

LAKE ATTITASH STORMWATER TREATMENT PROGRAM

PROJECT NUMBER: 01-20/319

PREPARED BY:

TOWN OF AMESBURY, MASSACHUSETTS

PREPARED FOR:

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF RESOURCE PROTECTION

AND

US ENVIRONMENTAL PROTECTION AGENCY
REGION 1

MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
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BUREAU OF RESOURCE PROTECTION
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DIVISION OF MUNICIPAL SERVICES
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Glenn Haas, Director

LAKE ATTITASH STORMWATER TREATMENT PROGRAM

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2001-2006

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Electronic copies of the NOI/OOC and QAPP is included on CD with this report.

Executive Summary

Lake Attitash is a 360 acre natural lake located within the Towns of Amesbury and Merrimac, Massachusetts (See attached site locus). Lake Attitash provides Amesbury and Merrimac with a portion of their water supply and is classified as a Class A Outstanding Resource Water (ORW). Although Lake Attitash serves as a popular recreational resource, it currently does not meet the Class A ORW water quality standards. Lake Attitash historically has experienced excessive nutrients in the form of phosphorus, resulting in algae blooms and excessive weed growth. It is currently listed on the state's 303(d) list of impaired waterbodies for metals.

In 1998, a DEM Lake and Ponds Grant was received by the Town to complete the *Lake Attitash Watershed Management Plan*. The resulting plan recommended the implementation of stormwater treatment devices to provide treatment of flows to reduce phosphorus loading to the lake. Based on this recommendation and previous data, the Town of Amesbury, with support letters from the Lake Attitash Association and the Amesbury Lakes and Waterways Committee, applied for and received an s.319 Nonpoint Source Pollution Grant to implement the design and installation of multiple stormwater BMPs to help improve the water quality of Lake Attitash.

In order to correct the continuing sedimentation problems, the 319 project included installation of BMPs in the Lake Shore Drive area. The BMPs consisted of two narrow baffled septic tanks and ten deep sump catch basins designed to moderate flows and drop out sediment to achieve higher removal rates and for subsequent collection. The ten deep sump catch basins with hooded outlets and a water treatment swale/ditch replaced three baffle tank BMPs that were originally proposed but could not be constructed because of unforeseen and unmarked utilities present at the proposed BMP locations as well as high bid costs for the tanks. In order to achieve the same removal rates as the baffle tanks, several additional deep sump basins were installed. By developing a simpler and more cost-effective water quality BMP, Amesbury will establish a "template" that can be used elsewhere with design modifications for specific sites.

Several of the other tasks in the project included preparation of a sampling QA/QC document known as the Quality Assurance Project Plan (QAPP), sampling and monitoring to assess the effectiveness of the proposed BMPs, permitting, a public outreach and education component to help raise awareness and quarterly and final reporting for the grant. This report will provide more in-depth information and provide some feedback about the general success of the project.

Project Summary

This project is a lake improvement project funded through the Massachusetts Department of Environmental Protection (MA DEP) 319 Nonpoint Source Pollution Grant Program. The goal of this project is to install BMPs to help remove pollutants currently entering Lake Attitash, resulting in an improvement in lake water quality. The treatment of these discharges will enhance the removal of pollutants such as suspended solids, metals and excessive nutrients associated with urban stormwater. Additionally, the related drainage improvements

are expected to slow flow velocity and reduce erosion and scouring difficulties in several areas.

The project involved installing BMPs along Lake Shore Drive (deep sump catch basins and baffle tanks) that are designed to remove sediment and other pollutants associated with urban stormwater flowing through several direct discharges to Lake Attitash. The deep sump catch basins and baffle tanks are expected to provide additional detention time for stormwater flow, allowing sediment and associated pollutants to settle out of the water column prior to entering the lake and have hooded outlets to prevent the transport of floatable pollutants. The scope for the Lake Attitash Stormwater Treatment Program project included:

Task 1. Quality Assurance Project Plan (QAPP)

Completing QAPP in tandem with the DCR grant *Lake Attitash Watershed Integrated Watershed Management* Plan for sampling water quality to assess the success and long-term viability of the BMPs. The sampling quality objective of the QAPP is to analyze the quality of water in Lake Attitash to provide a baseline that will be used to identify and assess future changes in water quality and to analyze stormwater entering and exiting representative BMPs through wet weather sampling.

Dry Weather Monitoring

In-lake sampling was performed on a monthly basis between in 2004 and 2005 during the warmer months. The in-lake water quality data is included in electronic format on CD with this report.

Wet Weather Monitoring

Post-construction monitoring of project to document BMP effectiveness. **Since construction and installation of the BMPs (Task 3) was not finished until May 2006, this task has not yet been completed as of the writing of this report.** The monitoring program will include, inflow-outflow stormwater sampling during four representative storm events. Sample analysis will include Total Suspended Solids (TSS) and Total Phosphorus (TP). Some sample locations have been adjusted because of the changes in BMP type and locations. An updated figure and table from the QAPP of the sampling points is included in **Appendix A**. Sample analysis originally included *E.coli*, however due to the holding time constraints this water quality parameter was removed as indicated in the QAPP plan.

Task 2. Design, Permitting and Construction

Design

Surveying and designing BMPs to treat three direct stormwater discharges into Lake Attitash. One discharge is located between First and Second Streets along Lake Shore Drive, one at the intersection of Lake Shore Drive and Fourth Street and one off Fifth Street in Amesbury, MA. Design plans, certification letters, bid documents and photos are included in **Appendix B, C, and D**.

Permitting

Preparing and submitting a Notice of Intent (NOI) to the Amesbury Conservation Commission and the Department of Environmental Protection (DEP) for review and approval. Sites selected for the storm water BMPs were located within wetland resource areas as defined by the Massachusetts Wetlands Protection Act (310 CMR 10.00). Resource areas and

associated buffer zones affected by temporary construction impacts are inland banks. The NOI was prepared and submitted to the Amesbury Conservation Commission for review and approval. Following a public hearing to review the improvement project, the NOI was approved. An Order of Conditions (OOC) was executed and followed during all stages of construction. The NOI and OOC are included in electronic format on CD with this report.

