute endorsement or recommendation for use." (Gov. Code 7550, 40 CFR 31.20)

Agreement No.: 01-229-550-1

TABLE OF CONTENTS

Tables

Figures

Exhibits

1.0 INTRODUCTION

1.1 Background

The City of Imperial Beach (City) is a small, beach-oriented community situated at the southwesterly corner of the United States-Mexico international border. Coastal resources such as beaches and estuaries are some of the City's most important amenities. Imperial Beach has long been a popular location for surfing, sunbathing, and other water-related recreational activities on a year-round basis. Beach usage is particularly heavy during the summer months, when the world-renowned U.S. Open Sandcastle Competition draws hundreds of visitors during the month of July.

Ocean water quality is of paramount concern to City leaders and citizens due to the human health risk associated with elevated levels of bacteria in local waters. For the past 20 years, various agencies have conducted bacteriological monitoring of ocean waters up and down the San Diego County coastline. Six sites are monitored at varying frequencies in Imperial Beach (see Figure 2). Weekly surf zone monitoring is conducted year-round at two locations (the projection of Carnation Avenue and the end of Seacoast Drive) pursuant to National Pollutant Discharge Elimination System (NPDES) requirements for the South Bay International Wastewater Treatment Plant (SBIWTP) ocean outfall. Two additional surf zone locations (the Imperial Beach Pier and the Camp Surf jetty) are monitored at least weekly from April 1st through October 31st pursuant to Assembly Bill 411 requirements. Finally, surf zone samples are taken at the projections of Cortez Avenue and Palm Avenue on an as needed basis during special investigations. When sampling results show bacterial indicators[1] to be present in quantities exceeding state standards, public health advisories are issued and temporary warning signs are posted on beaches to alert the public. Beaches are closed (Figure 1) any time a reported sewage spill impacts, or may impact, ocean waters. Table 1 summarizes the number of beach advisories and closures in Imperial Beach from 2000 through 2005.

Figure 1 - Beach Closure

Table 1 – Beach advisories and closures in Imperial Beach (2000-2005)

	2000	2001	2002	2003	2004	2005
Advisories	8	7	3	5	0	1
Closures	5	6	6	8	12	13

When the Date Avenue Low-Flow Diversion Project was proposed, Imperial Beach was experiencing a significant number of beach advisories and closures, but the origin and transport of bacteria were not well understood. A few sources had been identified as likely or potential contributors to the problem. First, the Tijuana River carries untreated wastewater from Mexico across the border before discharging to the Pacific Ocean off the coast of Imperial Beach. In 1999, to address this problem, the South Bay International Wastewater Treatment Plant (SBIWTP) was constructed on the U.S. side of the border just east of Imperial Beach. The

[1] Ocean water samples are measured for three indicators of disease-producing organisms: total coliforms, fecal coliforms, and enterococcus. Bacterial indicators are not necessarily human in origin. They may also come from any of the following: animal wastes, food waste, soils, decaying vegetation, etc.

Figure 2 – Date Avenue Diverter and Ocean Water Sampling Locations

SBIWTP is a 25 million gallon per day advanced primary treatment plant designed to treat excess wastewater flows that Mexico does not currently have the capacity to treat. The plant discharges to the ocean through the South Bay Ocean Outfall, a four and one-half mile long, eleven-foot diameter pipe. The SBIWTP is not capable of treating high flows during rain events or other high volume scenarios, so wastewater from Mexico continues to impact Imperial Beach on a periodic basis. This explains the high number of beach closures shown in Table 1 above. A few beach closures have also been instigated by sewage leaks on the Imperial Beach pier, but Tijuana River flows are the overwhelmingly most common source. The second potential source of bacteria at local beaches is the multitude of birds and other wildlife that inhabit the Tijuana Estuary, the San Diego Bay Wildlife Refuge, and other coastal areas. Storm water and urban runoff from City storm drains were a third suspected source and the impetus for moving forward with the Date Avenue project. Some residential and commercial areas in Imperial Beach drain storm water and urban runoff directly to the Pacific Ocean via outfalls (see Figure 2 for an illustration of the area draining to the Date Avenue coastal outfall). Although the City implements a comprehensive Jurisdictional Urban Runoff Management Program (JURMP) to minimize the amount of pollution entering its storm drain system, diversion of runoff to the sanitary sewer system is considered to be a more permanent and responsive solution.

1.2 Project Purpose

The City obtained Proposition 13 Clean Beaches Initiative (CBI) funds for three projects designed to 1) enhance its understanding of bacteria sources and transport in the region, and 2) initiate the process of eliminating known sources of pollution. The first project to be completed was the San Diego Coastal Ocean Observing System (SDCOOS), which provides real-time measurements of oceanographic parameters that are used to track the complex mechanisms driving currents and water transport in the vicinity of the Tijuana River mouth. SDCOOS enables public health officials to detect when Imperial Beach is being impacted by sewage-contaminated flows from the Tijuana River. Advisories and closures are then issued as appropriate.

The second CBI project, and the focus of this report, is the Date Avenue Low-Flow Urban Runoff Diversion Project (Date Avenue Diverter), which is designed to divert urban runoff from the storm drain to the sanitary sewer during dry weather and other low-flow conditions. Prior to construction of the diverter, all flows from the storm drain at Date Avenue discharged directly onto the beach through an outfall pipe at the Date Avenue street end. The Date Avenue project was initiated on July 1, 2001 when Agreement Number 01-229-550-1 (Agreement) was executed between the City and the State Water Resources Control Board (SWRCB). An additional diversion project at the Palm Avenue intersection with Seacoast Drive remains in the planning and permitting stage. Construction is anticipated in 2006. By diverting urban runoff from the storm drain to the sanitary sewer, it is hoped that one potential source of bacteria (urban runoff) will be completely eliminated during dry weather and other low-flow conditions. The Date Avenue and Palm Avenue outfalls were chosen because they drain the City's largest impervious land areas adjacent to the ocean and have the highest potential for contaminant discharge.

1.3 Project Description

The Date Avenue outfall empties onto the Imperial Beach ocean front and is fed by a single curb inlet located approximately 200 feet east of the outfall (see Figure 3). Four drop inlets located on each corner of the Date Avenue and Seacoast Drive intersection all channel water to a catch basin at the curb inlet pictured below. The Date Avenue drainage area encompasses approximately 61 acres of predominately residential land area (see Figure 2) and is capable of handling 16 cubic feet per second (cfs) of flow. This project consisted of the construction and monitoring of a system to divert low-flow urban runoff from the catch basin into the sanitary sewer system before it is discharged onto the beach.

Figure 3 – Date Avenue Curb Inlet During Construction

The diversion system consists of a screen at the curb inlet to prevent trash and large debris from entering the underground system. A catch basin was constructed to capture all discharges into the inlet. A pipe four inches in diameter was constructed to connect the catch basin to the sanitary sewer system. This pipe connects above the catch basin bottom to allow for retention of sediment. An access cover is installed

over the catch basin so that it can be easily maintained. An automated valve on the pipe between the catch basin and the sewer regulates diverted flows. Operating at maximum capacity, the pipe can divert flows of up to 0.5 cfs into the sanitary sewer. During low flows of less than 0.5 cfs, the valve remains open and all discharges to the curb inlet are diverted into the sanitary sewer. During flows greater than 0.5 cfs, the valve shuts and all discharges to the curb inlet bypass the diversion system and flow to the beach via the Date Avenue outfall.

2.0 PROJECT TASKS COMPLETED

The Agreement describes the required tasks in Exhibit A-1.B – "Work to be Performed." This report section summarizes the work products for each of the tasks reproduced in Table 2 below.

Task 1. Project Management and Administration

a. Quarterly Progress Reports

The **First Quarterly Progress Report** was submitted to the SWRCB on August 31, 2004 and covered the period from October 31, 2001 through March 31, 2004. During this time period the City focused on preparing permits and an Environmental Impact Report (discussed in Task 2). Project engineering was also underway and 100% design documents were completed. In early 2004, the construction request for proposal (RFP) was advertised, and by March 2004 a contract had been awarded. An RFP was also issued to secure a consultant to complete the project's post-construction water quality monitoring requirements.

The **Second Quarterly Progress Report** covered the period from April 1 through June 30, 2004. Zondiros Corporation initiated construction on May 10, 2004 (Figure 4), and the City selected Anchor Environmental, Inc. (Anchor) as the water quality-monitoring consultant.

Figure 4 - Initial Phase of Construction

The **Third Quarterly Progress Report** was submitted for the period ending September 30, 2004. Significant accomplishments during this time period included completion of diverter construction on July 9, 2004 and pump station improvements by September 13, 2004. Anchor also developed and submitted the draft Quality Assurance Project Plan (QAPP) for approval at this time. Finally, the City completed and submitted an Annual Progress Report to the SWRCB.

The **Fourth Quarterly Progress Report** covered the period ending December 31, 2004, and was submitted on January 26, 2005. During this reporting period the City issued a Notice of Completion on October 6, 2004 for construction of the diverter (Figure 5). Upon final approval of the QAPP, Anchor, along with City staff, initiated water quality sampling of diverted urban runoff (October 12, 2004).

Table 2: Grant Project Task Schedule (Date and Palm Avenue Diverters)[1]

Task		Product	Original Target Completion Date
1.0	**Project Management and Administration**		
	1.2	Quarterly Progress Report**s**	Quarterly
	1.5	Contract Summary Form	December 2003
	1.6	Subcontractor Documentation	November 2004
	1.7	Project Survey Form	February 2006
2.0	**State and Local Permits**		
	2.1a	Date Avenue CEQA Documentation	September 2003
	2.1b	*Palm Avenue CEQA Documentation*	*January 2006*
	2.2	Date Avenue San Diego MWWD Industrial User Discharge Permit	November 2003
	2.3	*Palm Avenue San Diego MWWD Industrial User Discharge Permit*	*February 2004*
3.0	**Monitoring and Quality Assurance Project Plans (QAPP)**		
	3.1	QAPP	April 2004
	3.2	Monitoring and Reporting Plan	April 2004
4.0	**Project Engineering**		
	4.2	Date Avenue Construction Documents	October 2003
	4.3	*Palm Avenue Construction Documents*	*January 2006*
	4.4	Date Avenue Contract Award Resolution	February 2004
	4.5	*Palm Avenue Contract Award Resolution*	*March 2006*
5.0	**Project Implementation**		
	5.3	Date Avenue Completed project supported by pre/post photos and “As-Built” drawings	May 2004
	5.4	*Palm Avenue Completed project supported by pre/post photos and “As-Built” drawings*	*November 2006*
	5.5	Contract with Project Monitoring Consultant	May 2004
6.0	**Reporting**		
	6.1	Date and Palm Avenue Annual Progress Summary	September 2004, September 2005
	6.2	Date Avenue Draft Final Report	November 2005
	6.3	Date Avenue Final Report	January 2006
	6.4	*Palm Avenue Annual Progress Summary*	*September 2006, September 2007*
	6.5	*Palm Avenue Draft Final Report*	*March 2008*
	6.6	*Palm Avenue Final Report*	*June 2008*

(1) Shaded tasks apply exclusively to the Palm Avenue Diverter and are not included in this Final Report.

Figure 5 - Date Avenue Diverter Completed

On April 21, 2005, the **Fifth Quarterly Progress Report** for the period ending March 31, 2005 was submitted. During this quarter the diverter was fully operational and monitoring of water quality and flow continued as planned. Flow data were recorded and Anchor provided analytical results for the first time.

The **Sixth Quarterly Progress Report** for the period ending June 30, 2005 was submitted in September 2005. Monitoring activities continued during this period with no unusual circumstances to report.

The **Seventh Quarterly Progress Report** covering July 1, 2005 through October 11, 2005 is submitted as Exhibit A. As reported for the previous quarter, major activities involved recording flow, sampling and testing water quality, and logging visual observations.

b. Contract Summary Form

The required Contract Summary Form was completed by the City on June 21, 2001 and submitted to the SWRCB as part of the first quarterly report.

c. Subcontractor Documentation

The City utilized three contractors for this project. BDS Engineering, Inc. (BDS) of Lemon Grove, CA performed diverter design, engineering, and preparation of the RFP for construction. As noted above, the construction contract was awarded to Zondiros Corporation of San Marcos, CA. The water quality monitoring and reporting contract was awarded to Anchor. All contractors signed binding agreements with the City to perform the work as specified in the SWRCB grant agreement.

d. Project Survey Form

The Project Survey Form will be submitted electronically through the Natural Resource Project Inventory (NRPI) supported by the University of California, Davis Web site upon completion of the second diversion project at Palm Avenue.

Task 2: State and Local Permits

a. CEQA Documentation

On May 13, 2002, the City's Community Development Department approved Administrative Coastal Development Permit ACP 02-05 for the Date Avenue Diverter. A Notice of Exemption (Task 2.1) was posted and filed with the San Diego County Clerk Recorder on August 12, 2003, categorically exempting the project from the CEQA process.

b. San Diego MWWD Industrial User Discharge Permit

The City prepared an Industrial User Discharge Permit Application and submitted it to the City of San Diego's Metropolitan Sewage Department Pretreatment Program on January 5, 2004. The Pretreatment Program indicated a permit was not necessary for this discharge and deemed the application sufficient notification of the discharge.

Task 3: Monitoring and Quality Assurance Project Plans (QAPP)

Anchor prepared the Monitoring Plan and QAPP on behalf of the City. In late June 2004, Anchor initiated development of the QAPP. A draft QAPP was completed and sent to the SWRCB for approval. The City received final approval of the QAPP from the SWRCB on October 8, 2004. Monitoring was initiated on October 12, 2004 following the procedures and requirements outlined in the approved QAPP. The approved QAPP is found in Exhibit B.

Task 4: Project Engineering

a. Date Avenue Construction Documents

BDS performed the design and engineering for the Date Avenue Diverter. BDS staffs the City's Engineering Department and was also responsible for issuing the RFP for construction. All of the agreement documents for the Date Avenue Diverter, including construction plans, specifications, and final cost estimates, were prepared in accordance with City standards. The City conducted project review at 90% and 100% levels, as outlined in the agreement with the State. BDS integrated all comments generated from the review into the construction documents. In early 2004, the construction RFP for the project was advertised.

The City advertised the Date Avenue Diverter Project in the San Diego Daily Transcript and the Eagle News Paper on January 8, 2004, and advertised with *Construction Bidboard, Inc.* (ebidboard.com) on January 5, 2004. The Date Avenue project required an addendum to revise the scope of work, which extended the bid due date accordingly. The construction contractor was selected based on a competitive bidding process using the approved agreement documents prepared as part of this task. Bid opening took place on February 19, 2004. Three bids were submitted: (1) Zondiros Corporation, $184,300; (2) Arrieta Construction, $239,067.07; and (3) Scheidel Contracting & Engineering, $224,218.

b. Date Avenue Contract Award Resolution

On March 3, 2004, the City Council approved Resolution 2004-5898 awarding the Date Avenue Diverter contract to Zondiros Construction, Inc. A copy of the City's Award Resolution is included as Exhibit C of this report.

Task 5: Project Implementation

a. Date Avenue Diverter Construction

A construction contract was awarded to Zondiros Corporation in March 2004. BDS selected Mr. Lawrence J. Martin from their staff as the inspector for the project. A Notice to Proceed as of May 10, 2004 was issued to Zondiros Construction as shown in Exhibit D.

b. Date Avenue Completed Project (supported by pre- and post-construction photos and "As-Built" drawings).

