

Municipality/Organization: City of Malden
EPA NPDES Permit Number: MA041046
MADEP Transmittal Number: 041088
**Annual Report Number
& Reporting Period:** No. 9: April 1, 2011-March 31, 2012

NPDES PII Small MS4 General Permit Annual Report

Part I. General Information

Contact Person: John J. Russell, P.E. **Title:** City Engineer
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Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: 
Printed Name: John J. Russell
Title: City Engineer
Date: 4-27-12

Part II. Self-Assessment

During a time of prolonged economic constraint, the City of Malden has continued to advance the goals of this MS4 General Permit and its corresponding stormwater quality program. The foundation for the achievements that have been realized during this reporting period has been set by the Engineering and Malden Department of Public Works (MDPW) staff through the integration of program goals into daily workplace practices. Through its Catch Basin/inventory, cleaning and mapping program, the City has completed timely repairs to its drainage infrastructure and removed several illicit connections. This has resulted in the reduction of total suspended solids and bacterial loadings to tributary surface waters, as well as the resolution of several long standing flooding issues. The positive benefits of these prior efforts on behalf of the community were most notable during the excessive rainfall events that occurred during the spring of 2010. As described within this and prior submittals, comprehensive improvements to the drainage system, a once neglected infrastructure component, have been made in a cost effective and efficient matter. Equally important, is the current involvement of both private and public parties in the areas of education, watershed cleanup activities, and targeted/innovative BMP implementation. Partnerships between local schools, stewardship agencies and the community have resulted in an advancement of the objectives of the MS4 General Permit to a level, which now exceeds earlier compliance goals.

Despite this downturn of the economy, the City has expended resources and efforts that would not have been feasible without the foundation built during prior permit years. At this time, the City has made significant progress towards meeting the requirements of proposed revisions to the MS4 General Permit, as they pertain to North Coastal Communities. On a course that parallels the efforts of the in-house staff, the City has also sought and received SRF funding assistance to support outside technical services and meet comprehensive infrastructure needs. Ongoing tasks include flow capacity analyses, GIS mapping of the all infrastructure components, completion of dry and wet weather sampling, IDDE Plan implementation and flow isolation studies, all of which are intended to support long term planning goals. Dry weather mass-balance/flow isolation studies have been completed throughout the City by the Stormwater Compliance Team. Beyond the removal of illicit contributions, extensive waterline leaks /losses have been corrected, resulting in the restoration of hundreds of thousands gallons of potable water into the municipal systems for Malden and a neighboring community.

It is important to note that Malden is a “flow through” community and that significant bacteria loadings which have been identified at certain City outfalls have been documented as arising from neighboring communities. This water quality information has been provided to the U. S. Environmental Protection Agency (US EPA), within previous submittals associated with the stormwater compliance program. In addition to the removal of illicit connections, the City has installed two (2) trash booms within the Malden River, which have collected extensive volumes of litter and debris, which once flowed down the Malden, as discussed under BMP 2-2. While significant progress has been made, the complexity of many issues having origins that date to over a century ago is apparent.

Part III. Summary of Best Management Practices (BMPs) and Compliance Team Goals

1. Public Education, Outreach and Community Involvement

BMP 1-1	Place Educational Information on City's Web Site and Malden Access Television (MATV)
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Responsible Department/Person:
Engineering Dept, Mayor's Office & MATV

Measurable Goal(s):
Continued maintenance of the City informational web site and participation with MATV.

Progress on Goals- Year 9:
The City continues to maintain an informational website and work with representatives of MATV to update the community on stormwater management issues. Recently, the City has accelerated its effort to broaden community outreach through the use of interactive websites and electronic information transfer to address wide range of local neighborhood concerns.

Goal Status:
Achieved original goals. Community outreach in now an integral part of the City's efforts to mitigate stormwater quality concern.

BMP 1-2	Conduct Recycling Opportunities & Paint Waste Collection Days
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Responsible Department/Person:
DPW & Mayor's Office

Measurable Goal(s):
Continuation and possible expansion of recycling collection days, distribution of related educational information.

Progress on Goals- Year 9
MDPW sponsors four (4) paint waste collection and recycling days annually. As summarized in Section 5.2, these four (4) collection days resulted in the accumulation of a volume that incurred disposal costs of \$15,200. The City also continues to maintain its recycling programs at the MDPW yard.

Goal Status:
Annual Program - Activity Ongoing

BMP 1-3 Enforce Pet Waste Management Programs

Responsible Department/Person:

Animal Control Dept & City Clerk

Measurable Goal(s):

Posting of signage, installation of waste collection containers, park maintenance, ordinance enforcement, Community involvement.

Progress on Goals- Year 9:

The Board of Health (BOH) actively monitors public recreation areas to discourage the feeding of waterfowl populations that contribute to the degradation of surface water quality. In addition, pet waste, education and control programs (stations) are in-place. The guidance is no longer considered a goal, rather it is an ongoing activity

Goal Status:

Achieved

BMP 1-4 Establish a partnership with local schools to educate Malden’s students about stormwater

Responsible Department/Person:

Stormwater Compliance Team

Measurable Goal(s):

Workshops, demonstration projects, student involvement

Progress on Goals- Year 9:

The Beebe School maintains a weekly Malden River Stormwater After School Group that is lead by Tri-CAP, resident Clay Larson, and the Partnership for Community School in Malden (PCSM), which is funded in part through a USEPA outreach grant with MyRWA. The Stormwater Compliance Team also spoke to Malden 4th and 5th graders regarding the City drainage system. A significant project completed for the Permit year has included the construction of a rain garden at the Beebe School which was built by a contractor with plantings by school children. This activity was led by Tri-Cap, MyRWA, and Mr. Larson which was funded by SEP. In addition, the Fellsmere Pond kiosk and “wet metal restoration” project was completed by Beebe School children. Photographic documentation of this stormwater quality enhancement project is presented below. In the summer of 2011, a Malden Stormwater Assessment Program was maintained by Tri-Cap youth which were employed through the City of Malden Summer Youth Employment Program. Activities performed included stormwater neighborhood surveys, green infrastructure design planning and a green infrastructure (rain garden/dry well) pilot installation at a Tri-CAP house.

Goal Status:

Through the use of website postings and connection to the classroom, the City hopes to continue the advance of student involvement of meeting this goal. The City appreciates and would like to recognize the efforts of Tri-CAP and, in particular, Mr. Nick Cohen who was instrumental in advancing this goal.



BMP 1-5 Hold formal school classroom programs supported by the Compliance Team

Responsible Department/Person:

Stormwater Compliance Team

Measurable Goal(s):

Classroom involvement

Progress on Goals- Year 9:

See BMP 1-4.

Goal Status:

Emphasis to be placed upon greater community interaction during Year 9. BMP 1-4 and 1-5 to be combined for this coordinated effort.

BMP 1-6 Development of student involvement/internship for High School Seniors

Responsible Department/Person:

Engineering Dept & MDPW

Measurable Goal(s):

Number of participants

Progress on Goals- Year 9:

See BMP 1-4

Goal Status:

Activity Ongoing

BMP 1-7 Expand Cooperative Education programs for college level interns

Responsible Department/Person:

Engineering Dept

Measurable Goal(s):

Number of participants

Progress on Goals- Year 9:

During this reporting period the City employed one college student as an intern. In addition, as a part of the Cooperative Education Program, the supervisor of the Stormwater Compliance Team assisted student(s) from Salem State University with workshops and internships involving stormwater applications. Students from Boston Architect College (BAC) are also working on designs for the Malden River which were presented at a Malden River Design forum held on December 14, 2011.

Goal Status:

The City is currently exploring ways to partner high school and college interns in areas of public outreach and curriculum development. BMPs 1-6 and 1-7 will be coordinated to meet this goal.

BMP 1-8	Host or participate in Stormwater Management brainstorming sessions with citizen advisory groups and Mystic River Watershed representatives (MyRWA)
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Responsible Department/Person:

Eng. Dept. & Mayor's Office

Measurable Goal(s):

Annual Participation. Dissemination of information to the general public

Progress on Goals- Year 9:

Advocacy forums and meetings between the City (MRA), Tri-CAP and MyRWA had been held concerning stormwater, green infrastructure opportunities and restoration efforts for the Malden River. Grant opportunities have also been investigated for projects such as the rehabilitation at Pleasant Street.

Goal Status:

Ongoing community activity

2. Local Planning Processes and Community Involvement

BMP 2-1 Development of incentives for redevelopment initiatives that address existing stormwater management concerns
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Responsible Department/Person:

Local Planning Agencies and Compliance Team

Measurable Goal(s):

Mitigation of existing stormwater concerns.

Progress on Goals- Year 9:

The City has initiated a review of green infrastructure opportunities and methods to encourage use of LID measures to enhance stormwater runoff quality. Due to the poor state of the economy, limited redevelopment /development opportunities have arisen recently. Proposed municipal restoration projects for recreational areas have integrated stormwater quality enhancement measures into the design that were completed during this Permit year. The most opportunities for the advancement of this goal continues to come from the identified infrastructure and watershed needs that are identified through the ongoing CB inventory, mapping inventory program.

Goal Status:

Consistent with the above, output from the ongoing infrastructure mapping/CB inspection program together with CIP Planning is being evaluated to prioritize infrastructure needs. It is anticipated that incentives will be considered for those redevelopment initiatives that address these concerns.

BMP 2-2 Development of a “Clean Malden” Program

Responsible Department/Person:

Stormwater Compliance Team

Measurable Goal(s):

Promote neighborhood stewardship programs designed to remove trash from sensitive watershed areas, catch basin inlets and report conditions of concern.

Progress on Goals- Year 9:

See BMPs 1-4 thru 1-8

In addition to local neighborhood cleanups, MDPW staff maintained two (2) trash booms across the Malden River to retain the significant amount of trash and debris that is generated during the urban system primarily during rainfall events. Prior to this, extensive trash/debris depositions occurred along the banks of the Malden and in particular within the vicinity of the Tuft Boathouse and Phase I of the River’s Edge project, as depicted within the following photographs shown below. The maintenance of these trash booms have resulted in a significant improvement in surface water conditions for both passes and recreational activities associated with the River. As indicated previously, the Stormwater Compliance Team participated in an Earth Day Educational Program, assisting volunteers with a clean up along the banks of the Malden River at Comcast / Verizon parking lots.

Goal Status:

Achieved and ongoing



BMP 2-3	Inter-departmental review and communication to address stormwater quality concerns
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Responsible Department/Person:

Local Planning and Inspectional Agencies

Measurable Goal(s):

Coordination of Planning and Inspectional services to further identify and address stormwater management issues.

Progress on Goals- Year 9:

Through the adoption of a City ordinance pertaining to the stormwater management requirements, the objectives of this BMP have been integrated into the formal Department Head meeting agenda. Representatives of Board of Health (BOH) continue to be instrumental in successful enforcement actions when necessary.

During this reporting period, a specific inter-departmental program was also established for the Malden Housing Authority complexes to clean and identify the drainage infrastructure.

Goal Status:

Ongoing

BMP 2-4	Development of an electronic database file management system
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Responsible Department/Person:

Engineering Department and Compliance Team

Measurable Goal(s):

Compilation of all stormwater infrastructure information, integration of all ongoing inspection, inventory and repair activities.

Progress on Goals- Year 9:

Through the assistance of Camp Dresser and McKee (CDM), the City is nearing completion of converting and updating its current mapping system to GIS/electronic format using field GPS receivers. Drainage infrastructure has been updated and inventoried as a part of daily work practices by MDPW personnel, with targeted mapping and inspection also performed by outside contractors. The results for the 2011 through the 2012 Permit year are summarized within the semiannual IDDE status reports that have been submitted to USEPA.

Goal Status:

Activity Ongoing

BMP 2-5 Development and implementation of local ordinances
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Responsible Department/Person:

Local Planning Agencies and Compliance Team

Measurable Goal(s):

Adopt and enforce state and federal regulatory guidance. Perform community infrastructure needs analysis and conveyance of information to local permitting processes. Assign BMP guidance and requirements to private land use activities that are connected to the urban stormwater network.

Progress on Goals- Year 9:

The City continues to enforce existing stormwater ordinances and is reviewing Green Infrastructure and LID guidance and proposed Permit revisions to provide further enforcement guidance.

Goal Status:

Achieved and Ongoing

BMP 2-6 Completion of an infrastructure needs analysis
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Responsible Department/Person:

Eng. Dept, DPW, Compliance Team

Measurable Goal(s):

Development of a long term plan for infrastructure upgrade

Progress on Goals- Year 9:

Significant advancement of the identification and understanding of infrastructure needs has been performed by Engineering and MDPW personnel during this Permit year, currently funding mechanisms area being evaluated to address both short and long term capital needs.

Goal Status:

Annual Ongoing Activity

BMP 2-7	Identification of capital improvement projects necessary to improve stormwater quality
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Responsible Department/Person:

Compliance Team

Measurable Goal(s):

Conveyance of CIP requirements to Planning Board and local permitting processes.

Progress on Goals- Year 9:

See BMP 2-6. This BMP is to be combined with the preceding, ongoing activities.

Goal Status:

See above.

3. Stormwater Monitoring and Inspection Program

BMP 3-1 Conduct a minimum of one annual inspection of all known outfalls during dry weather sampling events.

Responsible Department/Person:

Compliance Team

Measurable Goal(s):

Documentation of inspection results.

Progress on Goals- Year 9:

Dry weather inspection and sampling has been performed during this permit year. Illicit discharges have been identified and removed, together with discharges from bailing sewage servicing /lateral. See BMP 3-3

Goal Status:

Achieved and Ongoing Activity

BMP 3-2 Perform targeted sampling and analyses during dry weather and wet weather sampling events to document seasonal and annual trends.

Responsible Department/Person:

Compliance Team

Measurable Goal(s):

Collection of water quality data

Progress on Goals- Year 9:

A summary of historic dry and wet weather sampling results together with related flow isolation studies may be referenced as Attachment A. A wet weather sampling event is proposed during the next qualifying rainfall event.

Goal Status:

Achieved and Ongoing Activity

BMP 3-3	Perform mass balance modeling within primary watersheds to isolate sub basin bacteria loading sources.
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Responsible Department/Person:

Compliance Team

Measurable Goal(s):

Identification of source area contributions

Progress on Goals- Year 9:

During this reporting period, dry weather inspections and flow isolation studies have been completed for the infrastructure contributing to stormwater discharges to the Malden River, Little Creek, Town Line Brook and Linden Brook. Utilizing the outfall monitoring data and information obtained during sampling events, the City continues to see significant base flow, as surface waters, particularly to the Malden River during dry weather conditions. Consistent with the original design of the MDC/DCR conveyance network; this occurs primarily thorough culverted channels/brooks located in northwestern portions of the City. This flow includes contributions that originate from the Fells Reservation and Lower Spot Pond Brook.

During this permit year, the Stormwater Compliance Team conducted several dry weather sampling events within Lower Spot Pond Brook. A summary of the results obtained from dry weather sampling may be referenced from Attachment A. As shown, elevated E. coli levels were encountered at LSP-4 during both sampling events conducted during this reporting period. It is to be noted that base flow, as groundwater, is consistently observed within this drainage network. Due to high E. coli levels at outfall LSP-4, a comprehensive evaluation of the flow conveyance network associated with LSP-4 located within the Elrich Drive residential complex was completed on 10 February 2012. Given the proximity of the sewer and drain lines to LSP-4, as well as the settlement of the drain line in the area of Buildings 1054 and 1056 Elrich Drive, the focus of assessment activities was directed towards the sewer laterals and nearby drainage line servicing the two apartment buildings.

Based upon the information provided by the City, sewer flows generated from Buildings 1054 and 1056, tie into a single sewer line located in close proximity to the drainage network associated with LSP-4. To investigate the possibility of exfiltration from the sewer laterals, fluorescent dye was introduced by flushing water using a sink connection located within the basement of Building 1054. Subsequently this process was then repeated within Building 1056. In each instance, indications of dye were noted within drain manhole DMH-4 following termination of water flow through the sewer lines.

The observations noted by the Stormwater Compliance Team were provided to the owner of the Elrich Drive property. Recommendations made by the SCT involved restoring the integrity of the main drainage line to stop the discharges that have been documented at LSP-4. Working with representatives of the Malden Engineering Department, repairs to the sewer laterals in the area of Buildings 1054 and 1056 were completed. It is proposed to resample LSP-4 following the occurrence of a major rainfall event to evaluate the nature of proposed repair stormwater quality dry weather discharges. Additional details pertaining to the results obtained from the dry weather inspections may be referenced Attachment B.

Goal Status:

Initial city wide objectives for this goal have been met. IDDE program and dry weather flow isolation studies are ongoing.

BMP 3-4	Target the evaluation of stormwater discharges from “green space” parklands, cemeteries and open space to assist in the segregation of human, animal and waterfowl bacteria contributions.
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Responsible Department/Person:

Compliance Team

Measurable Goal(s):

Separation of non-human bacterial loading and implementation of mitigation measures.

Progress on Goals- Year 9:

The City has implemented several measures to reduce discharge of non-human bacterial loading at park lands, cemeteries and open space. These have included control measures for the geese population, such as egg collection/treatment, the use of dogs and postings to prevent the feeding of waterfowl. The City is continuing with the conversion from grass playing fields to synthetic surfaces, at South Broadway Park which will have a direct impact upon waterfowl waste contributions and overall runoff quality.

