Municipality/Organization:	City of Malden
EPA NPDES Permit Number:	MA041046
MADEP Transmittal Number:	**041088**
Annual Report Number & Reporting Period:	**No. 10: April 1, 2012-March 31, 2013**

NPDES PII Small MS4 General Permit Annual Report

Part I. General Information

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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: John J. Russell

Printed Name: John J. Russell

Title: City Engineer

Date: May 01, 2013

Part II. Self-Assessment

The City of Malden continues to advance the goals of this MS4 General Permit and its corresponding stormwater quality program. During this permit year, the City has reorganized its Engineering and Department of Public Works (DPW) staff to provide more direct daily involvement by Engineering personnel in the area of stormwater compliance. A primary goal of this reorganization is the advancement of capital and long term planning for the municipal infrastructure, major portions of which date back to the 1800s. Overall, the City of Malden has invested significant time and capital funding to develop a Stormwater Compliance Team. Primary tasks performed by this group include the systematic cleaning of catch basins, mapping of infrastructure system components, logging of component attributes, identification of infrastructure needs, and removal of illicit discharges and the posting of outfall signage. The foundation for the goals that have been realized during this reporting period is provided by Engineering and MDPW staff during their daily workplace practices. Through the catch basin inventory, cleaning and mapping program, the City has completed timely repairs to its drainage infrastructure and removed several illicit connections.

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 manner. 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. During this permit year several workshops/presentations have been held between representatives of the Stormwater Compliance Team, the Mystic River Watershed Association (MyRWA), and educational groups to highlight the importance of ongoing stormwater mitigation measures.

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 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, Illicit Discharge Detection and Elimination (IDDE) Plan implementation and flow isolation studies. The City maintains a very aggressive IDDE program that has resulted in readily apparent improvement in the quality of stormwater discharges. This program includes dry weather mass-balance/flow isolation studies that have been completed throughout the City by the Stormwater Compliance Team. Beyond the removal of illicit connections, extensive waterline leaks /losses have also been corrected, resulting in the restoration of hundreds of thousands of gallons of potable water into the municipal systems for Malden and neighboring communities.

In the fall of 2012, a comprehensive sampling program was completed across the City, with technical and funding assistance provided by representatives of USEPA. Building upon the historic database compiled from prior wet and dry weather sampling events, key target areas were evaluated using multiple lines of evidence testing. This cost for this analysis was borne by USEPA and the City wishes to express its appreciation for the assistance that has been provided. As a “flow though” City, this sampling also targeted inflows into the City’s drainage system from neighboring communities. Continued monitoring and flow isolation studies area ongoing.

Overall, the City has demonstrated its commitment to meeting the goals of the MS4 permit, both existing and as currently proposed. Through increased public outreach, dedicated staff assignment and necessary support funding, the City looks to expand upon the significant progress that has been made.

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)

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 10:
The City continues to maintain an informational website and work with representatives of MATV to update the community on stormwater management issues. The City has made a clear commitment, through its mayor and related support staff to promote community awareness and involvement.

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

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 10
MDPW sponsors two (2) paint waste collection and recycling days annually. As summarized in Part IV, Section 2.5, these two (2) collection days resulted in the accumulation of a volume that incurred disposal costs of approximately $8,000. 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 10:
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 continued replacement of earthen/grassy playing field surfaces with synthetic cover is also a key factor in the reduction of animal waste contributions to stormwater runoff. This 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 10:
The Beebe School continues to collaborate with Tri-CAP, 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. Stormwater management goals and ongoing practices are educational tools that area included in community outreach efforts.

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.

BMP 1-5 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 10:
See BMP 1-4

Goal Status:
Activity Ongoing

BMP 1-6 Expand Cooperative Education programs for college level interns

Responsible Department/Person:
Engineering Dept

Measurable Goal(s):
Number of participants

Progress on Goals- Year 10:
During this reporting period the City employed an intern.