Construction

Installing two baffle tanks, ten deep sump catch basins with hooded outlets and reconstructing/stabilizing a drainage swale at the Fourth Street location to reduce velocity and retain accumulated sediments. This task included bid and construction services including the review of contractor's submittals and plans, payment estimate review, and periodic site visits.

The original proposed task included a series of five baffle tanks but due to higher than expected cost increases for the baffle tank structures and constraints from underground utility lines not previously identified by the utility owners, ten deep sump catch basins with hooded outlets were installed in lieu of three of the units. The ten deep sump catch basins are expected to provide the same amount of treatment and detention time for stormwater flow as the originally proposed baffle tanks.

Restoration of the upstream drainage swale at Fourth Street included reshaping the swale side slopes, installing two gabion check dams to help slow and evenly distribute stormwater flows and to remove sediment, lining the swale with an erosion control fabric, and applying an appropriate erosion control vegetative mix.

In addition, the existing 12" outfall pipes at the 1st and 4th Street locations were resized to 24" pipe discharges, which are more appropriate for the volume of water exiting the drainage systems. These resized outlets discharge to new 5' x 5' riprap pads to help further slow flow and alleviate current shoreline erosion due to the previously undersized discharge pipes.

Task 3. Reconstruction/Stabilization of Drainage Ditch

Reconstructing/stabilizing the drainage outlet ditch at the Fourth Street location to reduce velocity and retain accumulated sediments. Restoration of the outlet ditch at Fourth Street included removing the existing paved surface, reshaping and lining the swale with an erosion control fabric, and applying an appropriate erosion control vegetative mix. This previously paved ditch created fast flows and caused severe slope erosion due to frequent overtopping resulting in a safety hazard to abutting properties.

Task 4. O&M Plan

Development of an operation and maintenance (O&M) plan for the BMPs installed in Tasks 2 to document effectiveness. Amesbury is planning to clean out the deep sump catch basins twice a year or more if warranted by sediment conditions. Baffle tanks are not expected to need cleaning more than on an annual basis by the Town. Sediment quantities removed by the BMP structures will be recorded and used for support of other potential future BMP projects in Amesbury. A copy of the O&M plan is included in **Appendix E**

Task 5. Prioritization of Discharges

Task 5 requires the prioritization of additional storm drain discharges for treatment, however at this time all of the stormwater discharges to Lake Attitash are being addressed.

Concurrently with the 2001 s.319 grant award, the Town was also awarded a MA Department of Environmental Management (now Department of Conservation and Recreation) Lake and Pond Demonstration Grant to develop Best Management Practices (BMPs) for the remaining Lake Attitash outfalls. Therefore there are no additional outfalls to prioritize. Funding budgeted for this task was used in the construction phase as discussed in Task 2.

Task 6. Outreach and Technology Transfer

Public outreach and Technology Transfer of project information. This task originally included the development of a half-day seminar for Town residents and stakeholders to present an overview of the project. In lieu of this task, the Town has developed a brochure specifically on this grant project and is available at the Town Hall and Town Library, for use by the Lake Attitash Association and for website publishing in the spring/summer 2006 (refer to **Appendix C** for brochure). In addition, existing stormwater brochures available from DEP and EPA will be utilized for resident public education.

Task 7. Reporting

Quarterly reporting and preparation of a draft and final report.

Project Budget

Grant funds in the amount of \$98,205 were awarded and a Notice to Proceed from DEP was granted. The Town was responsible for a non-federal match in the amount of \$65,470, for a total project cost of \$163,675. The Town contracted with Comprehensive Environmental Inc. (CEI) to complete the engineering work. **Table 1.** summarizes the project costs, match sources and costs associated with specific tasks.

Table 1. Project Cost Breakdown			
Task Description	Town Match	Federal Match	Total Funds
1. QAPP			
QAPP	\$0	\$2,240	\$2,240
Monitoring	\$0	\$6,780	\$6,780
2. Design, Permitting and Construction			
Design	\$2,754	\$16,265	\$19,019
Permitting	\$498	\$7,550	\$8,048
Construction	\$59,718	\$52,900	\$112,618
3. Reconstruction/ stabilization of Drainage Ditch			
	\$0	\$2,750	\$2,750
4. O&M Plan			
	\$0	\$1,200	\$1,200
5. Prioritization of Discharges			
	\$0	\$0	\$0
6. Outreach and Technology Transfer			
	\$2,500	\$3,200	\$5,700
7. Quarterly Reporting			
	\$0	\$5,320	\$5,320
Totals	\$65,470	\$98,205	\$163,675

Following design, permitting and preparation of bid documents, the project went to public bid for construction (See **Appendix C**). Only one bidder, Dow Company (DOW), submitted a proposal, which was over the intended budget. Since Amcsbury has been satisfied with past work completed by the contractor, they decided to make some changes to the proposed project and complete some of the construction work themselves to keep within the original budgeted amount as discussed in Task 3 of the Project Summary section in this report.

As is expected with designs based on a conceptual level, some of the actual construction costs increased. In this case, the baffle tank structures sharply rose in cost since first submitting the grant application. In addition to incremental annual increases in construction costs, the past few years have seen sharp increases in construction materials and services throughout the industry due to increased fuel costs and demand from natural disasters. Engineering and other non-construction related project estimates were accurate.

Environmental Outcomes

The goal of the monitoring program is to evaluate the quality of water entering and exiting the BMPs through laboratory analysis of TSS and TP. This will help in determining water quality improvements made by the BMPs and their pollutant removal efficiency. Data will be used to assess the effectiveness of the installed BMPs in terms of the beneficial impact on surface water quality.

At the time of the writing of this report, only one wet weather monitoring round has been completed due to construction delays and abnormally wet weather this spring/summer season. This report will be amended with monitoring results once sampling is complete.

