

## **Executive Summary**

This Executive Summary presents the methodology, analysis, conclusions and recommendations for the Phase 2 Control Plan for the Wellington Avenue Combined Sewer Overflow (CSO) Facility.

## **Background**

The Wellington Avenue CSO Facility is located in a sensitive area adjacent to the Kings Park Beach which was designated as a Flagship Beach in 2003 by the Environmental Protection Agency (EPA) and Rhode Island Department of Environmental Management (RIDEM). Since this CSO is located in a sensitive area, the City has evaluated control alternatives to eliminate all CSOs from the Wellington Avenue Facility for the largest storm in the typical year. The City has undertaken a phased planning process to achieve this objective.

In spite of sewer separation work that was initiated in the late 1970s when the City undertook a comprehensive sewer separation program in the Wellington Avenue Facility tributary catchment area, and more recently with the City's Enhanced Sewer Separation Program, the Wellington Avenue system continues to exhibit significant flows during rainfall events due to both infiltration and inflow (I/I) of a magnitude that would indicate that there are portions of the Wellington Avenue area that are not fully separated. The City's Enhanced Sewer Separation Program activities performed in the Wellington Avenue CSO Facility tributary catchment area in Phase 1 to identify and eliminate the sources of I/I are summarized as follows.

- Field investigations to identify sources of infiltration and inflow. In Phase 1 Part 1, of the seven drainage catchment areas, Priority Catchments 1, 3, 4 and 7 were identified for detailed infiltration and inflow field investigations that were subsequently performed in Phase 1 Part 2;
- In Phase 1, Part 2, additional flow metering and field investigations were performed to isolate inflow and infiltration flows in Catchment Area 6 due to inconclusive results obtained in the Phase 1 Part 1 flow metering. Results of the Sewer System Evaluation Survey Study (SSES) were presented in the Amendment to the Phase 1 Part 2 CSO Control Plan, Sewer System Evaluation Survey for Catchment Area 6;
- Phase 1 Part 3 included design of manhole rehabilitation plans and separation plans for catch basins identified as connected to the sewer system in previous reports to the City of Newport and identified in Phase 1 Part 2;
- Sewer system rehabilitation to repair manholes to reduce the impacts of infiltration;
- Disconnection and relocation of inflow sources such as sump pumps, area drains and roof drains identified as connected to the sewer system.
- Preparation of design plans and specifications for the High Priority Sewer Replacement for sanitary sewer segments in the Wellington Avenue catchment areas identified during Phase 1 Part 2 with defects such as pipe sags, cracked and broken pipes, and misaligned joints.

Each of these activities has contributed to a reduction in the wet weather flow generated in the Wellington Avenue tributary catchment area. Phase 2 has been developed to continue the City's ongoing effort to reduce CSOs at the Wellington Avenue CSO Facility with the ultimate objective of eliminating CSOs at this location.

## **Phase 2 CSO Plan Development**

The Phase 2 CSO Control Plan was developed with the following objectives:

- Develop a hydrologic and hydraulic model to analyze the existing and proposed conditions in the Wellington Avenue CSO Facility catchment area. A complete model of the Wellington Avenue service area sanitary sewer system, and a limited model of the Washington Street service area, was developed using the DHI MOUSE/MIKEURBAN model. The model was calibrated to existing conditions using flow meter data collected in 2005, 2007 and 2008. The existing conditions model was utilized to evaluate the effectiveness of the work performed in Phase 1 and for proposed CSO control alternatives to reduce the frequency and volume of CSOs from the Wellington Avenue CSO Facility; and to determine the impact of those control alternatives on the Washington Street CSO Facility, Water Pollution Control Plant (WPCP) and the Long Wharf Pump Station;
- Evaluate rainfall data to develop a typical year of rainfall to be used to assess the effectiveness of CSO controls to eliminate CSOs for the largest storm event in the typical year (“design event”) and their impacts on other facilities. Evaluation of rainfall data collected from 1948 to the present at T. F. Green Airport in Providence indicated that the year 1996 was a representative typical year.
- Recommend a CSO Control Plan for the Wellington Avenue CSO Facility based on the evaluation of the effectiveness of the CSO control alternatives, including evaluation of siting, construction, institutional, environmental, and permitting issues associated with each CSO control alternative;
- Evaluate the impact of the flows received from the Wave Avenue Pump Station in Middletown on Newport’s sewer system, the CSO facilities, and the Water Pollution Control Plant;
- Estimate the costs of the CSO control alternatives and the recommended CSO Control Plan and perform an economic affordability analysis to determine cost impacts on ratepayers; and
- Propose a schedule for future phases of work for the elements recommended in the CSO Control Plan.

