EXECUTIVE SUMMARY

The City of Newport has developed a phased project strategy to address CSO discharges at the Wellington Avenue CSO Facility. The project area comprises the Newport tributary catchments to the Wellington Avenue CSO Treatment Facility, including the flow discharged to the City's system from Middletown through the Wave Avenue Pump Station. Figure ES.1 depicts the Wellington Avenue CSO Facility study area.

BACKGROUND

In 2004, Earth Tech was awarded a contract to implement the Long Term CSO Control Plan. The initial phase of the enhanced sewer separation project, the Phase 1 Part 1 CSO Control Plan for the Wellington Avenue CSO Treatment Facility, was completed by Earth Tech in 2005. That phase of work consisted of flow metering to quantify the inflow and infiltration flows being generated by the tributary catchments within the Wellington Avenue CSO Facility service area and manhole inspections to assess the condition of the Thames Street Interceptor.

The primary objective of Phase 1 Part 1 was to review the results of the flow metering program and to prioritize the catchments in the facility service area that had the largest quantities of infiltration and inflow. Based on the Phase 1 Part 1 work, more detailed field investigations, consisting of a Sewer System Evaluation Survey (SSES), and analysis of the field data could be performed in this Phase 1 Part 2 project to identify the sources of and make recommendations for reduction of these flows. Based on the flow metering performed in Phase 1 Part 1, the following catchments were identified for detailed sewer system evaluation surveys (SSES) to identify inflow and infiltration sources to be further investigated in Phase 1 Part 2:

- Inflow SSES investigations: Catchments 1, 3 and 4; and,
- Infiltration SSES investigations: Catchments 3, 4 and 7.

These catchments are also delineated in Figure ES.1.

The Phase 1 Part 1 report included recommendations for work to be performed in Phase 1 Part 2, including: closed circuit television inspection of the Thames Street interceptor; a hydraulic model software evaluation; collection of additional sanitary system information to update the City's Geographic Information System (GIS) sanitary sewer system mapping; and windshield survey field work to identify locations where catch basins were suspected of being connected to

N

NEWPORT HARBOR

WELLINGTON AVE CSO FACILITY OUTFALL

PRIVATE

Easton Pond

Lily Pond, Newport

Almy Pond

1

2

3

4

6

7

m:\work\newport_ri\maps\cso_phase\fig1.1_Tributary_Catchments.mxd

DECEMBER 2006

0 500 1,000

Feet

EarthTech

A tyco International Ltd. Company

Note:
"Catchment Area" 5 consists of the flow contribution to Newport's system from the Wave Avenue pump station in Middletown.

LEGEND:

- Priority Catchments for Infiltration/Inflow Investigation
- Buildings
- Docks
- Paved Roads and Parking
- Unpaved Roads and Parking

FIGURE ES.1
WELLINGTON AVENUE CSO TREATMENT FACILITY TRIBUTARY CATCHMENTS
PHASE I PART 2 CSO CONTROL PLAN

the sanitary sewer such that conceptual methodologies and recommendations could be developed.

PHASE 1 PART 2 CONTROL PLAN WORK ACTIVITIES

This Phase 1 Part 2 CSO Control Plan for the Wellington Avenue CSO Treatment Facility includes the following:

- A Sewer System Evaluation Survey (SSES) in Priority Catchments 1, 3, 4, and 7 consisting of the following:
    - 68,000 linear feet of flow isolation and 23,300 linear feet of follow up closed circuit television inspection;
    - 6,200 linear feet of closed circuit television inspection of the Thames Street Interceptor;
    - 388 manhole inspections;
    - 1,309 house to house inspections;
    - 80,400 linear feet of smoke testing; and
    - 409 dye tests.
- Flow metering, rainfall gauging, and tide gauging to measure and evaluate dry weather and wet weather flows in Catchment Area 6 and development of the scope of work for SSES field activities to identify sources of infiltration and inflow;
- Development of recommendations for the removal of inflow sources, consisting of roof drains, area drains, and sump pumps, identified on private property in Priority Catchment Areas 1, 3, and 4 by the SSES field activities;
- Update of the City's Geographic Information System (GIS) database based on the results of a review of existing field markups, performance of approximately 400 additional manhole inspections, and field observations during the windshield surveys.