The Quality Assurance Project Plan (QAPP) calls for post-construction wet weather monitoring collected during four storm events as summarized in **Table 2**. See Appendix B for a figure of sampling locations and more details on types and numbers of samples required. Samples will be collected with appropriate containers, labeled according to the QAPP and immediately placed in a cooler. Upon selection of samples, the Chain of Custody records will be completed and signed by CBI and laboratory staff when relinquished to the appropriate laboratory. Samples will be analyzed for TSS and TP. Lab analysis for the first sampling round is provided in **Attachment F (The remaining three sampling rounds will be provided when completed)**.

Table 2. Surface Water Field Sample Summary

Analyte	No. of sampling locations	No. of samples per rain event per location	Number of rain events sampled	Number of field duplicates	Total number of samples to lab (includes 1 duplicate)
Total phosphorus	6	1	4 after BMP installation	1/rain event – 4	7 per rain event 28 total
Total Suspended Solids	6	1	4 after BMP installation	1/rain event – 4	7 per rain event 28 total

Based on EPA-NR Worksheet #9c.

QAPP

A QAPP was prepared in September 2004 for the sampling portion of the project in accordance to the *EPA Guidance For Quality Assurance Project Plans QA/G-5* (1998). The sampling quality objective of this QAPP is to analyze the quality of water entering and exiting the BMPs through wet weather stormwater sampling. It will also help to determine overall water quality improvements to Lake Attitash through dry weather in-lake sampling and monitoring while providing a baseline to identify and assess future changes in water quality.

Four rounds of wet weather stormwater samples were planned with numerous samples collected at each location. A protocol was developed to select specific samples at each location to be sent to the laboratory for analyzing. It was crucial that this was documented clearly and concisely for data integrity and since sampling would not take place immediately but at a later date. Data quality objectives will include precision, accuracy/bias, representativeness, comparability, and completeness. A copy of the QAPP can be found at the Division of Watershed Management, Department of Environmental Protection, 627 Main Street, Worcester MA, 01608.

EPA requires the development, review and approval of QAPPs for all environmental data operations performed by or on behalf of EPA. The term “environmental data operations” refers to activities involving the collection, generation, compilation, analysis, evaluation and use of environmental data. The QAPP is a planning document for obtaining the type, quantity and quality of data needed to support environmental decision making. It documents all quality assurance, quality control, and technical activities and procedures associated with planning, implementing and assessing all environmental data operations¹.

Required elements of the QAPP included the inclusion of project management and objectives, measurement and data acquisition, assessment and oversight, and data validation and usability. Discussions encompassed the identification of the roles and responsibilities of project personnel, communication procedures, and details of the proposed project schedule. It described the design and implementation of all sampling measurements, procedures, analytical methods, handling, and documentation. Also documented were quality control procedures, frequency requirements, acceptance criteria, and corrective action procedures. Finally, the QAPP discussed the proper implementation of the QAPP, appropriate data validation techniques, and determination of data usability and assessment.

Results and Conclusions

The post-construction sampling is currently ongoing and only one round of wet weather sampling has been completed as of the preparation of this report. An addendum monitoring report will be submitted upon completion of the wet weather sampling. The addendum report will present the results of the four sampling rounds and discuss the observed removal efficiencies of the BMPs, along with the impacts on water quality.

Results from the first wet weather sampling round that occurred May 9, 2006 are included in Table 3. Only TSS laboratory data is available at this time. TP samples will be sent after two wet weather rounds are collected per UMASS laboratory request.

¹ U.S. EPA. 1998. *EPA Guidance for Quality Assurance Project Plans QA/G-5*. EPA/600/R-98/018.

Table 3. Wet Weather Sampling Results – May 9, 2006

Sample ID No.	Location	TSS results (mg/l)
4A	End of 1 st street (CB – 1)	220
4B	In between 1 st and 2 nd Street (First Chamber of Baffle Tank #1)	440
5A	End of 1 st street (CB – 10)	930
5B	End of 1 st street (DMH – 1)	280
6A	End of 4 th Street (Baffle Tank #2)	600
6B	End of 1 st street (CB – 13)	300
Duplicate (3A)		300

NOTES:
High TSS downstream result for sample 4B are likely due to existing sediment in the baffle tank chambers. (The unit was in need of maintenance.)

Design and Construction

The design process began with a detailed review and analysis of the contributing watersheds and results obtained in past reports. Topographical surveys of the project areas were obtained and various conceptual design alternatives were analyzed. The original proposed project included the installation of five baffle tanks. However, because of sharp cost increases for the baffle tanks and tighter than expected constraints from underground utility lines, three of the units were replaced with a series of deep sump catch basins designed to remove equal amounts of TSS and TP.

Lessons Learned

Despite projects changes and construction delays due to DPW staffing levels, the Lake Attitash Stormwater Treatment Program is seen as a success by the Town of Amesbury. In terms of time for the completion of the project, the timeline was extended to accommodate construction design changes and the wet weather monitoring. This was a result of higher than expected baffle tank structure costs and delays in construction scheduling with the contractor and DPW.

It is important for future applicants to allow plenty of time within the schedule for design, permitting and construction, as well as extra time for the monitoring portion. Additionally, applicants should be aware that costs for certain structures/products may rapidly rise due to unforeseen consequences such as energy costs. In the case of this project, the costs of baffle tank structures sharply rose much higher than expected and as a result, three of the units were replaced with less costly alternatives, deep sump catch basins, which decreased construction costs.

When scoping the project and developing the application it is important to examine what portions of the project will need to be accomplished via financial match or in-kind services. Communities with a high level of volunteer involvement from individuals, or an organization, or with substantial municipal staff resources, should consider utilizing these people for non-cash match. It is important however to ensure that the level of commitment is fully understood

by both parties prior to the submission of the application, since when it comes to actually performing these tasks it can become difficult. Since many communities are feeling the pressure of budget constraints it is likely that more in-kind services will be proposed for match. In that case the lessons would be to keep options open in terms of utilizing individuals and personnel for components of the project to meet match requirements.