Phase 2 included evaluation of a range of CSO control alternatives for the Wellington Avenue CSO Facility including:

- Implementation of the Nine Minimum Controls;
- Sewer separation;
- In-line storage within the existing system utilizing either tanks or oversized conduits to provide additional storage capacity;
- Off-line storage parallel to the existing system utilizing tanks, conduits, or underground tunnels;
- Satellite treatment of flow at specific CSO outfall locations;

- Elimination or relocation of CSO outfall(s); and
- Conveyance and treatment at the existing Water Pollution Control Plant (WPCP).

The alternatives were assessed and screened with respect to the following: ability to eliminate CSOs; consequential impacts; cost considerations; environmental issues; technical issues; and implementation issues. Based on the screening analysis, the following CSO control alternatives were selected for more detailed analysis:

- Centralized storage in the vicinity of the Wellington Avenue CSO Facility, or decentralized storage at multiple locations;
- Conveyance and treatment of flow at the Water Pollution Control Plant (WPCP), either directly via the existing pump station and force main from the Wellington Avenue CSO Facility; or from a new pump station and force main from the Wellington facility to the Long Wharf Pump Station for pumping and conveyance via the existing 36-inch force main to the WPCP. Force main routing included analysis of both an overland route and sub-aqueous route below Newport Harbor for each alternative; and
- Sewer separation consisting of identification and elimination of direct sources of rainfall dependent infiltration and inflow (RDII) such as: connected catch basins on public property; connected roof leaders, driveway and yard drains, sump pumps, and leaking sewer services on private property; rehabilitation and/or replacement of existing sanitary sewers and manholes to repair system defects associated with rainfall dependent infiltration; and reduction of tidal infiltration into the system. Sewer separation was evaluated with respect to partial sewer separation in combination with storage and full sewer separation consisting of complete sanitary sewer system replacement and construction of new storm drains, where none currently exist.

The evaluation of each of the alternatives included analysis of the CSO controls' ability to eliminate the CSO for the design storm event in the typical year; and determination of the impacts on the Washington Street CSO Facility, Long Wharf Pump Station, and the WPCP. The CSO control alternatives were also each evaluated with respect to technical feasibility, siting, institutional, and regulatory issues. The results of the analyses are summarized in Table ES.1.

**TABLE ES.1  
CSO CONTROLS ALTERNATIVES ANALYSIS SUMMARY**

CSO Control Alternative	Elimination of CSOs at the Wellington Avenue CSO Facility for the Typical Year	Impacts to CSO Frequency and Volume at the Washington Street CSO Facility	Impacts to Water Pollution Control Plant		Construction Impacts	Floodplain Impacts	Wetland Impacts	Rare Species	Hazardous Materials	Conservation Land Impacts	Institutional Impacts	Rigorous Permitting Required
			Number of Exceedences Average Monthly Flow	Number of Exceedences Maximum Daily Flow								
Centralized Storage	Yes	Reduces	3	0	Yes	No	No	No	No	Yes	Yes	Yes
Decentralized Storage	Yes	Reduces	3	0	Yes	No	Yes	No	No	Yes	Yes	Yes
Conveyance to Long Wharf Pump Station	Yes	Increases	2	3	Yes	No	Yes (Sub-aqueous Route)	No	No	No	Yes	Yes
Conveyance to the WPCP	Yes	Increases	2	3	Yes	No	Yes (Sub-aqueous Route)	No	Yes	No	Yes	Yes
Sewer Separation	Yes	Reduces	1	0	Yes	Site Specific, To Be Determined	Site Specific, To Be Determined	Site Specific, To Be Determined	Site Specific, To Be Determined	Site Specific, To Be Determined	Yes	No

The cost of each of these alternatives is presented in Table ES.2. The costs include construction, engineering and administration, permitting, and present worth of operation and maintenance costs, as well as land acquisition and recreational improvements costs, as applicable.