- Evaluation of the EPASWMM, XP-SWMM, INFOWORKS and DHI MOUSE/MIKEURBAN hydraulic/hydrologic models and recommendations for the appropriate model for the City to utilize to evaluate both the sanitary sewer system and combined sewer overflow treatment facilities under existing conditions and the effectiveness of proposed CSO control alternatives;

- Development of conceptual sewer separation recommendations for the public inflow sources, consisting of catch basins and cross connections, that were identified by review of existing information, SSES field activities, and windshield surveys;

- Update of the evaluation of CSO activations at the Wellington Avenue CSO Facility and the control alternatives that were developed in the Phase 1 Part 1 Report; and,

- Based on the results of the review of existing information, discussions with the City's collection system operations staff, windshield surveys conducted in the tributary catchments, and the detailed SSES field investigations in Catchments 1, 3 and 4, twenty eight (28) public sources consisting of catch basins, cross connections, drain manholes/lines, and "unknown" (i.e., smoke observed rising from the ground within the street right of way which are possible cracked pipes or abandoned service connections) were identified as connected to the sanitary sewer. As part of this phase of work, each location was evaluated to identify design issues and constraints.

RESULTS OF PHASE 1 PART 2 FIELD ACTIVITIES

The results and recommendations of the field activities described above are presented in Table ES.1. In addition to estimates of potential infiltration and inflow quantities, Table ES.1 also identifies areas where structural defects in the sanitary sewer system exist.

TABLE ES.1

SUMMARY OF SEWER SYSTEM EVALUATION SURVEY RESULTS

AND RECOMMENDATIONS IN PRIORITY CATCHMENTS 1, 3, 4, AND 7

SSES Activity	Findings	Structural Defects	Estimated Potential Infiltration/ Inflow Removal (gpd)
Flow Isolation/CCTV	Identified defects such as pipe cracks, holes, misalignments, breaks, sags	Yes	107,000 gpd
Thames Street Interceptor CCTV	Identified defects such as perforated covers, loose/leaking/missing bricks, mineral/sediment deposits, running services, crossing pipes	Yes	See Note 1.
Manhole Inspections	Identified defects such as wall, corbel and invert cracks/leaks, loose/missing bricks, damaged frames/covers	Yes	6,000 gpd
House to House Surveys	Identified 192 sump pumps connected to the sanitary sewer	No	276,500 -1,400,000 gpd (See Note 2.)
Smoke Testing – Private	Identified 65 connections to the sanitary sewer	No	500,000 gpd
Smoke Testing - Public	Identified 28 locations with cross connections and catch basins connected to sanitary sewer	No	2,000,000 gpd
Dye Testing	Identified 105 connections to the sanitary sewer	No	1,700,000 gpd
Catchment Area 6 Flow Metering	Review of flow metering indicates high inflow	Probable	To Be Determined in Phase 1 Part 3
Total			**4.6 to 5.7 MGD**

1. Inflow from perforated manhole covers is nominal. Infiltration from running services to be determined in the ongoing Phase 1 Part 3 Catchment Area 6 SSES.
2. Sump pump flows were estimated based on an assumed pumping rate of 1 to 5 gpm.

Sources of private inflow consisting of roof drains, area drains and sump pumps were identified in Priority Catchments 1, 3, and 4 during the SSES. Based on these results, the City has prepared and sent notifications to those residents where such sources were identified requesting that the source(s) be disconnected from the sanitary sewer by the property owner. The results of the notification process as of January 2007 are summarized below.

Roof and Yard Drain Disconnections

- 56 letters were sent on November 15, 2006. Twenty-one owners responded to this initial letter and agreed to disconnect;
- A second letter was sent on December 11, 2006 to the non-responders to the initial letters. Twenty-two owners have responded to the second letter indicating a willingness to disconnect;
- In total, 75% of the owners have agreed to disconnect;
- Inspections performed between January 2 and January 11, 2007 confirmed that nineteen of these disconnections have been accomplished. To date, a total of 34% of the structures have been disconnected.
- Additional letters including Enforcement Action to the non-responders will be sent.