A Notice of Completion was issued on October 6, 2004 for construction of the diverter. A copy of the Notice of Completion is included in Exhibit E of this report. As-built drawings were finalized on September 29, 2005. The drawings are currently kept at the City of Imperial Beach Public Works Department located at 495 10th Street, Imperial Beach, CA.

c. Project Monitoring

i. Contract with Project Monitoring Consultant

Anchor was awarded the contract as the water quality-monitoring consultant for the project.

ii. Monitoring Overview

Monitoring was initiated by Anchor and City staff on October 12, 2004, and concluded one year later in October 2005. A summary of the data collected during the 12-month monitoring period is included in Chapter 3 of this report, "Project Effectiveness". Conclusions are presented in Chapter 4.

d. Operation and Maintenance Summary.

Figure 6 - Weekly Diverter Pumping

During the first year of operation, the Date Avenue Diverter catch basin was pumped every Monday morning, weather permitting, prior to conducting water quality monitoring (Figure 6). Pumping was necessary to ensure that water quality samples taken from the catch basin the following day represented only the most recent urban runoff flowing through the system.

The inlet catch basin was cleaned on a weekly basis to minimize the amount of debris encountered. Catch basin cleaning is anticipated to continue on an as needed basis to maintain the unit at its maximum operational efficiency. During approximately one year of monitoring, the diverter's flow

meter was regularly maintained and serviced. Data were downloaded from the meter at least monthly. Flow data will continue to be downloaded at least quarterly, or more frequently as needed, following completion of this project. This will allow the City to monitor the volume of water diverted to the sanitary sewer system. Continued maintenance and flow monitoring will ensure that the diversion structure continues to direct runoff to the sanitary sewer as designed.

Task 6: Reporting

a. Date Avenue Annual Progress Summary

The Annual Progress Summary Form was completed and submitted to the SWRCB by September 30, 2004.

b. Date Avenue Draft Final Report

The City submitted the Date Avenue Draft Final Report for SWRCB review and approval on November 30, 2005 as required in the grant agreement.

c. Date Avenue Final Report

The City received the SWRCB's comments on the Draft Final Report on January 12, 2006 and incorporated changes as requested. The Final Report was completed and submitted to the SWRCB on February 28, 2006.

3.0 PROJECT EFFECTIVENESS

Project effectiveness was measured through frequent monitoring of flow rates and water quality at the Date Avenue Diverter. Monitoring was conducted from October 2004 to October 2005. Anchor Environmental performed all bacteriological monitoring as specified in the project QAPP and Monitoring Plan. City staff performed all downloading of flow data as well as monitoring of non-bacteriological water quality constituents.

3.1 Field Observations

Visual observations were recorded onto field data sheets during each sampling event and are summarized below. Any observations indicating a potential illegal discharge to the storm drain were followed by public outreach and other enforcement activities as necessary.

a. Debris

Debris and plant material (mainly grass wastes) were observed during all sampling events. A potential source of this waste is a lawn area located on the same corner as the diverter. Typical urban garbage wastes (paper, aluminum, and plastic containers) were observed on December 14, 2004, and the following dates in 2005: January 25, February 8, March 22, April 5, 12, May 3, 31, June 7, 14, July 12, 19, August 9, 23, 30, September 6, 20, and October 12.

b. Water Color

Water color ranged from clear to light brown, brown/yellow, and yellowish. Oil sheens were observed during many sampling events and were likely the result of the catch basin's location adjacent to Seacoast Drive, one of the City's main thoroughfares. Water was darker than usual on July 5, 2005 but no explanation for this color change could be ascertained. On November 2, 2004, a foamy substance was formed when sample bottles were filled with urban runoff, possibly due to the presence of detergent-like chemicals. A foamy substance was also observed on June 21, July 19, September 13, and September 20, 2005. Large amounts of algae and sand were observed on December 14, 2004. This was likely due to a previous high tide that flooded the end of Date Avenue where the diverter is located.

c. Odor

Sewage-like odors were detected during most sampling events, and were especially strong on March 8, August 16, and September 6, 2005.

3.2 Flow Measurement

a. Flow Measurement Methods

A Marsh Mcbirney Model 460 Open Channel Non-Contact Radar Flow Meter consisting of a Flo Dar Sensor and Portable Monitor was used to determine the volume of urban runoff diverted by the Date Avenue Diverter. The Flo Dar Sensor measures the following parameters: water surface velocity using Doppler radar, the level of flow using an ultrasonic lookdown level sensor, and surcharge level using a pressure transducer.

Figure 7 - Flow Meter During Installation

The level and velocity readings are transferred to the monitor, processed, and combined with site characteristic data to calculate a flow rate. The resulting information consisting of the velocity, level, and flow rate was recorded at five-minute intervals and then retrieved during monthly downloading events. Using Flow Ware software, total volumes were calculated monthly for eleven of the twelve months covered by this report.[2]

[2] Equipment adjustments and software troubleshooting occurred in October 2004 and caused downloading to be delayed until November.

b. Flow Data Collection

Figure 8 - Traffic Control During Flow Meter Data Retrieval

A laptop computer was used to retrieve the velocity, level, and flow data from the portable monitor during monthly downloading events. The flow meter was situated underneath a manhole cover near the intersection of Date Avenue and Seacoast Drive, which required a traffic safety zone to be set up to access the meter (Figure 8). The velocity, level, and flow rate were recorded using the Flow Ware software and converted to a Microsoft Excel spreadsheet. Periodic checks were performed in real time during monthly downloading to ensure proper meter functioning. Flow measurements will continue to be downloaded from the meter at least quarterly, and more frequently as determined necessary, following completion of this report. This is both to ensure the continued functioning of the diverter and to make use of the valuable data provided by the flow meter.

c. Flow Data Analysis

A total of 648,091 gallons of runoff were recorded as diverted from the catch basin to the sanitary sewer over an eleven-month period (November 2004 to October 2005). The average recorded monthly volume was 50,422 gallons. Flow volumes were relatively consistent from month to month, with the exception of higher volumes recorded in February, August, and September (see Table 3 for monthly quantities). For August and September, increased flows might be expected given that water consumption is at its highest during summer months (i.e., more car washing, landscape irrigation, etc.). Staff experience and the discovery of several incidents of over irrigation and car washing during summer months support this hypothesis. The high flow recorded during February 2005 might have been associated with the first flush (i.e., until the 0.5 cfs threshold was reached) of storms during the wettest month of the year (six inches of rain).

Diverted flows included all flows less than 0.5 cfs. Flows greater than 0.5 cfs triggered closure of a valve within the pipe connecting the catch basin to the sewer, which redirected the water to the ocean outfall at the end of Date Avenue. Once flows decreased below 0.5 cfs, the valve again opened and allowed the runoff through the diversion pipe into the sewer. There were limitations in accurately quantifying diverted flows throughout this project. First, since the meter was set to record flows at five-minute intervals, any water going through the pipe in between measurements was not quantified. Second, through equipment troubleshooting and conferring with the equipment manufacturer, it was discovered that the meter did not capture very low velocities. This was due, not to any mechanical problems, but to the fact that the equipment is not designed to capture such low-velocity flows. Low velocities are common in the Date Avenue system given that urban runoff is gravity-fed through the system. Thus, the actual total gallons diverted may be significantly higher than what was recorded by the flow meter.

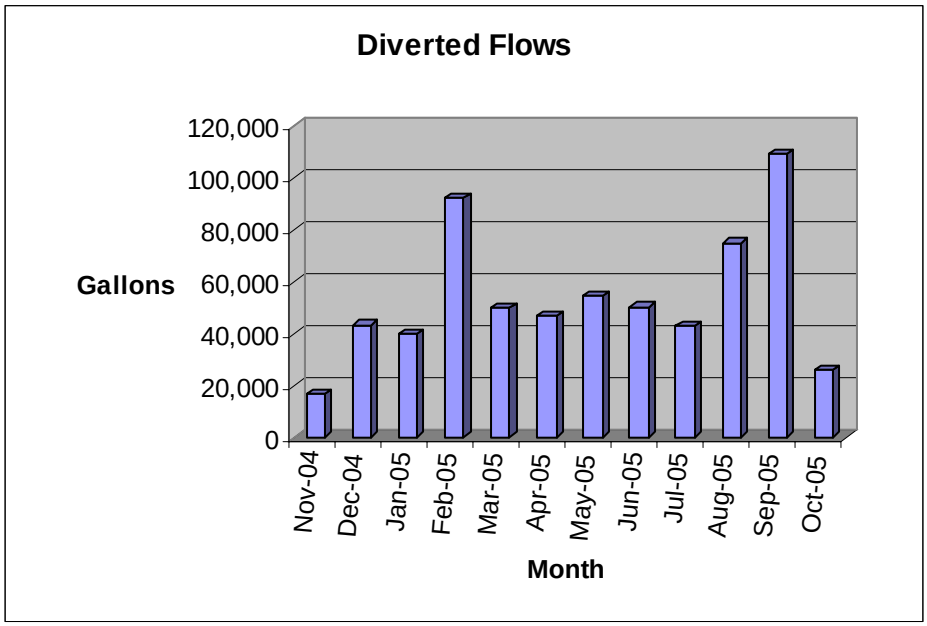
Table 3
Date Avenue Diverter Total Flows

Quarter	Month	Flow - Gallons
4th- 2004	November 2004	16,671
	December 2004	43,326
1st- 2005	January 2005	40,067
	February 2005	92,296
	March 2005	49,730
2nd – 2005	April 2005	46,907
	May 2005	54,514
	June 2005	50,440
3rd - 2005	July 2005	43,062
	August 2005	75,213
	September 2005	109,722
	October 2005	26,143
TOTAL		648,091

d. Flow Data Summary and Conclusions

Volumes diverted in August (75,213 gal), September (109,722 gal), and February (92,296 gal) were relatively higher than the average monthly volume of 50,422 gallons (see Figure 9). Drawing conclusions about these seasonal differences is speculative; however, several possible explanations are provided above. Obtaining accurate flow measurements was complicated due to the limitations of the equipment used in this project. Overall, the flow meter did provide a rough estimate of monthly flow quantities. This information was used in conjunction with pollutant concentration data to estimate the amount and type of pollutants that are common in this small drainage area.

Figure 9 – Diverted Flows by Month



3.3 Bacteria and Chemical Sampling: Collection and Methods

a. Sample Collection

Sampling of diverted runoff at the Date Avenue Diverter was scheduled to occur every Tuesday for a 12-month period starting on October 12, 2004. Tuesdays were selected to coincide with ocean water quality monitoring along the Imperial Beach coastline. Samples were only taken from the diverter during dry weather (no rain within 48 hours of sampling). A total of 40 samples were collected in the one-year period from October 2004 to October 2005. Every Monday prior to sample collection (excluding holidays and rain events), the diverter catch basin (or wet well) was pumped to remove any standing water that might have accumulated during the prior week. This ensured that samples taken from the catch basin were representative of only the most recent urban runoff (within the last 24 hours prior to sampling).

b. Bacteria and Chemical Testing Methods

The methods used for bacteria and chemical testing are fully described in the QAPP and Monitoring Plan approved by the SWRCB. The QAPP describes the program utilized to evaluate the effectiveness of the project to reduce bacteriological and other urban runoff pollution to the Pacific Ocean and addresses the following parameters: total coliforms, fecal coliforms, *Enterococcus* bacteria, and runoff flow.

Chemical testing for water temperature, pH, conductivity, ammonia (as nitrogen), nitrate (as nitrogen), reactive phosphorous, and turbidity was performed using instruments in the field. Samples were also sent to a state-accredited laboratory for analysis of oil and grease, total hardness, dissolved metals (cadmium, copper, lead, and zinc), detergents as methyl blue activated substances (MBAS), as well as two pesticides (diazinon and chlorpyrifos).

3.4 Summary of Bacteriological Monitoring Data

This section compares the results of bacteriological monitoring at the Date Avenue Diverter with the results of concurrent ocean samples collected from the surf zone at up-coast and down-coast locations. All sample locations are shown on a map in Figure 2 above. Results are presented in tabular form in Exhibit F and graphically in Figures 10 through 12. Table 4 lists the single-sample water quality objectives used for analysis. Objectives are established by AB 411 as well as the Water Quality Control Plan for the San Diego Region (Basin Plan), and are set at levels thought to be protective of human health. Table 4 also presents another useful benchmark for analysis: action levels developed by the San Diego Municipal Stormwater Copermittees. Sample results exceeding the "Copermittee Action Level" generally trigger upstream investigations of potential sources of bacteria.

Table 4
Bacterial Indicator Benchmarks

Bacterial Indicator	**Copermittee Action Level** (MPN/100 ml)	**Water Quality Objective** (MPN/100ml)
Total coliforms	50,000	10,000
Fecal coliforms	20,000	400
Enterococcus	10,000	104

a. Date Avenue Diverter Bacteria Levels

Total coliforms exceeded the 10,000 MPN / 100 mL objective in 34 of the 39 samples taken from the Date Avenue Diverter. Fecal coliforms exceeded the 400 MPN / 100 mL standard in 34 of 39 samples. *Enterococcus* exceeded the 104 MPN / 100 mL objective in 32 of 38 samples. Copermittee action levels were exceeded almost as frequently for each indicator. The few samples observed to be within allowable levels were all collected during the late fall and winter from November to March. These data suggest that urban runoff from the Date Avenue drainage area could be a significant source of bacteria. It is possible too that storm drain infrastructure (particularly catch basins) exacerbate the problem by allowing runoff to collect and stagnate. This last hypothesis was not tested as part of this study.

b. Comparison With Ocean Water Sampling Results

Figures 10, 11, and 12 compare the results of bacteriological monitoring at the Date Avenue Diverter with the results of concurrent ocean samples collected from the surf zone at up-coast and down-coast locations. All samples were collected at approximately the same time of day to enhance comparability. In general, there were significantly fewer exceedances of water quality objectives in the ocean water environment. Table 5 presents the number of exceedances detected for each indicator at each sampling location.

Table 5
Number of Exceedances by Station and Indicator

Sampling Location	Total Coliform Exceedances	Fecal Coliform Exceedances	Enterococcus Exceedances
End of Seacoast	5/41 (12%)	6/41 (15%)	4/41 (10%)
Cortez	0/3 (0%)	0/3 (0%)	0/3 (0%)
IB Pier	0/12 (0%)	3/11 (27%)	0/12 (0%)
Date Ave. Diverter	34/39 (87%)	34/39 (87%)	33/39 (85%)
Palm Ave.	0/3 (0%)	0/3 (0%)	0/3 (0%)
Carnation Ave.	2/41 (5%)	3/41 (7%)	1/41 (2%)
Camp Surf Jetty	0/8 (0%)	2/7 (29%)	0/8 (0%)

It is not possible to determine the direct effect of the diversion project on ocean water quality. Even prior to installation of the diverter, the Date Avenue outfall generally discharged to the beach, rather than to the surf zone where ocean water samples are collected. This condition depended upon the extent of beach erosion at various times of the year. It is apparent; however, that a significant amount of bacteria-laden water is now being diverted to the sanitary sewer during low-flow conditions. Thus, public health risks in the vicinity of the outfall are being eliminated or substantially reduced. The data also reveal occasional exceedances of water quality objectives in the surf zone when no water is flowing from Date Avenue. This would indicate that there are independent sources of bacteria to factor into the equation. Relatively more exceedances of water quality objectives were observed at the southern-most ocean water sampling location (End of Seacoast Dr.), which may point to the Tijuana River mouth ¾ of a mile to the south as a source. This last hypothesis, however, was not evaluated as part of this study.

It is clear from the monitoring discussed above that the Date Avenue Diverter prevents harmful bacteria from reaching the beach during low-flow conditions. The sources of these bacteria in the Date Avenue drainage area have not been clearly identified. The diffuse nature of urban runoff, despite efforts to investigate the drainage area, makes such identification difficult. Possible sources are typically birds, domestic pets, yard waste, and other organic debris. It is possible that fertilizers (phosphorus and nitrate) also contribute to the bacterial pollutants; however, the data do not show a strong relationship for this conclusion in this instance and further analysis would be required to confirm any correlation.