**TABLE ES.2  
CSO CONTROL ALTERNATIVES COST ESTIMATES**

CSO Control Alternative	Estimated Present Worth Cost (\$ Millions)
Centralized Storage	\$60.4
Decentralized Storage	\$105.8
Conveyance to Long Wharf- Sub-aqueous Route	\$78.3
Conveyance to Long Wharf- Overland Route	\$66.4
Conveyance to WPCP – Sub-aqueous Route	\$115.0
Conveyance to WPCP - Overland Route	\$84.3
Sewer Separation: Full Replacement	\$166.5
Sewer Separation and Storage	\$61.7

### Conclusions and Recommendations

The following were the conclusions from the Phase 2 modeling and alternatives analysis:

1. The modeling analysis indicated that the system is not only impacted by direct inflow sources, but is also impacted significantly by tidal inflow, specifically in the Thames Street Interceptor and the Wellington Avenue Sewer; and also by rainfall induced infiltration combined with high groundwater elevations in the Wellington Avenue tributary catchment area. During Phase 1 Part 2, it was surmised that the increased wet weather flows were more impacted by inflow sources and that infiltration sources were of lesser impact. The modeling results in Phase 2 have indicated that rainfall induced infiltration is a more significant component of the total wet weather flow than previously envisioned.
2. The model was used for the typical year 1996 to simulate flows under existing conditions, before implementation of the recent enhanced sewer separation (prior to 2007), for the typical year 1996 to determine if the model reasonably generated data close to the recorded CSO volume and number of events in a typical year at the Wellington Avenue CSO Facility.
3. The City’s Enhanced Sewer Separation Program has been ongoing from 2007 through 2008 in the Wellington Avenue CSO Facility tributary area. The existing conditions’ calibrated model was modified to account for the reductions in flow to the system from catch basins, sump pumps, and roof leaders that have been disconnected as of December 2008. And, model simulations estimated a 12% reduction in annual CSO volume, a 21% reduction of CSO events, and a 7% reduction in the largest CSO event volume in the typical year.
4. Simulation of the centralized storage alternative yielded a volume of 6.4 million gallons required to capture the CSO volume generated by the Design Storm Event, largest storm in the typical year of 1996. Potential storage locations evaluated included the Little League ball field/park area adjacent to the Wellington Avenue CSO Facility and/or Spencer Park on Wellington Avenue. The impacts to the Washington Street CSO Facility and the WPCP were also evaluated with the model and were presented above in Table ES.1.

5. Simulation of the decentralized storage alternative yielded a volume of approximately 9 million gallons required to capture the CSO volume generated by the largest storm in the typical year of 1996. Sixteen preliminary storage sites were evaluated and screened. Potential final storage locations evaluated with the model included the Little League ball field/park area adjacent to the Wellington Avenue CSO Facility, Spencer Park on Wellington Avenue, Morton Park, and Narragansett Avenue. The impacts to the Washington Street CSO Facility and the WPCP were also evaluated with the model and were presented above in Table ES.1.
6. Simulation of the alternative of conveying flow directly from the Wellington Avenue CSO Facility to the Long Wharf Pump Station via either an overland force main or a sub-aqueous force main below Newport Harbor; and conveying the flow via the existing 36-inch force main to the WPCP for treatment were evaluated. These resulted in several significant impacts to existing facilities, including the need for construction of a new pump station at Long Wharf and headwork's modifications/flow equalization, upgrades to primary treatment, and new disinfection and effluent pumping facilities at the WPCP. In addition, due to the increase in flow, construction of a new outfall would be required. This alternative would also require approval from RIDEM to modify the current RIPDES permit to allow primary treatment and disinfection of wet weather bypasses, as well as for an increase in the WPCP's discharge capacity. The impacts to the Washington Street CSO Facility and the WPCP were also evaluated with the model and were presented above in Table ES.1.
7. Simulation of the alternatives of conveying flow directly from the Wellington Avenue CSO Facility to the WPCP via either an overland force main or a sub-aqueous force main below Newport Harbor were evaluated. The required upgrades, new facilities, and permitting requirements at the WPCP were the same as those for the previous Long Wharf alternatives.
8. Completion of sewer separation in the Wellington Avenue CSO Facility tributary area would consist of further field investigations to identify additional public and private sources of infiltration and inflow; identification and reduction of sources of tidal infiltration; disconnection of additional connected catch basins, roof leaders and sump pumps; and rehabilitation and replacement of sewer laterals and sewer mains in the existing Wellington Avenue collection system. Model simulations of this alternative were performed to assess the impacts of reducing the rainfall dependent infiltration and inflow for three scenarios: 30%, 50%, and 80% reductions. Each of these scenarios also resulted in a reduction of CSO frequency and volume at the Washington Street CSO Facility and at the WPCP. The 80% reduction in RDII scenario was determined to be the level required to fully eliminate CSOs at the Wellington Avenue CSO Facility for the typical year 1996. Achieving this level of infiltration and inflow reduction would require rehabilitation and replacement of virtually the entire existing Wellington Avenue collection system.
9. Impacts of flows from the Wave Avenue Pump Station in Middletown were evaluated with the model. It was determined that high wet weather flows from the Wave Avenue Pump Station increase the frequency and volume of CSOs at both the Wellington Avenue CSO Facility and the Washington Street CSO Facility, with the more significant impact on volume of overflow at the Washington Street CSO Facility. This is illustrated in Table ES.3 which summarizes the impacts to overflows at the Wellington Avenue CSO Facility and the Washington Street CSO Facility for the three largest rain events that occurred in the typical year. Flows from the Wave Avenue Pump Station were developed as follows:
  - 1.5 mgd – Flow obtained from recent flow data recorded at the WPCP;