Sump Pump Disconnections

- 183 letters were sent on December 14, 2006 requesting owners to disconnect their sump pumps from the sanitary sewer system;
- As of January, 2007, 34 owners have responded to the letter (19% of total);
- Inspections have not begun to confirm how many disconnections have been accomplished; and
- A second letter to non-responders was sent in January, 2007.

A similar process will be performed by the City based on the results of the dye testing.

DEVELOPMENT OF PHASE 1 PART 3 SCOPE OF SERVICES

In order to immediately address some of the findings in Phase 1 Part 2, the City amended Earth Tech's contract in December, 2006 to initiate Phase 1 Part 3 work activities consisting of the following:

- Performance of smoke testing, house to house surveys, dye testing, and limited flow isolation/closed circuit television inspection in Catchment Area 6 to identify sources of inflow and infiltration;

- Development of design plans and specifications to separate 28 catch basins and cross connections identified in the smoke testing, review of information, and windshield surveys. The completion date of this work is planned for June, 2007 to allow for bidding and initiation of construction in July , 2007; and,

- Development of rehabilitation design plans and specifications of 290 manholes identified with defects during the manhole inspections including the replacement of the perforated manhole covers identified during the closed circuit television inspection of the Thames Street Interceptor.

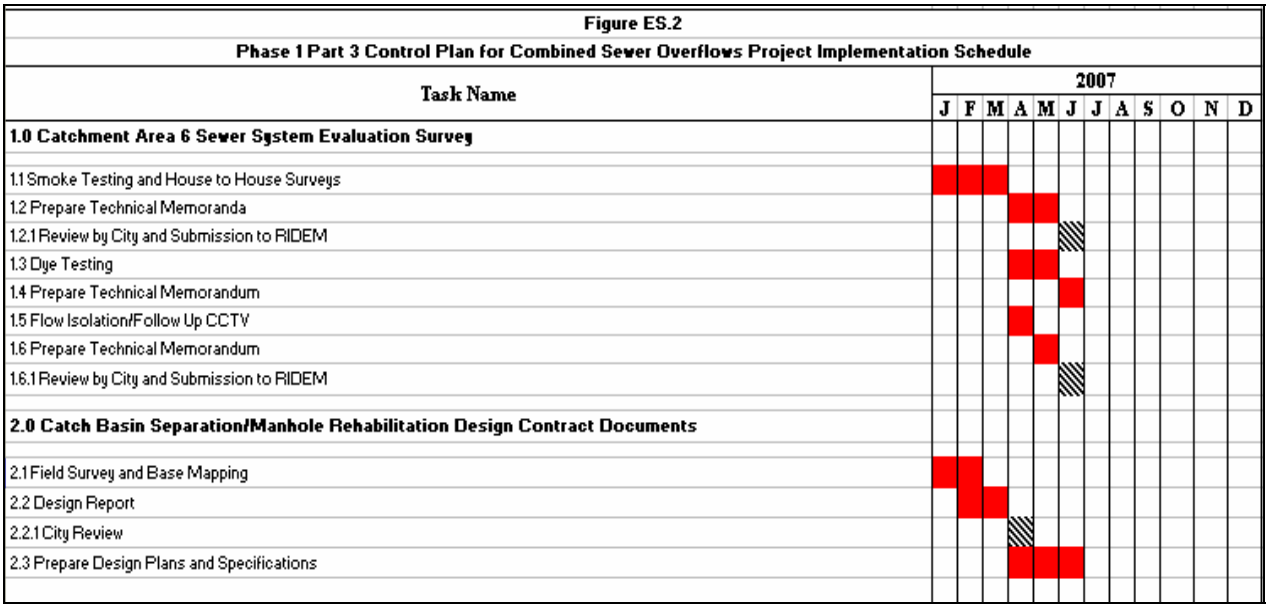
TABLE ES.2

PHASE 1 PART 3 CSO CONTROL PLAN COST

Phase 1 Part 3 Activity	Cost
Catchment Area 6 Sewer System Evaluation Survey	$175,000
Preparation of Catch Basin Separation and Manhole Rehabilitation Design Contract Documents	$174,000
Total Cost	**$349,000**

Figure ES.2 presents the schedule for Phase 1 Part 3 which is currently underway.