Figure 10 - Logarithmic Total Coliform Concentration

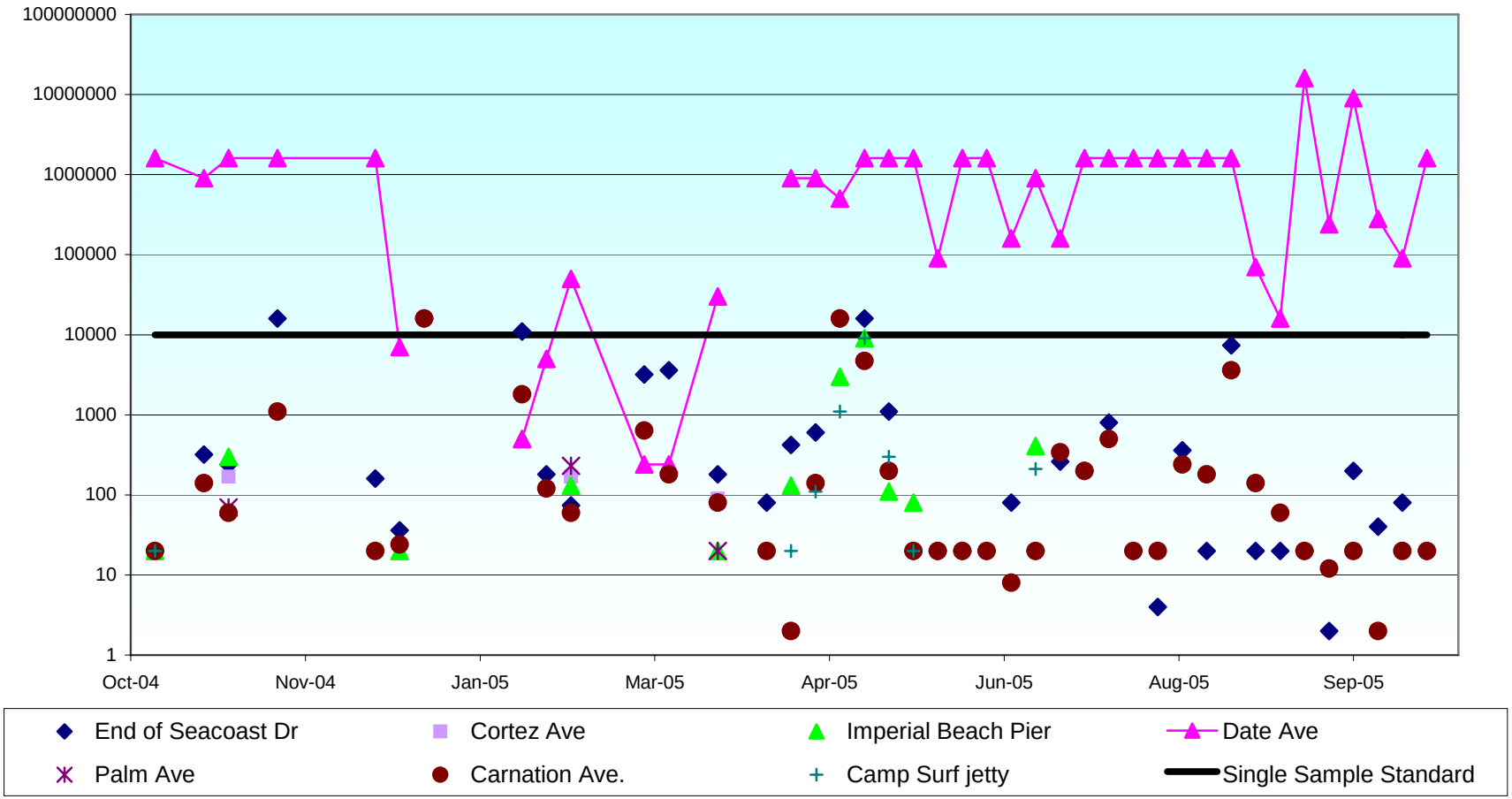


Figure 11 - Logarithmic Fecal Coliform Concentrations (MPN / 100 mL)

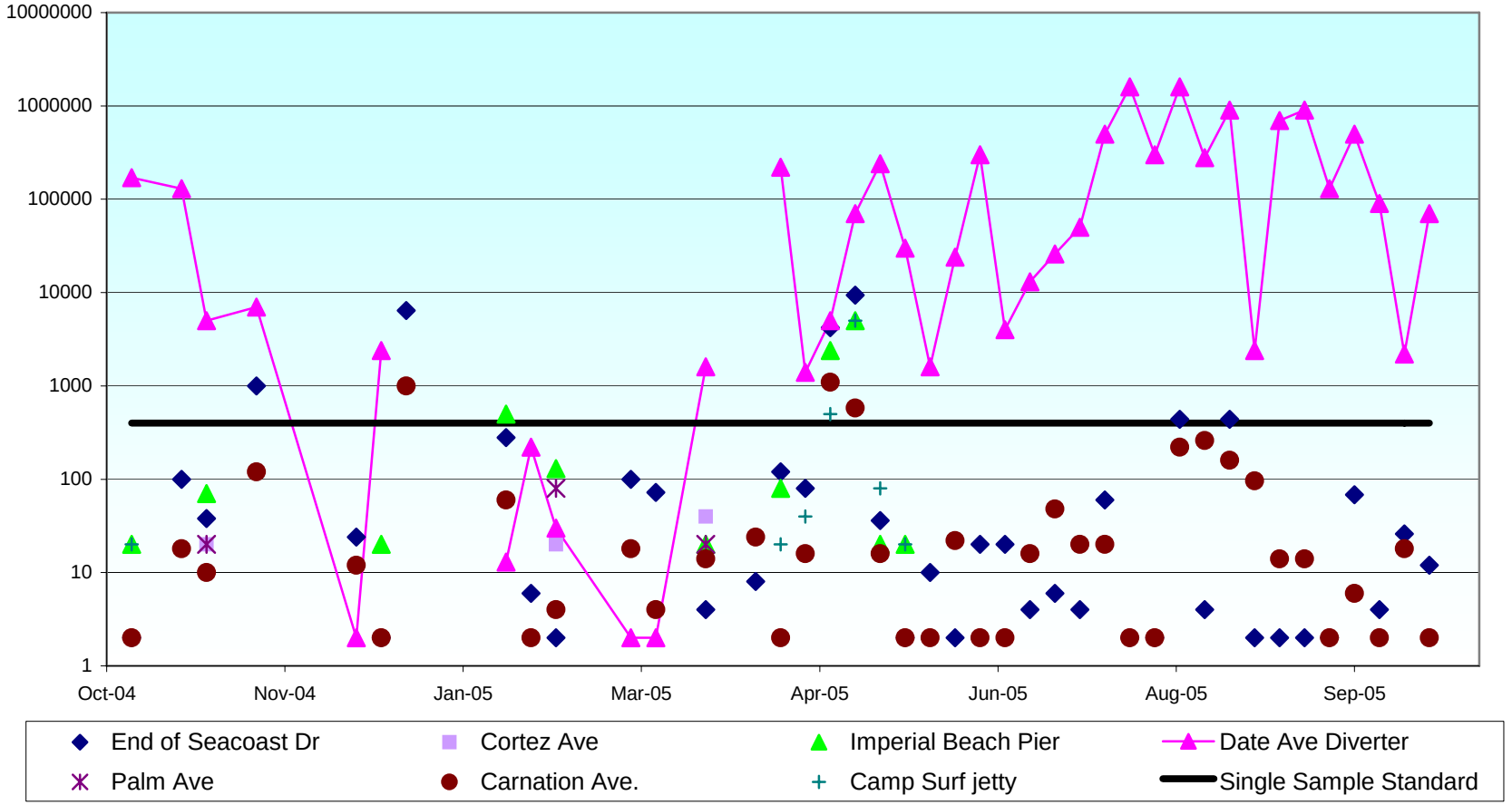
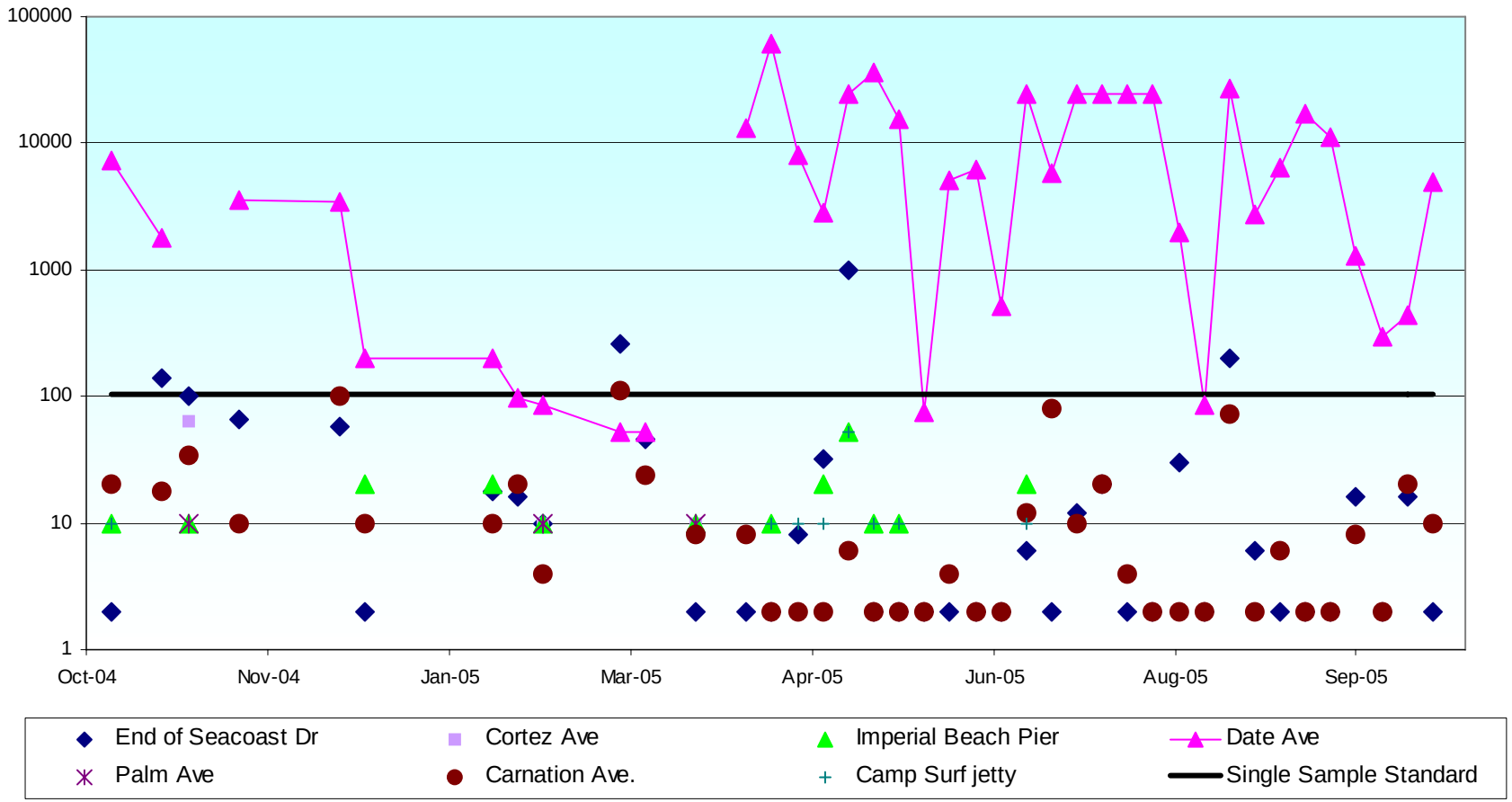


Figure 12 - Logarithmic Enterococcus Concentrations (MPN / 100 mL)



3.5 Chemical Testing Data Summary

Concurrent with the bacteria sampling required pursuant to the CBI grant, the City also collected water samples for chemical analysis. Samples were collected from the diverter catch basin on a weekly basis during dry weather and analyzed using field testing equipment for temperature, pH, conductivity, turbidity, ammonia, nitrate, and reactive phosphorous. Laboratory testing was also performed for oil and grease, total hardness, cadmium, copper, lead, zinc, detergents (MBAS), diazinon, and chlorpyrifos periodically throughout the twelve-month monitoring period.

The data for each analyte have been plotted over time with the corresponding flows also shown. The graph for turbidity in Figure 14 shows two distinct incidents with turbidity higher than previously recorded on August 10, 2005 at 77 NTU and on September 20, 2005 at 85 NTU. It is unknown what caused these spikes. Oil and grease data shown in Figure 15 also shows a spike on August 16, 2005 at 197 mg/L confirmed by visual observations of heavy oil sheen on the water surface prior to sampling.

The entire data set for the field and laboratory tests is included in Exhibit G and the graphed data in Exhibit H.

3.6 Field Observations and Follow-up Activities

This project is closely linked to routine activities performed by the City's Public Works Department staff in the Storm Water Section. The City performs illegal discharge investigations as part of their Jurisdictional Urban Runoff Management Program (JURMP) to identify sources of dry weather urban runoff pollution. The water quality data collected for this project prompted investigations when the test results indicated that if upstream source(s) were found, they could be mitigated.

The City performed 17 investigations for various pollutants during the twelve-month monitoring period. The majority of these were initiated because of high levels of oil and grease, detergents (MBAS), ammonia, and phosphate. The City continues to proactively address potential sources throughout the Date Avenue drainage area and in other parts of the City. A summary of upstream investigations can be found in Exhibit I.