References and Further Reading

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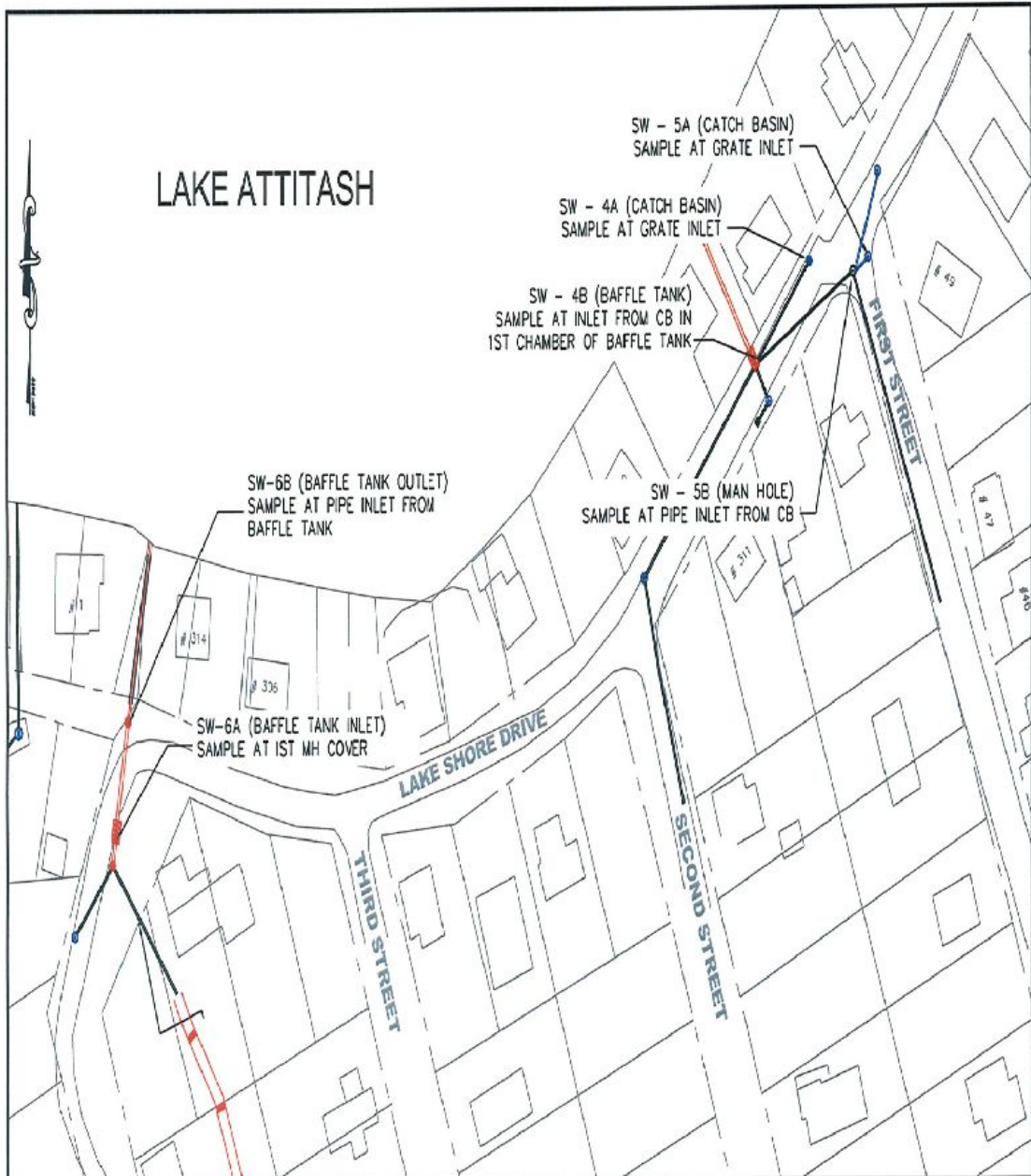
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APPENDIX A

Revised Sampling Locations



LAKE ATTITASH

DEP Stormwater Sampling Locations (FIGURE 6-4 IN QAPP)



COMPREHENSIVE ENVIRONMENTAL INCORPORATED
MILFORD, MASSACHUSETTS

LAKE ATTITASH STORMWATER IMPROVEMENTS
TOWN OF AMESBURY, MASSACHUSETTS

Table 10-1 Sampling/Monitoring Design – Wet Weather Data Collection

Measure(s) or Indicator(s)	Sites*	Sample Collection Time	Type of Sample & Collection Method	Time of Day Sampled	Frequency & Special Weather Conditions
Total Phosphorus & Total Suspended Solids (TSS)	SW-1a&b Deep Sump Catch Basin	N/A	N/A	Sample collection will be during daylight hours generally between 7 AM and 5 PM, 7 days a week; Alpha Analytical accepts samples 8 AM to 5 PM Monday through Friday and on weekends with advanced notice. Weekend lab coordination is not necessary since samples have a holding time of 7 days (TSS) and 28 days (TP)	Four storm events with no rain 72 hrs prior to sampling. Samples must represent first flush conditions. Sampling can be conducted for storm events that generate >0.5" of precipitation in a 24-hr period. Weather reporting will be obtained from the NOAA: National Weather Service website.
	SW-2a&b Deep Sump Catch Basin	N/A	N/A		
	SW-3a&b Deep Sump Catch Basin	N/A	N/A		
	SW-4a&b Deep Sump Catch Basin	Collect sample 6 minutes after flow is visible along 7 th Street. Collect outlet sample subsequent to inlet sample.	Lake Shore Drive & 1 st Street; inlet at storm grate prior to deep sump catch basin; inlet pipe in first chamber of baffle tank.		
	SW-5a&b Deep Sump Catch Basin	Collect sample 6 minutes after flow is visible along 7 th Street. Collect outlet sample subsequent to inlet sample.	Lake Shore Drive & 1 st Street; inlet at storm grate prior to deep sump catch basin; inlet pipe in downgradient drain manhole.		
	SW-6a&b Baffle Box	Collect sample 6 minutes after flow is visible along 4 th Street. Collect outlet sample subsequent to inlet sample.	Lake Shore Drive & 4 th Street; inlet pipe in first manhole of baffle box; inlet pipe in downgradient deep sump catch basin.		

a = inlet sample location; b = outlet sample location.