Goal Status:

Ongoing Activity

BMP 3-5	Development of mitigation strategy based upon sampling and inspection progress for consideration in annual capital planning.
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Responsible Department/Person:

Compliance Team

Measurable Goal(s):

Preparation of annual report.

Progress on Goals- Year 9:

As outlined under BMP 3-3, dry weather sampling continues to focus upon the four (4) primary surface water bodies that received base-flow as surface water as well as “flow through” bacterial loading of adjacent communities. Beyond the removal of illicit discharges, flow conveyance capacity requirements and necessary infrastructure repairs have been identified. Funding alternatives for both near term minor repairs and long term infrastructure needs are currently being evaluated. The results obtained from the outfall sampling program, together with the development of an electronic file management system continue to assist in the prioritization of infrastructure needs which are reflected in CIP recommendations for the 2011-2012 fiscal year.

Goal Status:

Both in-house and contracted services are in place to oversee mitigation maintenance and planning efforts.

BMP 3-6	Development and Implementation of an Illicit Discharge Detection and Elimination (IDDE) Plan
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Responsible Department/Person:

Eng Dept & Compliance Team

Measurable Goal(s):

Development and implementation of an IDDE Plan.

Progress on Goals- Year 9:

The City continues to implement its approved IDDE program through its daily CB inspection and maintenance program through the use of a dedicated MDPW Stormwater Team and outside services. The Semi-Annual Status Reports pertaining to this effort, which have been filed with USEPA maybe referenced as Attachment B.

Goal Status:

Achieved

4. Pre- and Post-Construction Stormwater Runoff Control Measures

BMP 4-1	Development of inspection protocol/checklist local permitting agencies to monitor ongoing construction activities
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Responsible Department/Person:

Compliance Team

Measurable Goal(s):

Development of checklist

Progress on Goals- Year 9:

The City's permitting process now incorporates the criteria contained within adopted stormwater ordinances to guide its review process. Further, work is ongoing to integrate the results from daily inspection and monitoring into these processes.

Goal Status:

Achieved and Ongoing

BMP 4-2	Integration of Applicant Certification requirement for the monitoring and inspection of development activities into local planning processes.
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Responsible Department/Person:

Compliance Team

Measurable Goal(s):

Applicant Certification and submission of inspection and monitoring reports (See BMP 4-1).

Progress on Goals- Year 9:

This goal is only been advanced to the level of conceptual planning.

Goal Status:

Ongoing

BMP 4-3	Promote the use of new and innovative products/designs in new development initiatives. Condition of approval, monitoring
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Responsible Department/Person:

Compliance Team

Measurable Goal(s):

Conditions of Approval, monitoring of construction activities.

Progress on Goals- Year 9:

During this Permit year, the expansion of recreational opportunities at Pink Banks Park was completed. Stormwater management practices that were implemented include the absence of direct point source discharges, onsite retention, and the avoidance of low permeability (paved) surfaces. South Broadway Park is proposed for renovation during the next Permit year and the completed design includes synthetic playfield surfaces, the use of low impact design measures and enhanced stormwater quality improvements.

Goal Status:

Ongoing

BMP 4-4	Enforcement of existing state and federal guidance.
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Responsible Department/Person:

Planning Board and Inspectional Services, Eng. Dept.

Measurable Goal(s):

Documentation of violations, implementation of corrective actions.

Progress on Goals- Year 9:

See BMP 3-6 and 5-8. Following the adoption of local control measures in April 2009, the City has enforced the removal illicit discharges and required that investigations be undertaken to support the removal of improper stormwater discharge as described in further detail within Attachment B.

Goal Status:

Ongoing

BMP 4-5 Develop partnerships in planning with local Conservation Commission

Responsible Department/Person:

Planning Board and Inspectional Services, Eng. Dept.

Measurable Goal(s):

Stormwater quality management practices as conditions of approval.

Progress on Goals- Year 9:

The goals of this general permit and the corresponding IDDE program are directly communicated to the local Conservation Commission. In addition infrastructure needs and deficiencies are communicated to the Commission for review and consideration during the local permitting process.

Goal Status:

Achieved and ongoing

BMP 4-6 Site design measures to improve stormwater quality

Responsible Department/Person:

Planning Board

Measurable Goal(s):

Improved design features for new development.

Progress on Goals- Year 9:

The adoption of local ordinances (See BMP 4-3) have provided planning review processes with guidance for appropriate design practices, in addition to BMP 2-5

Goal Status:

Ongoing

5.0 Pollution Prevention and Stormwater Management Strategies.

BMP 5-1 Develop a Formal Training Program for DPW Staff

Responsible Department/Person:

DPW, Human Resources Dept.

Measurable Goal(s):

Staff Training

Progress on Goals- Year 9:

The City has hired additional staff for the DPW and a dedicated vehicle is equipped with the necessary items for IDDE Plan implementation and overall program needs. A trained crew has also been established to aggressively maintain the catch basin cleaning, inspection and data collection program. This crew has been assigned to work with NCA and the Malden Engineering Department in meeting the objectives of the IDDE Plan and General Permit Program compliance. This team has been responsible for the identification of numerous water main leaks, resolution of illicit connections and repair of infrastructure components, all of which is directed towards the improvement in the quality of the City's stormwater discharges. All compliance team members have been trained in the use of GIS mapping equipment.

Goal Status:

Achieved and ongoing

BMP 5-2 Maintain Lawn Care Policy

Responsible Department/Person:

DPW, School Dept., Cemetery Dept

Measurable Goal(s):

Proper utilization of pesticides, herbicides, fertilizers and appropriate disposal of lawn trimmings, yard waste

Progress on Goals- Year 9:

The application of pesticides, herbicides and fertilizers is provided by a licensed outside contractor, supervised by the MDPW. All other lawn care for recreational areas is maintained by the MDPW.

Goal Status:

Ongoing activity

**BMP 5-3 Development of a maintenance and monitoring plan for open channel component of
Town Line Brook**

Responsible Department/Person:

Eng. Dept., DCR & Compliance Team

Measurable Goal(s):

Removal of excess sediment deposits, restoration of flow capacity, structural repair.

Progress on Goals- Year 9:

To-date, no response or maintenance activities by DCR have been noted. The extent of damage to the concrete wall of this trapezoidal channel remains a significant concern, in that further delays are likely to result in costly damages that could be avoided through proper attention. The reduction of inflow conveyance capacity, due to significant sediment deposits and vegetative growth area also key issues of concern.

Goal Status:

No Action

**BMP 5-4 Implementation of recommended maintenance and monitoring plan developed for
Spot Pond Brook at Oak Grove.**

Responsible Department/Person:

Eng. Dept., DPW & DCR

Measurable Goal(s):

Implementation of those recommendations contained within engineering study completed by Meridian Associates, Inc.

Progress on Goals- Year 9:

No planned maintenance activities occurred during this reporting period.

Goal Status:

Funding for necessary improvements and attention by DCR will be requested.

BMP 5-5 Expansion of programs such as the Fellsmere Pond restoration initiative

Responsible Department/Person:

Mayor's Office, Compliance Team DPW

Measurable Goal(s):

Water quality improvement

Progress on Goals- Year 9:

During this Permit year, native plantings were placed along Fellsmere Pond by Beebe School children and Tri-CAP. In addition, an informational kiosk was installed within the park area of Fellsmere Pond, which outlines how Fellsmere Pond Hydrology is connected to the Mystic River Watershed and how Stormwater Pollution affects the pond. (See BMP 1-4).

Goal Status:

The Fellsmere project has been completed and two recreational projects involving significant improvements to the City's drainage system and existing playing field surfaces are ongoing.

BMP 5-6 Comprehensive catch basin inspection, inventory, maintenance program

Responsible Department/Person:

Eng. Dept., DPW & Compliance Team

Measurable Goal(s):

Electronic logging of CB locations, documentation of CB construction and functional characteristics, recommendations for improved performance standard compliance at individual locations or tributary segments of the drainage system.

Progress on Goals- Year 9:

During the 2011-2012 permit year,

GIS mapping and identifying repair issues along with assisting with a re-design to add structures in low-lying areas.

Goal Status:

Achieved and Ongoing

BMP 5-7 Continue sewer re-lining and connection upgrade program

Responsible Department/Person:

Eng. Dept. & DPW

Measurable Goal(s):

Reduction in I/I, identification of potential illicit connections, assist in infrastructure needs analysis

Progress on Goals- Year 9:

A capacity assessment has been completed by CDM Smith for the Malden sanitary sewer system. This assessment included the monitoring of flows and depths at key locations throughout the system. A hydraulic model has also been constructed of the main sewers in the City including those owned by MWRA. The model has been calibrated to measured flows and is being used to project the response of Infiltration and inflow (I/I) to assess potential capacity deficiencies. Preliminary results indicate that some portions of the City's system do have excessive I/I when a 1 year design storm is applied (as per MADEP protocol). However, the hydraulic capacity of the pipes can convey these flows downstream without showing signs of overflows. A draft report is soon to be completed which will document the capacity assessment process.

CDM, on behalf of the City, has prepared a Phase 3 SSES report that includes a summary of findings and proposed recommendations to mitigate excessive infiltration and inflow into the City's sewer system. This report was presented for approval to MWRA during this permit year. Approval was received together with necessary funding.

Goal Status:

Ongoing activity

BMP 5-8 Development and implementation of communication/notification plan for SSOs

Responsible Department/Person:

Eng. Dept. & DPW

Measurable Goal(s):

Notification of U.S. EPA and MDEP within 24 hours of event occurrence

Progress on Goals- Year 9:

No SSOs were identified during Year 9.

Goal Status:

Achieved and Ongoing

6. Pollution Prevention and Good Housekeeping in Municipal Operations

BMP 6-1 Regular meetings of Compliance Team to review plan implementation results
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Responsible Department/Person:

Compliance Team

Measurable Goal(s):

Data evaluation and review, implementation of corrective actions, and prioritization of mitigation measures.

Progress on Goals- Year 9:

Stormwater management requirements, compliance enforcement and ongoing working practices are now a regular agenda item at Department Head meetings. There is daily interaction with key members of the Compliance Team.

Goal Status:

Achieved and Ongoing

BMP 6-2 Annual Compliance review

Responsible Department/Person:

Compliance Team & Mayor's Office

Measurable Goal(s):

Identification of capital plan improvements, modification of plan and objectives, documentation of plan activity for Annual Report.

Progress on Goals- Year 9:

This document together with the development of a working GIS system represents major milestones that serve to demonstrate the extent of efforts that have been undertaken by the City of Malden to achieve the goals and objectives of the MS4 program. In that recent focus upon stormwater quality in addition to quantity has become a focal point of daily work practices. This is evidenced by both the timing and extent of infrastructure repairs that have been completed and the significant advancement of municipal needs that has been achieved.

Goal Status:

Ongoing

Part IV. Summary of Information Collected and Analyzed

See Attachment B

Part V. Program Outputs & Accomplishments (Optional)

1. Programmatic (See BMPs 1-4 and 5-1)

1.1	Stormwater management position created/staffed	Compliance Team Established
1.2	Annual program budget/expenditures	\$ 670,000 – 700,000

2. Education Community Involvement and Training (See BMPs 1-1, 1.2, 1-4, and 1-5)

2.1	Estimated number of residents reached by education program(s)	75%
2.2	Stormwater management committee established	Yes
2.3	Stream teams established or supported	Yes
2.4	Shoreline clean-up participation or quantity of shoreline miles cleaned	2 Miles
2.5	Household Paint Waste Collection Days	
	Days sponsored	4 Days
	Community participation	45%
	Material collected	\$15,200
2.6	School curricula implemented	Yes

3. Legal/Regulatory (See BMPs 2-5 and 3-6)

3.1	Regulatory Mechanism Status	
	Illicit Discharge Detection & Elimination	Adopted
	Erosion & Sediment Control	Adopted
	Post-Development Stormwater Management	Adopted

4. Mapping and Illicit Discharges (See BMPs 2-4)

4.1	Outfall mapping complete	All Known-100%
4.2	Estimated or actual number of outfalls	65
4.3	System-Wide mapping complete	
	Sewer-Paper/Mylar	100%
	Sewer-GIS	100%
	Drain-Paper/Mylar	100%
	Drain-GIS	
4.4	Outfalls inspected/screened	100%
4.5	Illicit discharges identified	9
4.6	Illicit connections removed	60 GPD (est.)
4.7	% of population on sewer	99.6%
4.8	% of population on septic systems	0.4%

5. Construction

5.1	Number of construction starts (>1-acre)	2
5.2	Estimated percentage of construction starts adequately regulated for erosion and sediment control	2
5.3	Site inspections completed	4
5.4	Tickets/Stop work orders issued	None
5.5	Fines collected	None
5.6	Complaints/concerns received from public	None

6. Post-Development Stormwater Management

6.1	Estimated percentage of development/redevelopment projects adequately regulated for post-construction stormwater control	100%
6.2	Site inspections completed	6
6.3	Estimated volume of stormwater recharged	

7. Operations and Maintenance (See BMPs 5-1)

7.1	Average frequency of catch basin cleaning (seasonal) (non-commercial/non-arterial streets)	5 days a week
7.2	Average frequency of catch basin cleaning (commercial/arterial or other critical streets)	5 days a week
7.3	Total number of structures cleaned	200
7.4	Storm drain cleaned	500 LF
7.5	Qty. of screening/debris removed from storm sewer infrastructure	450 tons
7.6	Disposal or use of debris (landfill, POTW, compost, recycle for sand, beneficial use, etc.)	Haverhill LF
7.7	Cost of screening disposal	NA
7.8	Average frequency of street sweeping (non-commercial/non-arterial streets)	6 days a week
7.9	Average frequency of street sweeping (commercial/arterial or other critical streets)	6 days a week
7.10	Qty. of sand/debris collected by sweeping	900 tons
7.11	Disposal or use of sweepings (landfill, POTW, compost, recycle for sand, beneficial use, etc.)	Haverhill LF
7.12	Cost of sweeping disposal	NA
7.13	Street sweepers purchased/leased	0
7.14	Street sweepers specified in contracts	0
7.15	Reduction in application on public land of: ("N/A" = never used; "100%" = elimination) Fertilizers (State regulations require applicators (license which City does not currently have) Herbicides Pesticides	100% None None

7.16	Anti/De-Icing precuts and rations	Salt 98%
		Sand 2%
		CaCl ₂ 100 gals/30 tons
	5000 gallon tank	CaCl ₂ -100%
7.17	Pre-wetting techniques utilized	Yes
7.18	Manual control spreaders used	No
7.19	Automatic or Zero-velocity spreaders used	Yes
7.20	Estimated net reduction in typical year salt application	15%
7.21	Salt pile covered	Yes

ATTACHMENT A

Environmental Engineering and Land Use Planning

ATTACHMENT B

Environmental Engineering and Land Use Planning

CITY OF MALDEN

Illicit Discharge Detection and Elimination Program Semi-Annual Status Report

July 1, 2011 – December 31, 2011

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TABLE OF CONTENTS

1.0	Introduction	1
2.0	Documented Illicit Discharges and Connections	2
3.0	Overview of IDDE Activities: July 2011 – December 2011	2
3.1	Targeted Dry Weather Inspection / Sampling Program (NCA)	3
3.1.1	Malden River Watershed	4
3.1.1.1	Little Creek	5
3.1.2	Town Line Brook Watershed	6
3.1.3	Linden Brook Watershed	6
3.1.4	Saugus Branch Watershed	7
3.2	Drainage System Mapping-IDDE Inspection Program (MDPW)	7
3.3	Inflow Infiltration Sewer System Evaluation & Capacity Analysis	7
3.4	Drainage System Maintenance/Repair (MDPW)	9
4.0	Sanitary Sewer Overflows (SSO's)	9
5.0	Evaluation of IDDE Program Goals and Objectives	9

TABLES

Table 1.0	Summary of Illicit Connections/Discharges Identified as of 12/31/2011
Table 2.0	Summary of Dry Weather E. Coli Concentrations

FIGURES

- Figure 1 Illicit Discharge Locations
- Figure 2 Dry Weather Inspection Areas - NCA
- Figure 3 Dry Weather Inspection Areas - NCA/MDPW
- Figure 4 Dry Weather Flow Map
- Figure 5 Malden River Outfalls
- Figure 6 Lower Spot Pond Brook Outfalls
- Figure 7 Town Line Brook Outfalls
- Figure 8 Sewer Survey Plan

ATTACHMENTS

- Attachment A MS4

1.0 INTRODUCTION

The City of Malden has developed and continues to maintain an Illicit Discharge Detection and Elimination (IDDE) Program that is directed towards the improvements of surface water quality through the mitigation of illegal and unsuitable discharges through its municipal stormwater conveyance network. This semi-annual status report for the period of 1 July through 31 December 2011 has been prepared through the cooperative efforts of the City of Malden Engineering Department, the City of Malden Department of Public Works (MDPW) and Nangle Consulting Associates, Inc. (NCA) to document key program tasks completed during this reporting period. The City of Malden's IDDE plan was developed to facilitate the implementation of a systematic and iterative procedure for the evaluation of the storm drainage infrastructure to not only identify the presence of illicit discharges, but to implement necessary repairs. Since its inception, the City's IDDE program has identified illicit discharges/connections to the municipal drainage system, reduced significant potable water losses due to the detection of leakages and aided in the completion of extensive repairs to the drainage infrastructure. This effort has also supported the City of Malden's GIS mapping and catch basin cleaning/repair program through the integration of dry weather inspections and outfall sampling.