Figure ES.2
Phase 1 Part 3 Control Plan for Combined Sewer Overflows Project Implementation Schedule



Development of Recommendations and Plans for Catchment Area 6

At the conclusion of the Phase 1 Part 3 SSES field activities in Catchment Area 6, sources of inflow and infiltration will be identified on both public and private property. The Phase 1 Part 2 Report will be amended to include the results and recommendations from this Catchment Area 6 SSES, and submitted to RIDEM by May 31, 2007.

With regard to private sources, such as roof leaders, yard drains, and sump pumps identified on private property, the City will continue with its ongoing Notification and Disconnection Program. Similarly, as part of a separate contract (Phase 1 Part 4), design plans and specifications will be developed to separate the sources identified on public property, such as catch basins and cross connections. The cost and schedule to prepare the designs to separate the public sources of inflow will be developed based on the review of the results of the SSES at the conclusion of the Catchment Area 6 SSES. The subsequent construction of the separation of public sources will be performed under Phase 2.

RESULTS OF OTHER PHASE 1 PART 2 ACTIVITIES

Hydraulic Model Evaluation

An evaluation of the EPASWMM, XP-SWMM, INFOWORKS, and DHI MOUSE/MIKEURBAN hydraulic/hydrologic models was performed to determine which model(s) would be appropriate

model(s) for the City to utilize to evaluate the behavior of the system under existing conditions and the effectiveness of proposed CSO control alternatives. A technical memorandum was prepared and submitted to the City that summarized each of the model's capabilities, advantages and disadvantages, compatibility with the City's existing GIS database, hardware and software requirements, and licensing and purchase costs. Based on the review of the features of each of each of these models, Earth Tech recommends that the DHI MOUSE/MIKEURBAN model be utilized to perform the analysis of Newport's sanitary sewer system.

GIS Update

An update of the City's Geographic Information System (GIS) mapping of the sanitary sewer system was performed as part of this phase of work. The GIS database was updated based on the results of the following: approximately 800 manhole inspections performed in Catchment Areas 1, 2, 3, 4, 6 and 7 and in the northern part of the City; corrections to the existing sewer system information provided by Earth Tech Operations personnel responsible for operating and maintaining the City's sewerage system and the Newport Water Pollution Control Plant; inclusion of street address information for all buildings in Catchment Areas 1, 2, 3, 4, and 7; update of sanitary sewer and storm drain structure information obtained during field visits and during the windshield survey of the priority catchment areas; and addition of horizontal information for sanitary sewer and drainage structures from a previous Global Positioning Survey (GPS) ground survey.

Windshield Surveys and Development of Public Inflow Source Conceptual Separation Recommendations

Based on the results of the review of existing information, discussions with collection system operations staff, windshield surveys conducted in the tributary catchments, and the detailed SSES field investigations in Catchments 1, 3 and 4, twenty eight (28) public sources consisting of catch basins, cross connections, drain manholes/lines, and "unknown" (i.e., smoke observed rising from the ground within the street right of way which are possible cracked pipes or abandoned service connections) were identified as connected to the sanitary sewer. As part of this phase of work, each location was evaluated to identify design issues and constraints.

Analysis of CSO Control Alternatives and CSO Reduction

Based on the updated evaluation of the CSO data and the assessment of CSO control alternatives, removal of 4,000,000 gallons of flow from the tributary catchments to the Wellington Avenue CSO

Treatment Facility will potentially reduce CSO frequency at this facility by over 90%. This target removal volume includes the catchments in Newport as well as the flow contribution from Middletown via the Wave Avenue Pump Station, either by enhanced sewer separation, storage, and conveyance and treatment at the WPCP, either separately or in combination. Based on the results presented in Table ES.1, the infiltration and inflow sources that were identified in this phase of work contribute approximately 4.6 to 5.7 million gallons of flow a day during wet weather to the sanitary sewer system. Removing a significant portion of this flow from the system will reduce the overall volume of flow that the sanitary sewer system conveys during wet weather which is expected to reduce both CSO frequency and volume measurably.

In addition, as part of any program to manage flows in Newport, and similar to the recommendation that was included in the Phase 1 Part 1 Report, the Town of Middletown should be required to reduce its flows in general and to control its wet weather discharges to Newport. The City is currently negotiating a renewal of the inter-municipal agreement with Middletown. It is recommended for the City to impose dry and wet weather flow limits on Middletown to provide an incentive to reduce their flows to Newport.