APPENDIX B

Design Plans

TOWN OF AMESBURY, MASSACHUSETTS
**LAKE ATTITASH STORMWATER
IMPROVEMENTS**

SEPTEMBER 2005

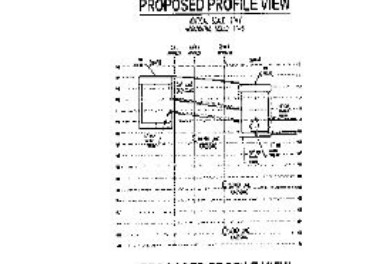
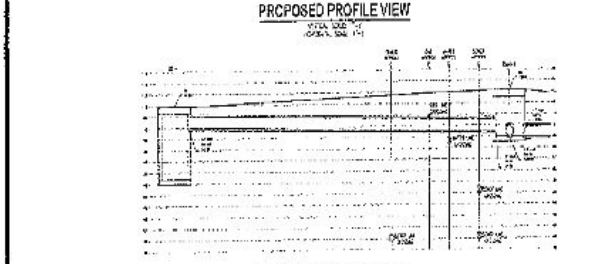
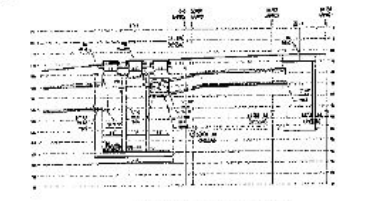
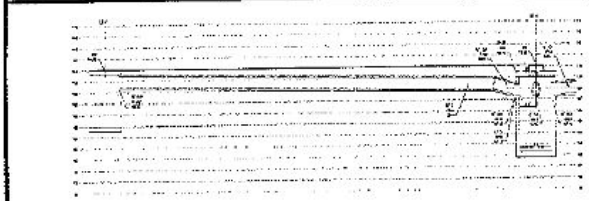
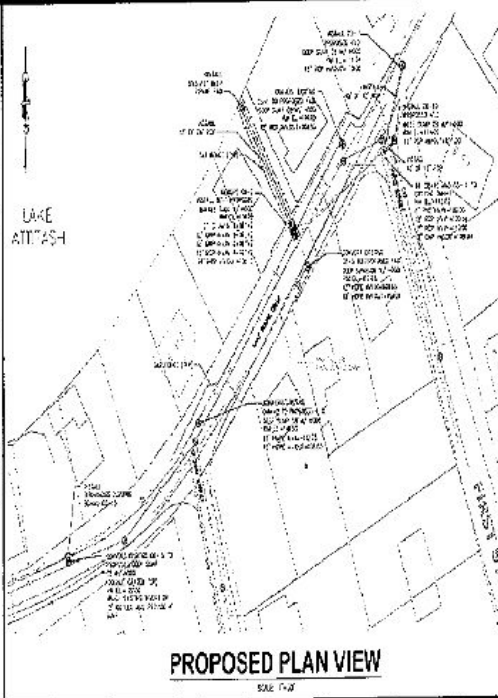
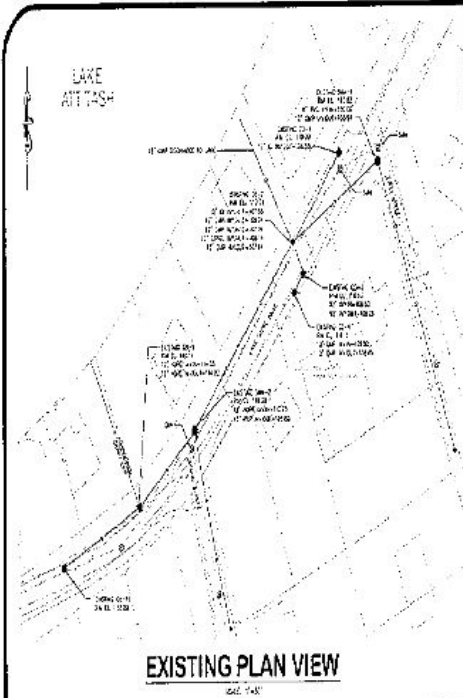


FOR CONSTRUCTION

<u>SHEET</u>	<u>TITLE</u>
C-1B	LAKE SHORE DRIVE AT 1ST AND 2ND STREETS PLAN AND PROFILE (DOW' WORK)
C-2B	LAKE SHORE DRIVE AT 4TH AND 5TH STREETS PLAN AND PROFILE (DOW' WORK)
C-3	SWALE PLAN VIEW, PROFILE AND DETAILS



COMPREHENSIVE ENVIRONMENTAL INCORPORATED • MILFORD, MASSACHUSETTS



NOTES

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE CALIFORNIA STANDARD SPECIFICATIONS FOR HIGHWAYS AND BUILDINGS, LATEST EDITIONS OF THE CALIFORNIA STANDARD SPECIFICATIONS FOR BRIDGES AND STRUCTURES, AND THE LATEST EDITIONS OF THE CALIFORNIA STANDARD SPECIFICATIONS FOR PORTLAND CEMENT CONCRETE AND MORTAR.
2. THE EXISTING SIDEWALK SHALL BE REPAIRED TO MATCH THE PROPOSED SIDEWALK. THE EXISTING ASPHALT DRIVE SHALL BE REPAIRED TO MATCH THE PROPOSED ASPHALT DRIVE.
3. THE EXISTING ASPHALT DRIVE SHALL BE REPAIRED TO MATCH THE PROPOSED ASPHALT DRIVE.
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10. THE EXISTING ASPHALT DRIVE SHALL BE REPAIRED TO MATCH THE PROPOSED ASPHALT DRIVE.