The goals and objectives of this IDDE plan are directed towards the reduction in the historic bacteria levels at selected outfalls within the City, particularly during wet weather conditions. The results of dry weather inspections, together with both dry and wet weather sampling, support the opinion that wet weather loadings are tied to the age and condition of the municipal infrastructure, major portions of which were installed during the late 1800's and early 1900's. The integration of the goals of this IDDE Plan into daily work practices by City personnel has resolved many of infrastructure deficiencies and direct response mitigation/repair measures have led not only to the removal of illicit connections/discharges, but improved flow conveyance to eliminate historic flooding concerns.

As stated above, the City Engineering and Public Works Departments have coordinated their efforts and together with outside technical assistance, have developed a program that integrates the implementation of the IDDE Plan into the routine daily work practices. In addition to the mitigation measures identified above, the results of the IDDE program have advanced the efficiency of capital planning and infrastructure improvements. This report has been prepared to document and summarize IDDE activities that have been undertaken by the City during the July 2011 through December 2011 reporting period and identify key goals and objectives to be considered during future phases of plan implementation. During this reporting period, the comprehensive GIS mapping program, which was initially developed by NCA and expanded upon by Camp, Dresser and McKee (CDM), has been brought on line for use by City personnel. Utilizing the data and information obtained during this reporting period, an updated work plan of prioritized tasks for the next 6 month period has also been prepared and is included within Section 5.0 of this report.

2.0 DOCUMENTED ILLICIT DISCHARGES AND CONNECTIONS

During this reporting period, no illicit discharges were identified. A summary of the illicit discharges/connections identified to date is presented on Figure 1 and Table 1.0.

3.0 OVERVIEW OF IDDE ACTIVITIES (JULY 2011 – DECEMBER 2011)

The City of Malden's IDDE program incorporates the use of three (3) primary measures to identify and mitigate illicit discharges to its municipal drainage system which may be described as follows:

- (1) Targeted dry weather inspections by representatives of the Stormwater Compliance Team
- (2) Detailed inspection of the municipal infrastructure during the daily implementation of the catch basin clean-out and drainage system mapping program.
- (3) Response to public, private or governmental agencies reports of possible sudden and/or identified discharge to the municipal storm system.

As described in the City's 2009 IDDE work plan, targeted dry weather inspections are driven in large part by the results of dry and wet weather sampling at outfalls which discharge to surface water conveyances, principally the Malden River, Lower Spot Pond Brook, West End (Edgeworth Brook) Culvert, Little Creek, Linden Brook and the Town Line Brook. To provide a basis for the iterative dry weather inspection program and the observations recorded during this reporting period, the following excerpt from the City's IDDE work plan describes the methods and prioritization procedure maintained for this ongoing mitigation measure;

- Based upon the initial outfall monitoring data obtained, the City is currently implementing a Rapid-Assessment Prioritization approach through the targeted assessment of dry-weather flows in several areas within the City. Specifically the major tributaries to the most significant volume dry weather discharges to the Town Line Brook and the Malden River have been identified and sampled at key junction locations to initially determine the dry weather contributions from adjacent communities through major flood control infrastructure that is routed through the City of Malden.

By design, the observations recorded during each reporting period and corresponding recommended work plan tasks serve as the basis for updates and modifications to the original IDDE work plan. The IDDE program maintained by the City is an ongoing and iterative effort that has successfully demonstrated the capability to quickly respond to water quality issues as needs and concerns are identified.

As described in further detail within Section 3.2 of this status report, the City of Malden, has invested significant time and capital funding to develop a Stormwater Compliance Team compiled of members of the Department of Public Works, Engineering and outside technical support. Key tasks performed by this group includes the systematic cleaning of catch basins, mapping of infrastructure system components, logging of component attributes, identification of infrastructure needs, identification and response to illicit discharges, posting of outfall signage, general system maintenance and mitigation of environmental conditions of concern as they are being identified.

Through department head meetings, public outreach, postings of signage and daily work practices, a general awareness of the need for response to illicit discharges has been developed as the third component of the City's IDDE program. Contact information is readily available through a variety of media, including mailings and web site postings to ensure implementation of appropriate response measures by members of the Stormwater Compliance Team. Public outreach has also included active participation by the Compliance Team through community workshops, educational presentations and regional watershed meetings. During this reporting period a significant milestone in public awareness was reached through the inclusion of community leaders, educational partners, and the general public in a comprehensive presentation of issues and opportunities pertaining to the Malden River hosted by Tri-City Community Action Program, Inc. (Tri-CAP)

3.1 Targeted Dry Weather Inspection/Sampling Program (NCA)

Representatives of NCA and MDPW personnel continue to conduct targeted dry weather inspections of the City's infrastructure. This is an interactive or systematic program that has extended across the entire City, resulting in the identification and correction of infrastructure deficiencies and improvements to the general quality of stormwater discharges. Areas selected for inspection are generally based upon the results of the outfall sampling program and/or the identification of dry weather flows by MDPW staff during their routine maintenance and infrastructure locating program. Dry weather inspections conducted during this reporting period have not revealed any illicit discharges, or connections. A map depicting the approximate locations where targeted dry weather inspections have been conducted by NCA to date is presented as Figure 2. Areas inspected by DPW staff for illicit connections/discharges consist of portions of the infrastructure that are addressed during the catch basin cleaning program. During this effort, infrastructure components are mapped and the corresponding attributes are located. During this reporting period, the frequency of dry weather inspections by MDPW personnel was hindered due to a serious injury to the team leader. Overall portions of the municipal infrastructure that have been addressed by the compliance team including the targeted subset areas are summarized on Figure 3.

During the course of the dry weather inspections, a number of dry weather flows, consisting primarily of waterline leaks and culverted surface waters have been identified. A summary of these flows within the municipal system that have been identified to date are shown on Figure 4, and are described as follows.

- Flow 1 – City of Medford water line leak (**removed**)
- Flow 2 – Groundwater breakout near St. Mary's Street
- Flow 3 – Fellsmere Reservation base flow
- Flow 4 – Malden River surcharge (submerged invert)
- Flow 5 – DCR Spot Pond Brook base flow
- Flow 6 – Base flow, Forestdale-Pine Banks Park
- Flow 7 – Groundwater breakout, illicit discharge (**removed 8/09**)
- Flow 8 – Waterline Leak (**removed**)
- Flow 9 – Groundwater breakout
- Flow 10 – Linden Brook base flow
- Flow 11 – LSP-4 dry weather flow

Consistent with the original objectives of the IDDE program, the focus of the dry weather sampling effort was initially directed towards those portions of the infrastructure that discharge to the Malden River. Since that time, the IDDE Program has been expanding to include the Town Line Brook, Linden Brook and the Saugus Branch systems. Key observations and/or conditions that have been identified are summarized below;

3.1.1 Malden River Watershed

The City of Malden's stormwater compliance team initially targeted potential illicit discharges to the Malden River as its highest priority. Utilizing the outfall monitoring data and information obtained during sampling events, the City has identified significant base flow as surface waters, to the Malden River during dry weather conditions. Consistent with the original design of the MDC/DCR conveyance network; this occurs primarily through culverted channels/brooks located in northwestern portions of the City. This flow includes contributions that originate from the Fells Reservation and Lower Spot Pond Brook. As shown on Figure 5, a total of 23 outfalls to the Malden River have been identified, nine (9) of which have been identified as flowing during dry weather conditions. Periodic dry weather sampling has been performed both by NCA and the regional watershed group, Mystic River Watershed Association (MyRWA). Reference to Table 2.0, shows that during this reporting period, E. coli levels ranged from 4.1 col/100ml (MR-6) to 9,200 col/100ml (MR-0). In addition to the level detected at MR-0, concentrations of E. coli were also encountered at MR-1 (390 col/100ml) and MR-2 (1,200 col/100ml).

As stated above, in addition to monitoring information collected by the City, dry weather monitoring data was also collected from the Malden River by the MyRWA in April of 2011. The following excerpt was taken from the MyRWA technical report entitled "Bacterial Assessment: Malden River and Little Creek Survey" prepared on 23 June 2011.

On April 21, 2011 MyRWA conducted a dry weather sampling event along the Malden River and Little Creek. During this sampling event, MyRWA collected twelve water samples and tested them for bacteria levels to identify potential sources of contamination that could affect water quality in the surface water bodies. MyRWA tested eleven sites located in Malden, and one site in Medford.

MAR19NE and MARNES were sources of contamination to the Malden River, with E. coli levels of 5,199 and 1,462 MPN/100mL, respectively. Both these sites have had consistently high E. coli values in the past, as shown in the archive tables. MARx29 also contributed to the impairment of Malden River with bacteria levels of 1,230 MPN/100mL.

To assist in the evaluation of data obtained by the City and MyRWA, the following table has been prepared to compare proximate sample locations collected by both organizations.

Sample Designation	E. Coli (MF) (col/100ml)	Sample Designation	E. Coli (MF) (col/100ml)
City 12/13/2011		MyRWA 4/21/2011	
MR-0	9,200	MAR19NE	5,199
MR-1	390	MAR019	475
MR-2	1,200	-	-
-	-	MARNEN	839
-	-	MARNES	1,462
MR-4	220	MARx25	12
MR-9	-	MARx28	ND
MR-11	ND (1.0)	COMCAST	ND
MR-12	59	MARx29	1,230
LC-0	65	-	-
LC-1	-	LIC003N	422
LC-2	-	LIC003S	80

As shown, bacteria loading concentrations detected by both the City and MyRWA were fairly consistent during the last reporting period. E. Coli levels encountered within the northern portion of the Malden River (MR-0/MAR19NE and MR-1/MAR019) included contributions that originate from the Fells Reservation and Lower Spot Pond Brook. In addition, MR-2, MARNEN and MARNES were collected from a culvert the originates in the Saugus Branch watershed. The City will continue to monitor these outfalls and evaluate potential source contributions.

During the last reporting period, the Stormwater Compliance Team conducted several dry weather sampling events within the Lower Spot Pond Brook Culvert. However, due to high base flow with the Lower Spot Pond Brook channel, a full assessment of all outfalls was not completed. At this time, a comprehensive evaluation of the flow conveyance network within the Elrich Drive residential complex is being completed due to consistently high E. coli levels at outfall LSP-4 (Figure 6). As indicated on Table 2.0, an E. coli level of 17,000 col/100ml was detected during the 4 August 2011 sampling event. As described in prior reports, upstream sampling has revealed significantly lower bacteria levels and smoke/dye testing is being arranged to isolate contributing flows to this discharge.

3.1.1.1 Little Creek

On 13 December 2011, in conjunction with the dry weather sampling event within the Malden River, dry weather sampling was performed at the culvert at Little Creek. An E. coli level of 65 MPN/100ml was detected at BLANK X that time. As referenced within the prior status report, a sample from the northern outfall of Little Creek (LC-1) was to be collected to determine if discharge from upstream manhole C46-MH19 was impacting Little Creek surface water. However, the outfall was inaccessible.

3.1.2 Town Line Brook Watershed

Town Line Brook begins as surface runoff near the Malden and Everett city boundary and is culverted until it daylights into an open concrete lined trapezoidal channel at Broadway. Base flow conditions exist within Town Line, which emanate from culverted flows that originate in the Town of Everett. Significant tidal influences also exist in the form of an approximate 2-3 foot change in surface water elevation between Broadway and the remaining length of the culvert to the Revere City line. As shown on Figure 7, a total of 29 outfalls to Town Line Brook have been identified; four (4) of which were observed flowing during the dry weather event conducted on 8 November 2011.

The historic monitoring data of Town Line Brook at Broadway has revealed relatively uniform bacteria levels during dry weather sampling events. Several outfall locations have consistently contained bacteria loadings during dry weather sampling events. These are identified as TL-0, which is base flow where the Town Line Brook daylights at Broadway, Trifone Brook (TL-24), which discharges into Town Line from Everett and outfall TL-9, which serves the lower portion of Hadley Street and the City of Everett. A comprehensive investigation of the Hadley Street system has been performed as described in previous submittals. This scope of work confirmed that bacteria loadings were entering the system from the City of Everett.

As shown on Table 2.0, the most recent dry weather sampling event at Town Line Brook on 8 November 2011 revealed E coli levels ranging from 8.5 col/100ml (TL-3) to 96 col/100ml (TL-0). It should be noted that Trifone Brook (TL-24) was not sampled, as the water proximate to the discharge point into Town Line Brook was stagnant. This is most likely due to significant tidal changes that have been noted in the past. Based upon the data obtained, three (3) major sources of dry weather bacteria loading to the open channel portion of Town Line Brook have been identified, including culverted flows from the City of Everett, discharges from storm drainage within lower Hadley Street, in Everett (TL-9), and from Trifone Brook (TL-24). As stated previously, mass balance sampling has been performed at Hadley Street to the Everett city line and contributions from both Trifone Brook and the upper most sampling location for Town Line Brook suggest that these contributions are emanating from areas outside the City of Malden. The monitoring of these outfalls will be continued during future reporting periods.

3.1.3 Linden Brook Watershed

Linden Brook Culvert is the major stormwater conveyance network located in northeasterly portions of the City. Dry weather inspections have revealed base flow throughout the culvert at all times, with E. coli levels detected within the middle portions of the culvert (D17-MH1 and H43-MH1). An inspection of tributary drainage lines in the area has not revealed any dry weather flows discharging to the culvert and the continued investigation of flow characterization will be performed during the next reporting period.

3.1.4 Saugus Branch Watershed

The Saugus Branch watershed services central and adjacent portions of Malden and begins proximate to Broadway, then flowing westerly to its outfall at the Malden River. Historic sampling of surface water quality at this discharge location has revealed low to moderate bacteria levels, with the exception of E. coli levels observed during dry and wet weather events in 2010. It appeared that these results were reflective of contributions from the significant surcharge of the MWRA sewer system during the heavy rainfall events which occurred in the spring of 2010. During the December 2011 sampling event, E. coli concentrations were encountered at MR-2 (1,200 col/100ml). Additional sampling will be performed during the next reporting period to evaluate this in further detail.

3.2 Drainage System Mapping-IDDE Inspection Program (MDPW)

The City has converted and updated a majority of its current storm drain system mapping to GIS format using field GPS receivers. Drainage infrastructure is located and inventoried as a part of ongoing system wide maintenance, service and inspection program being implemented by the MDPW. During routine maintenance activities, structures are located and key attributes of the systems features are recorded. Information pertaining to the structure type, condition, inlet/outlet size(s) and type(s) and workability are recorded. As identified previously, the stormwater compliance Team leader was injured during this reporting period; however the MDPW mapped 33 catch basins in conjunction with repairs to the drainage network. In addition to this data collection process, MDPW personnel are also inspecting drainage system components for indications of dry weather flow, as well as illicit discharges or connections. Upon encountering any indications of the potential for illicit discharges to the storm drain system, the MDPW personnel notify engineering personnel to investigate.

The information collected by MDPW is continually compiled in a GIS stormwater drainage system database. Further, information collected during this process can also be utilized by MDPW to prioritize repairs and assist in Capital Improvement Planning. During the implementation of this program numerous structural deficiencies and line blockages have also been identified by the Compliance team. A summary of infrastructure repairs and maintenance tasks may be referenced from Section 3.4. A substantial benefit that has been achieved is the direct response mitigation of these conditions, which have been reflected in the significant reduction of flooding concerns within the City.

3.3 Inflow Infiltration Sewer System Evaluation & Capacity Analysis

The City of Malden now maintains a strategic GIS Implementation plan that was developed with the assistance of CDM. The City of Malden has also completed through a comprehensive Infiltration and In-flow (I&I) study for its municipal sewer system. A City of Malden sewer survey plan depicting the Phase 3 study area, the final component of this plan, together with previously completed areas of study, is presented as Figure 8. As stated below, the first component of this plan, Phase 3 of this SSES program has included the following specific tasks, as outlined by CDM.

Phase 3 SSES

In the spring of 2010, a flow isolation program was conducted in what has been identified as the "Phase 3 Area" within the City. The Phase 3 Area represents the final of a 3 phase SSES program that intends to identify and mitigate infiltration and inflow (I/I) in the City. The attached figure depicts the Phase 3 Area. Approximately 246,000 linear feet of sewer was flow isolated that resulted in the identification 1,446,562 GPD of infiltration. The flow isolation data was also evaluated to determine the limits of follow up close circuit television inspection (CCTV). As a result, approximately 28,754 linear feet of sewer was CCTV inspected in the summer and fall of 2010. Currently, COM on behalf of the City is preparing a Phase 3 SSES report that includes a summary of findings and proposed recommendations to mitigate excessive infiltration and inflow into the City's sewer system. The report is expected to be finalized in early 2011. It is also anticipated that the City will implement design and construction recommendations in 2011/2012.