Figure 13

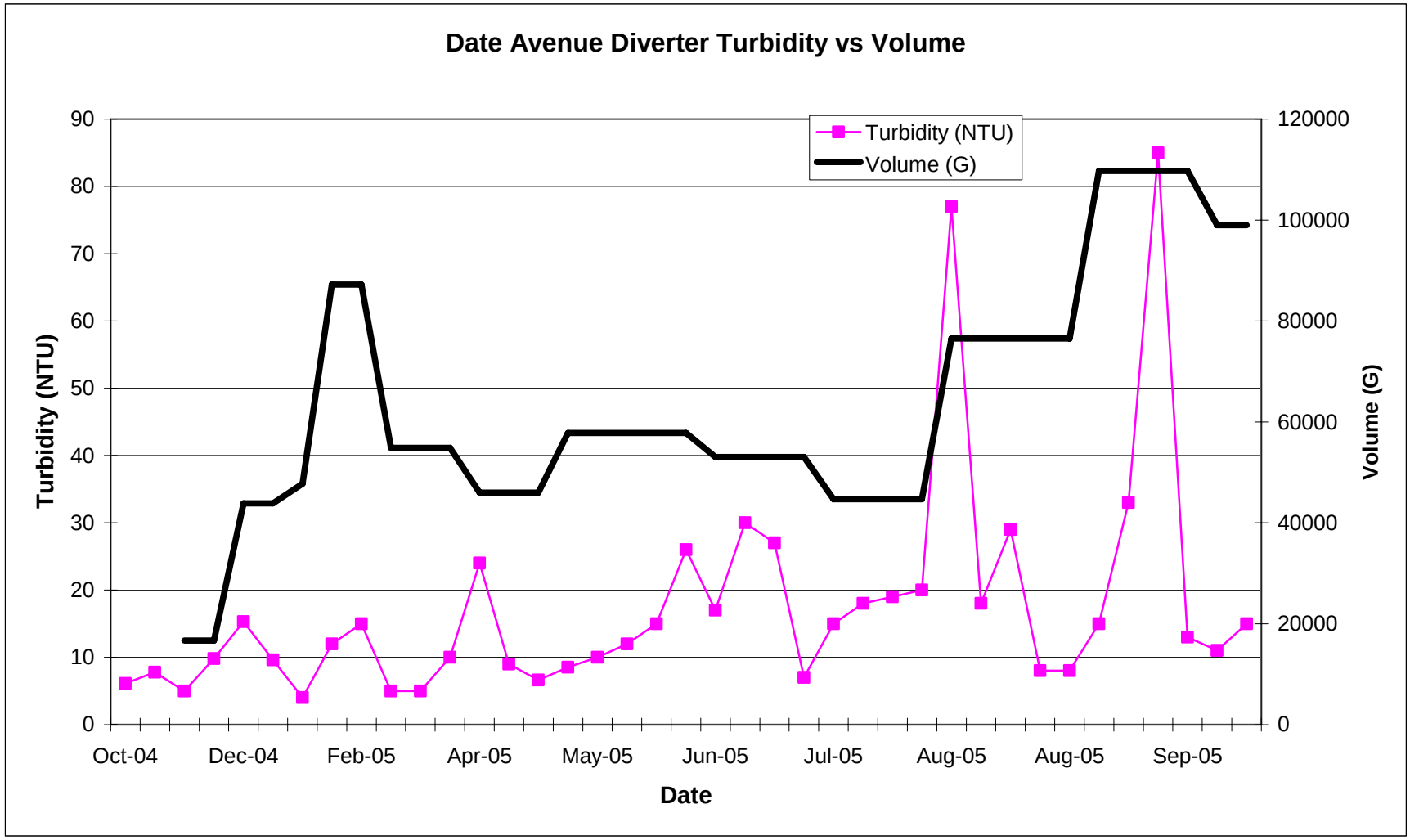
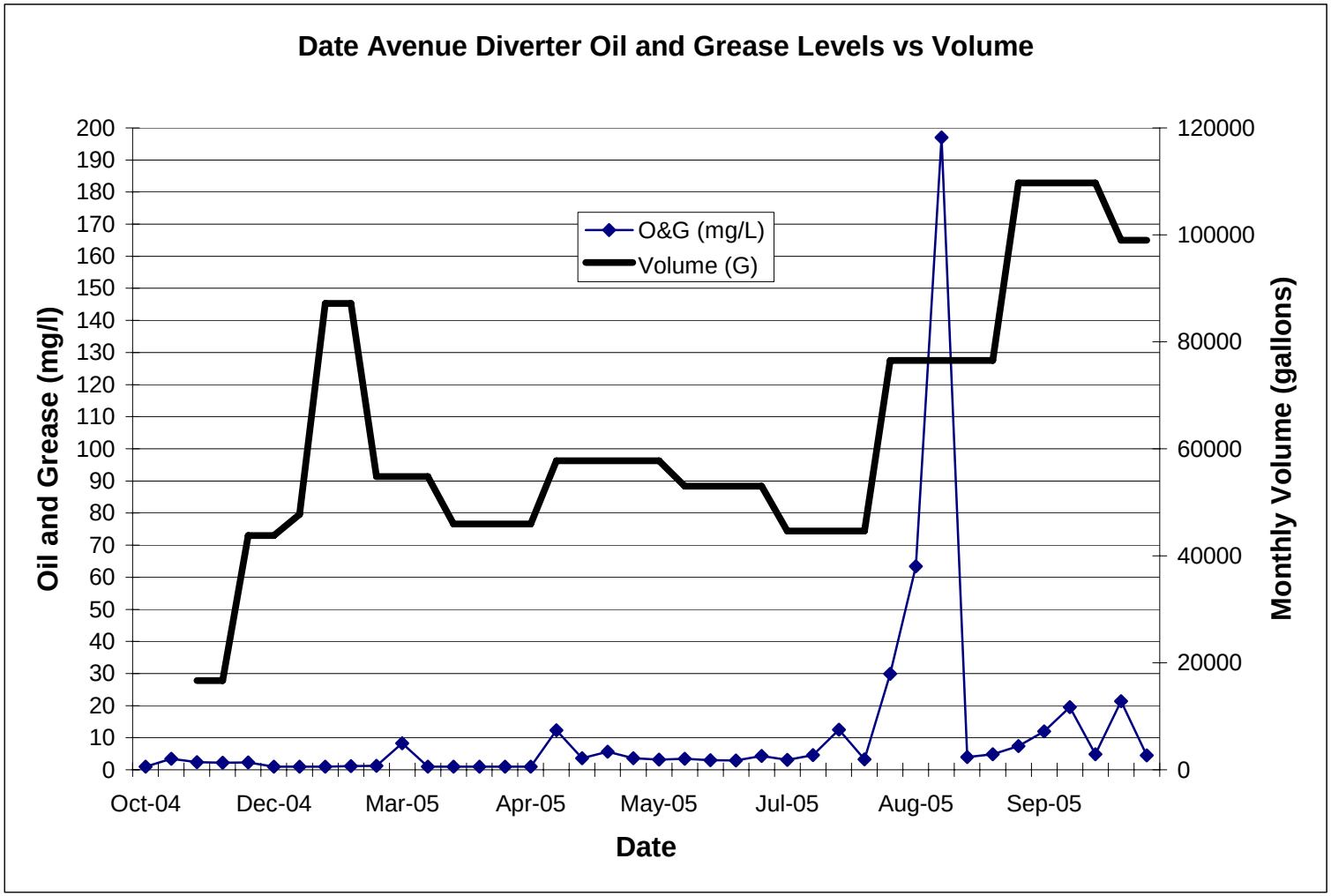

Date Avenue Diverter Turbidity vs Volume
Turbidity (NTU)
Volume (G)
90
80
70
60
50
40
30
20
10
0
120000
100000
80000
60000
40000
20000
0
Oct-04
Dec-04
Feb-05
Apr-05
May-05
Jun-05
Jul-05
Aug-05
Aug-05
Sep-05
Date

Figure 14


Date Avenue Diverter Oil and Grease Levels vs Volume
Oil and Grease (mg/l)
Monthly Volume (gallons)
O&G (mg/L)
Volume (G)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
120000
100000
80000
60000
40000
20000
0
Oct-04
Dec-04
Mar-05
Apr-05
May-05
Jul-05
Aug-05
Sep-05
Date

4.0 CONCLUSIONS

The CBI award for the Date Avenue Low-Flow Urban Runoff Diverter Project has had several positive benefits for the City of Imperial Beach. The highly developed neighborhood that drains to the Date Avenue storm drain outfall is now intercepted to the sanitary sewer system during dry weather and other low-flow conditions. As shown by the water quality monitoring data collected during the year long, post-construction monitoring phase of this project, the diversion of urban runoff has prevented the discharge of bacteria and other common urban pollutants to receiving waters in the vicinity of the Date Avenue outfall. The project has, therefore, contributed positively to beach water quality. In addition to eliminating a known source of bacterial pollution, it has afforded the City the opportunity to contribute modest funding to analyze other, non-biological contaminants present in urban runoff. Thus, the City can now more narrowly target the pollutant sources in this drainage area.

Potential improvements in the number of beach postings and closures directly associated with the implementation of this project could not be quantitatively determined for the following reasons:

1. Beach closures and postings in south San Diego County (Imperial Beach, Coronado, and San Diego) are known to be influenced by flows from the Tijuana River and possibly by the San Antonio De Los Buenos wastewater treatment plant in Baja California, Mexico during northerly moving currents.

2. The relatively large distances between the Date Avenue outfall and the AB 411 ocean monitoring sites prevent easy comparison.

3. Samples were only collected during dry weather when, even prior to construction of the diverter, urban runoff flows would reach the beach sand and not the surf zone where ocean water samples are taken.

Nonetheless, this project's monitoring results indicate that urban runoff diversion is removing high levels of bacteria and having a positive impact on the water quality at the beach at Date Avenue, with an average flow of at least 50,000 gallons per month being diverted to the sanitary sewer system. It is anticipated that continued operation of the Date Avenue Diverter will have long-term benefits and continue to be a positive contribution to water quality in Imperial Beach. The City's continued implementation of its JURMP, which includes the identification and elimination of illegal discharges and connections to the storm drain system, is anticipated to further reduce the influx of pollutants to the diverter.

Exhibit A
Quarterly Report for July 1 through October 11, 2005

Exhibit B
Quality Assurance Project Plan

Exhibit C
City Council Resolution 2004-5898

Exhibit D
Zondiros Construction – Notice to Proceed

Exhibit E
Notice of Completion

Exhibit F
Bacteria Data Summary Tables

Table F-1
Total Coliform Results

SampleDate	End of Seacoast Dr	Cortez Ave	Imperial Beach Pier	Date Ave	Palm Ave	Carnation Ave.	Camp Surf jetty
12-Oct-04	20		20	1,600,000		20	20
26-Oct-04	320			900,000		140	
2-Nov-04	240	170	300	1,600,000	70	60	
16-Nov-04	16,000			1,600,000		1,100	
14-Dec-04	160			1,600,000		20	
21-Dec-04	36		20	7,000		24	
28-Dec-04	16,000			---		16,000	
25-Jan-05	11,000		500	500		1,800	
1-Feb-05	180			5,000		120	
8-Feb-05	74	170	130	50,000	230	60	
1-Mar-05	3,200			240		640	
8-Mar-05	3,600			240		180	
22-Mar-05	180	90	20	30,000	20	80	
5-Apr-05	80			---		20	
12-Apr-05	420		130	900,000		2	20
19-Apr-05	600			900,000		140	110
26-Apr-05	16,000		3,000	500,000		16,000	1,100
3-May-05	16,000		9,000	1,600,000		4,700	9,000
10-May-05	1,100		110	1,600,000		200	300
17-May-05	20		80	1,600,000		20	20
24-May-05	20			90,000		20	
31-May-05	20			1,600,000		20	
7-Jun-05	20			1,600,000		20	
14-Jun-05	80			160,000		8	
21-Jun-05	20		408	900,000		20	211
28-Jun-05	260			160,000		340	
5-Jul-05	200			1,600,000		200	
12-Jul-05	800			1,600,000		500	
19-Jul-05	20			1,600,000		20	
26-Jul-05	4			1,600,000		20	
2-Aug-05	360			1,600,000		240	
9-Aug-05	20			1,600,000		180	
16-Aug-05	7,400			1,600,000		3,600	
23-Aug-05	20			70,000		140	
30-Aug-05	20			16,000		60	
6-Sep-05	20			16,000,000		20	

SampleDate	End of Seacoast Dr	Cortez Ave	Imperial Beach Pier	Date Ave	Palm Ave	Carnation Ave.	Camp Surf jetty
13-Sep-05	2			240,000		12	
20-Sep-05	200			9,000,000		20	
27-Sep-05	40			280,000		2	
4-Oct-05	80			90,000		20	
11-Oct-05	20			1,600,000		20	

Blank = Not Sampled

= Result Exceeded Single Sample Standard

--- = Sample Lost During Laboratory Process

Table F-2
Fecal Coliform Results

SampleDate	End of Seacoast Dr	Cortez Ave	Imperial Beach Pier	Date Ave Diverter	Palm Ave	Carnation Ave.	Camp Surf jetty
12-Oct-04	2		20	170,000		2	20
26-Oct-04	100			130,000		18	
2-Nov-04	38	20	70	5,000	20	10	
16-Nov-04	1,000			7,000		120	
14-Dec-04	24			2		12	
21-Dec-04	2		20	2,400		2	
28-Dec-04	6,400			---		1,000	
25-Jan-05	280		500	13		60	
1-Feb-05	6			220		2	
8-Feb-05	2	20	130	30	80	4	
1-Mar-05	100			2		18	
8-Mar-05	72			2		4	
22-Mar-05	4	40	20	1,600	20	14	
5-Apr-05	8			---		24	
12-Apr-05	120		80	220,000		2	20
19-Apr-05	80			1,400		16	40
26-Apr-05	4,200		2,400	5,000		1,100	500
3-May-05	9,400		5,000	70,000		580	5,000
10-May-05	36		20	240,000		16	80
17-May-05	2		20	30,000		2	20
24-May-05	10			1,600		2	
31-May-05	2			24,000		22	
7-Jun-05	20			300,000		2	
14-Jun-05	20			4,000		2	
21-Jun-05	4			13,000		16	
28-Jun-05	6			26,000		48	
5-Jul-05	4			50,000		20	
12-Jul-05	60			500,000		20	
19-Jul-05	2			1,600,000		2	
26-Jul-05	2			300,000		2	
2-Aug-05	440			1,600,000		220	
9-Aug-05	4			280,000		260	
16-Aug-05	440			900,000		160	
23-Aug-05	2			2,400		96	
30-Aug-05	2			700,000		14	
6-Sep-05	2			900,000		14	

SampleDate	End of Seacoast Dr	Cortez Ave	Imperial Beach Pier	Date Ave Diverter	Palm Ave	Carnation Ave.	Camp Surf jetty
13-Sep-05	2			130,000		2	
20-Sep-05	68			500,000		6	
27-Sep-05	4			90,000		2	
4-Oct-05	26			2,200		18	
11-Oct-05	12			70,000		2	

Blank = Not Sampled

= Result Exceeded Single Sample Standard

--- = Sample Lost During Laboratory Process

Table F-3
Enterococcus Results

SampleDate	End of Seacoast Dr	Cortez Ave	Imperial Beach Pier	Date Ave Diverter	Palm Ave	Carnation Ave.	Camp Surf jetty
12-Oct-04	2		10	7324		20	10
26-Oct-04	140			1764		18	
2-Nov-04	100	64	10	---	10	34	
16-Nov-04	66			3597		10	
14-Dec-04	58			3428		100	
21-Dec-04	2		20	200		10	
25-Jan-05	18		20	200		10	
1-Feb-05	16			98		20	
8-Feb-05	10	10	10	86	10	4	
1-Mar-05	260			52		110	
8-Mar-05	46			52		24	
22-Mar-05	2	10	10	---	10	8	
5-Apr-05	2			13000		8	
12-Apr-05	2		10	61300		2	10
19-Apr-05	8			8160		2	10
26-Apr-05	32		20	2850		2	10
3-May-05	1000		53	24200		6	53
10-May-05	2		10	36100		2	10
17-May-05	2		10	15500		2	10
24-May-05	2			75		2	
31-May-05	2			5170		4	
7-Jun-05	2			6130		2	
14-Jun-05	2			520		2	
21-Jun-05	6		20	24200		12	10
28-Jun-05	2			5790		80	
5-Jul-05	12			24200		10	
12-Jul-05	20			24200		20	
19-Jul-05	2			24200		4	
26-Jul-05	2			24200		2	
2-Aug-05	30			1950		2	
9-Aug-05	2			86		2	
16-Aug-05	200			27200		72	
23-Aug-05	6			2780		2	
30-Aug-05	2			6490		6	
6-Sep-05	2			17300		2	
13-Sep-05	2			11200		2	

SampleDate	End of Seacoast Dr	Cortez Ave	Imperial Beach Pier	Date Ave Diverter	Palm Ave	Carnation Ave.	Camp Surf jetty
20-Sep-05	16			1290		8	
27-Sep-05	2			292		2	
4-Oct-05	16			439		20	
11-Oct-05	2			4880		10	