Goal Status:
The City is currently exploring ways to partner high school and college interns in areas of public outreach and curriculum development. BMPs 1-5 and 1-6 will be coordinated to meet this goal.

BMP 1-7	Host or participate in Stormwater Management brainstorming sessions with citizen advisory groups and Mystic River Watershed representatives (MyRWA)

Responsible Department/Person:
Eng. Dept. & Mayor's Office

Measurable Goal(s):
Annual Participation. Dissemination of information to the general public

Progress on Goals- Year 10:
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. In May of 2012, a representative of the Stormwater Compliance Team also provided an overview of stormwater management efforts by the City to representatives of MyRWA.

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

Responsible Department/Person:
Local Planning Agencies and Compliance Team

Measurable Goal(s):
Mitigation of existing stormwater concerns.

Progress on Goals- Year 10:
Recently completed and proposed municipal restoration projects for recreational areas have integrated stormwater quality enhancement measures into the design process. 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:
Through the changes in staffing and engineering support, increased planning and incentives to promote improved stormwater management practices will be a priority during the next permit year.

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 10:
See BMPs 1-4 thru 1-7

In addition to local neighborhood cleanups, MDPW staff maintains 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.

Goal Status:
Achieved and ongoing

BMP 2-3	Inter-departmental review and communication to address stormwater quality concerns

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 10:
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 the Board of Health (BOH) continue to be instrumental in successful enforcement actions when necessary.

Goal Status:
Ongoing

BMP 2-4	Development of an electronic database file management system

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 10:
Through the assistance of CDM-Smith, the City has completed the conversion of its current mapping system to GIS/electronic format using field GPS receivers. Future goals to advance the operational integration of the electronic file and data management program currently utilized by the City include the use of "tablets" in the field to more readily access information and update existing files. Changes in staffing and more direct daily involvement by engineering personnel will further advance this goal.

Goal Status:
Activity Ongoing

BMP 2-5 Development and implementation of local ordinances

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 10:
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

BMP 2-6 Completion of an infrastructure needs analysis

Responsible Department/Person:
Eng. Dept, DPW, Compliance Team

Measurable Goal(s):
Development of a long term plan for infrastructure upgrade

Progress on Goals- Year 10:
The reorganization of Engineering and MDPW support staff is intended to advance the understanding and prioritization of infrastructure needs.

Goal Status:
Annual Ongoing Activity

BMP 2-7	Identification of capital improvement projects necessary to improve stormwater quality

Responsible Department/Person:
Compliance Team

Measurable Goal(s):
Conveyance of CIP requirements to Planning Board and local permitting processes.

Progress on Goals- Year 10:
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 10:
Dry weather inspection and sampling has been performed during this permit year. Illicit discharges/connections have been identified and removed. 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 10:
A summary of historic dry weather sampling results together with related flow isolation studies may be referenced as Attachment A. Dry weather sampling will continue during the next permit year and 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.**

Responsible Department/Person:
Compliance Team

Measurable Goal(s):
Identification of source area contributions

Progress on Goals- Year 10:
In response to odor complaints in the central downtown area and to further assess flows into the Malden River, a characterization of the Spot Pond Brook Culvert in the area of Exchange Street was performed by the Stormwater Compliance Team in April of 2012. The focus of this investigation involved that portion of the drainage infrastructure located within and proximate to Exchange Street, including the culverted flows of Spot Pond Brook that flow in an easterly direction parallel to Exchange Street. According to City personnel, a strong sewerage odor was identified on several occurrences emanating from the grated cover over the Spot Pond Brook culvert located in the parking lot on the corner of Jackson and Exchange Streets. To investigate potential sources for this condition the entire drainage system within the Jackson and Exchange Streets area was inspected. This revealed no flows as a source condition, however, one (1) no-flow illegal connection to a catch basin located at the corner of Exchange and Washington Streets was identified. Over the course of the investigation program, which was carried out on multiple days, intermittent odors were confirmed at the culvert location of concern (E28-SP2).