The SSES program is being funded primarily through the MWRA Infiltration and Inflow Local Financial Assistance Program. According to the MWRA III Local Financial Assistance Program funding summary as of May 2010, the City has a balance of \$2,132,000 available. Further, according to a letter dated December 9, 2009 from the MWRA to the City of Malden, the City maintains a balance of interests totaling \$898,300.04 therefore the total funding available to the City through the MWRA III Local Financial Assistance Program is \$3,030,300.04.

In conjunction with the completion of a photometric survey CDM initiated a comprehensive flow measurement study for the municipal sewer system for use in the completion of the capacity assessment that will identify system deficiencies, with the overall goal of reducing the potential of SSOs within the City. An overview of this program, as prepared by CDM is outlined below.

Wastewater Collection System Capacity Assessment

In response to the ACO, the City is performing a capacity assessment of its wastewater collection system. This involves development of a dynamic hydraulic model of the City's wastewater collection system to evaluate the interceptor sewers and to support the capacity assessment. The model will be integrated into the GIS system to allow it to be viewed in conjunction with other geographic data and facilitate electronic data collection and analysis now and in the future. Development of the hydraulic model includes two primary activities that include data collection and model development and calibration. The data collection effort includes obtaining physical system data, reports, and electronic flow metering records to support model development. The model development and calibration effort will help prepare a dynamic computer model of the wastewater collection system and calibrate the model using existing measured flow data. To date, an extensive flow metering effort has been completed. In the spring of 2010, 20 flow meters were installed at key locations within Malden's sewer system further the City has coordinated with the MWRA and obtained integral flow meter data, collected from 2005 through 2010, for the 8 MWRA meters in the City. The City's flow metering program and meter data obtained from the MWRA will be used to calibrate the proposed hydraulic models to develop accurate baseline conditions. further, the City is updating wastewater collection system mapping that accurately represents pipe connectivity, pipe sizes, pipe invert elevations, and pipe materials for all pipes 10-inches in diameter and greater. This map will be the basis for the hydraulic model. The sewer system developed for the hydraulic model is expected to be completed in 2011.

An update on the status of the Wastewater Collection System Capacity Assessment has been prepared by CDM and is as follows:

A capacity assessment is currently being completed by CDM Smith for the Malden sanitary sewer system. This assessment includes monitoring flows and depths at key locations throughout the system. A hydraulic model has also been constructed of the main sewers in the City including those owned by MWRA. The model has been calibrated to measured flows and is being used to project the response of Infiltration and inflow (I/I) to assess potential capacity deficiencies. Preliminary results indicate that some portions of the City's system do have excessive I/I when a 1 year design storm is applied (as per MADEP protocol). However, the hydraulic capacity of the pipes can convey these flows downstream without showing signs of overflows. A draft report is soon to be completed which will document the capacity assessment process.

3.4 Drainage System Maintenance/Repair (MDPW)

In addition to the inspection and mapping program, during this reporting period MDPW personnel performed the following drainage system maintenance/repair activities.

- Cleaned 200 catch basins
- Cleaned 39 drain manholes
- Rodded 790 feet of laterals
- Repaired 33 catch basins
- Repaired 6 storm manholes
- Repaired 90 feet of collapsed laterals

During this reporting period, the following specific tasks have also been completed by the stormwater compliance team to further the goals of the IDDE program.

- Collected and disposed of 700 tons of street sweepings
- Collected 400 tons of catch basin sediments.
- Hosted 2 educational days at the Bebe School.
- Organized a cleanup of St. Mary's Brook with Malden students.
- MDPW continues to train employees to access the GIS storm water map.
- Stenciled 1,500 catch basins.
- Permanent outfall signage was installed by the MDPW at all outfall locations.
- 26 catch basin covers were stolen from various Malden Streets, all have been replaced.

4.0 SANITARY SEWER OVERFLOWS (SSO'S)

No SSOs were identified during this reporting period.

5.0 EVALUATION OF IDDE PROGRAM GOALS AND OBJECTIVES

The results of the IDDE program continue to support the opinion that wet weather contributions, or infiltration/exfiltration during high rainfall events, represent the majority of bacterial loading detected at outfalls to surface waters within the City. As described in prior reports, the foundation for this condition was set once open channel surface waters were culverted by the DCR (formerly the MDC). This flood control/early development program began during the late 1800's and has included the culverting of Spot Pond Brook, West End (Edgeworth) Brook, Linden Brook, and Town Line Brook and Little Creek.

This IDDE program is part of a much larger effort directed towards the improvement of stormwater quality that is being performed under the City of Malden's MS4 program. A copy of the annual status report that pertains to the 2010 – 2011 permit year may be referenced as Attachment A. As stated therein, the City has met a majority of the proposed provisions of the 2010 North Coastal permit and greatly advanced its efforts to meet the goals of the IDDE program through the implementation of ordinances, staffing and funding. The Stormwater Compliance Team's Rapid Assessment Program has successfully isolated illicit discharges and completed comprehensive repairs to the municipal system.

Overall, the City has greatly advanced its capacity to meet the goals of the IDDE program through the development of a dedicated stormwater team. Each member of the Compliance Team has been trained in the use of field mapping equipment and the guidance provided in the IDDE work plan. Building upon the foundation established during previous reporting periods and ongoing implementation of the City wide GIS system, IDDE plan implementation is now an integral component of daily activities. In addition to the catch basin inventory and cleanout program, ongoing and proposed tasks to be addressed during the next biannual reporting period include the microscale investigation of the infrastructure contributing to outfall LSP-4, flow isolation and possible dye tracing of the Linden Brook system, targeted dry weather inspections of the Saugus Branch watershed and the isolation of dry weather flows to Little Creek. Further, data obtained from the January 2012 dry weather sampling event will be evaluated relative to historic trends.

Table 1.0 Dry Weather Conditions - E. Coli Concentrations

Site Location, Outfalls/Manholes Malden, MA

Sample Description: Water

Sample Designation	E. Coli (MF)												
	(col/100ml)												
	9213D												
	ACTION LEVEL- 235 col/100ml												
	09/12/06	09/11/07	9/24/2008	4/17/2009	6/25/2009	8/6/2009	7/29/2010	8/4/2010	8/10/2010	8/31/2010	8/4/2011	11/8/2011	12/13/2011
Malden River													
MR-0	150	1,100	-	68	-	-	110	-	-	-	-	-	9,200
MR-1	-	160	-	-	-	-	130	-	-	-	-	-	390
MR-4	-	-	-	-	-	-	-	-	-	-	-	-	220
MR-5	-	-	-	-	-	-	-	-	-	-	-	-	9.7
MR-6	-	-	-	-	-	-	-	-	-	-	-	-	4.1
MR-11	-	-	-	-	-	-	-	-	-	-	-	-	ND (1.0)
MR-12	-	-	-	-	-	-	-	-	-	-	-	-	59
Saint Mary St. ¹	-	110	-	-	-	-	-	-	-	-	-	-	-
LSP-0-Channel ²	-	460	-	-	-	-	-	10,000	-	2,000	-	-	-
LSP-3	-	-	-	-	-	-	-	-	-	-	-	-	-
LSP-4	-	-	-	-	-	-	-	14,000	-	2,000	17,000	-	-
LSP-5.1-Channel ²	-	630	-	-	-	-	-	-	-	-	-	-	-
LSP-9	-	-	-	-	-	-	-	-	-	-	-	34	-
LSP-10-Channel ²	-	350	-	-	-	-	-	4900	-	-	-	-	-
C39-MH0.1	-	-	-	-	-	ND (2.0)	-	-	-	-	-	-	-
E2-MH2	-	-	-	ND (2.0)	-	-	-	-	-	-	-	-	-
E2-MH1	-	-	-	ND (2.0)	-	-	-	-	-	-	-	-	-
H16-MH13	-	-	-	-	-	25	-	-	-	-	-	-	-
H16-MH17	-	-	-	-	ND (2.0)	ND (2.0)	-	-	-	-	-	-	-
H25-MH2	-	-	-	-	16	-	-	-	-	-	-	-	-
M3-MH2	-	-	-	-	-	-	-	-	-	98	-	-	-
M3-MH4	-	-	-	-	-	-	-	-	-	2,400	-	-	-
M8-MH3	-	-	-	5,100	-	ND (2.0)	-	-	-	-	-	-	-
M26-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-
P36-MH5	-	-	3,500	-	-	-	-	-	-	-	-	-	-
R18-MH1	-	-	-	-	-	290	-	-	-	-	-	-	-
S29-MH3	-	-	96	-	-	-	-	-	-	-	-	-	-
W25-MH1	-	-	-	-	-	2.0	-	-	-	-	-	-	-
Little Creek													
LC-0	7	140	-	ND (2.0)	-	-	190	-	-	-	2,400	-	65
Town Line Brook													
TL-0 ³	1,500	280	-	62	-	-	730	-	-	-	-	96	-
TL-1	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-
TL-3	-	-	-	-	-	-	-	-	-	-	-	8.5	-
TL-5	-	-	-	-	-	-	-	2,400	-	-	-	-	-
TL-9	640	-	-	-	-	-	-	8,200	-	-	-	130	-
TL-13	30	70	-	-	-	-	-	-	-	-	-	ND (1.0)	-
TL-24	520	1,500	-	-	-	-	-	24,000	-	-	-	-	-
TL-BL-EV	440	740	-	-	-	-	-	-	-	-	-	-	-
S3-MH12 ³	-	2,200	-	-	-	-	-	-	-	-	-	-	-
L23-MH1	-	-	-	3	-	-	-	-	-	-	-	-	-
Saugus Branch													
MR-2	-	ND (2.0)	-	-	-	-	220	-	-	1,100	-	-	1,200
Broadway/Eastern ⁴	-	140	-	-	-	-	-	-	-	-	-	-	-
Linden Brook													
C36-MH1	-	-	-	-	-	-	160	-	-	-	-	-	-
D17-MH1	-	-	-	-	-	-	1,200	-	360	-	-	-	-
H43-MH1	-	-	-	-	-	-	1,600	-	2,400	-	-	-	-
P24-MH1	-	-	-	-	-	-	96	-	-	-	-	-	-
V1-MH1	-	-	-	-	-	-	-	-	15	-	-	-	-
W26-MH1	-	-	-	-	-	-	180	-	-	-	-	-	-

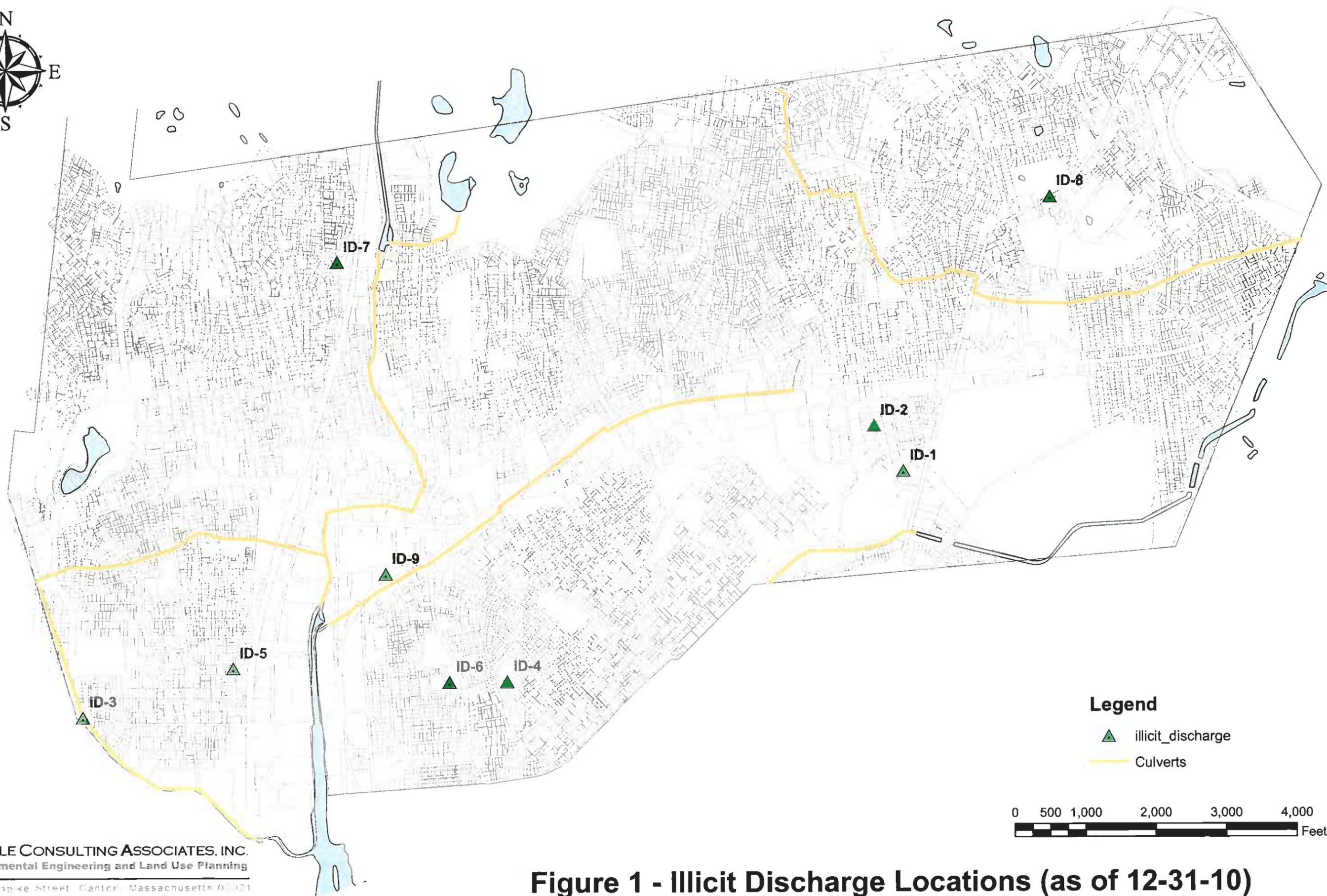
File No. 465.09

¹2007 samples collected 9/25/07

²2007 samples collected on 6/21/07

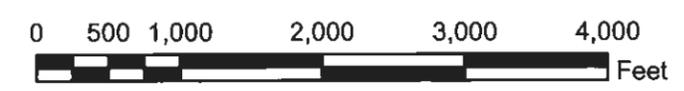
³2007 samples collected 7/12/07

⁴2007 samples collected 9/12/07



Legend

-  illicit_discharge
-  Culverts



NANGLE CONSULTING ASSOCIATES, INC.
Environmental Engineering and Land Use Planning
480 Turnpike Street Canton, Massachusetts 01921

Figure 1 - Illicit Discharge Locations (as of 12-31-10)

