COMMITMENT & INTEGRITY
DRIVE RESULTS

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April 1, 2011

Mike Bobinsky
Department of Public Services
City of Portland
55 Portland Street
Portland, ME 04101

Dear Mike:

Woodard & Curran and AMEC are pleased to submit an Appendix to the original "Stormwater Does It Make Sense" Study prepared by AMEC Earth & Environmental Inc., in November 2008. As outlined in our contract accepted on October 21, 2010, the objective of the project was as follows:

- to improve the City's understanding of the condition of its stormwater infrastructure through a strategic stormwater system inventory, and
- to provide an update to the Stormwater Program Costs based on the sampling of the City's stormwater drainage infrastructure and current stormwater compliance efforts.

The DIMS Appendix includes the following attachments:

- Attachment A - The "Infrastructure Report" providing an overview of the field sample results and extrapolations used in the *Stormwater Program Cost Summary* spreadsheet.
- Attachment B - Cost estimate spreadsheets used as a basis for remedial repair and replacement, non-structural compliance and City maintenance activity costs.
- Attachment C - Catchbasin, manhole and outfall data collection forms used in the field study.

Additionally, we have included a CD containing the final *Stormwater Program Cost Summary* spreadsheet, the collected field data spreadsheet and field photos from the stormwater system inventory.

We look forward to discussing the results of this work with you and appreciate the opportunity to have supported your efforts to advance consideration for sustainable stormwater financing.

Sincerely,

WOODARD & CURRAN INC.

Barry Sheff P.E.
Senior Vice President

Zach Henderson
Project Scientist

222804.25
Attachments

cc: Ian Houseal
Kathi Earley
Doug Roncarati

DIMS Addendum 2011

Objectives

AMEC had four objectives within this limited scope of services:

- Advise Woodard & Curran (W&C) in execution of an infrastructure inventory;
- Update, as appropriate, program costs from the original DIMS study based on extrapolated findings from the infrastructure inventory;
- Re-examine and update, as appropriate, the program cost assumptions presented in the 2008 DIMS, including a validation of the larger estimated program costs; and
- Review the estimate of revenue potential based on more recent impervious area data.

Findings from these activities are to be contained in a brief addendum to the original Does it Make Sense? Study (DIMS) completed in November 2008.

AMEC provided advice on the execution of an infrastructure inventory, and upon receipt of the infrastructure inventory conducted by W&C, extrapolated the information to provide a meaningful estimate of long-term infrastructure remedial needs.

Inventory Extrapolation

The tabular data was combined with the City's GIS to examine the geographic distribution of structures. The GIS coverage was defined as the universe of data that would be considered. For example, the largest pipe exiting from a manhole was assumed to be the drain pipe and pipe system length calculated accordingly.

Data not in the GIS layer is unknown and was not considered. In addition, size information was available on 67.4 out of 139.8 miles of storm sewer pipe and 113.9 out of 136.6 miles of CSO pipe. Size and condition distributions were extrapolated to the rest of the system in the same proportions.

We evaluated the available data to determine if there was any significant correlation with specific variables:

- The field data could not be correlated to land use so as to develop a land use based extrapolation
- No condition information is available for combined sewer lines, storm sewer lines and only three outfalls were collected.
- There was a slight correlation with condition and percent impervious (>PI<condition)
- There was a slight correlation with condition and elevation (<elevation <condition)
- There was a slight correlation with condition and slope-break (condition worse just below steep to flat slope break)

None of these correlations could be extrapolated in a meaningful way.

Since these relationships were not strong enough to warrant geographic analysis, statistical distributions of the conditions of the structures that do have sufficient data were used to extrapolate costs across the populations of each type of infrastructure. This assumption needs to be ground-truthed with Portland staff.

Details of the inventory and its extrapolation and a spreadsheet have been provided to the City and will not be repeated here. The *Infrastructure Report* was delivered on Monday January 24, 2011 and the Stormwater Program Cost Summary spreadsheet, dated March 01, 2011, are attached.

Program Revenue and Cost Estimates

The primary focus of the inventory and analysis was to develop a better estimate for the "Remedial maintenance" line item within the DIMS cost of service spreadsheet. The 2008 DIMS line item contains a $900,000 item tied specifically to the Preble Street culvert. The idea was to develop a more accurate estimate tied to the needs of the system.