FOR CONSTRUCTION

1. Asphalt Drive	650
2. Sidewalk	1750
3. Concrete Curb	1800
4. Repave Drive	250

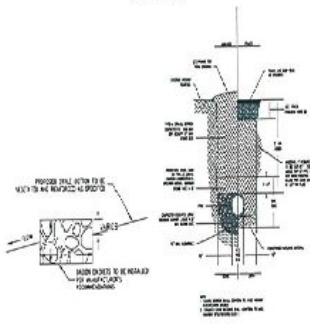
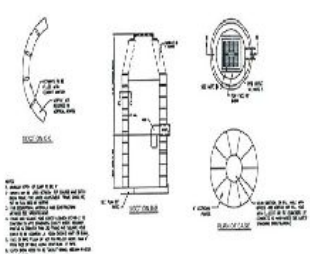
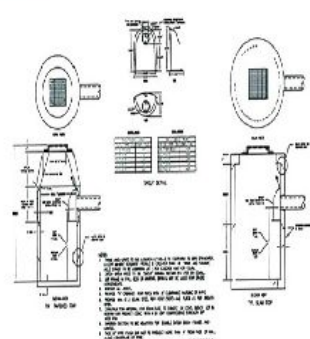
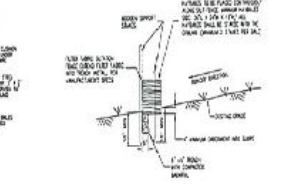
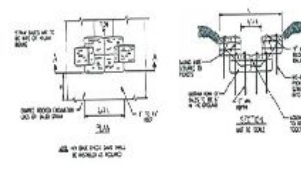
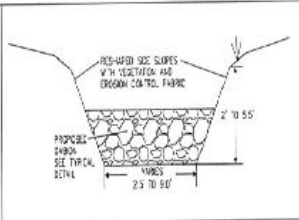
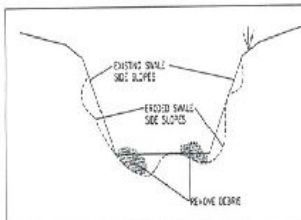
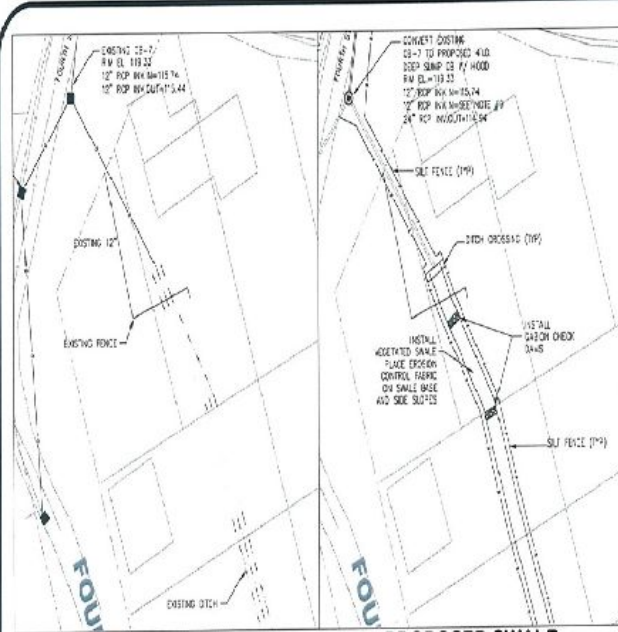
CITY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

LAKE ATTASH STORMWATER IMPROVEMENTS
LAKE SHIP EDWARDS AT ISLAND ONE STREET PLAN AND PROFILE

Plan of Approval
S. Frank Street
Inventory No. 0015

Project No.	
Sheet No.	
Scale	
Drawn by	
Checked by	
Approved by	

C-1B



General Notes

1. DRAWINGS BASED ON 1984 LANE ATTORNEY TRIP DATA AND GROUNDWATER PROJECT NO. 100-100-100 BY ACTION & SAMPLE. THIS DATA SHOULD BE USED AS A GUIDE ONLY. ANY DISCREPANCIES SHOULD BE POINTED OUT TO THE CLIENT BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
2. THE LOCATION OF UNDERGROUND UTILITIES HAVE NOT BEEN VERIFIED OR EXPLORED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION AND DEPTH OF ALL UTILITIES AND CONTACT THE CITY OF SEASIDE AT 1-800-544-7253.
3. ROADING AND DRIVING STRUCTURE LOCATIONS INDICATED ON THIS PLAN ARE APPROXIMATE AND MUST BE VERIFIED BY THE CONTRACTOR. THE LOCATION AND DEPTH OF UNDERGROUND UTILITIES ON THIS PLAN ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
4. THE CONTRACTOR SHALL EXPOSE EXISTING UTILITIES TO PREVENT ANY DAMAGE TO ADJACENT PROPERTIES. ALL UTILITIES SHALL BE PROTECTED BY THE CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO ADJACENT PROPERTIES AT ALL TIMES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO ADJACENT PROPERTIES AT ALL TIMES.
5. ANY CHANGE IN FIELD CONDITIONS SHALL BE REPORTED TO THE ENGINEER IMMEDIATELY. ANY MODIFICATION TO THE ORIGINAL DESIGN AND DRAWINGS MUST BE APPROVED BY THE ENGINEER PRIOR TO CONSTRUCTION.
6. THE CONTRACTOR SHALL MAINTAIN ALL RECORDS OF ALL WORK DONE ON THIS PROJECT. ALL RECORDS SHALL BE MAINTAINED FOR A PERIOD OF 10 YEARS AFTER THE COMPLETION OF THE PROJECT.
7. THE CONTRACTOR SHALL MAINTAIN ALL RECORDS OF ALL WORK DONE ON THIS PROJECT. ALL RECORDS SHALL BE MAINTAINED FOR A PERIOD OF 10 YEARS AFTER THE COMPLETION OF THE PROJECT.
8. THE CONTRACTOR SHALL MAINTAIN ALL RECORDS OF ALL WORK DONE ON THIS PROJECT. ALL RECORDS SHALL BE MAINTAINED FOR A PERIOD OF 10 YEARS AFTER THE COMPLETION OF THE PROJECT.
9. THE CONTRACTOR SHALL MAINTAIN ALL RECORDS OF ALL WORK DONE ON THIS PROJECT. ALL RECORDS SHALL BE MAINTAINED FOR A PERIOD OF 10 YEARS AFTER THE COMPLETION OF THE PROJECT.