Based upon the absence of contributing flows upstream, the focus of the investigation was directed to a laundromat located adjacent to the upstream grated cover (E28-SP1), as well as the regional sewer main that passes by E28-SP2. An interior inspection of the laundromat indicated the presence of a high temperature discharge to the sewer main that runs parallel to the Brook. Through continued monitoring it was determined that these high temperature discharges were likely causing off gassing of sewer gasses between the grated covers to Spot Pond Brook. To support this condition, samples were collected at E28-SP1 and E28-SP2 and submitted for laboratory analysis for E. coli. Fairly uniform, though high levels were identified at E28-SP1 (6,100 col/100ml) and E28-SP2 (5,200 col/100ml). This suggested that no flow contributions were entering into Spot Pond Brook between the sampling points. However, field observations noted during the April assessment program identified sewer gasses entering the culvert, as they were being detected at E28-SP2. This flow network was also re-evaluated during the joint City of Malden and USEPA program specified in September of 2012, as described in further detail within the IDDE Semi-Annual Status Reports within Attachment B.

During this permit year, representatives of NCA and MDPW personnel continued 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.

To address the "human waste" contributions to bacteria counts present at certain outfall discharges, a multiple line of evidence sample program was performed in September of 2012, with technical and funding assistance provided by representatives of USEPA.

As stated previously, this sampling effort was offered to the City to help identify the infiltration and/or discharge of illicit sewage/human waste stream loadings to the municipal drainage system using a multiple lines of evidence testing approach. This included the evaluation of a comprehensive suite of parameters, including the following:

1. E. coli
2. Enterocossus
3. Atenolol
4. Acetaminophen
5. Cotinine
6. 1,7-Dimethylxanthine
7. Caffeine
8. Metoprolol
9. Carbamazepine
10. Surfactants
11. Chlorine
12. NH3
13. Salinity
14. Temperature
15. Conductivity

Specifically, this approach was intended to resolve traditional limitations involving reliance upon bacteria analysis associated with animal waste contributions. Overall, a total of 17 samples were collected during the 11 September event. To assist in the evaluation of the results obtained relative to historic water quality data, the sample designations identified on Table 1.0 correspond to the following watershed designations.

A. Malden River
B. Linden Brook
C. Town Line Brook

During the September 2012 sampling event, representatives of the USEPA collected a water sample from outfall LBR-1, located in Revere, where distinct indications of sewage odors were noted (Figure 1). Consistent with identification of strong sewage odors and immediately apparent from a review of Table 1.0 are the significant levels of all sampling parameters, with the exception of Carbomazepine in sample LBR-1.

To investigate the elevated bacteria levels encountered at LBR-1, the City of Malden contracted with National Water Main Cleaning Company, under the supervision of CDM Smith. It is believed that line blockage due to grease build up may have been a crucial factor for the conditions identified at LBR-1, in addition to a "minor" defect in the form of a leaky joint. Although maintenance is routinely performed on this siphon, the extent of grease build up indicates that a higher frequency of cleaning and maintaining is necessary to further understand the condition. Based upon this recommendation, the City is now conducting weekly inspections of the siphon. These inspections have not revealed any significant blockage or grease buildup within the sewer network proximate to the siphon infrastructure. In addition, two (2) sampling events have been performed at LBR-1, with no significant E. coli levels detected.

In addition to the EPA sampling referenced above, the Stormwater Compliance Team also conducted several dry weather sampling events within the Malden River and Linden Brook watersheds. A summary of the results obtained from dry weather sampling may be referenced from Table 2.0. Samples were also collected by NCA within the Linden Brook watershed at the locations that contribute dry weather flows into the Linden Brook system in September 2012 and April 2013. These included a manhole on Orchard Street (O10-MH1) which is located upstream of location H43-MH1 and a sample from a manhole on Kennedy Drive (K6-MH1). The Kennedy Drive manhole is located at the entrance to the Grenada Highlands Apartment complex and represents the highest point in the tributary watershed to Linden Brook within this portion of the

City. As indicated on Table 2.0, levels of E. coli at O10-MH1 decreased significantly from the 27 September 2012 sampling event (4,300 col/100ml) to the 5 April 2013 sampling event (650 col/100ml). In general, an overall reduction in E. coli levels was observed within Linden Brook during the 5 April 2013 sampling event.