Revenue Capacity

Using currently available data AMEC performed an updated revenue capacity estimate. The data sets used in the update included: building footprints, satellite data converted to impervious features, parcel boundaries, land use data parcel attributes. We developed a median value estimate of an "Equivalent Residential Unit" (ERU) of 2,500 s.f. based on review of a sampling of residential properties. Using this and a blending of the data sets several estimates were made of the total revenue capacity in Portland. We assumed one ERU per residential property and a rounded value for the rest of the parcels. We performed this estimate on 20,501 parcels.

The process for developing the estimate and the descriptions for the data sources and the acronyms are as follows: AMEC received from the City a Parcels GIS polygon layer and a CAMA tax dataset, both of which are indexed on the parcel ID field called "Lead CBL." We also received a building footprint polygon layer from the City, and had previously received a satellite-derived impervious feature polygon layer from Woodard & Curran.

The impervious features were edited to combine the building footprints with the satellite-derived impervious features to create two alternative impervious polygon layers (to choose from), both of which are more accurate than either source taken alone. Ultimately the impervious features we used for the estimates were developed by "unioning" the building polygons with the satellite-derived polygons, then eliminating single pixel impervious polygons from the satellite-derived impervious features where these single pixels were not overlain by building polygons. Because the building polygons are more accurate than satellite-derived features, and because single pixel impervious areas are often false positives, this was viewed as the most accurate approach for the given budget and time constraint.

The GIS parcel polygons were intersected with this modified impervious area polygon layer to compute the impervious area for each parcel polygon citywide. Next, the computed impervious areas were tallied by unique "Lead CBL" parcel ID, by grouping the dataset on Lead CBL. This resulted in two types of Lead CBL: "real" parcels with a Lead CBL that matched a CAMA database record, and GIS polygons that appeared to not represent typical fee-simple owned land. For this second type of polygon, the tallies were carried forward but the decision was made not to include these in the revenue estimate because they would likely be unbillable in a utility. These polygons had Lead CBL ID's of Interstate, MDOT, Railroad, ROW, and Water. The "count" shown in the summary table for these is deceiving because the grouping process described above (to achieve unique Lead CBL ID's) results in the grouped count being 1 for these situations in most cases. For example, there are 69 polygons in the parcel layer that have "MDOT" as the Lead CBL ID, but since records were grouped by Lead CBL, the count is shown as 1.

For all resulting unique Lead CBL ID parcel polygons, the CAMA table was used to assess the field called “LCI”, which is an indicator of residential or non-residential land use. For parcels with an LCI of “R” and a measured impervious area (from the intersect) over 400 square feet, the parcel was assumed a flat-rate one ERU billable single family residential (SFR) parcel. Statistics were run on these 15,463 parcels to determine the median impervious area of these and it was approximately 2,500 square feet. This was then used as the ERU.

For parcels with less than 400 square feet of impervious area, we classified these as VACANT.

For parcels with an LCI that indicated non-residential use, we mapped these to be non-single family residential (NSFR) in the estimate. There are 2,995 of these parcels and for each, the number of ERUs was reported as the impervious area on the parcel divided by the ERU of 2,500 square feet.

In the estimate, decisions had to be made on whether to include certain types of properties in the revenue estimate. Table 1 shows the decisions that were made in the revenue estimate, and are discussed in the next paragraph. The anticipated annual revenue ($602,687) represents one dollar per month charge, for each of the roughly 50,300 ERU on the stormwater bill. For example, increasing from $1/ERU per month to $3.50 would generate about $2.1M on annual stormwater revenue. All fees for non-single family residential properties can be calculated by dividing the total impervious area of the parcel by 2,500 and rounding up to the next higher even ERU. A larger ERU size will reduce the annual revenue. For example an increase to 3,000 square feet will reduce the overall revenue an estimated 8.6%.

Note that Maine Turnpike, MDOT ROW properties, railroad tracks, street right-of-way and local streets, and waterbodies were not included in the estimate. However if the City chooses to include any of these entities, the increase in ERUs and annual revenue (12 times the ERU number) per monthly dollar charge can be calculated from the table. In summary, prior to any credits being applied or accounting for bad debt it is estimated that a one-dollar charge per ERU with the ERU being set at the median home amount of impervious area is estimated to generate $600,000 revenue annually.