FOR CONSTRUCTION

1	Additional Locations	1/75
2	City Director Change	12/04
3	Location Change	12/04
4	Revised/Issue	2/05

CHERRYBROOK ENGINEERING, INCORPORATED

64 COLLETT STREET, SEASIDE, CA 92152

LANE ATTORNEY STORMWATER IMPROVEMENTS SWALE PLAN AND PROFILE & DETAILS

Drawn by: H. Park, J. Smith, M. Smith, A. Smith

Scale: 1" = 20'

C-3

APPENDIX C

Photos and Brochure

LAKE ATTITASH WATERSHED IMPROVEMENT PROJECT

Lake Attitash is a 360 acre natural lake located within the Towns of Amesbury and Merrimac. It provides Amesbury and Merrimac with a portion of their water supply and serves as a popular recreational resource.

In 2003, the Town of Amesbury Engineering Department applied for and received funding to implement the Lake Attitash Watershed Improvement Project. This lake restoration effort was aimed to help improve the water quality of Lake Attitash through the implementation of stormwater improvements. The project was supported through a s.319 Nonpoint Source Pollution Grant with funding from the U.S. EPA and MA DEP. To enhance project efforts, Amesbury along with Merrimac concurrently received funding from the MA Department of Conservation and Recreation (formerly MA DEM) through a Watershed Demonstration and Restoration Grant – one of only 5 awarded in the state, to make additional stormwater improvements within the Lake Attitash Watershed.

The project included the design and installation of various stormwater treatment devices along First Street and Fourth Street. Constructed elements include 2 baffle tanks, 10 deep sump catch basins with hooded outlets and the reconstruction and stabilization of a degraded drainage swale. Additionally, several stormwater outlets were resized and improved to help slow flow and alleviate current shoreline erosion.

The above stormwater improvements are expected to significantly improve the quality of stormwater entering Lake Attitash by slowing stormwater velocity, reducing flows and preventing nonpoint source pollutants from directly entering Lake Attitash via stormwater discharge.



Aerial View of Lake Attitash (Source: MA GIS)

Stormwater Pollution Prevention Tips

- ◆ Clean up and properly dispose of pet waste.
- ◆ Minimize use of fertilizers and pesticides.
- ◆ Keep trash and debris out of storm drains.
- ◆ Water lawns sparingly.
- ◆ Inspect and maintain your septic system on a regular basis.
- ◆ Keep cars leak free and dispose of fluids and batteries at designated drop-off locations.
- ◆ Wash your car on pervious surfaces such as grass or use a commercial car wash.

Additional stormwater and nonpoint source pollution information can be found at

www.epa.gov/nps

*Project engineering/design: Comprehensive Environmental.
Funded by: U.S. EPA, MA DEP, and Town of Amesbury with support from the Lake Attitash Association.*

This project has been financed with Federal Funds from the U.S. EPA to the MA DEP under a s.319 competitive grant. The contents do not necessarily reflect the views and policies of the U.S. EPA or the MA DEP, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

APPENDIX D

Public Bid Documents

DOW Corp.
154 B Haverhill Street
Methuen, MA 01844

RE: Intent to Award
Lake Attitash Stormwater Improvements

Gentlemen:

Please be advised that the Town of Amesbury intends to award the below listed contract to you in accordance with the Town of Amesbury "Notice to Bidders" and your agreement to honor the unit prices in the bid contained in your proposal for the same opened on:

September 2, 2004
Lake Attitash Stormwater Improvements

for a total bid price of \$80,965, with payment to be made at the Unit Bid and/or lump-sum prices. This price represents a reduction in the original scope of work by eliminating certain unit price items in order to bring the project within available funding limits.

You are further advised that you must provide the required insurance certificates and contract bonds and to complete the applicable sections of the contract documents prior to formal award of this contract and notice to proceed as soon as possible.

Please communicate with Rob Desmarais, Town Engineer at 978-388-8135 in all matters pertaining to this contract.

Town of Amesbury

Lake Attitash Stormwater Improvements
Plan Takers

Date	SPEC NO.	CONTRACTOR	MAILING ADDRESS	TEL NO.	FAX NO.	Sent/Pd
08/19/04	1	Rob Desmarais	Town of Amesbury - Engineering 62 Friend St. Amesbury, MA 01913	978-388-8135	978-388-6727	FX
08/19/04	2	Mark Casella, DEP	DEP	978-661-7771	978-661-7615	FX
08/19/04	3	Ed Dishong	Dow Company 154B Haverhill St. Methuen, MA 01844	978-682-1414	978-682-1284	FX their act #112818693
08/24/04	4	Joe Farnese	Farnese Construction 73 Schanda Dr. Newmarket, NH 03857	603-639-3538	603-292-5071	FX
08/24/04	5	John D. Harnett	John D. Harnett & Son, Inc 8 Graf Rd Newburyport, MA 01950	978-463-0124	978-462-9330	FX Pd ck#2193
08/24/04	6	Rob Desmarais	Town of Amesbury - Engineering 62 Friend St. Amesbury, MA 01913	978-388-8135	978-388-6727	FX overnight
08/24/04	7	Rob Desmarais	Town of Amesbury - Engineering 62 Friend St. Amesbury, MA 01913	978-388-8135	978-388-6727	FX overnight
08/24/04	8	R.M. Pacella	Pacella R.M. 3 Madison St. Plainville, MA 02762	508-695-5100	508-695-2793	FX overnight
08/25/04	9		Lederman Engineering 29 Fremont Ave Chelsea, MA 02150	617-889-2079	617-889-2079	FX Pd ck#1078
08/25/04	10	Bill Gear	Unified Contracting 87 East St Melrose, MA 02176	781-665-8588	781-979-9104	FX
08/27/04	11	John Carr	Ramey Contractors 112 Marston St. Lawrence, MA 01840	978-683-6791	978-688-8942	FX Pd ck#1509
08/27/04	12	Lisa Green	Target Construction 14 Pinewood Rd. Salem, NH 03079	603-893-2229	603-890-6171	FX their act #283599663