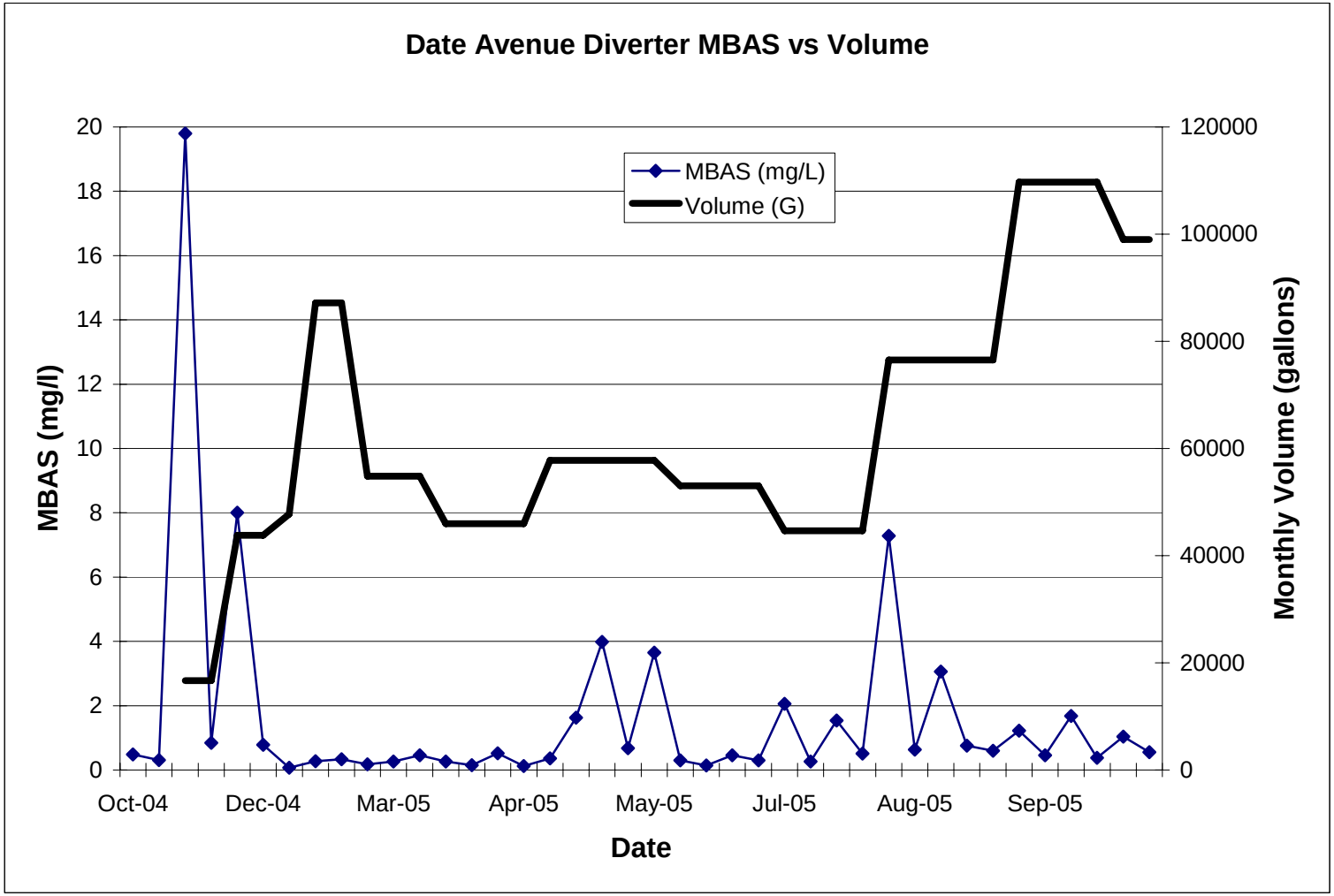
Blank = Not Sampled

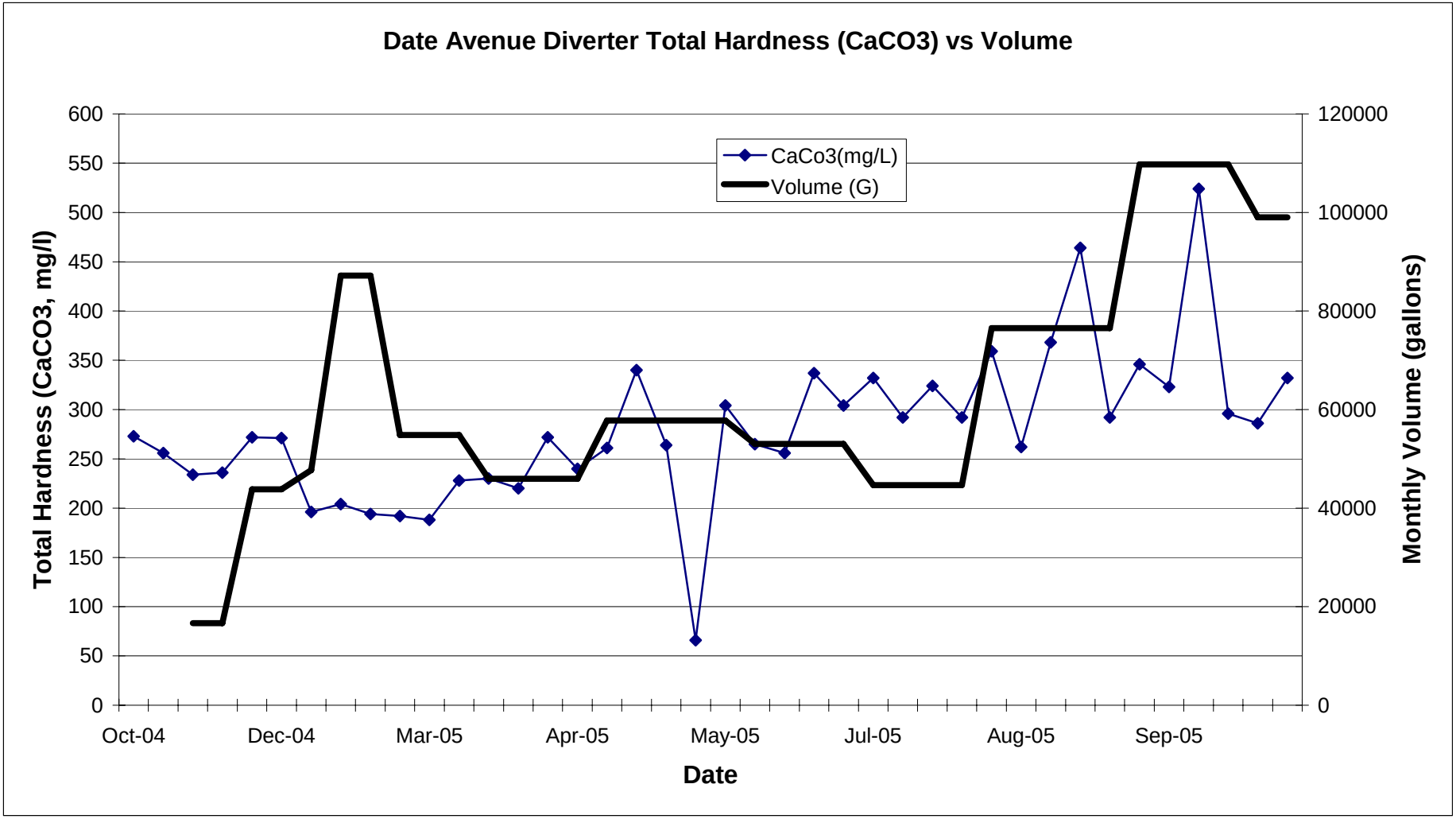
= Result Exceeded Single Sample Standard

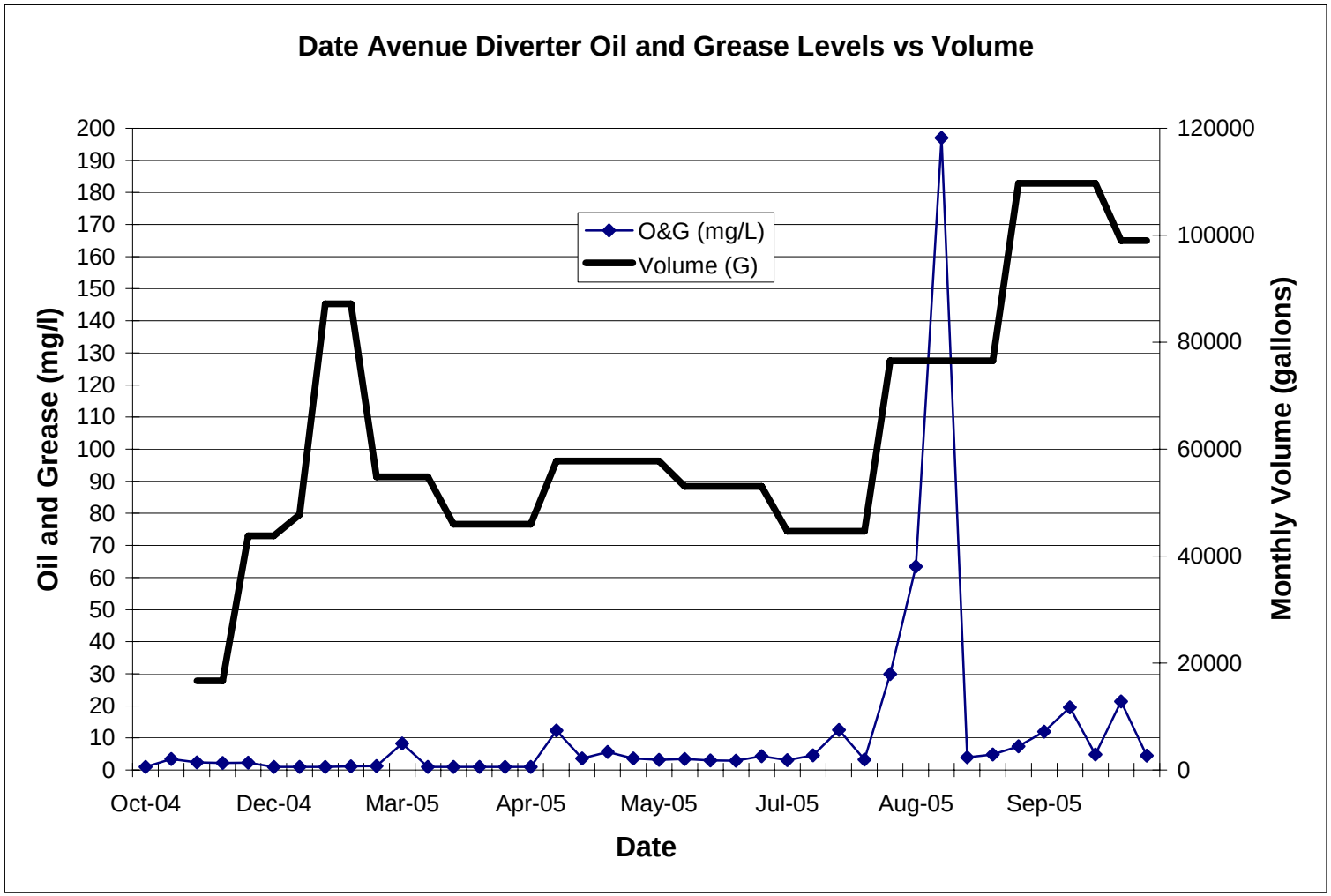
--- = Sample Lost During Laboratory Process

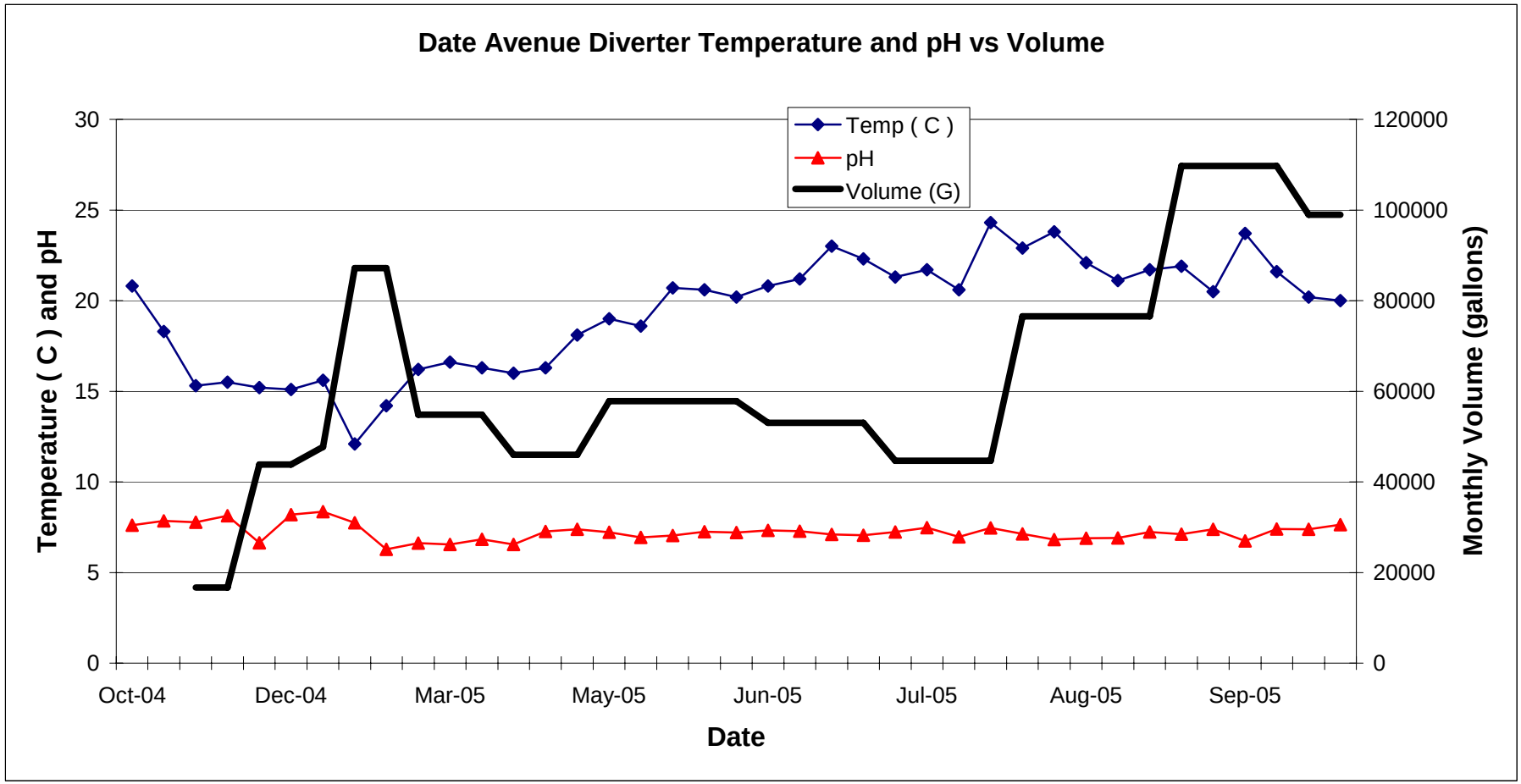
Exhibit G
Field and Laboratory Data Tables