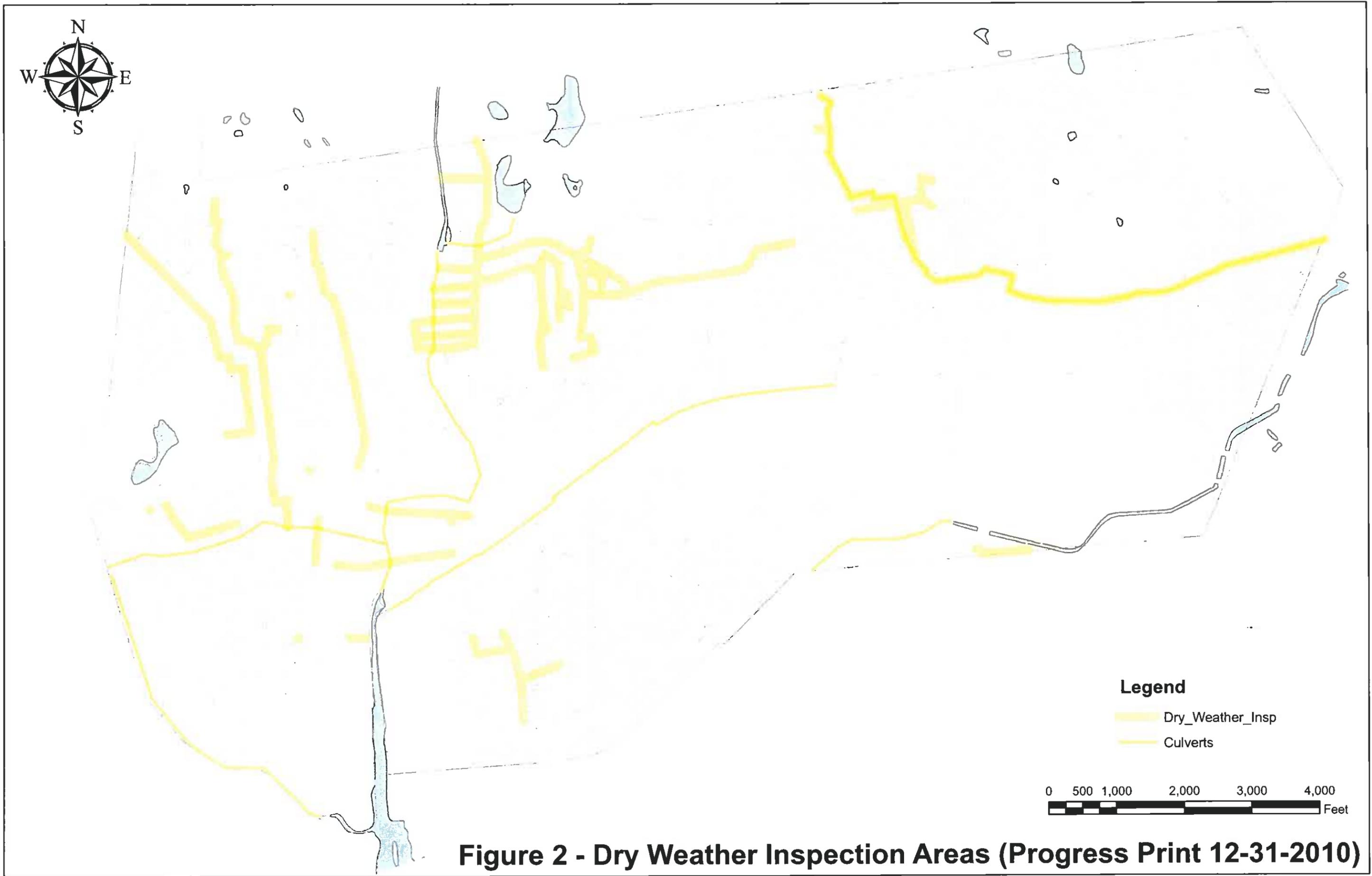
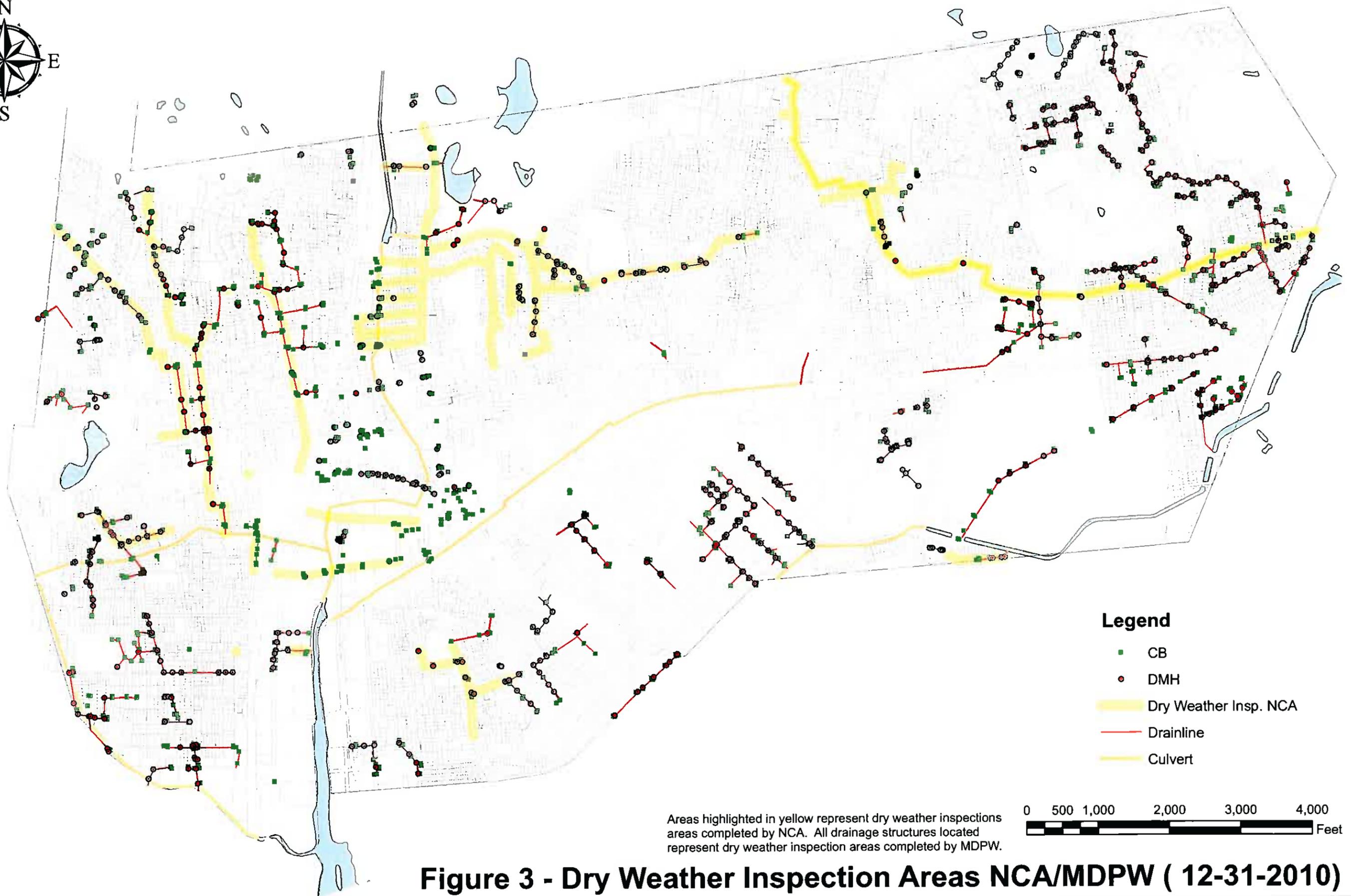


Figure 2 - Dry Weather Inspection Areas (Progress Print 12-31-2010)



Legend

- CB
- DMH
- Dry Weather Insp. NCA
- Drainline
- Culvert

Areas highlighted in yellow represent dry weather inspections areas completed by NCA. All drainage structures located represent dry weather inspection areas completed by MDPW.

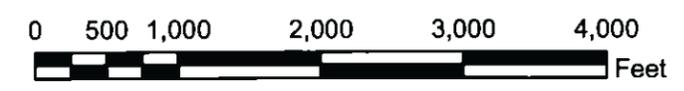


Figure 3 - Dry Weather Inspection Areas NCA/MDPW (12-31-2010)

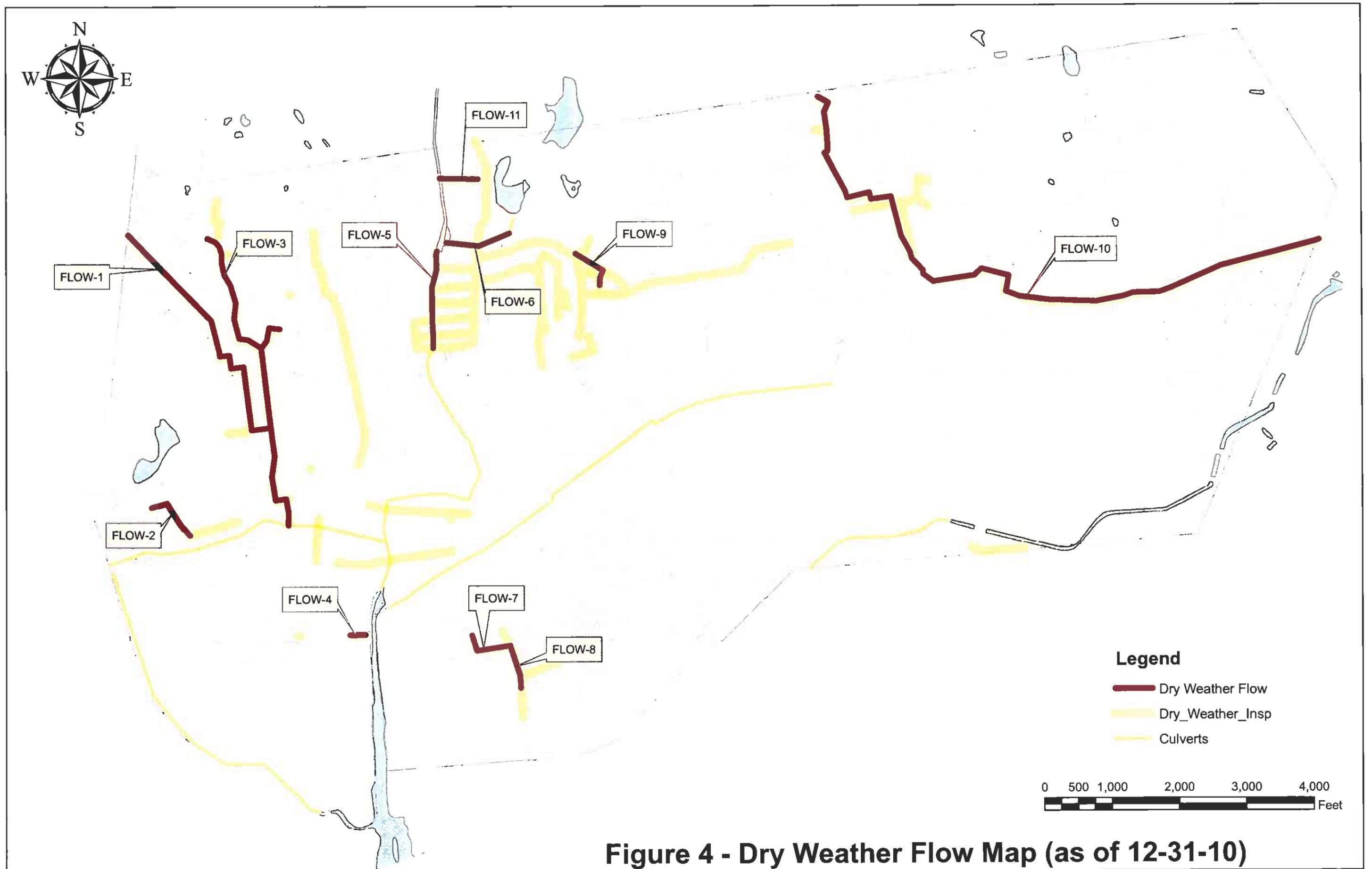


Figure 4 - Dry Weather Flow Map (as of 12-31-10)



Figure 6 - Malden River Outfalls



Figure 5 - Lower Spot Pond Brook Outfalls

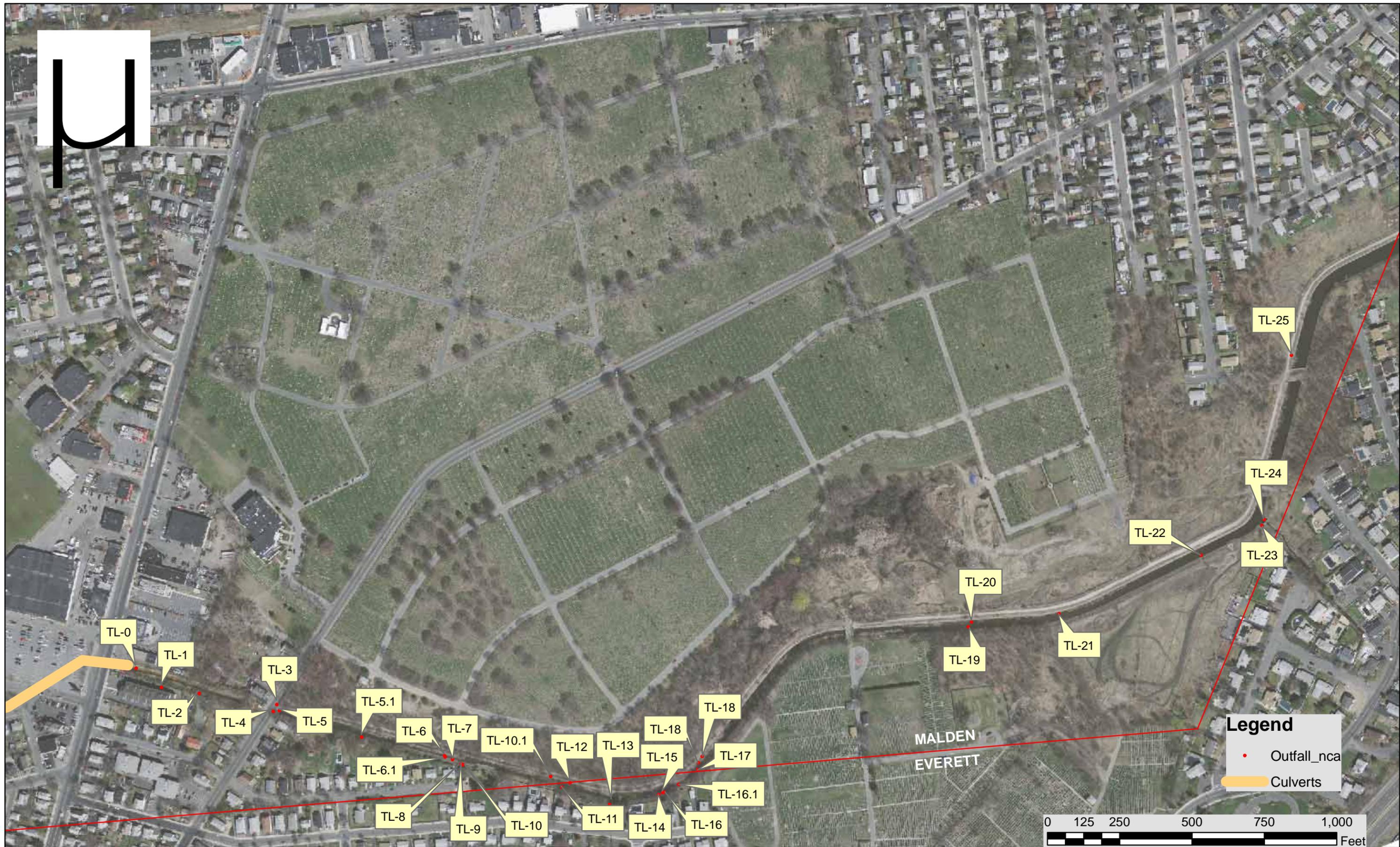
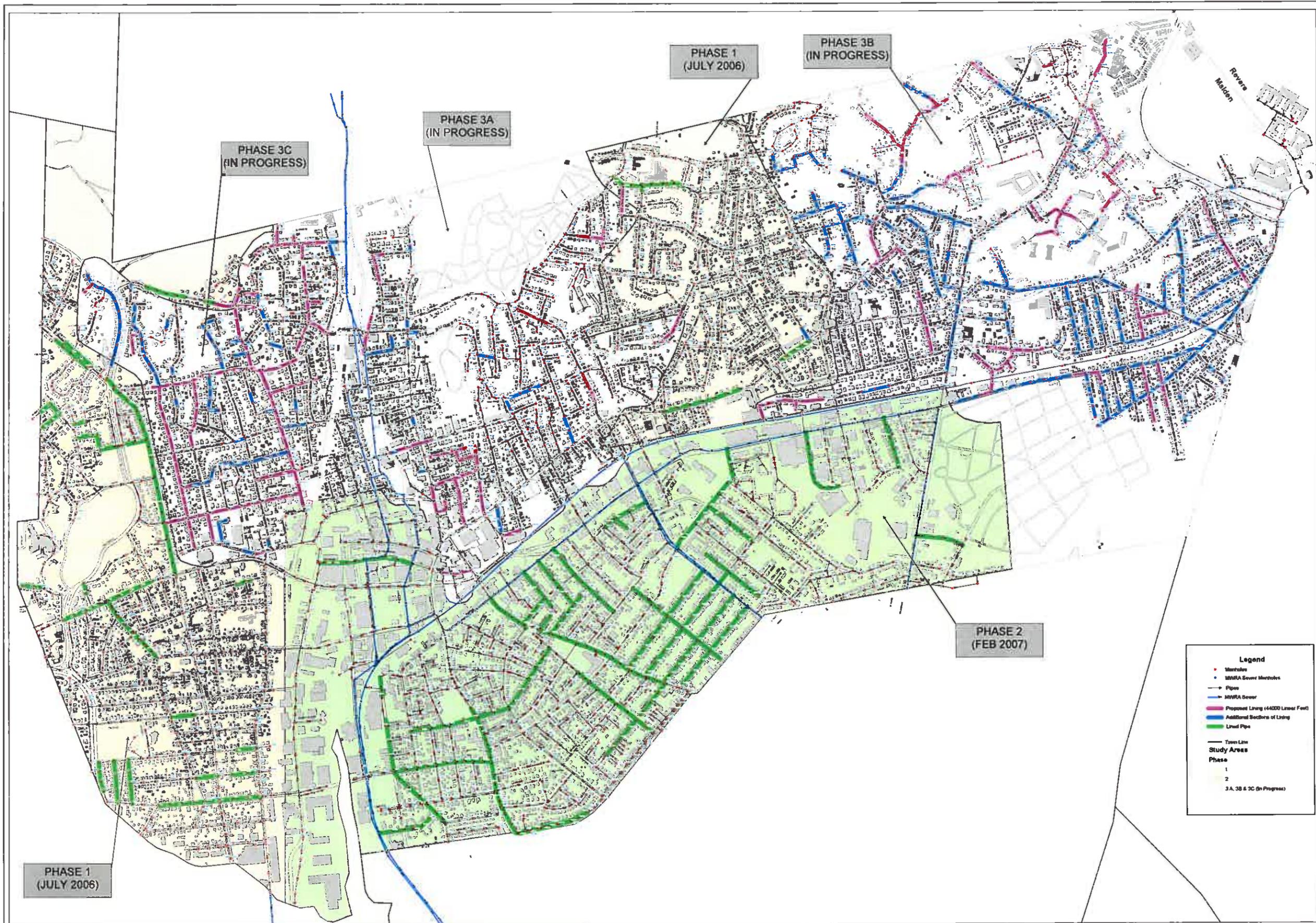