Table 1. Revenue Estimate

TYPE	Count	ERUs	INCLUDE?	Parcel ID?
Airport	N/A	854	Y	N
Non-Single Family Residential	2995	33907	Y	Y
Single Family Residential	15463	15463	Y	Y
Parcels w/o Impervous Area	2035	0	Y	Y
	SUM	**50224**		
		$ 602,687		

Remedial Maintenance Cost Development

During the Stormwater System Inventory Task, five categories of infrastructure were included (stormwater manholes, stormwater pipes, catch basins, combined sewer pipes, and outfalls) and each was given an assigned remedial maintenance cost based on site specific dimensions and on one of three conditions observed in the field: fair, poor, very poor. These costs were extrapolated city-wide. Table 2 shows the raw data.

Table 2. Overall Results of Inventory Extrapolation

Condition	Stormwater Manholes	Stormwater Pipes	Catch Basins	Combined Sewer Pipes	Outfalls	TOTALS
Very Poor	$ 132,000	$ 1,196,000	$ 80,000	$ 1,203,000	$ 18,000	$ 2,629,000
Poor	$ 132,000	$ 11,956,000	$ 1,559,000	$ 12,033,000	$ 172,000	$ 25,852,000
Fair	$ 515,000	$ 27,505,000	$ 2,077,000	$ 28,479,000	$ 387,000	$ 58,963,000
TOTALS	$ 779,000	$ 40,657,000	$ 3,717,000	$ 41,714,000	$ 577,000	$ 87,444,000

From this table it can be seen that the maximum backlog for all conditions and for all kinds of infrastructure is estimated to be $87.4M dollars (including combined sewer pipe system). This total may be beyond the City's financial capability with respect to a tax-based or user-fee based funding mechanism. For example, if the user fee were set at $5.00 per ERU per month, it would take almost 30 years for the current backlog to be removed.

However, choices must be made as to which conditions warrant city action, and what categories would be funded by a stormwater user fee. Several combinations of decision would change the total. For example:

- Excluding all infrastructures in "fair" condition would eliminate almost $59M dollars bringing the total to $28.5M (Poor and Very Poor infrastructure).
- Excluding the Combined Sewer Pipes expenses with the reasoning that they are wastewater expenses would bring the total to $45.7M.
- Excluding both fair condition and Combined Sewer Pipes expenses will bring the total to $15.2M.

A subsequent recommendation was made that that all combined sewer pipes remedial repair be eliminated from consideration at this time, and that costs for stormwater pipes be adjusted downward by 25% as a conservative accounting for uncertainties regarding actual pipe condition. This adjustment factor could be reconsidered during stormwater utility feasibility analysis if additional televising data is made available by the City or through additional data collection acquired through the feasibility study. Table 3 reflects these recommendations.

Table 3. Modified Overall Results of Inventory Extrapolation

Condition	Stormwater Manholes	Stormwater Pipes	Catch Basins	Combined Sewer Pipes	Outfalls	TOTALS
Very Poor	$ 132,000	$ 897,000	$ 80,000	$ -	$ 18,000	$ 1,127,000
Poor	$ 132,000	$ 8,967,000	$ 1,559,000	$ -	$ 172,000	$ 10,830,000
Fair	$ 515,000	$ 20,629,000	$ 2,077,000	$ -	$ 387,000	$ 23,608,000
TOTALS	$ 779,000	$ 30,493,000	$ 3,717,000	$ -	$ 577,000	$ 35,565,000

Program Cost Development

W&C and Portland staff have evaluated original DIMS program costs and supplemented the worksheet with updated cost estimates for various stormwater program needs. The program cost updates have been based on requirements under the City's Municipal Separate Storm Sewer System (MS4) permit and recent restoration recommendations in the impaired Capisic Brook watershed. These updated costs have been integrated into the overall program cost of service. Changes to the cost of service estimate (COS) made by W&C and Portland staff is reflected in this report. There will be a need to refine estimated stormwater program costs during future stormwater utility feasibility analysis.

Based on these estimates the total stormwater program cost is estimated at $1.78M annually. These costs include General Routine Maintenance (street sweeping and catchbasin cleaning), Regulatory Compliance & Enforcement, Engineering and Planning, Technical Support, Public Education, and Miscellaneous Administration.

Summary of Costs and Rates

Referring to Table 2 and the *Program Cost* worksheet in the *Stormwater Program Cost Summary* spreadsheet, the total program cost then includes both an annual stormwater program cost of $1.78M plus a remedial maintenance cost. Based on Table 3 the existing remedial maintenance backlog that will be addressed by the user fee is $35.56M. This backlog will be addressed over a period of years.