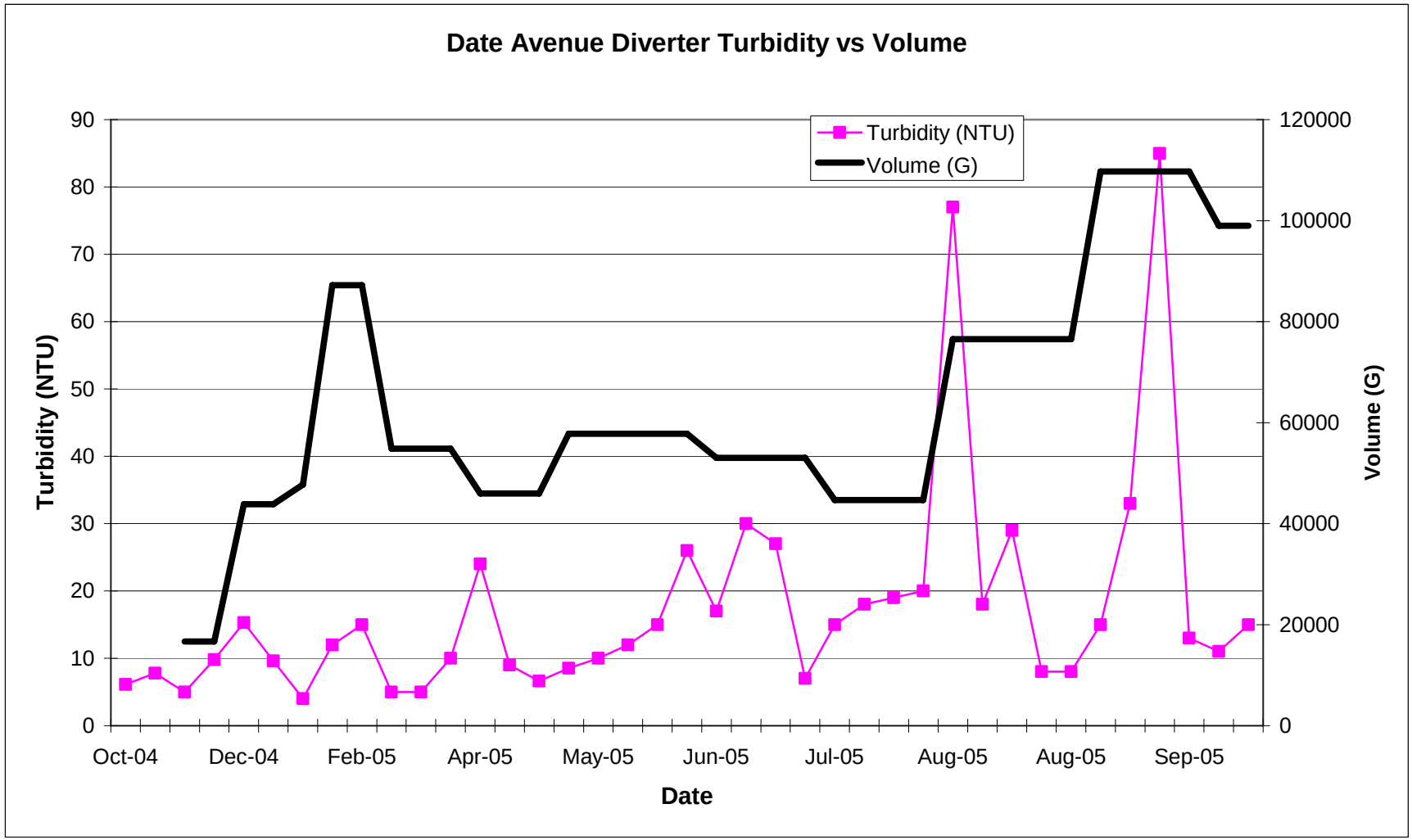
Exhibit H
Field and Laboratory Data Graphs

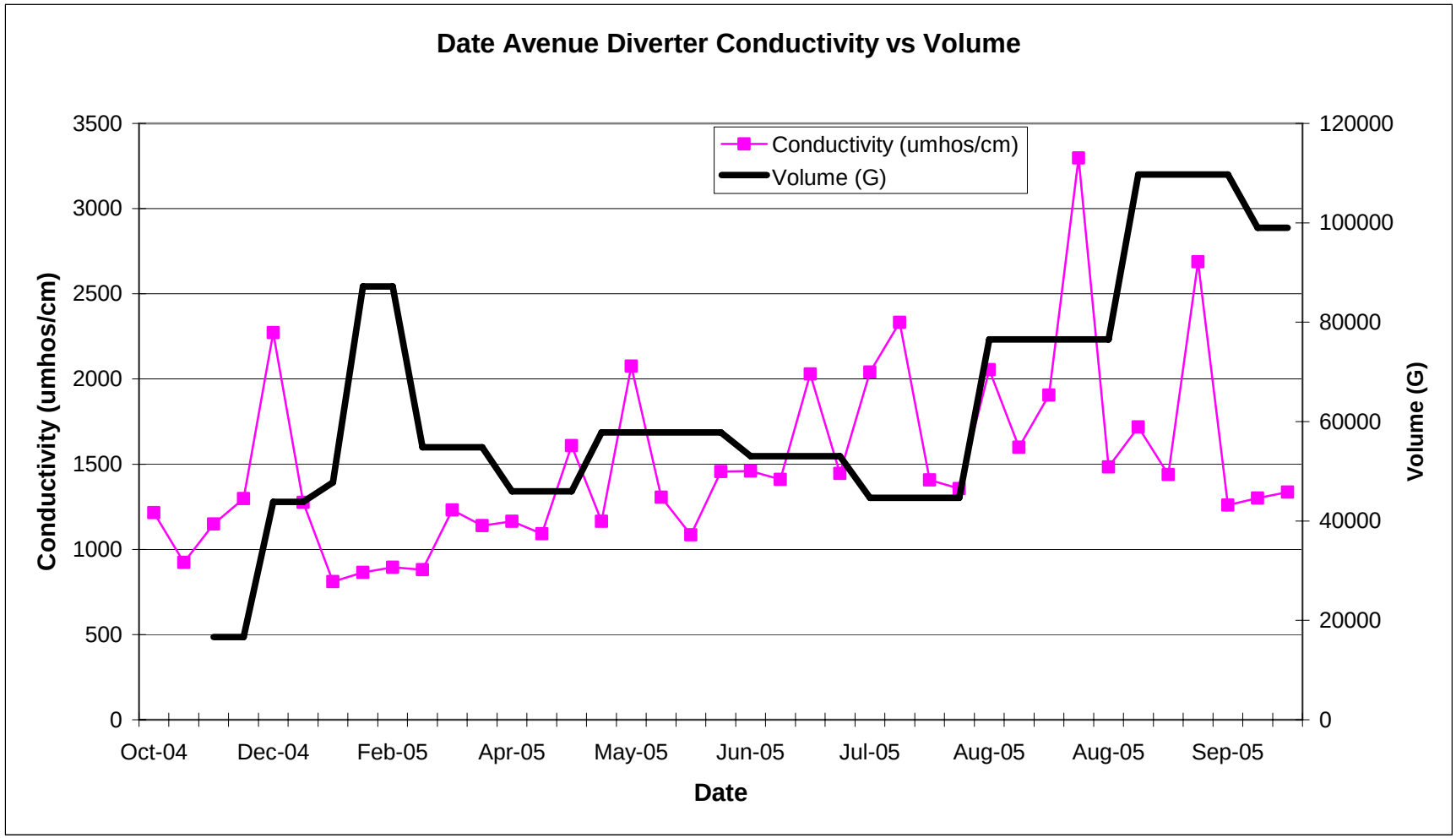

Date Avenue Diverter MBAS vs Volume
MBAS (mg/L)
Volume (G)
MBAS (mg/l)
Monthly Volume (gallons)
Date
0
2
4
6
8
10
12
14
16
18
20
0
20000
40000
60000
80000
100000
120000
Oct-04
Dec-04
Mar-05
Apr-05
May-05
Jul-05
Aug-05
Sep-05

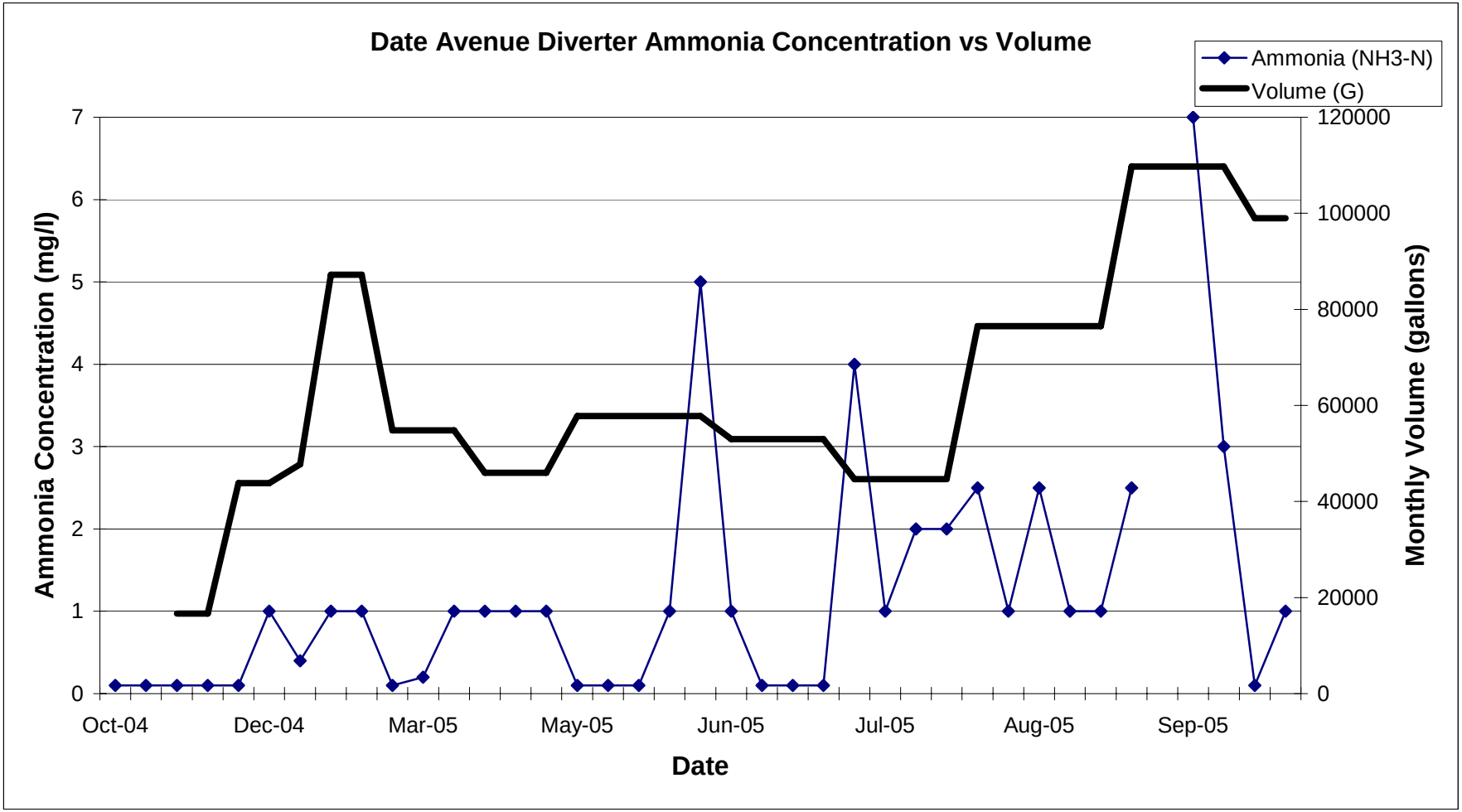

Date Avenue Diverter Total Hardness (CaCO3) vs Volume
CaCo3(mg/L)
Volume (G)
Total Hardness (CaCO3, mg/l)
Monthly Volume (gallons)
600
550
500
450
400
350
300
250
200
150
100
50
0
120000
100000
80000
60000
40000
20000
0
Oct-04
Dec-04
Mar-05
Apr-05
May-05
Jul-05
Aug-05
Sep-05
Date

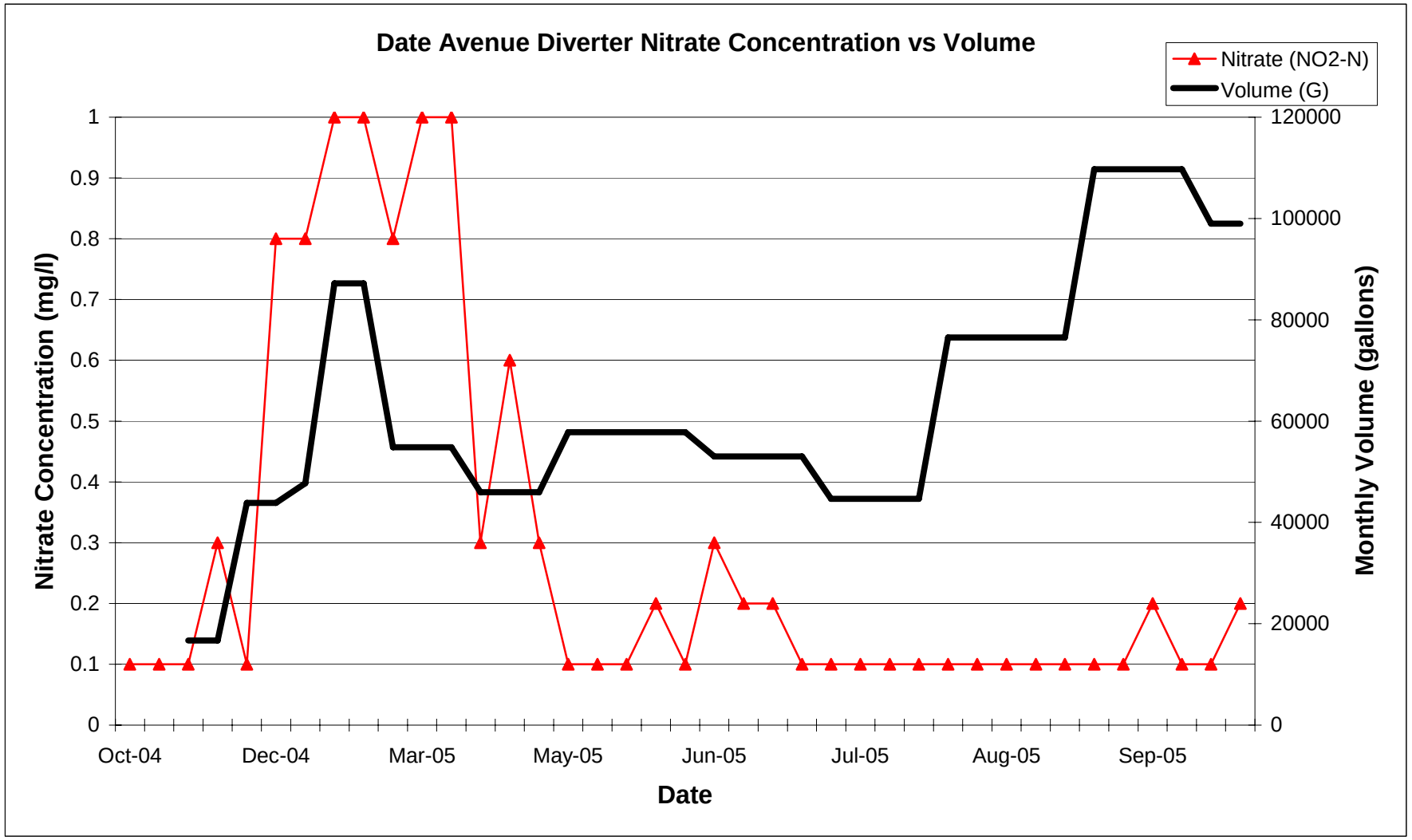

Date Avenue Diverter Oil and Grease Levels vs Volume
Oil and Grease (mg/l)
Monthly Volume (gallons)
O&G (mg/L)
Volume (G)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
120000
100000
80000
60000
40000
20000
0
Oct-04
Dec-04
Mar-05
Apr-05
May-05
Jul-05
Aug-05
Sep-05
Date