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.**

Responsible Department/Person:
Compliance Team

Measurable Goal(s):
Separation of non-human bacterial loading and implementation of mitigation measures.

Progress on Goals- Year 10:
The City has implemented several measures to reduce discharge of non-human bacterial loading at park lands, cemeteries and open space. These have included the use of dogs, postings to prevent the feeding of waterfowl, pet waste stations and enforcement of posted signage. During this permit year the City awarded a contract for the conversion from grass playing fields to synthetic surfaces, at South Broadway Park. These improvements area located within the Town Line Brook watershed and will have a direct impact upon waterfowl waste contributions, as well as 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.

Responsible Department/Person:
Compliance Team

Measurable Goal(s):
Preparation of annual report.

Progress on Goals- Year 10:
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 from adjacent communities. Beyond the removal of illicit discharges, flow conveyance capacity requirements and necessary infrastructure repairs have been identified.

Included amongst long term planning efforts is Phase 3 of a comprehensive Infiltration and In-flow (I&I) study for the municipal sewer system that was performed by CDM Smith, on behalf of the City. This report includes a summary of findings and proposed recommendations to mitigate infiltration and inflow into the City's sewer system and was presented for approval to MWRA during this permit year. Approval has been received, together with necessary funding.

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. 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 and outside technical staff to further investigate. As a part of the restructuring between MDPW and Engineering Department staff, representatives of the Engineering Department typically allocate one (1) work day per week to travel with the catch basin inspection team. 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 2012-2013 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

Responsible Department/Person:
Eng Dept & Compliance Team

Measurable Goal(s):
Development and implementation of an IDDE Plan.

Progress on Goals- Year 10:
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

Responsible Department/Person:
Compliance Team

Measurable Goal(s):
Development of checklist

Progress on Goals- Year 10:
The City's permitting process now incorporates the criteria contained within adopted stormwater ordinances to guide its review process. These ordinances provided the mechanism for enforcement and 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.

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 10:
No progress has been made to these certification requirements, beyond conditions of approval and City oversight.

Goal Status:
Ongoing

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

Responsible Department/Person:
Compliance Team

Measurable Goal(s):
Conditions of Approval, monitoring of construction activities.

Progress on Goals- Year 10:
Recent development within the City has primarily involved the conversion of urban fill areas into capped recreational improvements and the planned conversion of South Broadway Park to synthetic playing field surfaces. Additional improvements performed during this permit year have included the placement of synthetic playing surfaces at MacDonald Stadium, located in the downtown area. Stormwater runoff from prior grass and earthen surfaces at MacDonald Stadium flowed into West End Brook, which discharges to the Malden River.

Goal Status:
Ongoing

BMP 4-4 Enforcement of existing state and federal guidance.

Responsible Department/Person:
Planning Board and Inspectional Services, Eng. Dept.

Measurable Goal(s):
Documentation of violations, implementation of corrective actions.

Progress on Goals- Year 10:
See BMP 3-6 and 5-8. Following the adoption of local control measures in April 2009, the City has enforced the removal of illicit discharges and required that investigations be undertaken to mitigate improper stormwater discharges. This has involved the upgrade of private sewer connections to the municipal system, removal of illicit discharge connections and the cleanup/maintenance of private properties exhibiting the potential to adversely contribute to wet weather runoff.

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 10:
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 10:
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. Further, compliance with stormwater guidance for new development (310 CMR 10.00) is maintained.

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 10:
In addition to increased Engineering involvement in daily work practices, 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 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 10:
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 10:
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, and has been reviewed with representatives of USEPA. The extent of sediment deposition with the channel, together with compromises in its structural integrity represents long term and ongoing sources for degradation of surface water quality.