**SUMMARY OF BIDS
TOWN OF AMESBURY**

OPENING: _____

CONTRACT NO.: LAKE ATTITASH

RECORDING: _____

BID DATE: Thur. Sept. 2, 2004

TIME: 2:00 p.m.

PROJECT: Lake Attitash Stormwater Improvements

PROSPECTIVE BIDDERS

CONTRACTOR:			Dow			
ADDENDA ACKNOWLEDGED			YES - NO			YES - NO
BID SECURITY			BOND-CHECK-CASH			BOND-CHECK-CASH
BID ITEMS						
ITEM NO. PART 1	ITEM OF WORK	QUAN	UNIT PRICE	BID AMOUNT	UNIT PRICE	BID AMOUNT
1	2000 Gal Sed. Tank (ea.)	5	\$ 20,840.00	\$ 104,200.00		
2a	4' Precast CB (ea.)	2	\$ 2,300.00	\$ 4,600.00		
2b	5' Precast CB (ea.)	1	\$ 3,000.00	\$ 3,000.00		
3a	Convert Existing to 4' CB (ea.)	2	\$ 2,500.00	\$ 5,000.00		
3b	Convert Existing to 5' CB (ea.)	1	\$ 3,100.00	\$ 3,100.00		
4	Convert Existing to 4' CB w/ Hood (ea.)	1	\$ 2,800.00	\$ 2,800.00		
5	Modify Existing Manhole (ea.)	1	\$ 3,300.00	\$ 3,300.00		
6	Semi-Permanent Erosion Fabric (sy)	250	\$ 2.50	\$ 625.00		
7	Loam and Seed (sy)	250	\$ 6.00	\$ 1,500.00		
8	Silt Fence (lf)	1100	\$ 4.25	\$ 4,675.00		
9	Gabions (sy)	12	\$ 550.00	\$ 6,600.00		
10	Riprap (cy)	2	\$ 70.00	\$ 140.00		
11a	12" RCP (lf)	110	\$ 47.00	\$ 5,170.00		
11b	15" RCP (lf)	90	\$ 57.00	\$ 5,130.00		
11c	18" RCP (lf)	80	\$ 60.00	\$ 4,800.00		
11d	24" RCP (lf)	250	\$ 88.00	\$ 22,000.00		
12	Police (hr)	100	\$ 33.00	\$ 3,300.00		
TOTAL BASE BID				\$ 179,940.00		

APPENDIX E

Operation and Management Plan

Operations & Maintenance Plan
Deep Sump Catch Basins & Baffle Tanks

Town of Amesbury, MA

Lake Attitash Stormwater Treatment Program 319 Grant

BMP Owner Information:

*Town of Amesbury, MA
Town Hall
62 Friend Street
Amesbury, MA 01913*

O&M Responsibility:

*Department of Public Works
Town Hall
62 Friend Street
Amesbury, MA 01913*

June 2006

Deep Sump Catch Basin

Procedure	Objective	Frequency
Surface Inspection	Remove sediment and debris from the surface grate to prevent street flooding.	Performed quarterly for the first year and after heavy storms. Establish a specific schedule based on previous years capacity inspections.
Interior and Sump Sediment Removal	Maintain flow capacity. Inspect and remove sediment prohibiting outflow at pipe discharge.	Performed quarterly for the first year and after heavy storms. Establish a specific schedule based on previous years capacity inspections. (minimum annually)
Outlet Hood Inspections	Visually inspect condition of outlet hood (i.e. cracks, missing bolts, and debris.) If debris is present, remove and discard.	Annually
Pipe Inspection	Remove accumulated sediment to maintain flow capacity through inlet and outlet pipes.	Performed quarterly for the first year and after heavy storms. Establish a specific schedule based on previous years capacity inspections.

Notes:

Deep sump catch basins should be maintained at a minimum on a yearly basis. However, if maintenance is only conducted once per year, it is optimally performed after winter sanding has terminated.

The accumulated sediment, leaves, and debris from the surface grate are to be removed. Inspect all connecting pipes for accumulated debris and sediment, remove if necessary.

Collected debris shall be disposed of in an approved manner and in such a way as to not cause harm to the environment.



Baffle Tank

****CAUTION****

Accumulated sediments often release gasses that can be dangerous – Always use an approved confined space procedure when inspecting or entering baffler tanks.

Procedure	Objective	Frequency
Outlet Hood Inspections	Visually inspect condition of outlet hood (i.e. cracks, missing bolts, and debris.) If debris is present, remove and discard.	Annually
Capacity Inspections	To schedule sediment cleanings by monitoring the rate of sediment accumulation (measured as the difference between the sediment surface to the manhole rim and water surface to the manhole rim) in the three compartments within the baffle box.	Performed quarterly for the first year and after heavy storms. Establish a specific schedule based on previous years capacity inspections.
Sediment Removal	Maintain flow capacity. To keep sediment from being resuspended and flushed downstream during large storms.	Removal should take place when either the difference between measurements is one foot or less or when based on Capacity Inspections, the first compartment no longer accumulates sediment while the downstream two compartments do continue to collect (washover is occurring from the first compartment to the next.)
Pipe Inspection	Remove accumulated sediment to maintain flow capacity through inlet and outlet pipes.	Annually