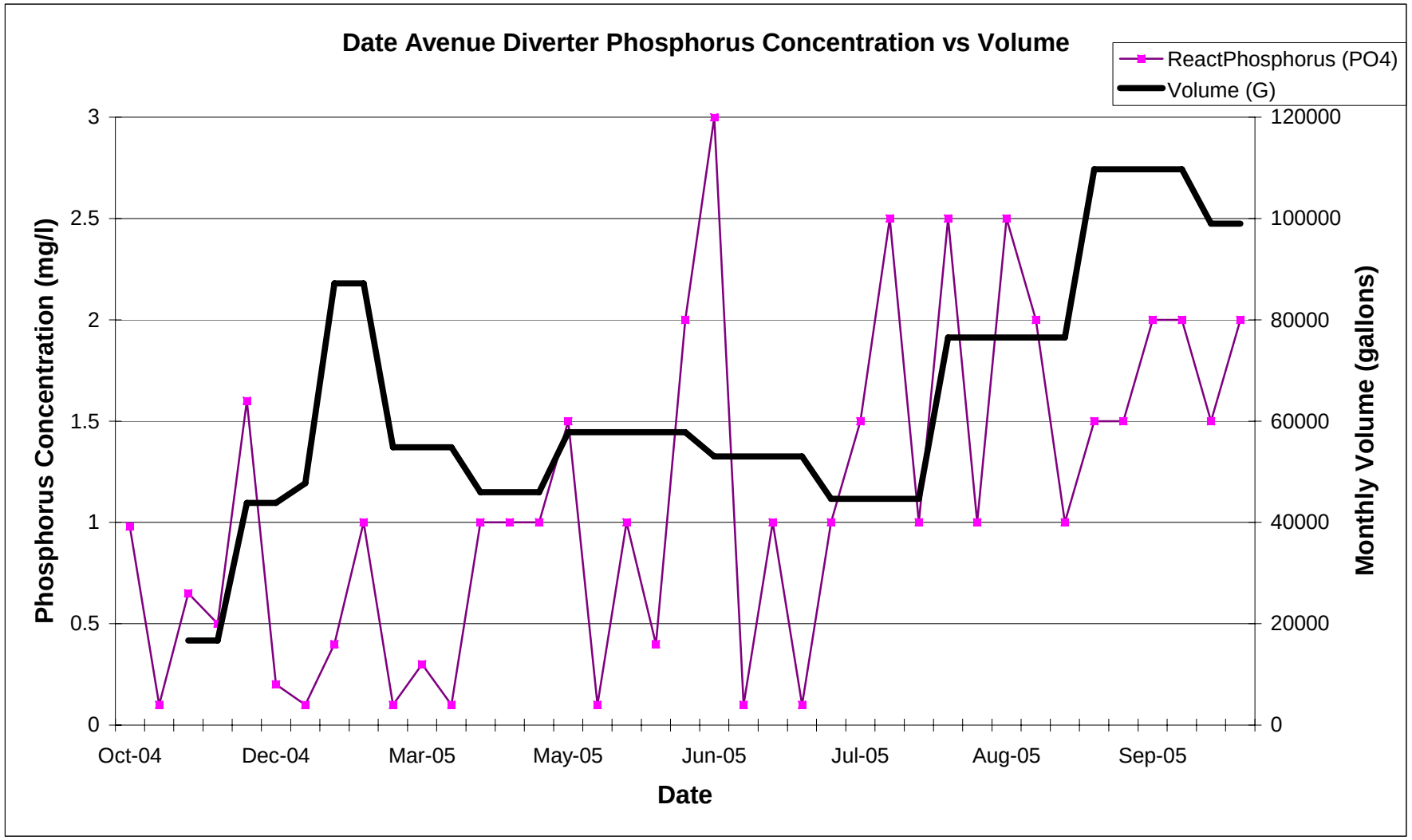

Date Avenue Diverter Temperature and pH vs Volume
Temp (C)
pH
Volume (G)
Temperature (C) and pH
Monthly Volume (gallons)
Date
0
5
10
15
20
25
30
0
20000
40000
60000
80000
100000
120000
Oct-04
Dec-04
Mar-05
May-05
Jun-05
Jul-05
Aug-05
Sep-05

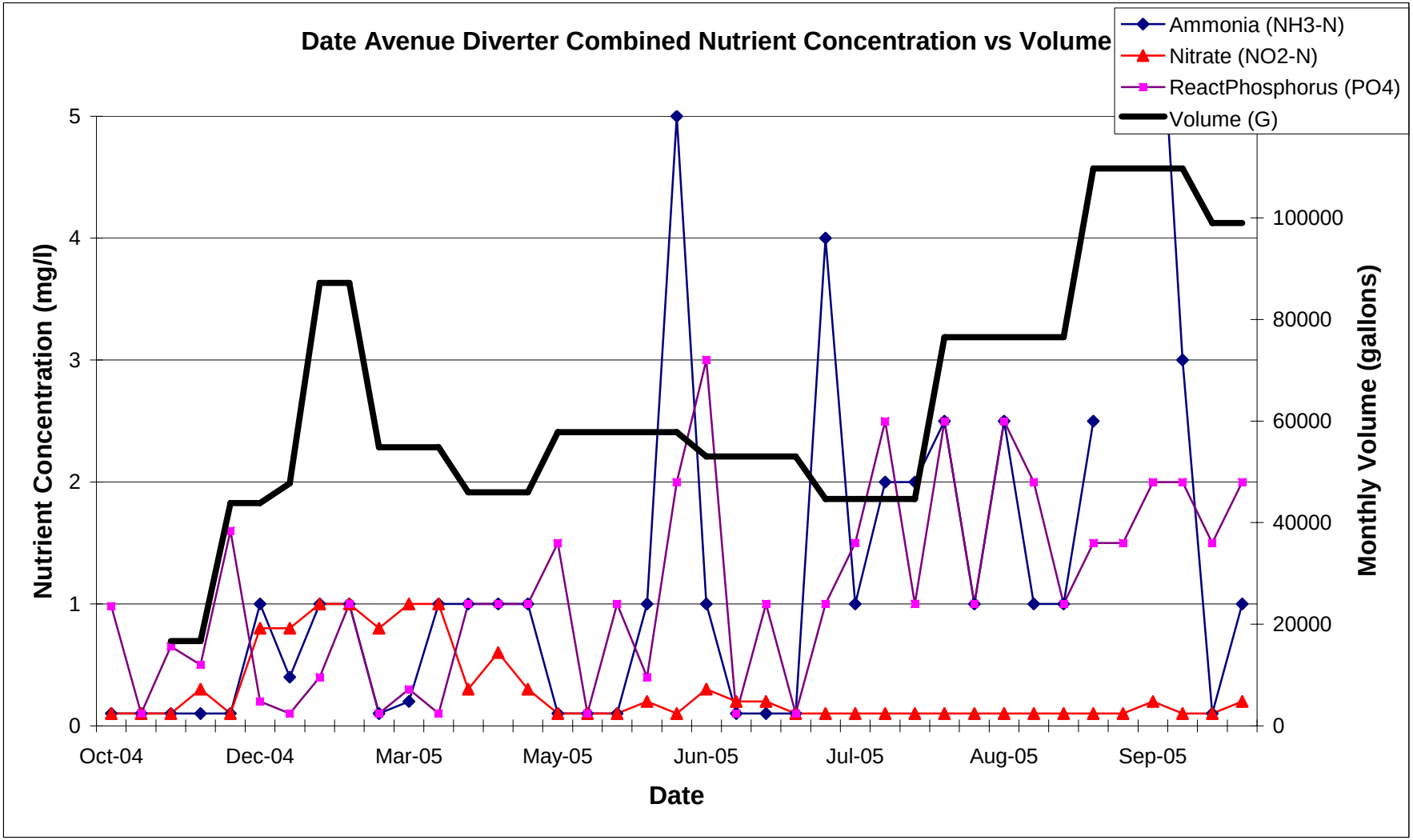

Date Avenue Diverter Turbidity vs Volume
Turbidity (NTU)
Volume (G)
90
80
70
60
50
40
30
20
10
0
120000
100000
80000
60000
40000
20000
0
Oct-04
Dec-04
Feb-05
Apr-05
May-05
Jun-05
Jul-05
Aug-05
Aug-05
Sep-05
Date

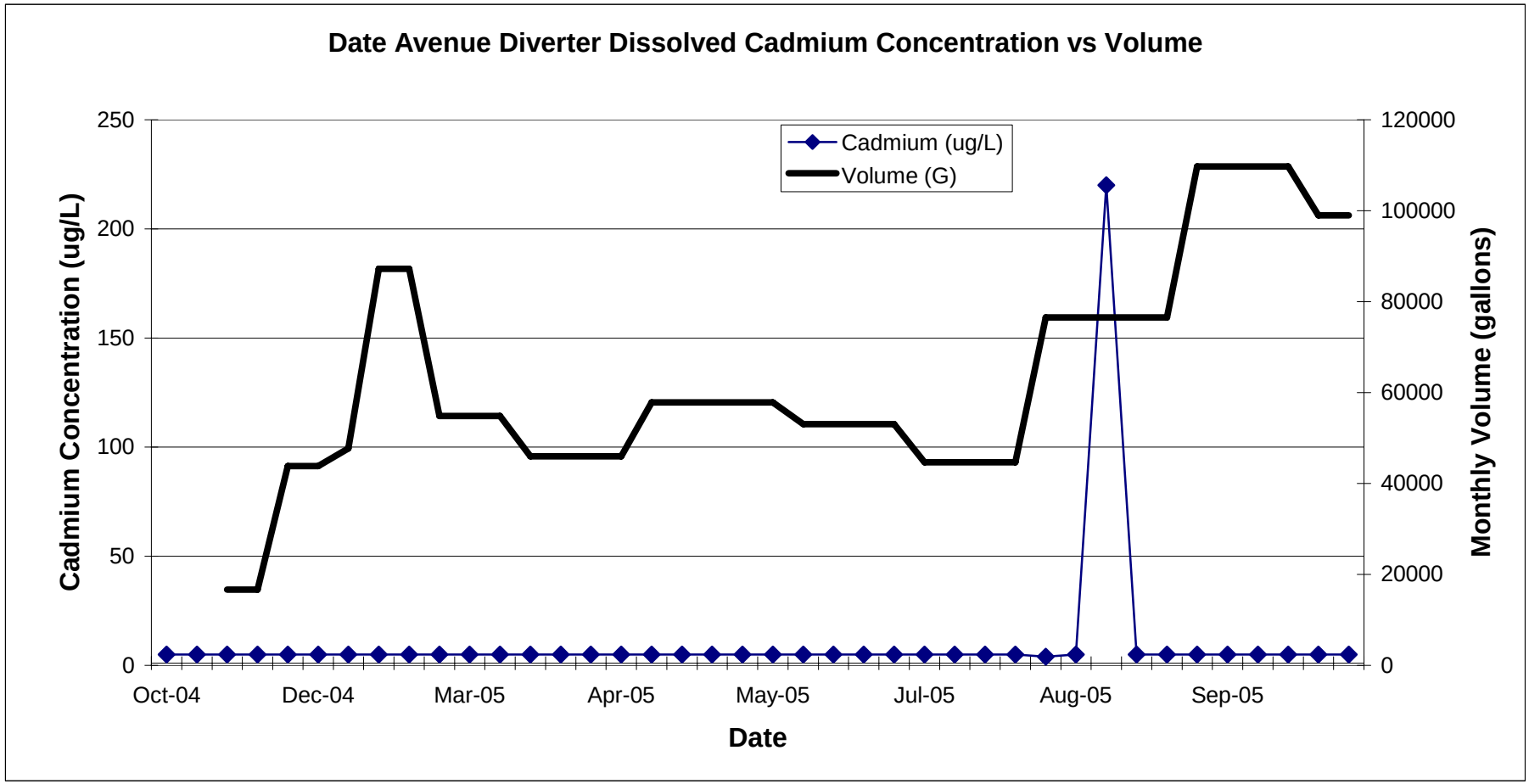

Date Avenue Diverter Conductivity vs Volume
Conductivity (umhos/cm)
Volume (G)
3500
3000
2500
2000
1500
1000
500
0
120000
100000
80000
60000
40000
20000
0
Oct-04
Dec-04
Feb-05
Apr-05
May-05
Jun-05
Jul-05
Aug-05
Aug-05
Sep-05
Date

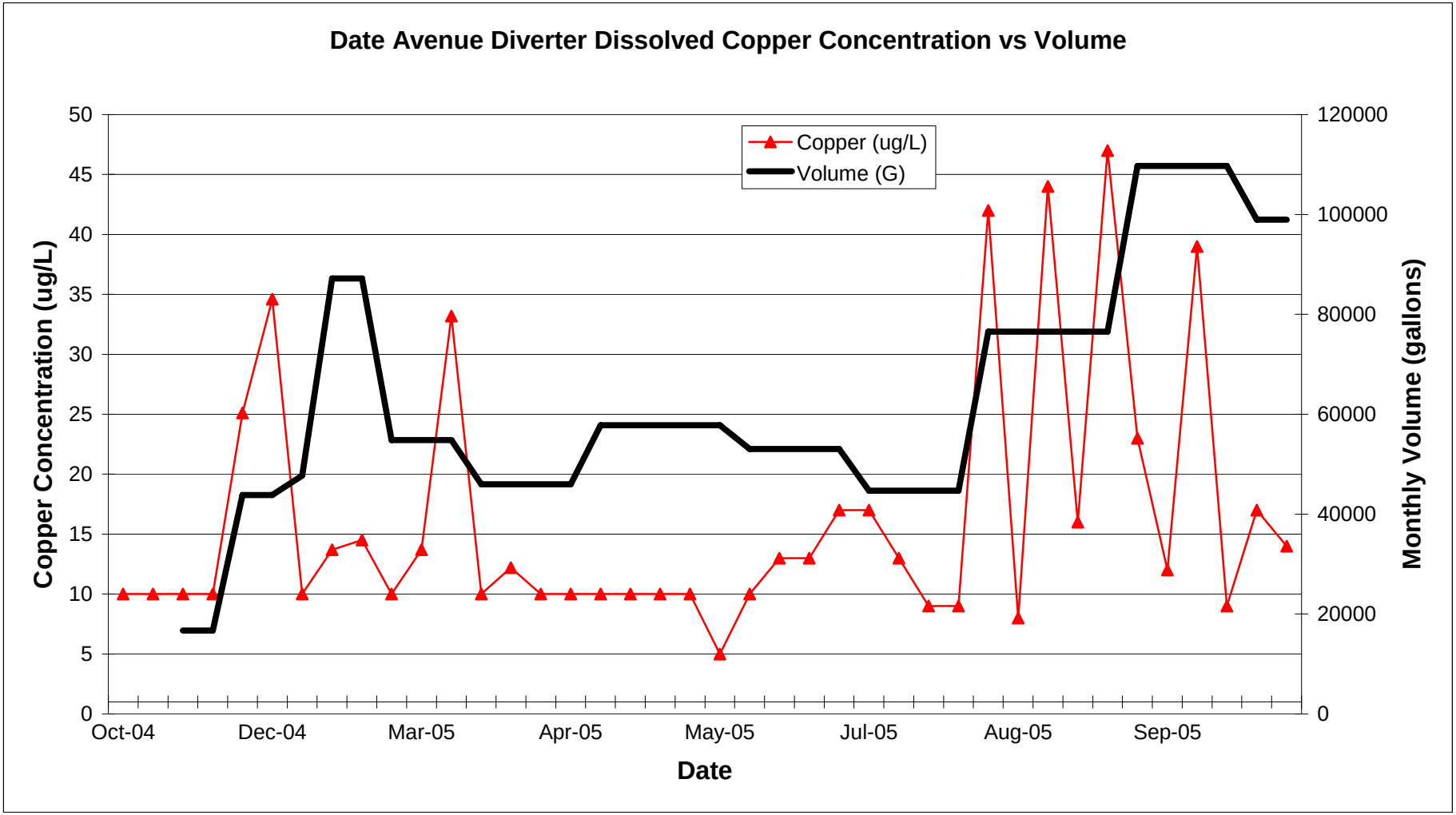

Date Avenue Diverter Ammonia Concentration vs Volume
Ammonia (NH3-N)
Volume (G)
Ammonia Concentration (mg/l)
Monthly Volume (gallons)
0
1
2
3
4
5
6
7
0
20000
40000
60000
80000
100000
120000
Oct-04
Dec-04
Mar-05
May-05
Jun-05
Jul-05
Aug-05
Sep-05
Date