During that time others specific parts of the system or structures will deteriorate and will need to be added to the backlog. A reasonable assumption is that the backlog might grow at about 2% per year. Taking this into account Table 4 provides annual remedial maintenance costs to work off the current and incremental backlog within the planning horizon.

For example, if a 20 year planning horizon is chosen the annual remedial maintenance cost is estimated to be $2.1M.

The right hand column is the estimated monthly fee per ERU for that combination of basic stormwater program plus annual remedial maintenance cost from the second column.

Table 4. Annual Remedial Maintenance Costs and Total Fee

Planning Horizon (years)	Projected Annual Cost ($$)	Monthly Total User Fee Per ERU ($$)
10	$ 3,882,000	$ 9.39
20	$ 2,132,000	$ 6.49
30	$ 1,557,000	$ 5.54
40	$ 1,275,000	$ 5.07

In closing this addendum to the DIMS study, several things should be pointed out. First of all, it should be noted that the updated cost items outside the inventory extrapolation were not the product of a rigorous analysis of the implications either of future compliance requirements or of a comprehensive discussion of which costs should be recognized as “stormwater” costs and which properly reside in other budgetary areas. The decision was made to make a preliminary best estimate of changes from the original DIMS analysis and reserve a more detailed analysis for a future time should the decision be made to move forward with additional feasibility analysis and decision making.

Secondly, the decision of which inventory-based remedial maintenance costs to include in stormwater was made independent of a more comprehensive look at the allocation of infrastructure costs generally and levels of service offered by the City. The inventory extrapolation results are the best data available, but are admittedly estimates. When more experience is gained in remedial maintenance of the system and a broader inventory is completed these numbers can be tightened. However, a wider staff group should review decisions and their implications.

Lastly, the monthly rates per ERU reflected in Table 4 may or may not be above a perceived willingness to pay for stormwater management in the City. Stormwater must, even as a separate user fee, compete with other demands. Such balancing of priorities should be made by a larger and more widely constituted group.

It is clear that hard decisions must be made on the establishment of priorities for stormwater expenditure, an acceptable level of user fee, and other decisions about the rate basis, credits, etc. We recommend that these decisions be made during a feasibility study wherein a larger stakeholder group systematically moves through a decision process culminating in answers in these key areas.

ATTACHMENT A: INFRASTRUCTURE REPORT

Portland Stormwater Infrastructure Analysis

Quick Summary

AMEC was tasked with estimating remedial costs for stormwater infrastructure in Portland focusing on catch basins, manholes, outfalls and sewer lines. AMEC was provided:

GIS data layers from the City of Portland GIS;

Tabular information regarding field sampling of condition data for 193 catch basins (191 referenced in the GIS), 79 manholes and 3 outfalls (2 in the GIS);
Unit cost data for structure rehabilitation or replacement was provided based on specific infrastructure types, depth or size, and physical condition.

The objective was to take this data and attempt to extrapolate it to city-wide costs for system rehabilitation.

Extrapolation

The tabular data was combined with the GIS to examine the geographic distribution of structures. The GIS coverage was defined as the universe of data that would be considered. For example, the largest pipe exiting from a manhole was assumed to be the drain pipe and pipe system length calculated accordingly.

Data not in the GIS layer is unknown and was not considered. In addition, size information was available on 67.4 out of 139.8 miles of storm sewer pipe and 113.9 out of 136.6 miles of CSO pipe. Size and condition distributions were extrapolated to the rest of the system in the same proportions.

We evaluated the available data to determine if there was any significant correlation with specific variables:

- The field data could not be correlated to land use so as to develop a land use based extrapolation
- No condition information is available combined sewer lines, storm sewer lines and only three outfalls were collected.
- There was a slight correlation with condition and percent impervious (>PI<condition)
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- There was a slight correlation with condition and slope-break (condition worse just below steep to flat slope break)

None of these correlations could be extrapolated in a meaningful way.

Since these relationships were not strong enough to warrant geographic analysis, statistical distributions of the conditions of the structures that do have sufficient data were used to extrapolate costs across the populations of each type of infrastructure. This assumption needs to be ground-truthed with Portland staff.

Worksheet Description

Note the annotations within the spreadsheet as to assumptions or ancillary information.