- 3.7 mgd – The assumed flow from the Wave Avenue Pump Station to the WPCP under maximum daily flow conditions; and
- 7.2 mgd – Flow obtained from review of recent wet weather flow data at the WPCP during wet weather.

**TABLE ES.3  
IMPACTS TO CSO FACILITIES FROM WAVE AVENUE PUMP STATION FLOWS  
TYPICAL YEAR 1996 SIMULATION SEPTEMBER THROUGH OCTOBER 1996**

Flow From Wave Avenue Pump Station (mgd)	CSO Volume at Wellington Avenue CSO Facility (MG)			CSO Volume at Washington Street CSO Facility (MG)		
	9/17/96	10/8/96	10/20/96	9/17/96	10/8/96	10/20/96
	2.78 inches	2.36 inches	3.05 inches	2.78 inches	2.36 inches	3.05 inches
1.5	3.37	2.98	6.29	0.38	0.22	0.95
3.7	3.45	3.04	6.39	0.62	1.32	2.19
7.2	3.57	3.17	6.56	6.74	4.15	7.55

10. Based on the estimated costs presented in ES.2, the most cost effective alternative to achieve the objective of eliminating all CSOs up to the CSO volume associated with the largest storm in the typical year (i.e., “design storm event”) was the alternative of combining sewer separation and storage. Although its cost is slightly higher than the cost of centralized storage, the overall reduction in annual flows to the Long Wharf Pump Station and the WPCP will result in greater long term operation and maintenance cost savings.
11. Implementation of the Sewer Separation and Storage alternative for the Wellington Avenue area will place a financial and economic burden on the City of Newport, as well as the other entities that utilize the City’s wastewater and CSO system. Based upon the USEPA’s guidance and definitions of burden, the economic and financial burden on Newport residents utilizing the system will be high. Although the combination alternative of sewer separation and storage is recommended because it is environmentally effective and one of the most cost-effective, each CSO alternative was also reviewed per the EPA Guidance. In accordance with this Guidance, each alternative evaluated would put a “High Burden” on the residents.

**Recommended CSO Control Plan**

During the development of the Phase 2 plan, progress meetings with RIDEM and the Environmental Protection Agency indicated that, from a regulatory approval perspective, complete sewer separation should be pursued by the City as the primary method of CSO control. Other CSO controls, such as storage, may be considered if complete sewer separation could not be achieved, either technically or from a financial affordability standpoint. The following Phase 2 recommendations are based on this requirement and constitute the first steps toward meeting this objective.

The recommended plan for CSO control to eliminate CSOs for the largest storm in the typical year (“Design Storm Event”) for the Wellington Avenue CSO Facility is sewer separation combined with storage, if, as a result of post-construction monitoring, it is determined that sewer separation alone could not meet the objective. The recommended initial phase of separation to achieve this objective is based on a target of removing 30% of the rainfall dependent infiltration and inflow and is as follows:

1. A comprehensive flow metering program to be conducted for one year, including: 1) installation of groundwater gauges at each meter location; and, 2) tide gauging intended to identify locations within each of the tributary catchment areas in the Wellington Avenue CSO Facility catchment area. The gauging would include the private sewer catchment area and select locations in the Washington Street catchment area to provide boundary conditions, with excessive infiltration and inflow. The plan includes installation of 30 meters for a 12-month period in order to capture all seasonal flow, rainfall, and groundwater elevation fluctuations.
2. Based on the results of the future flow metering program, further expanded sewer system evaluation survey (SSES) field investigation are recommended for those areas identified by the flow metering with excessive infiltration and inflow. An estimate of the extent of field activities to identify sources of infiltration and inflow with the goal of removing 30% of the rainfall dependent infiltration and inflow and will include the following:
  - 72,000 feet of Smoke Testing;
  - 113,000 feet of closed circuit television inspection;
  - 1,200 building inspections;
  - Dye flooding (30 locations); and
  - Dye testing (1,200 tests);

These quantities represent the balance of the quantities that were not field investigated in Phase 1 Part 2 and Phase 1 Part 3 and includes field investigations in the private sewer catchment areas. Private sources of infiltration and inflow, such as sewer laterals with running flow, sump pumps, roof drains, area drains, etc. will be identified and scheduled for elimination based on the City’s ongoing program for removal of these sources. Public sources, such as additional connected catch basins, that are identified will be disconnected from the sanitary system and connected to existing or new storm drains.