Figure 7 - Town Line Brook Outfalls (updated 11-10-11)



PHASE 1
(JULY 2006)

PHASE 1
(JULY 2006)

PHASE 3B
(IN PROGRESS)

PHASE 3A
(IN PROGRESS)

PHASE 2
(FEB 2007)

Legend

- Manhole
- MWRA Sewer Manhole
- Pipe
- MWRA Sewer
- Proposed Lining (44000 Linear Feet)
- Additional Sections of Lining
- Lined Pipe
- Town Line

Study Areas

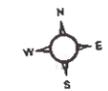
Phase

- 1
- 2
- 3A, 3B & 3C (In Progress)



Designed By: C. Spangone
 Drawn By: D.M. & S.C. & L.Z.
 Reviewed By: S. Peters
 Approved By: S. Burke
 Date: January 2011

Malden Sewer Survey III
 City of Malden, Massachusetts
 January 2011



Mass State Plane Coordinate System
 Datum: NAD83, UTM Zone
 Information from PG&E 2008
 Periodic and Utility Data obtained from the MWRA

FIGURE 10

CITY OF MALDEN

Illicit Discharge Detection and Elimination Program Semi-Annual Status Report

January 1, 2011 – June 30, 2011

Prepared by:

Nangle Consulting Associates, Inc.
960 Turnpike St
Canton, MA 02021

and

City of Malden Engineering Department
200 Pleasant Street
Malden, Massachusetts

TABLE OF CONTENTS

1.0	Introduction	1
2.0	Documented Illicit Discharges and Connections	2
3.0	Overview of IDDE Activities: January 2011 – July 2011	2
3.1	Targeted Dry Weather Inspection / Sampling Program (NCA)	3
3.1.1	Malden River Watershed	4
3.1.1.1	Little Creek	4
3.1.2	Town Line Brook Watershed	5
3.1.3	Linden Brook Watershed	6
3.1.4	Saugus Branch Watershed	6
3.2	Drainage System Mapping-IDDE Inspection Program (MDPW)	7
3.3	Inflow Infiltration Sewer System Evaluation & Capacity Analysis	7
3.4	Drainage System Maintenance/Repair (MDPW)	9
4.0	Sanitary Sewer Overflows (SSO's)	10
5.0	Evaluation of IDDE Program Goals and Objectives	11

TABLES

Table 1.0	Summary of Illicit Connections/Discharges Identified as of 06/30/2011
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FIGURES

- Figure 1 Illicit Discharge Locations
- Figure 2 Dry Weather Inspection Areas - NCA
- Figure 3 Dry Weather Inspection Areas - NCA/MDPW
- Figure 4 Dry Weather Flow Map
- Figure 5 Lower Spot Pond Brook Outfalls
- Figure 6 Malden River Outfalls
- Figure 7 Town Line Brook Outfalls
- Figure 8 Sewer Survey Plan

ATTACHMENTS

- Attachment A MS4

1.0 INTRODUCTION

In accordance with the provisions of the City of Malden Illicit Discharge Detection and Elimination (IDDE) Program, this semi-annual status report for the period of 1 January through 30 June 2011 has been prepared through the cooperative efforts of the City of Malden Engineering Department, the City of Malden Department of Public Works (MDPW) and Nangle Consulting Associates, Inc. (NCA). This IDDE plan was prepared to enable the implementation of a systematic program to assess the storm drainage infrastructure for the presence of illicit discharges. Since its inception, the City's IDDE program has identified illicit discharges/connections to the municipal drainage system, reduced significant potable water losses due to the detection of leakages and aided in both the identification of and completion of extensive repairs to the drainage infrastructure. This effort has also supported the City of Malden's GIS mapping and catch basin cleaning/repair program through the integration of dry weather inspections and outfall sampling.

The goals and objectives of this IDDE plan are tied to the historic identification of bacteria levels encountered during the sampling of selected outfalls within the City, particularly during wet weather conditions. The results of dry weather inspections, together with both dry and wet weather sampling support the opinion that wet weather loadings are tied to the age and condition of the municipal infrastructure, major portions of which were installed during the late 1800's and early 1900's. The integration of the goals of this IDDE Plan into daily work practices by City personnel has enabled the identification of infrastructure deficiencies and direct response mitigation/repair measures have led not only to the removal of illicit connections/discharges but improved flow conveyance to eliminate historic flooding concerns.

As stated above, the City Engineering and Public Works Departments have coordinated their efforts and together with outside technical assistance, have developed a program that integrates the implementation of the IDDE Plan into the routine daily work practices and general storm drain system maintenance. In addition to the mitigation measures identified above, the results of the IDDE program have advanced the efficiency of capital planning and infrastructure upgrades. This report has been prepared to document and summarize the IDDE activities that have been undertaken by the City during the January 2011 through July 2011 reporting period and identify key goals and objectives to be considered during future phases of plan implementation. During this reporting period, the comprehensive GIS mapping program, which was developed by Camp, Dresser and McKee (CDM), has been brought on line for use by City personnel. Consistent with this, utilizing the data and information obtained, an updated work plan of prioritized tasks for the next 6 month period has also been prepared and is included within Section 5.0 of this report.

2.0 DOCUMENTED ILLICIT DISCHARGES AND CONNECTIONS

During this reporting period, no illicit discharges were identified. A summary of the illicit discharges/connections identified to date is presented on Figure 1 and Table 1.0. It should be noted that due to personnel shortages and winter maintenance requirements, as well as snow melt, targeted dry weather inspections and drainage system mapping were reduced relative to the summer and fall reporting periods.

3.0 OVERVIEW OF IDDE ACTIVITIES (JANUARY 2011 – JULY 2011)

The City of Malden's IDDE program incorporates the use of three (3) primary measures to identify and mitigate illicit discharges to its municipal drainage system which may be described as follows:

- (1) Targeted dry weather inspections by representatives of the Stormwater Compliance Team
- (2) Detailed inspection of the municipal infrastructure during the daily implementation of the catch basin clean-out and drainage system mapping program.
- (3) Response to public, private or governmental agencies reports of possible sudden and/or identified discharge to the municipal storm system.

As described in the City's 2009 IDDE work plan, targeted dry weather inspections are driven in large part by the results of dry and wet weather sampling at outfalls which discharge to surface water conveyances, principally the Malden River, Lower Spot Pond Brook, West End (Edgeworth Brook) Culvert, Little Creek, Linden Brook and the Town Line Brook. To provide a basis for the iterative dry weather inspection program and the observations recorded during this reporting period, the following excerpt from the City's IDDE work plan describes the methods and prioritization procedure maintained for this ongoing mitigation measure;

- Based upon the initial outfall monitoring data obtained, the City is currently implementing a Rapid-Assessment Prioritization approach through the targeted assessment of dry-weather flows in several areas within the City. Specifically the major tributaries to the most significant volume dry weather discharges to the Town Line Brook and the Malden River have been identified and sampled at key junction locations to initially determine the dry weather contributions from adjacent communities through major flood control infrastructure that is routed through the City of Malden.

By design, the observations recorded during each regulatory period and corresponding recommended work plan tasks serve to update or modify the original IDDE work plan to meet its overall goals. The IDDE program maintained by the City is an iterative effort that has displayed the capability to directly implement water quality enhancement measures as needs and concerns are identified.

As described in further detail within Section 3.2 of this status report, the City of Malden, has invested significant time and capital funding to develop a Stormwater Compliance Team compiled of members of the Department of Public Works, Engineering and outside technical support. Key tasks performed by this group includes the systematic cleaning of catch basins, mapping of infrastructure system components, logging of component attributes, identification of infrastructure needs, identification and response to illicit discharges, posting of outfall signage, general system maintenance and mitigation of environmental conditions of concern as they are being identified.

Through department head meetings, public outreach, postings of signage and daily work practices, a general awareness of the need for response to illicit discharges has been developed as the third component of the City's IDDE program. Contact information is readily available through a variety of media, including mailings and web site postings to ensure implementation of appropriate response measures by members of the Stormwater Compliance Team. Public outreach has also included active participation by the Compliance Team through community workshops, educational presentations and regional watershed meetings.

3.1 Targeted Dry Weather Inspection/Sampling Program (NCA)

Representatives of NCA and MDPW personnel continue to conduct targeted dry weather inspections of the City's infrastructure. Areas selected for inspection are generally based upon the results of the outfall sampling program and/or the identification of dry weather flows by MDPW staff during their routine maintenance and infrastructure locating program. Dry weather inspections conducted during this reporting period have not revealed any illicit discharges, or connections. A map depicting the approximate locations where targeted dry weather inspections have been conducted by NCA to date is presented as Figure 2. Areas inspected by DPW staff for illicit connections/discharges consist of portions of the infrastructure that are addressed during the catch basin cleaning program. During this effort, infrastructure components are mapped and the corresponding attributes are located. Overall portions of the municipal infrastructure that have been addressed by the compliance team including the targeted subset areas are summarized on Figure 3.

During the course of the dry weather inspections, a number of dry weather flows, consisting primarily of waterline leaks and culverted surface waters have been identified. A summary of these flows within the municipal system that have been identified to date are shown on Figure 4, and are described as follows.

- Flow 1 – City of Medford water line leak (**removed**)
- Flow 2 – Groundwater breakout near St. Mary's Street
- Flow 3 – Fellsmere Reservation base flow
- Flow 4 – Malden River surcharge (submerged invert)
- Flow 5 – DCR Spot Pond Brook base flow
- Flow 6 – Base flow, Forestdale-Pine Banks Park
- Flow 7 – Groundwater breakout, illicit discharge (**removed 8/09**)
- Flow 8 – Waterline Leak (**removed**)
- Flow 9 – Groundwater breakout
- Flow 10 – Linden Brook base flow
- Flow 11 – LSP-4 dry weather flow

As stated previously, no illicit discharges were identified during this reporting period during either the targeted or MDPW daily inspection program (Section 3.2). Consistent with the original objectives of the IDDE program, the focus of the dry weather sampling effort was initially directed towards those portions of the infrastructure that discharge to the Malden River. Since that time, the IDDE Program has been expanding to include the Town Line Brook, Linden Brook and the Saugus Branch systems. Key observations and/or conditions that have been identified are summarized below;

3.1.1 Malden River Watershed

As stated, the City initially targeted potential illicit discharges to the Malden River as its highest priority. Utilizing the outfall monitoring data and information obtained during sampling events, the City has identified significant base flow to the Malden River during dry weather thorough culverted channels/brooks located in northwestern portions of the City. This flow includes contributions from the Fells Reservation and Lower Spot Pond Brook Culvert. As shown on Figures 5 and 6, a total of 17 outfalls to the Malden River have been identified to date, three (3) of which have been identified as flowing during dry weather conditions.

During the last reporting period, the Stormwater Compliance Team conducted several dry weather sampling events within the Lower Spot Pond Brook Culvert. An elevated *E. coli* level of 10,000 col/100ml was detected within open channel flow for Spot Pond Brook at the Malden/Melrose line on 8/14/2010 (Figure 5). Consistent with this, dry weather monitoring data collected by the Mystic River Watershed Association (MyRWA) in March of 2010 from Ell Pond which is located upstream of this open channel sample location, also revealed elevated *E. coli* levels (5,654 col/100ml). Accordingly, this condition appears to be reflective of upstream contributions to the Malden River/Spot Pond Brook watershed. Historically, *E. coli* levels as high as 16,640 col/100ml have been reported by MyRWA from their sampling efforts at Ell Pond.

In contrast to the above, the dry weather sampling of outfall LSP-4 (Figure 5), which is located approximately 460 feet downstream of the Malden/Melrose Town line revealed bacteria loadings which appear to be emanating from a housing complex on Elrich Drive.

An inspection of the drainage system within the housing complex revealed dry weather flow and water quality samples collected from upgradient drain manholes M3-MH2 and M3-MH4 revealed *E. coli* levels of 98 and 2,400 col/100ml, respectively. It is to be noted that M3-MH4 is the closest to LSP-4 and based upon field observations, M3-MH2 is the upstream most manhole of the housing complex drainage network. Based upon the volumes of flow at outfall LSP-4 and the upstream sample location (M3-MH2) within the Elrich Drive complex, it appeared that additional contributions were occurring between these two sampling points, however, a detailed assessment of the drainage system by NCA/DPW did not identify any additional dry weather flows. However, during the assessment of this condition, several drain manholes and catch basins were discovered within the housing complex in close proximity to sewer lines. The subsequent sampling of LSP-4 revealed a significant decrease in *E. coli* levels and further investigations of this condition are ongoing.

3.1.1.1 Little Creek

In a letter dated 27 December 2010, the City of Medford informed Malden that a manhole located on Commercial Street, north of Little Creek was found to be discharging flow during dry weather. As stated within this correspondence, the flow was sampled on 7 July 2010 by the City of Medford and levels of surfactants (0.75 mg/L) and ammonia (0.7 mg/L) were identified. It should be noted that the flow was also sampled for *Enterococcus* and *E. Coli*, with no detectable levels of either encountered. In response to the letter, on 6 January 2011, the Malden Stormwater Compliance Team investigated the manhole (Malden ID C46-MH19), finding

minimal flow emanating from the northern drain line within the manhole at that time. An assessment of the outfall which discharges into Little Creek was inconclusive, as the outfall invert was submerged.

On 21 April 2011, an additional dry weather sampling event was conducted within Little Creek by Mystic River Watershed Association (MyRWA) at the northern culvert where Little Creek daylights. An E. coli level of 422 MPN/100ml was detected by MyRWA at that time. As the outfall for manhole C46-MH19 is located downstream of the northern culvert of Little Creek, it is unlikely that dry weather discharges from the manhole are causing the E. coli levels detected by MyRWA. During the next reporting period, dry weather samples will be collected from the northern culvert of Little Creek and manhole C46-MH19. In addition, a flow isolation test will be performed, to determine where the dry weather flow within C46-MH19 is emanating.

3.1.2 Town Line Brook Watershed

Town Line Brook begins as surface runoff west of Broadway near the Malden and Everett city boundary and is culverted until it daylights into an open concrete lined trapezoidal channel at Broadway. Base flow conditions exist within Town Line, which emanate from culverted flows that originate in the Town of Everett. Significant tidal influences in the form of an approximate a 2-3 foot change in surface water elevation was observed from Broadway and over the remaining length of the culvert to the Revere City line. As shown on Figure 7, a total of 29 outfalls to Town Line Brook have been identified to date, five (5) of which have been observed as flowing during dry weather conditions.

The historic monitoring data of Town Line Brook at Broadway has revealed relatively uniform bacteria levels during dry weather sampling events. However, downstream outfalls at two (2) specific locations have consistently contained bacteria loadings during dry weather sampling events. These are identified as Trifone Brook (TL-24), which discharges into Town Line from Everett and outfall TL-9, which serves the lower portion of Hadley Street and the City of Everett. As described in the July 2009 status report, a comprehensive investigation of dry weather flows within the Hadley street area was performed in July 2009. The results of this effort revealed the following.

A review of the sewer engineering plans for Hadley Street revealed a reference to a SSO connection at the manhole designated H1-MH2. In addition, as outlined in prior submittals, the results of the rapid assessment outfall sampling program revealed an elevated level of fecal coliform during one (1) sampling event at outfall location TL-9, which is located downstream of H1-MH2. To investigate this condition and the possibility of a SSO connection on Hadley Street a manhole inspection was performed in July of 2009. A Sketch Plan of Site depicting the configuration of the drainage network, located within Hadley Street and its intersection with Miller Street may be referenced as Figure 9.

The inspection of this manhole indicated that this connection had been sealed with concrete. However, dry weather flow was observed. Upstream manholes revealed that this dry weather flow was emanating from a drainage line connected to H1-MH1 at the intersection of Miller and Hadley Streets. As elevated fecal coliform had been detected previously at outfall sample location TL-9, this indicator parameter was utilized during the July 2009 sampling event. With reference to Figure 9, fecal coliform levels of 68, 260 and 220 col/100ml were detected at H1-MH1, H1-MH2 and TL-9, respectively. As noted previously, E. Coli will be utilized as the parameter for illicit

discharge/connections, if identified, with the fecal coliform parameter used solely as a screening tool.

E coli levels (2,400 col/100ml) have been detected within dry weather open channel flow within Town Line Brook immediately adjacent to Lynn Street. The levels encountered at Lynn Street may be attributable to flushing as a result of the significant tidal changes noted. Based upon the data obtained to date, three major sources of dry weather bacteria loading to the open channel portion of Town Line Brook have been identified including culverted base flows from the City of Everett, discharges from storm drainage within lower Hadley Street (TL-9), and from Trifone Brook (TL-24). As described above, mass balance sampling has been performed at Hadley Street to the Everett city line and contributions from both Trifone Brook and the upper most sampling location for Town Line Brook suggest that these contributions are emanating from areas outside the City of Malden. The monitoring of these outfalls will be continued during future reporting periods; however, this condition appears related to upstream flows emanating from Everett.