Samples

- Green Shaded – field inventory information
- Unshaded – GIS database interpretation

GIS Populations

The overall populations are given for each type of infrastructure examined.

- For catch basins, the number was taken from the count in the Portland GIS layer "sde_PORTGIS_CatchBasin."
- The manhole count was taken from "sde_PORTGIS_ManholeD," and
- outfalls from "sde_PORTGIS_DischargePointD."
- Sewer line quantities were determined in length of pipe (given in feet) in the layers "sde_PORTGIS_StormMain" and "sde_PORTGIS_SewerMain."

These population numbers were used for extrapolation in the third worksheet, "Extrapolations," and if changed, all extrapolated numbers should change as well.

Extrapolations

Worksheet contains attributes that can be used to derive more specific distribution data on what structures need to be repaired or replaced: depth, size, material, condition (as appropriate). These attributes were only present for a subset of the total population, for example only 58 manholes had depth information out of the population of 1846. Exit pipe diameters in all cases were derived using GIS analysis to find the largest diameter pipe touching each structure. Outfalls had too few structures sample to create a condition distribution and no condition information was part of the sampling protocol for pipes. This would require camera equipment not part of the original scope of services.

Where condition data did not exist, AMEC worked under the assumption that the distributions from other structures could be averaged to estimate condition. As the condition distributions were similar for catch basins and manholes, this assumption may be safely applied to outfalls.

The assumption was also applied to sewer lines though this may be a weaker assumption. If the distributions are updated in the "Extrapolations" worksheet then the pricing information will update accordingly. Therefore a CSO and Storm Sewer pipe adjustment factor was supplied as shown on the right of the spreadsheet. These factors are NOT changed on this sheet but on the Cost Summary sheet at the end of the workbook. Only the values are shown here. Changing these values will reapportion the condition information applying only that fraction of the factor to the three conditions: "Very Poor", "Poor" and "Fair". For example using a 0.75 factor reduces each of these three conditions by 25% of their original value and reapportions that number of structures and percentage to the "Good" and "Very Good" categories where no cost is attributed.

Pricing

The distribution information is applied equally among each set of attributes to further partition structure information. For example, 554 of the 1846 manholes had a depth of 0-6 feet. Of those 1846, 1216 manholes had an exit pipe (i.e. largest pipe touching) diameter greater than 8 inches and less than or equal to 18 inches. Of those 1846 manholes, 23 should be considered in poor condition. Conditions of Good and Very Good were not included as AMEC assumed that no repair or replacement would need to occur for those conditions.

Cost information was developed by Woodard & Curran and entered in the red boxes associated with that type of structure. For example, the replacement cost of $4,000 for a manhole 0-6 feet deep with an exit pipe diameter of less than or equal to 8 inches with a condition of "Poor" was entered into cell 'F7.' Once unit costs were entered, total costs were calculated for each structure type in the distribution.

Cost Summary

These totals were summed on the final worksheet, “Cost Summary.”

Program Costs

This is the program cost spreadsheet from the DIMS study. It has been modified to reflect several major changes based on Woodard & Curran input. The changes are highlighted in yellow and include: street sweeping, catch basin cleaning, and public involvement and education.

ATTACHMENT B: COST ESTIMATE WORKSHEETS

COMMITMENT & INTEGRITY
DRIVE RESULTS

41 Hutchins Drive
Portland, Maine 04102
Tel. 207-774-2112

CLIENT	City of Portland		
PROJECT	Stormwater Assets Inventory		
DESIGNED BY	ZH	DATE	1/21/2011
COST BY	MRD	DATE	1/21/2011
CHECKED BY	ZH and DS	DATE	
PROJECT NO.	222804.25		

Stormwater Infrastructure Maintenance - Opinion of Probable Cost

	Unit	Unit Cost	Notes
Pipe Replacement			
Pipe Diamenter <8-in	LF	$ 130.00	*For each pipe size range, the upper end of the size range is used for cost determination. Exception for pipe sizes greater than 18", where 36" diameter is used.*
Pipe Diamenter 8-in to 18-in	LF	$ 150.00	*8" to 18" diameter pipe assumed to be PVC. RCP is assumed material for pipe diameters greater than 18".*
Pipe Diamenter >18-in	LF	$ 240.00	*If location of old pipe is within 4' horizontal of excavation of new pipe, cost of demolition of old pipe is considered incidental to the cost of new pipe.*
			No structural rock removal is anticipated.