Based on the results of the proposed SSES, the locations within the tributary catchments requiring sewer system rehabilitation and replacement will be identified. An estimate of the extent of sewer rehabilitation, replacement and new storm drainage that may be required to meet the goal of removing 30% of the rainfall dependent infiltration and inflow is as follows:

- 28,000 linear feet of joint testing and sealing;
- 28,000 linear feet of cured-in-place pipelining or sliplining;
- Lining of the Thames Street Interceptor (approximately 6, 200 feet);
- 16,000 linear feet of sewer replacement;



- 2,500 feet of sewer replacement on Wellington Avenue
- 25,000 linear feet of new storm drain
- 20 catch basin disconnections;
- 8- service connections; and
- 225 manholes for rehabilitation.

The quantities were developed based on the assumption that 70% of the sanitary sewers that are investigated will require some form of rehabilitation, with 25% requiring joint testing and sealing, 30% requiring rehabilitation, and 15% requiring sewer replacement. It was further assumed that 50% of the manholes that are inspected will require some rehabilitation. The quantities of new storm drain, catch basin disconnections, and service connection repairs were assumed. The first recommended projects under the sewer rehabilitation and replacement program are rehabilitation of the Thames Street Interceptor and replacement of the Wellington Avenue Sewer from the intersection of Thames Street to Halidon Street. During the Phase 1 flow metering and tide gauging, these locations were identified as being directly impacted by tidal inflow.

3. Upon completion of the next phase of sewer separation as noted above, post-construction monitoring of the frequency and volume of CSO at the Wellington Avenue CSO Facility for a one-year period is recommended. In addition, a post-construction flow monitoring plan should be developed to determine to what extent the infiltration and inflow removal in areas identified has been effective.
4. Based on the results of the future post-construction monitoring, it is recommended that the City utilize the model to establish the post-construction baseline conditions. At that time, the final sizing of storage required to eliminate CSOs up to the largest storm in the typical year can be determined. Based on removal of 30% of the rainfall dependent infiltration and inflow, the model currently predicts a storage requirement of approximately 2 million gallons. The model can be used to confirm this estimate, and adjust the volume accordingly based on the then existing conditions.
5. The costs for the initial phase of sewer separation and storage are summarized in Table ES.4

**TABLE ES.4  
RECOMMENDED CSO PLAN COSTS  
FOR THE WELLINGTON AVENUE CSO AREA**

	<b>Estimated Cost</b>
Thames Street Interceptor Rehabilitation	\$4,500,000
Wellington Avenue Sewer Replacement	\$1,800,000
Flow Metering	\$1,280,000
Sewer System Evaluation Survey	\$783,000
Sewer Separation – Rehabilitation and Replacement	\$31,200,000
Storage Tank (2 MG)	\$21,900,000
Present Worth of Operation and Maintenance Cost	\$200,000
<b>Estimated Cost (Rounded)</b>	<b>\$61,700,000</b>

6. The City has been working with RIDEM to optimize flow to the Water Pollution Control Plant. The Flow Optimization Study submitted to RIDEM in 2007 indicated that an increase in the allowable average monthly flow from 10.7 to 15.7 mgd could be accomplished without an impact on the discharge water quality. It is recommended that the City continue to work with RIDEM to obtain permission for an increase in monthly average daily flow to 15.7 mgd on a “trial basis” for one year to determine not only the impacts at the WPCP but also on the frequency and volume of overflows at the Wellington Avenue and Washington Street CSO Facilities. During the trial period, no other improvements should be made to the WPCP in order to limit the variables influencing the results. Also, during the trial period, the average monthly flow would be increased incrementally in order to confirm that no adverse impacts resulting from the flow increases are experienced.
  
7. It is recommended that the City perform flow metering to provide the required data to initiate an infiltration and inflow investigation in the Washington Street tributary catchment area similar to the program that was performed in Phase 1 for the Wellington Avenue CSO Facility. This metering should be performed at the same time as the metering proposed in the Wellington Avenue area, as noted in Item 1, above. The infiltration and inflow study can then be used to prioritize catchments for detailed sewer system evaluation field investigations. The limited model in the Washington Street area should also be expanded to include the entire Washington Street system and the remainder of the City.