3.1.3 Linden Brook Watershed

Linden Brook Culvert is the major stormwater conveyance structure in northeastern portions of the City. Prior dry weather inspections have revealed base flow throughout the culvert at all times. To supplement the water quality database for Linden Brook, three (3) manhole locations (D17-MH1, H43-MH1 and V1-MH1) along the length of the culvert were sampled. E. coli in the range of 1,600 – 2,400 col/100ml were detected within the middle portions of the culvert. An inspection of tributary drainage lines in the area at the time of sampling did not reveal any dry weather flows discharging to the culvert and during the next reporting period it is proposed to target this area for further evaluation.

3.1.4 Saugus Branch Watershed

The Saugus Branch watershed services central and adjacent portions of Malden and this drainage system begins proximate to Broadway and flows westerly to its outfall at the Malden River. Historic sampling of surface water quality at this discharge location has revealed low to moderate bacteria levels. As stated in the last status report, higher E. coli levels were observed during dry and wet weather events in 2010 and it appears that these results reflect contributions from the significant surcharge of the MWRA sewer system during the heavy rainfall events which occurred in the spring of 2010. The Saugus Branch Watershed is the last area to be targeted for dry weather inspections beyond the ongoing catch basin cleaning and repair program and represents a focus of work to be conducted in the summer of 2011.

3.2 Drainage System Mapping-IDDE Inspection Program (MDPW)

The City has converted and updated a majority of its current storm drain system mapping to GIS format using field GPS receivers. Drainage infrastructure is located and inventoried as a part of ongoing system wide maintenance, service and inspection program being implemented by the MDPW. During routine maintenance activities, structures are located and key attributes of the systems features are recorded. Information pertaining to the structure type, condition, inlet/outlet size(s) and type(s) and workability are recorded. During this reporting period the MDPW mapped 75 catch basins and 45 drain manholes at Newland and Linden Streets. In addition to this data collection process, MDPW personnel are also inspecting drainage system components for indications of dry weather flow as well as illicit discharges or connections. Upon encountering any indications of the potential for illicit discharges to the storm drain system, the MDPW personnel notify engineering personnel to investigate.

The information collected by MDPW is continually compiled in a GIS stormwater drainage system database. Further, information collected during this process can also be utilized by MDPW to prioritize repairs and assist in Capital Improvement Planning. During the implementation of this program numerous structural deficiencies and line blockages have also been identified by the Compliance team. A summary of infrastructure repairs and maintenance tasks may be referenced from Section 3.4. A substantial benefit that has been achieved is the direct response mitigation of these conditions, which have been reflected in the significant reduction of flooding concerns within the City.

3.3 Inflow Infiltration Sewer System Evaluation & Capacity Analysis

The City of Malden is also currently implementing a strategic GIS Implementation plan with the assistance of the firm of Camp, Dresser and McKee, Inc (CDM). The City of Malden has been in the process of a comprehensive I&I study for its municipal sewer system, which is nearing completion. A City of Malden sewer survey plan depicting the Phase 3 study area, together with previously completed areas of study, is presented as Figure 8. As stated below, Phase 3 of this SSES program has included the following specific tasks, as outlined within a memorandum to the City prepared by CDM.

Phase 3 SSES

In the spring of 2010, a flow isolation program was conducted in what has been identified as the "Phase 3 Area" within the City. The Phase 3 Area represents the final of a 3 phase SSES program that intends to identify and mitigate infiltration and inflow (I/I) in the City. The attached figure depicts the Phase 3 Area. Approximately 246,000 linear feet of sewer was flow isolated that resulted in the identification 1,446,562 GPD of infiltration. The flow isolation data was also evaluated to determine the limits of follow up close circuit television inspection (CCTV). As a result, approximately 28,754 linear feet of sewer was CCTV inspected in the summer and fall of 2010. Currently, COM on behalf of the City is preparing a Phase 3 SSES report that includes a summary of findings and proposed recommendations to mitigate excessive infiltration and inflow into the City's sewer system. The report is expected to be finalized in early 2011. It is also anticipated that the City will implement design and construction recommendations in 2011/2012.

The SSES program is being funded primarily through the MWRA Infiltration and Inflow Local Financial Assistance Program. According to the MWRA III Local Financial Assistance Program funding summary as of May 2010, the City has a balance of \$2,132,000 available. Further, according to a letter dated December 9, 2009 from the MWRA to the City of Malden, the City maintains a balance of interests totaling \$898,300.04 therefore the total funding available to the City through the MWRA III Local Financial Assistance Program is \$3,030,300.04.

In conjunction with the completion of a photometric survey CDM initiated a comprehensive flow measurement study for the municipal sewer system for use in the completion of the capacity assessment that will identify system deficiencies, with the overall goal of reducing the potential of SSOs within the City. An overview of this program, as prepared by CDM is outlined below.

Wastewater Collection System Capacity Assessment

In response to the ACO, the City is performing a capacity assessment of its wastewater collection system. This involves development of a dynamic hydraulic model of the City's wastewater collection system to evaluate the interceptor sewers and to support the capacity assessment. The model will be integrated into the GIS system to allow it to be viewed in conjunction with other geographic data and facilitate electronic data collection and analysis now and in the future. Development of the hydraulic model includes two primary activities that include data collection and model development and calibration. The data collection effort includes obtaining physical system data, reports, and electronic flow metering records to support model development. The model development and calibration effort will help prepare a dynamic computer model of the wastewater collection system and calibrate the model using existing measured flow data. To date, an extensive flow metering effort has been completed. In the spring of 2010, 20 flow meters were installed at key locations within Malden's sewer system further the City has coordinated with the MWRA and obtained integral flow meter data, collected from 2005 through 2010, for the 8 MWRA meters in the City. The City's flow metering program and meter data obtained from the MWRA will be used to calibrate the proposed hydraulic models to develop accurate baseline conditions. further, the City is updating wastewater collection system mapping that accurately represents pipe connectivity, pipe sizes, pipe invert elevations, and pipe materials for all pipes 10-inches in diameter and greater. This map will be the basis for the hydraulic model. The sewer system developed for the hydraulic model is expected to be completed in 2011.

3.4 Drainage System Maintenance/Repair (MDPW)

In addition to the inspection and mapping program, during this reporting period MDPW personnel performed the following drainage system maintenance/repair activities.

- Cleaned 75 catch basins
- Cleaned 45 drain manholes
- Rodded 3,000 feet of laterals
- Repaired 21 catch basins
- Repaired 8 storm manholes
- Repaired 18 feet of collapsed laterals

Specific locations of the catch basins/manholes repaired by at the City of Malden are as follows:

Catch Basins:

177 Newland Street
27 Coburn Street
Maplewood Street @ Broadway Park
Maplewood Street @ Eastern Ave
233 Eastern Ave
Commercial Street @ Exchange Street
288 Pearl Street
105 Pamela Circle
Rte 60 @ Jackson Street
44 Upham Street
Sylvan Street @ Willard Street
18 Fremont Street
Medford Street @ Sheridan Street
21 Hancock Street
Tremont Street @ Spring Street
168 Bowdoin Street

Storm Water Manholes:

Ferry Street @ Eastern Ave
Main Street @ Rte 60
9 Converse Ave
26 Converse Ave
Medford Street @ Pearl Street
Bellvale Street @ Eastern Ave
616 Broadway
630 Broadway

During this reporting period, the following specific tasks have also been completed to further the goals of the IDDE program.

- Trash buoy in the Malden River was cleaned, repaired and reset on May 30, 2011.
- The vactor truck was repaired in February and March.
- The Storm water crew spoke to Malden 4th and 5th graders regarding the City drainage system.
- MDPW has trained four (4) employees to access the GIS storm water map.
- To provide additional capacity to the sewer system and address the goals of the City's IDDE Plan, 108 sump pumps, which formerly discharged to the municipal system have been removed.

In addition to the above, outfall signage has been installed in accessible areas by the MDPW and the majority of outfall locations have been temporarily marked in the field to facilitate outfall sampling. Permanent signage in remaining areas is currently being installed by MDPW personnel.

4.0 SANITARY SEWER OVERFLOWS (SSO'S)

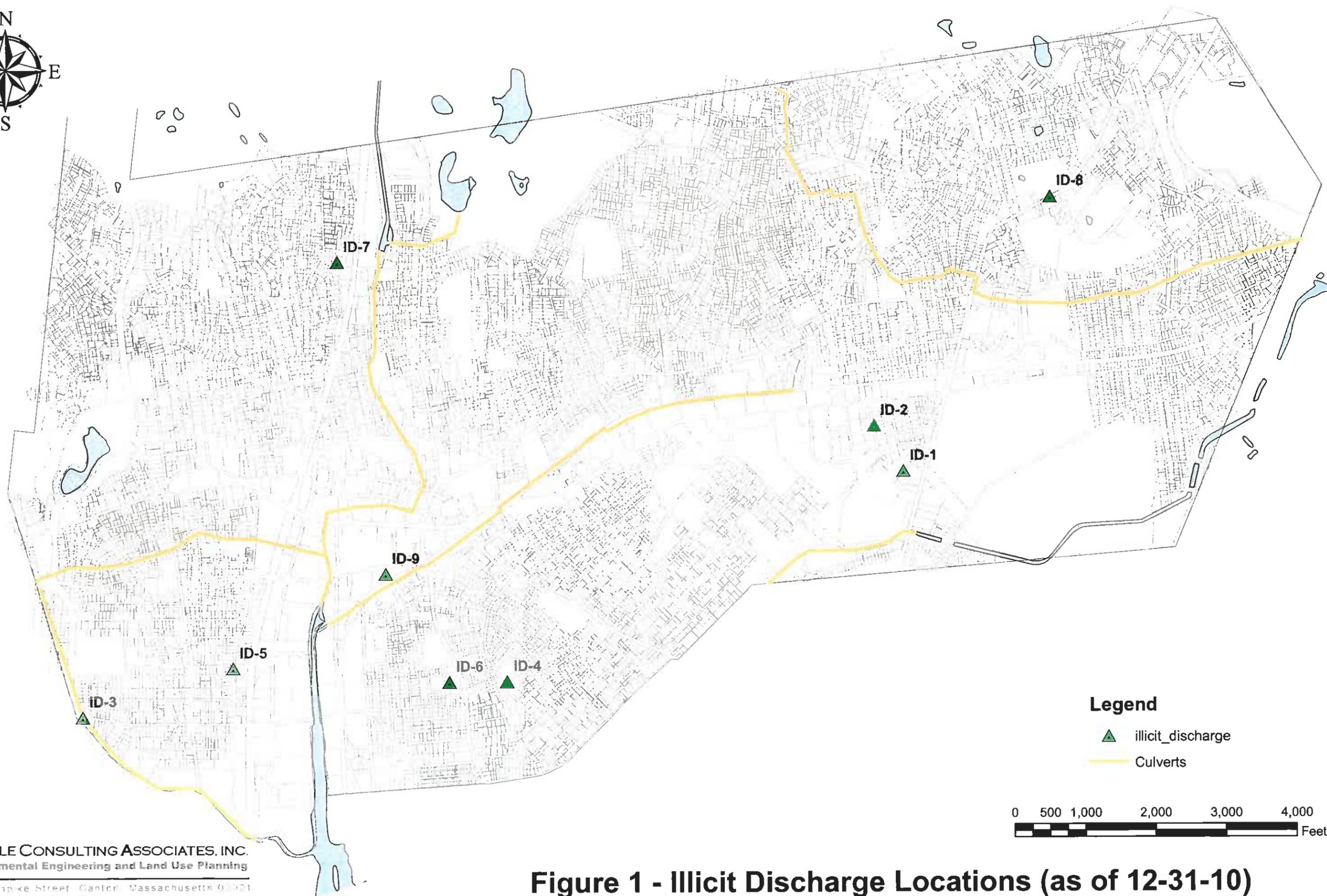
No SSOs were identified during this reporting period.

5.0 EVALUATION OF IDDE PROGRAM GOALS AND OBJECTIVES

To date, the results of the IDDE program continue to support the opinion that wet weather contributions, or infiltration/exfiltration during high rainfall events, represent the majority of bacterial loading detected at outfalls to surface waters within the City. As described in prior reports, the foundation for this condition was set once open channel surface waters were culverted by the Department of Conservation and Recreation (DCR) (formerly the Metropolitan District Commission). This flood control/early development program began during the late 1800's and led to the culverting of Spot Pond Brook, West End (Edgeworth) Brook, Linden Brook, and Town Line Brook and Little Creek.

This IDDE program is part of a much larger effort directed towards the improvement of stormwater quality that is being performed under the City of Malden's MS4 program. A copy of the annual status report that pertains to the 2010 – 2011 permit year may be referenced as Attachment A. As stated therein, the City has met a majority of the proposed provisions of the 2010 North Coastal permit and greatly advanced its efforts to meet the goals of the IDDE program through the implementation of ordinances, staffing and funding. The Stormwater Compliance Team's Rapid Assessment Program has successfully isolated illicit discharges and completed comprehensive repairs to the municipal system.

Overall, the City has greatly advanced its capacity to meet the goals of the IDDE program through the development of a dedicated stormwater team. Each member of the Compliance Team has been trained in the use of field mapping equipment and the guidance provided in the IDDE work plan. Building upon the foundation established during previous reporting periods and ongoing implementation of the City wide GIS system, IDDE plan implementation is now an integral component of daily activities. Following the winter season, in addition to the catch basin inventory and cleanout program, ongoing and proposed tasks include the microscale investigation of the infrastructure contributing to outfall LSP-4, flow isolation and possible dye tracing of the Linden Brook system, targeted dry weather inspections of the Saugus Branch watershed and the isolation of dry weather flows to Little Creek.



Legend

-  illicit_discharge
-  Culverts



NANGLE CONSULTING ASSOCIATES, INC.
Environmental Engineering and Land Use Planning
480 Turnpike Street Canton, Massachusetts 01921

Figure 1 - Illicit Discharge Locations (as of 12-31-10)