	Unit	Unit Cost	Notes
Structure Replacement			*Structure Replacement cost includes all appurtenances (barrel section, cone section, brick riser, frame and grate or cover).*
Catch Basin, 48-in Diameter			*If the center of the old manhole is within 8' horizontal of the center of the new manhole, cost of demolition of old manhole is considered incidental to the cost of new manhole.*
Depth to invert <=6ft	EA	$ 3,700.00	*Catch Basin replacement assumes re-use of existing granite curb sections.*
Depth to invert >6ft	EA	$ 6,000.00	*Replacement of brick riser only assumes re-use of existing frame/cover.*
Manhole, 48-in Diameter			*Replacement of brick riser only assumes 3-layers of brick.*
Depth to invert <=6ft	EA	$ 4,000.00	
Depth to invert >6ft	EA	$ 6,500.00	*No structural rock removal is anticipated.*
Brick Riser Replacement	EA	$ 1,000.00	

	Unit	Unit Cost	Notes
Pipe Maintenance			
Cured in place pipe (CIPP), <8-in	LF	$ 70.00	*CIPP cost estimate on City of Portland information.*
Cured in place pipe (CIPP), 8-in to 18-in	LF	$ 110.00	*CIPP cost includes flaggers and traffic control*
Cured in place pipe (CIPP), >18-in	LF	$ 370.00	
Jetting	LF	$ 0.50	*Jetting cost provided by City of Portland*

Additional Assumptions:

Unit costs provided for this estimate are installed costs based on those presented for projects recently completed in Portland, Maine.
Maintenance costs are not included at this time
All structure and pipe installation, invert fabrication, and materials are in accordance with City of Portland Design Standards

For Pipe Replacement, the following are included in the linear foot cost:

- Pavement Demolition
- Pipe bedding
- Granualar Borrow
- Test Pit Excavation
- Crushed Stone (Overdepth)
- Earth Excavation (Overdepth)
- Trench paving
- Altering Existing Catch Basin or Manhole
- Reset Type 1 Curb
- Insert-A-Tee Pipe
- White or Yellow Paint Pavement Marking Line
- Dust Control
- Density Test
- Flaggers
- Traffic
- Erosion Control

COMMITMENT & INTEGRITY
DRIVE RESULTS

41 Hutchins Drive
Portland, Maine 04102
Tel. 207-774-2112

CLIENT	Portland, ME
PROJECT	Portland Stormwater
DESIGNED BY	ZLH
COST BY	AJM
CHECKED BY	ZLH
PROJECT NO.	222804.25

DATE	1/21/2011
DATE	1/21/2011
DATE	1/21/2011
SHEET NO.	1 of 1

Compliance Street Sweeping Cost Estimates

STREET SWEEPING ASSUMPTIONS	
13 Lane-miles per day	290 CY disposed annually
2 No. of operators	12 CY disposed per trip
$23.99 Hourly Labor Rate	$149 per CY disposed

CAPITAL OPERATIONS AND MAINTENANCE

Equipment & Maintenance	Unit Cost per Hour	Hours per Event	O&M Cost per Event	Annual O&M Costs
Tymco 500x Street Sweeper	$ 85.00	95	$ 8,107.69	$ 32,430.77
Disposal		6	$ 10,911.19	$ 43,644.76
		Annual Capital Replacement and Maintenance		*$ 76,075.53*

SWEEPING LABOR

	Lane-Miles	Labor Cost per Event	Annual Sweeping Labor Costs
Town & State Roadways under responsibility of City	124.0	$ 4,576.55	$ 18,306.22
		Annual Street Sweeping Labor	*$ 18,400.00*
		TOTAL ANNUAL STREET SWEEPING COSTS	*$ 94,475.53*

Cost Analysis Assumptions:

1. Annual Street Sweeping Costs assume quarterly sweeping of all town- and state-owned roadways within impaired watersheds.
2. Capital Operations and Maintenance Costs have been normalized by the City of Portland and incorporated into an hourly rate of use.
3. Costs apply to sweeping of Town- and State-owned roads only.
4. Town and State roadway miles per GIS analysis. Two (2) lane-miles assumed per mile of roadway.
5. Ten (10) -hour work days.