The estimated cost for the flow metering (assumed one year duration); an order of magnitude cost for the sewer system evaluation survey using the costs for similar work performed in the Wellington area as the basis; and the estimated cost to expand the model to include the Washington Street area and the remainder of the City are presented in Table ES.5.

**TABLE ES.5  
PRELIMINARY COST ESTIMATES FOR RECOMMENDATIONS FOR WASHINGTON  
STREET CSO AREA**

<b>Recommendation</b>	<b>Estimated Cost</b>
Flow Metering	\$200,000
Sewer System Evaluation Survey	\$800,000
Model Expansion	\$200,000
Total	\$1,200,000

Table ES.6 summarizes the costs of the recommended sewer separation and storage program for Wellington Avenue and the recommendations for Washington Street.

**TABLE ES.6  
COST SUMMARY OF RECOMMENDED PLAN**

<b>Recommendation</b>	<b>Estimated Cost</b>
Recommended Plan – Wellington Avenue	\$61,700,000
Washington Street Recommendations	\$1,200,000
Total	<b>\$62,900,000</b>

**Implementation Schedule**

Figure ES.1 presents the implementation schedule for the recommended plan. The schedule was developed with consideration toward the required sequencing of recommended activities. The requirement for collection of one year of flow data is to account for the seasonal variation of rainfall and to provide adequate time to capture a variety of storm events and conditions during the year. The flow metering results must then be analyzed to identify the specific areas throughout the Wellington Avenue catchment area for detailed sewer system evaluation survey (SSES) activities. SSES work must be completed and the data then analyzed to determine the location and extent of the required sewer separation work, (i.e., sanitary sewer rehabilitation and replacement and new storm drainage systems). Areas on public property will require preparation of design plans, permitting, and construction. Removal of sources identified on private property will require a notification and follow-up process similar to the program performed by the City in Phase 1.

Upon completion of the initial phase of sewer separation construction, post-construction monitoring of the frequency and volume of overflows will be required to determine the impacts of the sewer separation work performed. At that time, the model can be used to determine if additional sewer separation work is required and/or to refine the required volume of storage.

While the overall CSO control program for the Wellington Avenue area is scheduled to extend for the next 13.5 years, it is possible as a result of the work performed on Phases A-C, which is scheduled to take 7.5 years, that sufficient extraneous flow can be removed from the system to meet the objectives of the Control Plan. If this can be confirmed by the post-construction monitoring, then the design, permitting and construction of a storage facility will not be needed. It is also conceivable that significant sources of extraneous flows (RDII and tidal infiltration) are identified early in the SSES process so as to shorten the estimated implementation schedule even further; however, this cannot be predicted at this time.

FIGURE ES.1  
WELLINGTON AVENUE CSO FACILITY TRIBUTARY SEWER  
CITY OF NEWPORT, RI

Phase 2 Control Plan for Combined Sewer Overflows Project Implementation Schedule for the Wellington Avenue Area

Phase	Task Name	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14
	Notice To Proceed Received from City of Newport	█													
A-1	Flow Metering for Wellington Avenue and Washington Street CSO Facility Tributary Areas	█													
A-1	Expand Model to Washington Street Tributary Area	█													
A-1	Water Quality Monitoring	█													
A-1	Preliminary Design and Permitting - Thames St. Interceptor Rehab.		█												
A-1	Preliminary Design and Permitting - Wellington Ave. Sewer Replacement		█												
A-2	I/I Study - Wellington Avenue Tributary Area		█												
A-2	Water Quality Modeling		█												
A-2	Final Design (including City and RIDEM Review and Bidding) - Thames St. Interceptor Rehab.			█											
A-2	Final Design (including City and RIDEM Review and Bidding) - Wellington Ave. Sewer Replacement			█											
A-3	SSES Field Work - Remaining Catchment Areas within the Wellington Avenue Tributary Area			█											
A-3	Construction - Thames St. Interceptor Rehab.			█	█	█	█								
A-3	Construction - Wellington Ave. Sewer Replacement				█	█	█								
B-1	Disconnection of Private Connections (Sump Pumps, Rain Leaders, Yard Drains)			█	█										
B-1	Replace Service Lines - Wellington Avenue Tributary Area			█	█										
B-1	Preliminary Design and Permitting - Disconnection of Public Connections			█	█										
B-1	Preliminary Design - SSES Identified Sewer Rehab.			█	█										
B-2	Final Design - Disconnections of Public Connections				█	█									
B-2	Final Design - SSES Identified Sewer Rehab. (including City and RIDEM Review and Bidding)				█	█									
B-3	Construction - Disconnection of Public Connections					█	█								
B-3	Construction - SSES Identified Sewer Rehab.					█	█	█							
C-1	Preliminary Design and Permitting - New Storm Drain					█	█								
C-2	Final Design - New Storm Drain (including City and RIDEM Review and Bidding)						█	█							
C-3	Construction - New Storm Drain							█	█						
D-1	Post Monitoring of Rehabilitation Work								█	█					
E-1	Preliminary Design and Permitting - Storage Tank									█	█				
E-2	Final Design - Storage Tank										█	█			
E-3	Construction - Storage Tank											█	█	█	
F	Post Monitoring of Storage Tank													█	█