RECOMMENDED PHASE 2 CSO CONTROL PLAN SCOPE OF WORK

The following are the recommended tasks for the Phase 2 CSO Control Plan for the Wellington Avenue CSO Facility.

1. Development of a Hydraulic Model of the City's Sanitary Sewer System

The development of a hydraulic model of the entire Newport sewer system, including its pump stations and CSO treatment facilities, is recommended to be included in Phase 2 to accurately predict the effectiveness of sewer separation, storage, or conveyance and treatment at the Newport Water Pollution Control Plant, either individually or in combination, to accomplish reduction and/or elimination of CSOs. The model will provide an analysis tool to better understand how the system functions under existing and proposed conditions to estimate possible CSO reductions for different alternatives, either as stand-alone or in combination; and to use the results of the modeling investigations to determine the cost and affordability of various alternatives.

2. Development of Design Plans and Specifications for High Priority Defects Identified in Flow Isolation/CCTV Investigations

The results of the flow isolation and follow-up closed circuit television inspections performed in Priority Catchments 1, 3, and 4 indicate that the system has multiple defects that would be expected due to the age of the system and type of materials (i.e., vitrified clay pipe). It is recommended that the City address in Phase 2 the recommended high priority rehabilitation that was identified in the Flow Isolation/CCTV Technical Memorandum including broken pipes, sagging pipes, pipes with holes, and pipes exhibiting other signs of imminent failure.

3. Preparation of Phase 2 CSO Control Plan Report

The results, recommendations, and costs based on the hydraulic analysis of the system will be presented in the Phase 2 CSO Control Plan Report. The report will include the following:

- Results of existing and proposed conditions hydraulic analysis;
- Recommended CSO Control Plan for the Wellington Avenue CSO Treatment Facility based on the evaluation of CSO control alternatives such as sewer separation, storage, conveyance and treatment at the WPCP, and relocation/elimination of the CSO outfall based on the requirements of EPA and RIDEM CSO Control Policies;
- Impacts of the recommendations for the Wellington Avenue CSO Treatment Facility on operation and performance of the Washington Street CSO Treatment Facility, Long Wharf Pump Station, Water Pollution Control Plant, and other key facilities;
- Evaluation of impacts of flows received from the Wave Avenue Pump Station in Middletown on the existing and proposed sanitary sewer system;

- Estimated costs for the recommended CSO Control Plan and economic achievability analysis to determine cost impacts to ratepayers;

- The proposed schedule for the Phase 3 Design and Phase 4 Construction of the elements recommended in the CSO Control Plan;

- The results of post-monitoring of the removal of inflow and infiltration sources as identified in Phase 1 Part 2 and Phase 1 Part 3 as well as the recommended post-monitoring plan for the recommended Phase 3 design elements.

PHASE 2 CSO CONTROL PLAN COST ESTIMATE

The estimated costs for the recommended planning and design elements of the Phase 2 CSO Control Plan are summarized in Table ES.3.

TABLE ES.3

PHASE 2 CSO CONTROL PLAN COST ESTIMATE

Phase 2 Planning/Design Projects	
Engineering Design for Rehabilitation of High Priority Sanitary Sewer System Pipe Defects Identified in Flow Isolation/CCTV	$83,000
Hydraulic Modeling • Model Purchase • Model Setup • Flow Metering • Calibration/Verification/Existing Conditions Simulations • Development and Simulation of CSO Control Alternatives • Technical Memoranda Documentation	$418,000
Preparation of the Phase 2 CSO Control Plan Report	$50,000
Project meetings with the City of Newport and RIDEM	$15,000
Public Meetings and Workshops to Present Results of Hydraulic Modeling Analysis and Phase 2 CSO Control Plan Recommendations to City Council and Public	$20,000
Total	**$586,000**

PHASE 2 CSO CONTROL PLAN IMPLEMENTATION SCHEDULE

The implementation schedule for the Phase 2 Program is presented in Figure ES.3.

Figure ES.3
Phase 2 Control Plan for Combined Sewer Overflows Project Implementation Schedule