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CLIENT	Portland, ME	DATE	1/21/2011
PROJECT	Portland Stormwater	DATE	1/21/2011
DESIGNED BY	ZLH	DATE	1/21/2011
COST BY	AJM	SHEET NO.	1 of 1
CHECKED BY	ZLH		
PROJECT NO.	222804.25		

Catch Basin Cleaning Cost Estimates

	No. Catch Basins	*Cost per Catch Basin*	*Cost per Event*	*Annual CB Cleaning Costs*
Catch Basin Cleaning	3111	$ 83.96	$ 261,199.56	$ 261,199.56
		TOTAL ANNUAL CATCH BASIN CLEANING COSTS		*$ 261,199.56*

Cost Analysis Assumptions:

1. Assumes 1/2 catch basins are cleaned annually.
2. Catch basin cleaning unit cost includes labor, equipment and disposal costs - as provided by City of Portland.
3. Number of catch basins were determined using GIS database.
4. Costs apply to catch basins located within the City of Portland or State roadway ROW only.

City of Portland Public Services
Stormwater Maintenance Cost Estimates
January 2011

Task	Man Hours	Labor Cost	Equipment Cost	Materials Cost	Cost Per Linear Foot (Estimated)	Total Repair Cost	Assumptions
Parging Brick / Manhole Riser	16	$381.44	$276	$150		$807.44	
Replace Cover	4	$95.36	$50	$130		$275.36	
Replace Headstone	40	$953.60	$680	$500		$2,133.60	
Install Casco Trap	8	$190.72	$100	$300		$590.72	
Parging Barrel / Shelf (Cracks / Loose Brick)	24	$572.16	$400	$200		$1,172.16	
Televise (Daily Rate)	20	$580.80	$248		$0.75	$828.80	Daily rate and cost per linear foot.
Jetting					$0.50		City jet vactor cost.
Outfall Maintenance (plunge pool touch up and erosion control)						$1,500	City estimate for repair does not include permitting.
Outfall Replacement (plunge pool rebuild and erosion control)						$2,000	City estimate for replace does not include permitting.

Note: Cost estimates provided by City of Portland Public Services Staff.
Labor Assumptions: Assumes based labor rate and fringe benefits.
Equipment Costs: Based on 2010 FEMA schedule.
Materials Costs: Supplier costs for materials.

ATTACHMENT C: FIELD DATA COLLECTION FORMS

(ADAPTED FROM CITY OF PORTLAND)

Asset Attribution Inspection

(W&C Modified 11-18-2010)

Date & Time: MM/DD/YYYY	Work Order #: [WorkOrderID] N/A
Inspector: W&C City of Portland	Asset ID: [EntityUIDs City Unique Identifier
Vehicle: N/A	Location: [EntLocation] Street Name
Catchment: N/A	Grate Type (Circle One): Cast Iron, Cascade, Beehive, Other
Grade: Above At Below	Ring Material: Barrel Block, Brick, Precast, Other Basin Material: Stone, Brick, Concrete, Other
Headstone (Circle One): 4 Foot 6 Foot	Trap/Hydrobrake: Yes or No
Rim to Invert: Inches	Pet Waste (Amount): Number of Bags
Needles (Number): Number of Needles	Photo ID: We have taken one photo of Asset ID number externally Then one internally

Asset Attribution Inspection

(W&C Modified 11-18-2010)

Feature	Condition
Cover/Grate	0-5 Rationale: 4 or 5 used to indicate if a replacement cover is necessary due to incorrect cover type as well as condition of cover.
Frame Type: Cast Iron or Other	0-5
Ring Type: Barrel Block, Brick, Precast, Other	0-5 Rationale: 3 indicate parging or other simple maintenance, 4 or 5 indicates saw cut, removal and replacement of entire riser structure.
Rungs Type: Cast Iron, Steel, Plastic, Aluminum, Brick	0-5
Basin Type: Stone, Brick, Concrete, Other	0-5
Trap: Yes or No	0 (Abandoned/NA), 1 (Good), 3 (Replace), 5 (Install) Rationale: If no trap then install.
Hydrobrake	0-5
Invert Out Type: Brick, Asbestos Concrete Pipe, Cast Iron Pipe, Corrugated Metal Pipe, Ductile Iron Pipe, High Density Polyethylene Pipe, Polyvinyl Chloride, Reinforced Concrete Pipe, Vitrified Clay Pipe, Wood	0 (Abandoned/NA) 1 - Good 3 - TV or inspect 5 - Replace Rationale: If any indication of issue then 3 even in underdrain or pipe connections.
Invert Depth: Inches	N/A
Headstone Type: 4 foot or 6 foot	0-5
Overall Structure Condition: Rationale: 4 or 5 indicate replace entire structure, 3 indicate that some level of service is needed, 1-2 means okay. If any of the individual structural condition assessment was a 3, 4 or 5 then this should be at least a 3.	0-5
IDDE	Yes or No Rationale: Indicates if IDDE inspection is required at this location