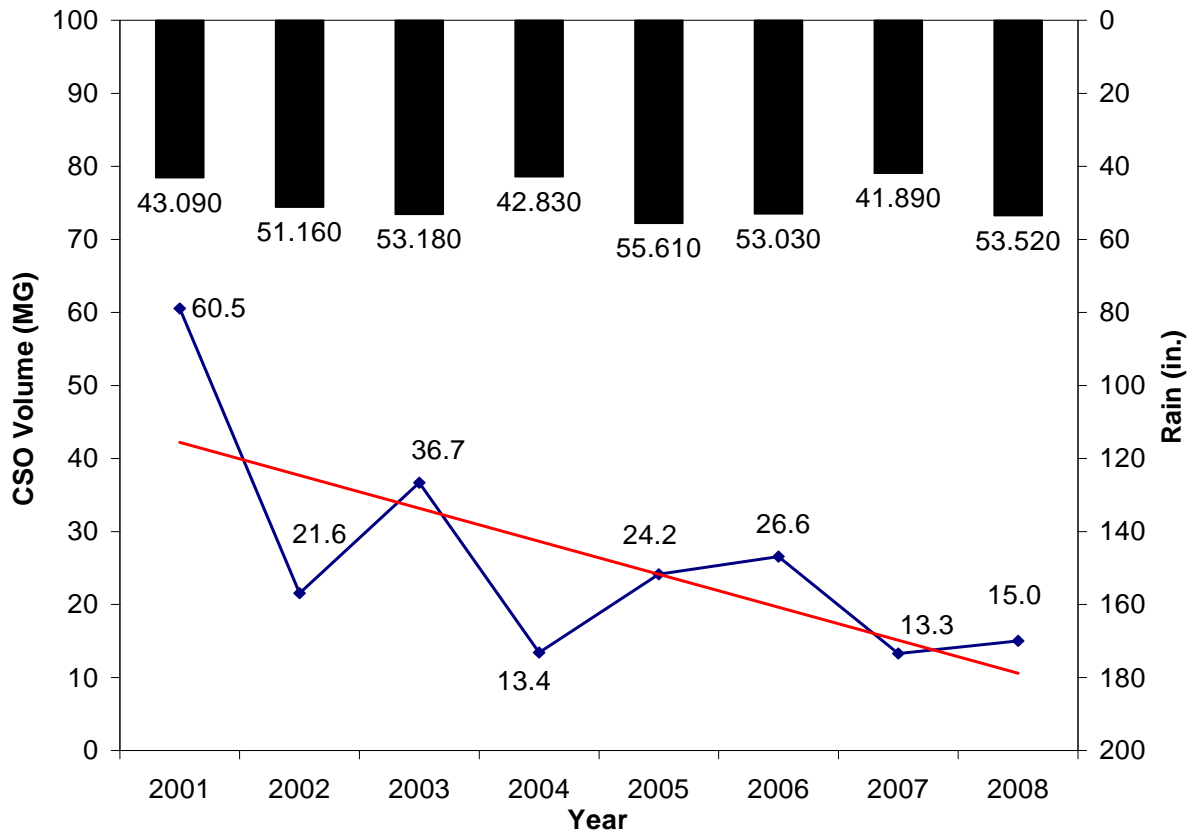
Revised 3-20-2009

**Monitoring Plan**

The City has an existing CSO monitoring program for the Wellington Avenue and Washington Street CSO Facilities which records the number and volume of overflows. This information is submitted to the Rhode Island Department of Environmental Management (RIDEM). Analysis of monitoring results at the Wellington Avenue CSO Facility is presented below.

Figure ES.2 presents the volume of combined sewer overflow (with trend line in red) and total rainfall collected at the WPCP for the period of 2001 to 2008 at the Wellington Avenue CSO Facility.