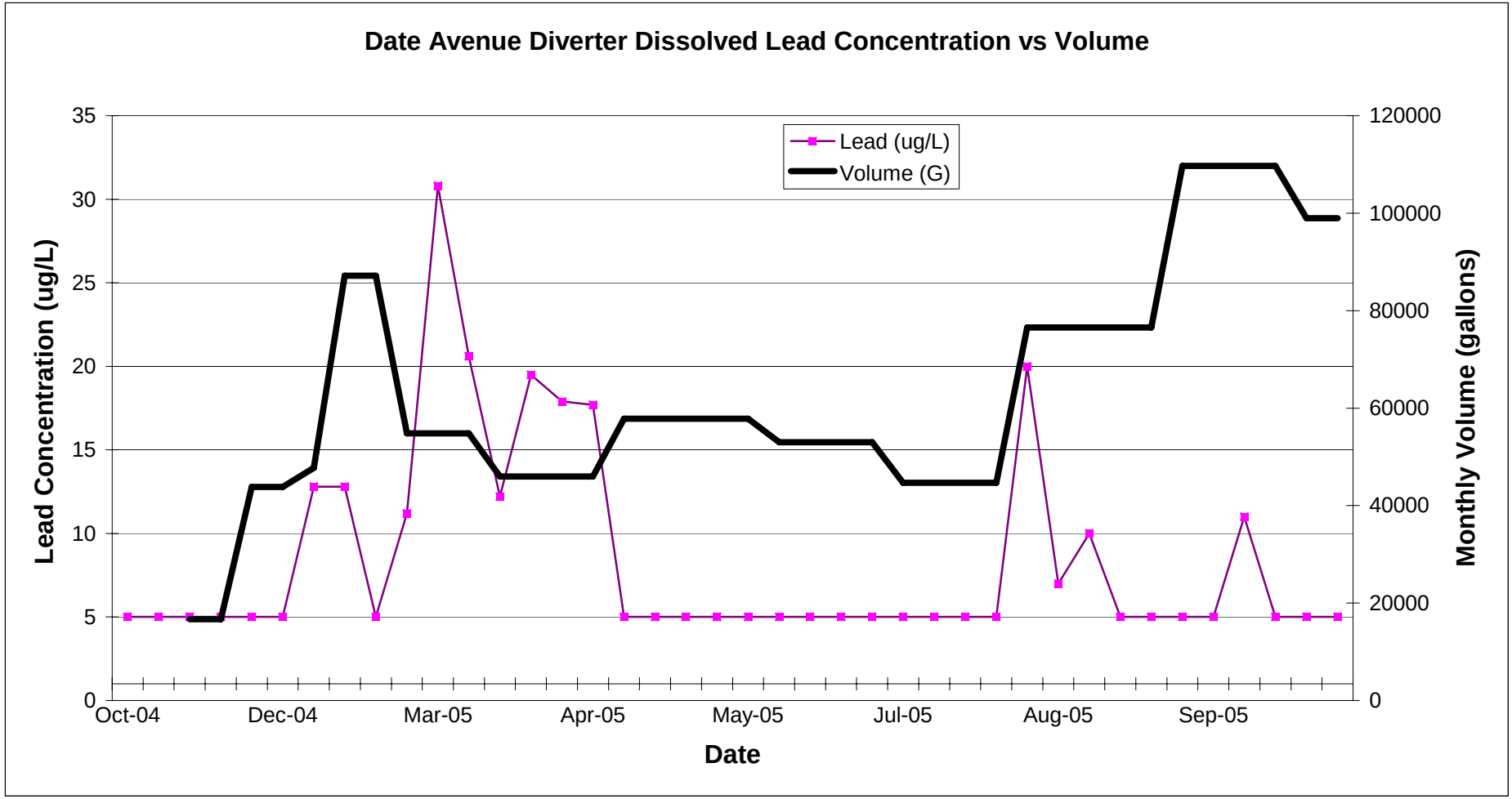

Date Avenue Diverter Nitrate Concentration vs Volume
Nitrate (NO2-N)
Volume (G)
Nitrate Concentration (mg/l)
Monthly Volume (gallons)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
20000
40000
60000
80000
100000
120000
Oct-04
Dec-04
Mar-05
May-05
Jun-05
Jul-05
Aug-05
Sep-05
Date

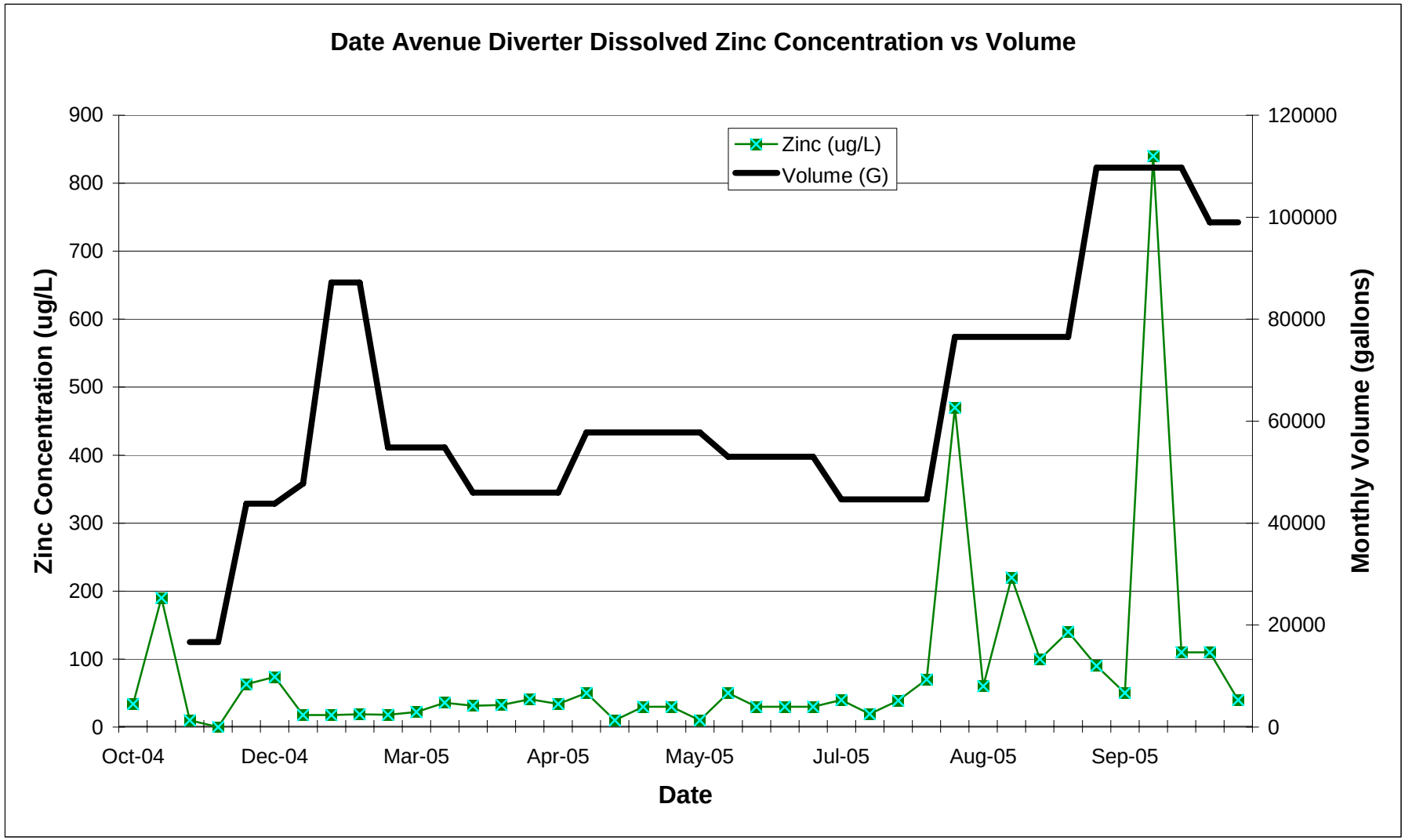

Date Avenue Diverter Phosphorus Concentration vs Volume
ReactPhosphorus (PO4)
Volume (G)
Phosphorus Concentration (mg/l)
Monthly Volume (gallons)
Date
0
0.5
1
1.5
2
2.5
3
0
20000
40000
60000
80000
100000
120000
Oct-04
Dec-04
Mar-05
May-05
Jun-05
Jul-05
Aug-05
Sep-05


Date Avenue Diverter Combined Nutrient Concentration vs Volume
Ammonia (NH3-N)
Nitrate (NO2-N)
ReactPhosphorus (PO4)
Volume (G)
Nutrient Concentration (mg/l)
Monthly Volume (gallons)
0
1
2
3
4
5
0
20000
40000
60000
80000
100000
Oct-04
Dec-04
Mar-05
May-05
Jun-05
Jul-05
Aug-05
Sep-05
Date


Date Avenue Diverter Dissolved Cadmium Concentration vs Volume
Cadmium (ug/L)
Volume (G)
Cadmium Concentration (ug/L)
Monthly Volume (gallons)
250
200
150
100
50
0
120000
100000
80000
60000
40000
20000
0
Oct-04
Dec-04
Mar-05
Apr-05
May-05
Jul-05
Aug-05
Sep-05
Date


Date Avenue Diverter Dissolved Copper Concentration vs Volume
Copper (ug/L)
Volume (G)
Copper Concentration (ug/L)
Monthly Volume (gallons)
Date
0
5
10
15
20
25
30
35
40
45
50
0
20000
40000
60000
80000
100000
120000
Oct-04
Dec-04
Mar-05
Apr-05
May-05
Jul-05
Aug-05
Sep-05


Date Avenue Diverter Dissolved Lead Concentration vs Volume
Lead (ug/L)
Volume (G)
Lead Concentration (ug/L)
Monthly Volume (gallons)
Date
0
5
10
15
20
25
30
35
0
20000
40000
60000
80000
100000
120000
Oct-04
Dec-04
Mar-05
Apr-05
May-05
Jul-05
Aug-05
Sep-05


Date Avenue Diverter Dissolved Zinc Concentration vs Volume
Zinc (ug/L)
Volume (G)
Zinc Concentration (ug/L)
Monthly Volume (gallons)
900
800
700
600
500
400
300
200
100
0
120000
100000
80000
60000
40000
20000
0
Oct-04
Dec-04
Mar-05
Apr-05
May-05
Jul-05
Aug-05
Sep-05
Date

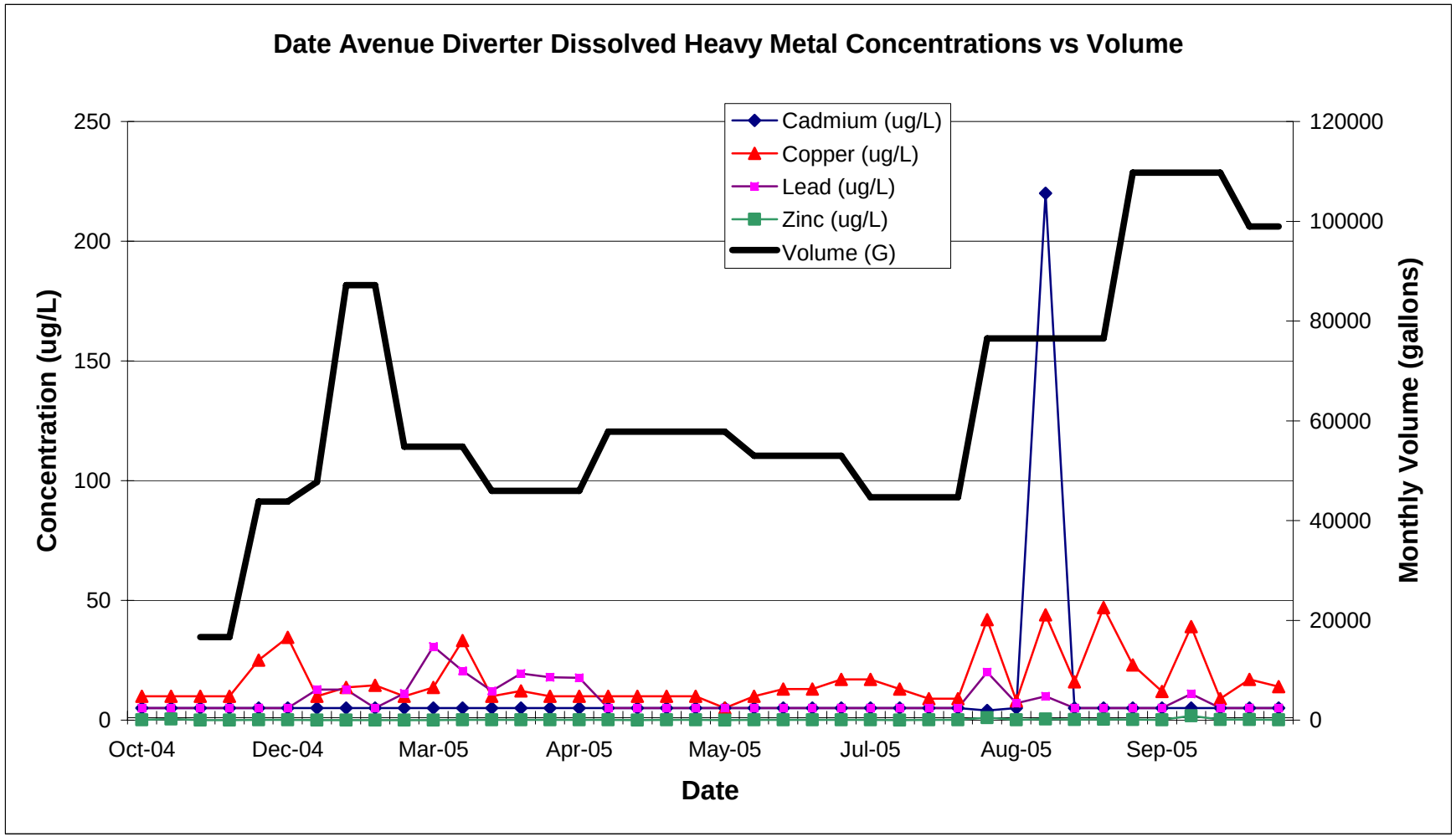

Date Avenue Diverter Dissolved Heavy Metal Concentrations vs Volume
Cadmium (ug/L)
Copper (ug/L)
Lead (ug/L)
Zinc (ug/L)
Volume (G)
Concentration (ug/L)
Monthly Volume (gallons)
250
200
150
100
50
0
120000
100000
80000
60000
40000
20000
0
Oct-04
Dec-04
Mar-05
Apr-05
May-05
Jul-05
Aug-05
Sep-05
Date

Exhibit I
Investigation and Follow-up Summary Table