Asset Attribution Inspection

(W&C Modified 11-18-2010)

Comments:

Number of buckets removed: N/A

Grade	Condition	Description
0	Abandoned	No longer in service
1	Very Good	Operable and well-maintained
2	Good	Superficial wear and tear
3	Fair	Significant wear and tear; minor deficiencies
4	Poor	Major deficiencies
5	Very Poor	Obsolete

Manhole Asset Attribution Inspection

(W&C Modified 11-18-2010)

Date: **MM/DD/YYYY**	**Inspector & Vehicle:** **W&C** **City of Portland**	**Asset ID:** **City Unique Identifier**
Location: **Street Name**	**Work Order #:** N/A	

Feature	Attribute	Condition Rating
Cover Size:	(inches)	N/A
Cover Type:	No Hole, 1 Hole, Locking, Perforated	0-5 Rationale: 4 or 5 used to indicate if a replacement cover is necessary due to incorrect cover type as well as condition of cover.
Frame Size:	(inches)	N/A
Frame Type:	Cast Iron, Other	0-5
Riser Material:	Barrel Block, Brick, Precast, Other	0-5 Rationale: 3 indicate parging or other simple maintenance, 4 or 5 indicates saw cut, removal and replacement of entire riser structure.
Barrel Material:	Stone, Brick, Concrete, Other	0-5
Barrel Size:	(inches)	N/A
Rung Material:	Cast Iron, Steel, Plastic, Aluminum, Brick	0-5
Shelf Material:	Brick, Cast in Place Concrete, Fiberglass, Other	0-5
Invert Material: **This is the condition of the pipe out of the manhole visible from the structure**	Brick, Asbestos Concrete Pipe, Cast Iron Pipe, Corrugated Metal Pipe, Ductile Iron Pipe, High Density Polyethylene Pipe, Polyvinyl Chloride, Reinforced Concrete Pipe, Vitrified Clay Pipe, Wood	0-5
Depth From Rim To Invert:	(inches)	N/A
Surcharge:	Yes or No	N/A
Rim To Surcharge:	(inches if applicable)	N/A

Manhole Asset Attribution Inspection

(W&C Modified 11-18-2010)

Exterior Photo ID:	We have taken one photo of Asset ID number externally	N/A
Interior Photo ID:	Then one internally	N/A
Overall Structural Condition	Rationale: 4 or 5 indicate replace entire structure, 3 indicate that some level of service is needed, 1-2 means okay. If any of the individual structural condition assessment was a 3, 4 or 5 then this should be at least a 3.	0-5
IDDE	Yes or No Rationale: Indicates if IDDE inspection is required at this location	N/A
Notes		

Outfall Attribution Inspection

(W&C Created 11-18-2010)

Date: **MM/DD/YYYY**	**Inspector & Vehicle:** **W&C** **City of Portland**	**Asset ID:** **City Unique Identifier**
Location: **Street Name**	**Work Order #:** N/A	

Feature	Attribute	Condition Rating
Fortification	None, Loose Stone, Rip Rap, Stone Headwall, Concrete Headwall	0-5 Rationale: 3 is maintenance, 4 or 5 is rebuild/replace
Outfall Material Type:	Brick, Asbestos Concrete Pipe, Cast Iron Pipe, Corrugated Metal Pipe, Ductile Iron Pipe, High Density Polyethylene Pipe, Polyvinyl Chloride, Reinforced Concrete Pipe, Vitrified Clay Pipe, Wood	0-5 Rationale: 3 if minor maintenance needed, 4 or 5 used to indicate if a replacement is necessary.
Discharge Environment:	Plunge Pool, Rip Rap Swale, Rip Rap Apron, Rip Rap with Check Dam, Open Ditch, Stream	N/A
Submerged Outfall:	Yes or No	N/A
Screen Present:	Yes or No	N/A
Notes:		N/A
Photo ID:	One photo taken of outfall with ID	N/A