**Figure ES.2  
Wellington Avenue CSO Facility  
CSO Volume and Total Rainfall 2001-2008**



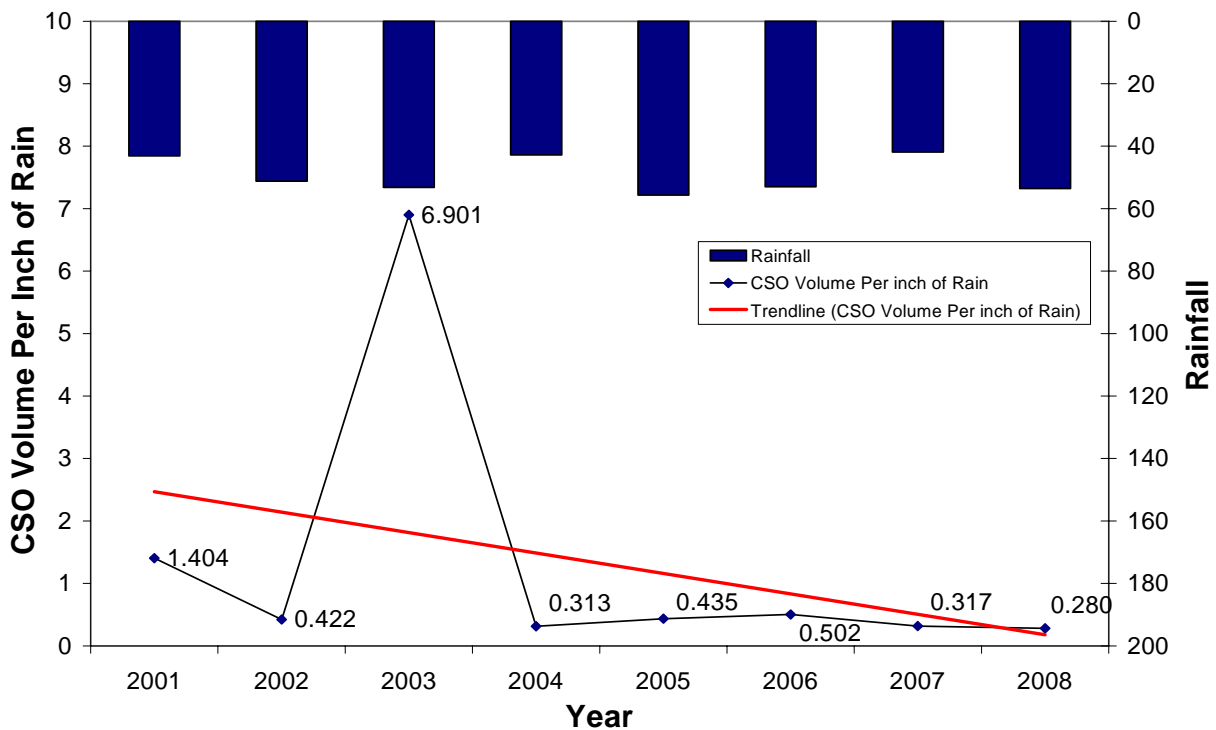
The following was noted based on review of the data:

- The overall trend line indicates a steady reduction in overflow volume for the years 2001 to 2008 which is attributed to improvements to the operation of the Wellington Avenue CSO Facility and to the improvements to the Narragansett Avenue Storage Conduit in 2001.

- In addition, recent sewer separation activities in 2007 and 2008 have included roof leader disconnection, catch basin separation, and disconnection of sump pumps. It is noted that 2008 was a wet year with over 50 inches of total rainfall. However, the volume of overflow, 15 mg, is significantly less than the overflow volume recorded in the previous years of 2002, 2003, 2005, and 2006, which received similar amounts of total rainfall.

A metric of volume of CSO (million gallons, MG) per inch of rainfall at the Wellington Avenue CSO Facility was then analyzed from 2001 through 2008 and is presented in Figure ES.3.

**Figure ES.3**  
**Wellington Avenue CSO Facility**  
**CSO Volume per Inch of Rainfall 2001-2008**



Review of Figure ES.3 indicates that the metric noted above shows that the volume of CSO per inch of rain has decreased from 2001 to 2008. Similarly, the reduction in the metric from 2007 to 2008 is attributed to the City’s recent Enhanced Sewer Separation efforts that have been completed as of December 2008.

The City’s current monitoring program will continue during and after implementation of the recommended plan. The data that is collected will be compared to the existing conditions data to evaluate the further effectiveness of the CSO controls. In addition, it is recommended that the City continue the water quality monitoring program and consult with RIDEM and EPA to develop a water quality modeling plan to be utilized to demonstrate the effectiveness of the implementation of the recommendations presented above, and to address RIDEM and EPA’s long term objective of meeting water quality standards.