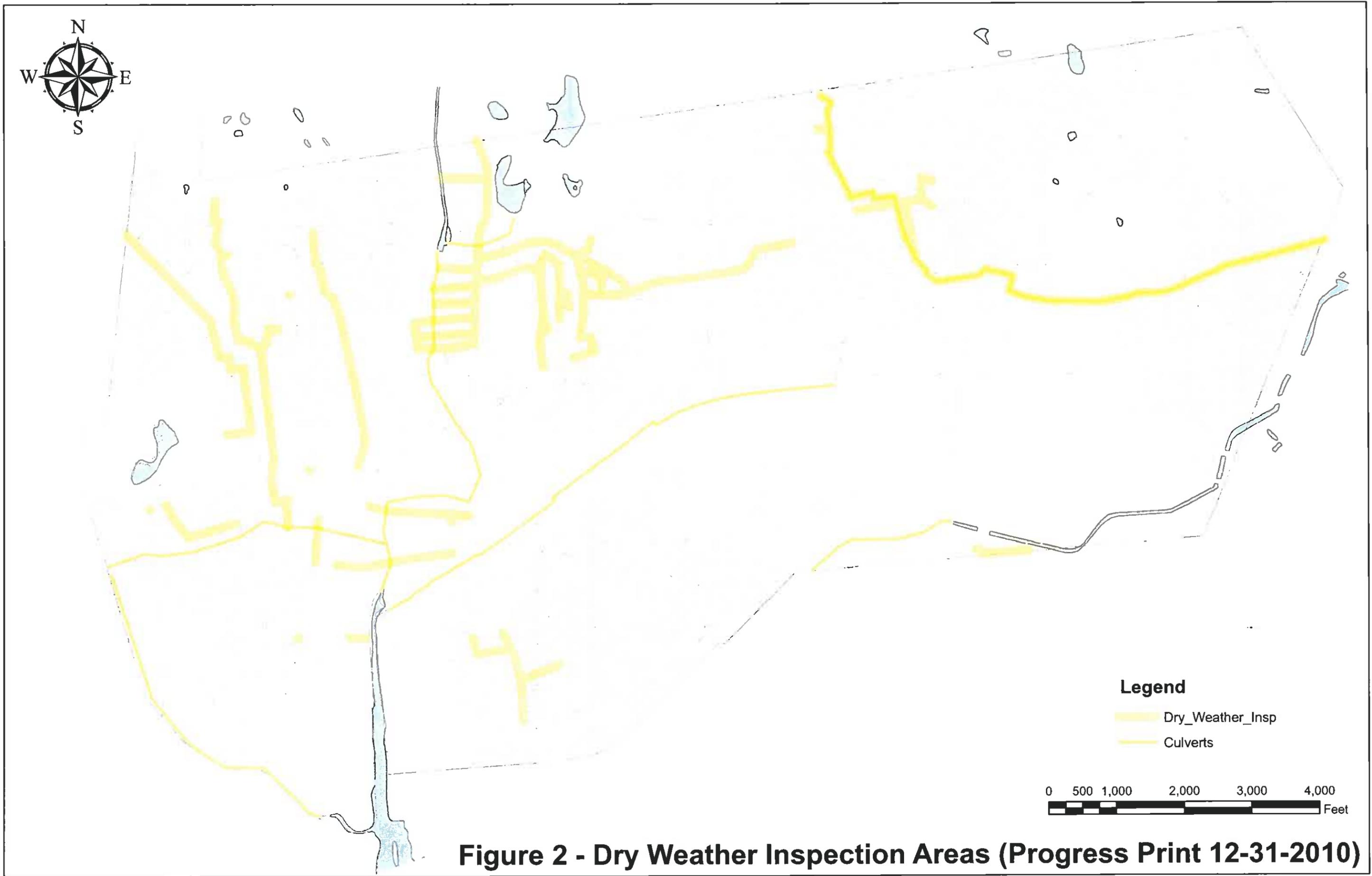
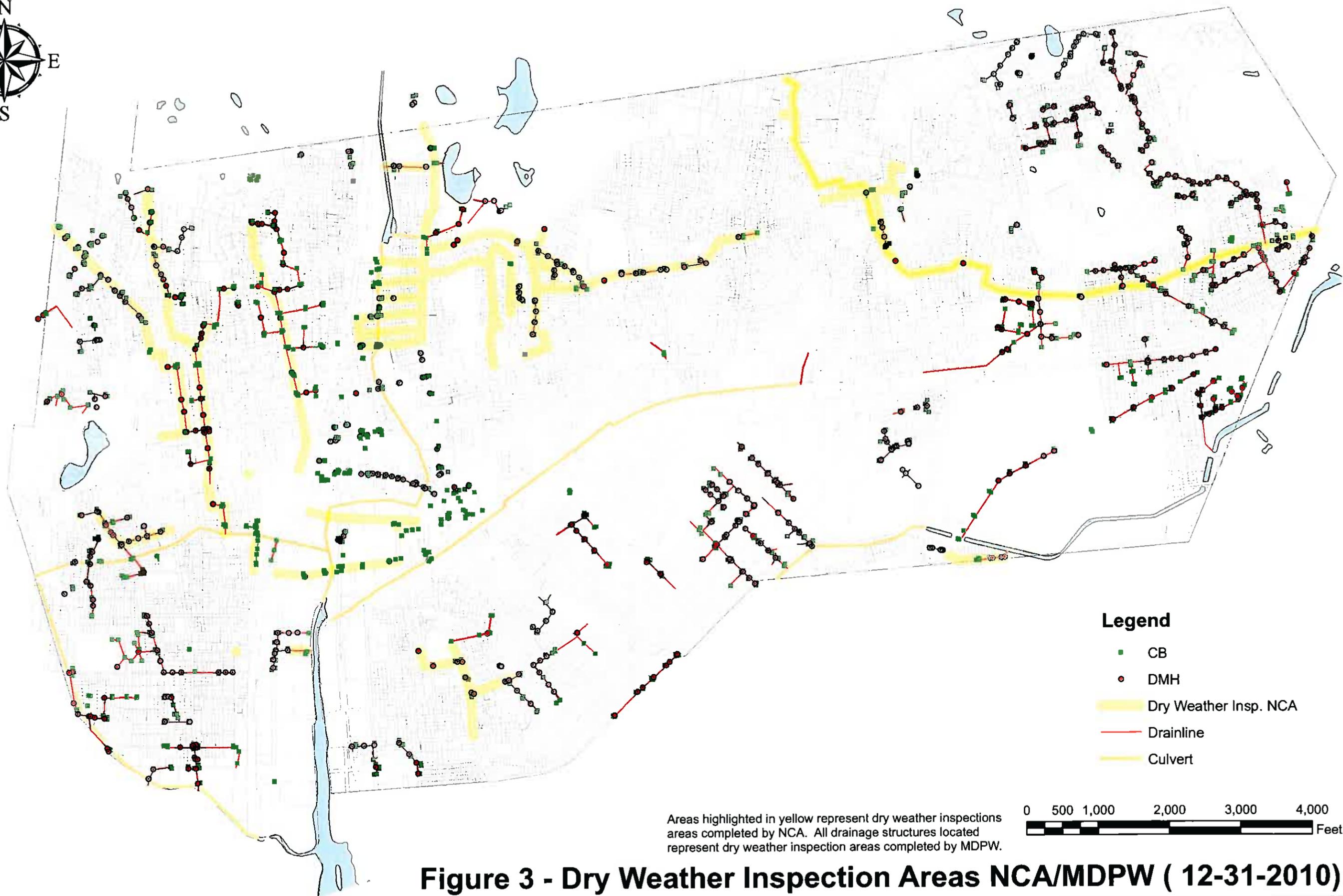


Figure 2 - Dry Weather Inspection Areas (Progress Print 12-31-2010)



Legend

- CB
- DMH
- Dry Weather Insp. NCA
- Drainline
- Culvert

Areas highlighted in yellow represent dry weather inspections areas completed by NCA. All drainage structures located represent dry weather inspection areas completed by MDPW.



Figure 3 - Dry Weather Inspection Areas NCA/MDPW (12-31-2010)

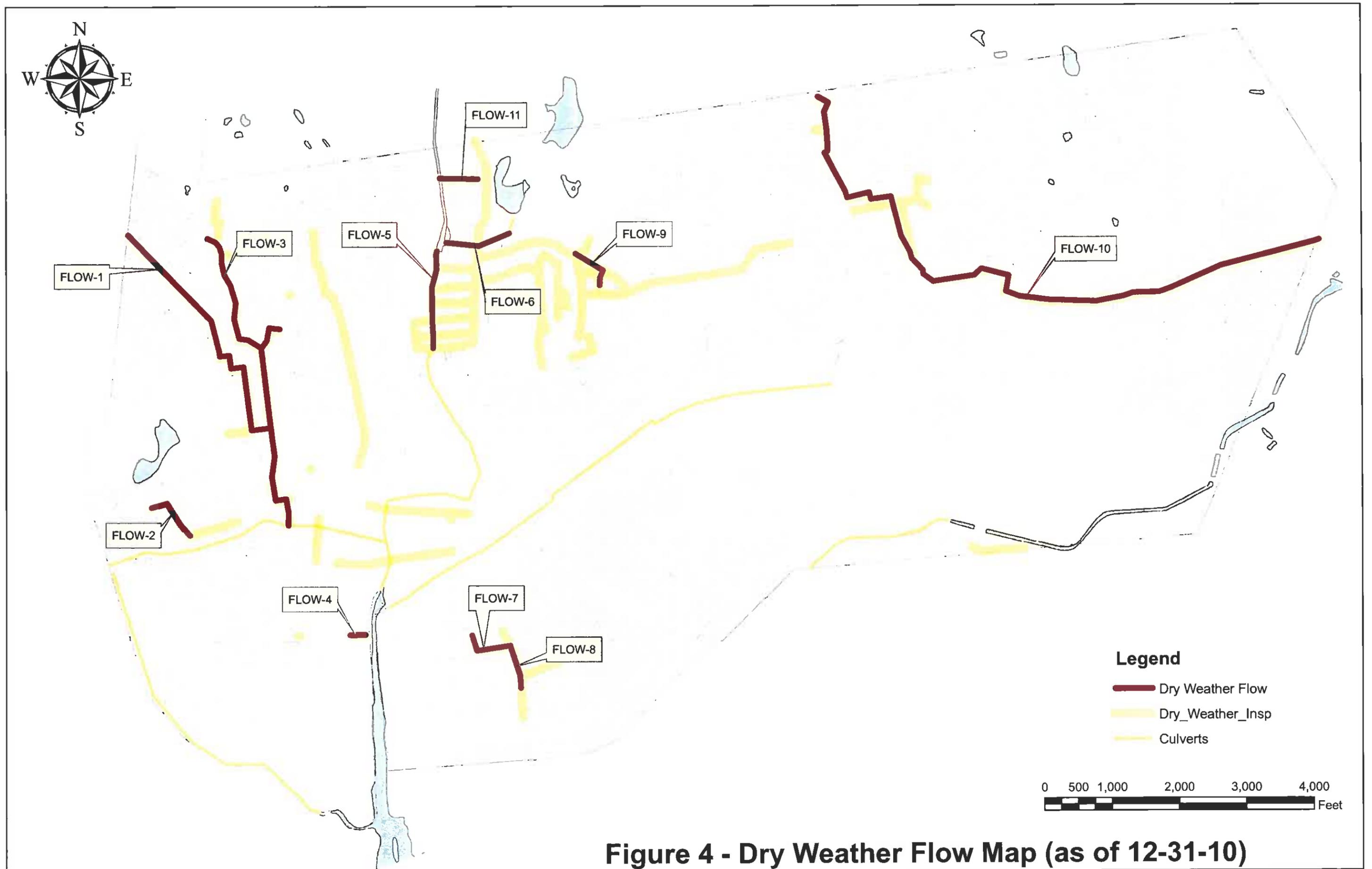


Figure 4 - Dry Weather Flow Map (as of 12-31-10)



Figure 5 - Lower Spot Pond Brook Outfalls

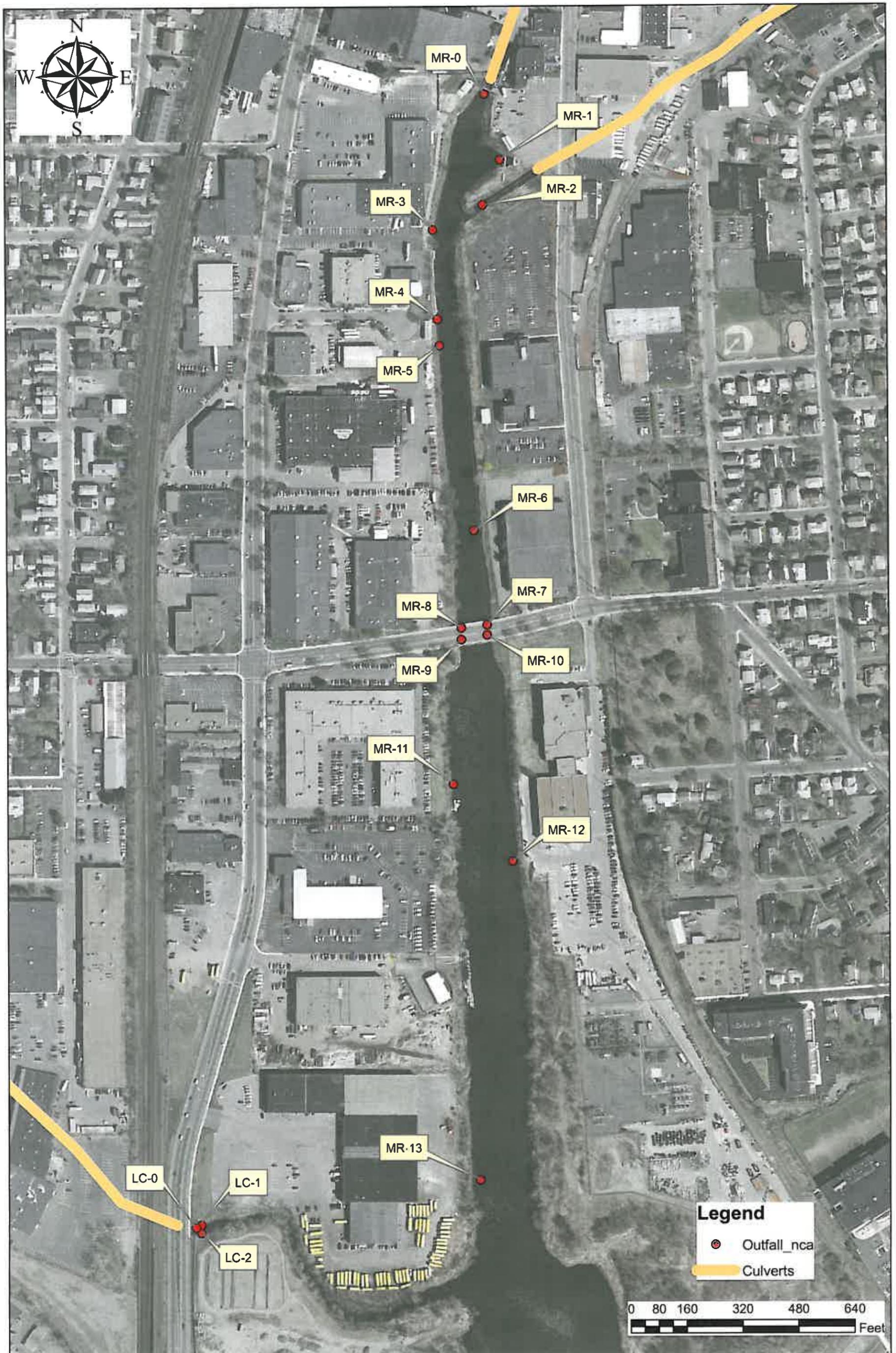
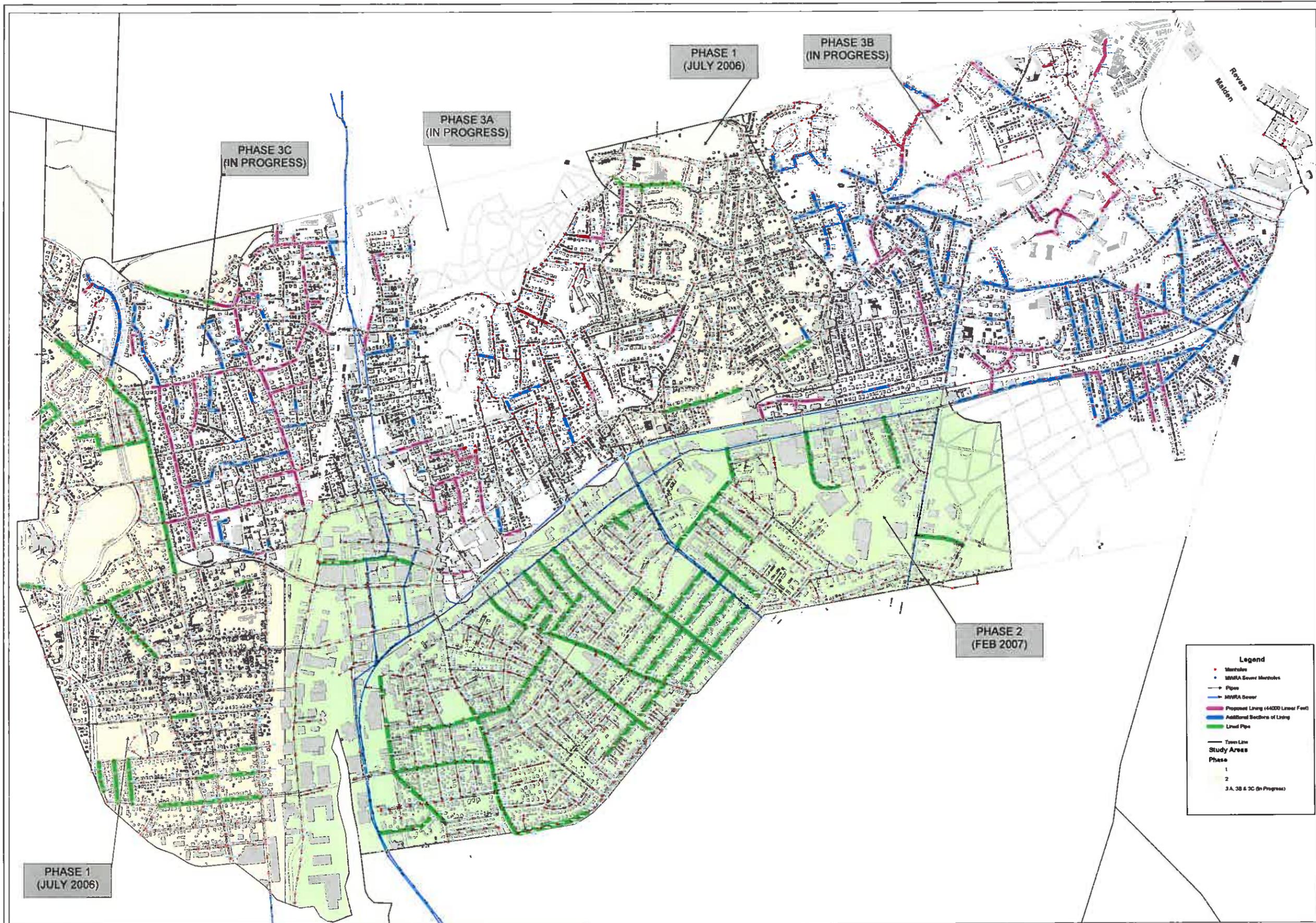


Figure 6 - Malden River Outfalls



Figure 7 - Town Line Brook Outfalls



PHASE 1
(JULY 2006)

PHASE 1
(JULY 2006)

PHASE 3B
(IN PROGRESS)

PHASE 3A
(IN PROGRESS)

PHASE 2
(FEB 2007)

Legend

- Manhole
- MWRA Sewer Manhole
- Pipe
- MWRA Sewer
- Proposed Lining (44000 Linear Feet)
- Additional Sections of Lining
- Lined Pipe
- Town Line

Study Areas

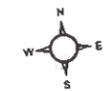
Phase

- 1
- 2
- 3A, 3B & 3C (In Progress)



Designed By: C. Spangone
 Drawn By: D.M. & S.C. & L.J.
 Reviewed By: S. Peters
 Approved By: S. Burke
 Date: January 2011

Malden Sewer Survey III
 City of Malden, Massachusetts
 January 2011



Mass State Plane Coordinate System
 Datum: NAD83, UTM Zone
 Information from PG&E 2008
 Periodic and Utility Data obtained from the MWRA

FIGURE 10