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 10:
No planned maintenance activities occurred during this reporting period.

Goal Status:
Funding for necessary improvements and attention by DCR remains the goal of this BMP.

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 10:
The current Administration has made significant commitment to public outreach and community involvement. At the core of this effort is education and input from concerned residents, as well as the business community. Building upon the foundation for ecosystem restoration represented by Phase I of the River's edge project, the current focus of community involvement includes bank cleanup and public benefits and enhancement opportunities for the Malden River.

Goal Status:
Achieved and 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 10:
During the 2012-2013 permit year, the Engineering Department and the MDPW continued to document catch basin locations and functional characteristics in conjunction with catch basin cleanings. It is anticipated that during the next permit year, full GIS capabilities will be established through work completed by CDM. At that time, full GIS mapping and the identification of repair issues will be part of the maintenance program.

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 10:

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.

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. Approval has been 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 10:
No SSOs were identified during Year 10.

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

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 10:
Stormwater management requirements, compliance enforcement and ongoing work practices have been integrated into daily work procedures, with an emphasis placed upon improved communication.

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 10:
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. This is evidenced by both the timing and extent of infrastructure repairs and the overall improved understanding of the municipal drainage and sewer systems.

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	$ 700,000 – 850,000

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	2 Days
	Community participation	45%
	Material collected	$8,000
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	90%
4.4	Outfalls inspected/screened	100%
4.5	Illicit discharges identified	7
4.6	Illicit connections removed	260 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	300 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	576 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)	100%
	Herbicides	None
	Pesticides	None

7.16	Anti/De-Icing precuts and rations	Salt 98% Sand 2% CaCl2 100 gals/30 tons
	5000 gallon tank	CaCl2-100%
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

NANGLE CONSULTING ASSOCIATES, INC

ATTACHMENT A

Environmental Engineering and Land Use Planning

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Table 1.0 EPA New England Stormwater Outfall Inspection & Sampling Summary - Malden, MA 9/11/12[1]

Location				PPCP ng/L							Surfactants	Chlorine	NH3 (mg/l)	YSI Meter		
Site Name	Time	E.coli (MPN/100ml)	Entero (MPN/100ml)	Atenolol	Acetaminophen	Cotinine	1,7-Dimethylxanthine	Caffeine	Metoprolol	Carbamazepine			Test St.	Salinity ppt	Temp C	Conductivity uS
Malden River Watershed																
MR-0	815	3,090	ND	7.8	340	12	80	560	ND	6	NA	NA	NA	0.4	17.1	763
E28-SP2	835	310	ND	ND	1.5	1.5	2.3	21	ND	12	0.25	0	0	0.5	15.1	1061
E28-SP1	855	740	100	ND	2.6	1.3	2	27	ND	14	NA	NA	NA	0.5	14	1059
C46-MH19	915	850	310	49	3.3	27	ND	12	6.9	ND	1	0.02	>6	3.9	20.5	7.13 (mS)
S29-MH3	950	13,330	410	3.7	1,900	2	220	190	8.9	0.29	NA	NA	NA	0.3	17.8	693
NG-C1	1015	510	ND	ND	38	1.4	24	220	ND	ND	NA	NA	NA	0.4	18.1	717
Town Line Brook Watershed																
TL-9	1100	410	2,380	2.8	480	31	16	7,200	57	0.27	NA	NA	NA	0.4	21.3	770
B53-MH7	1120	410	100	ND	62	43	99	470	0.84	1.5	NA	NA	NA	0.2	20.6	334.9
BP-MH3	1135	200	ND	1.6	29	9.6	5.9	68	ND	0.31	NA	NA	NA	0.6	20.5	1205
S3-MH12	1155	2,880	2,160	ND	2,500	43	49	100	ND	ND	NA	NA	NA	0.2	21.2	479.3
S3-MS12D	1155	2,980	1,610	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Linden Brook Watershed																
LB-R1	1220	>241,920	26,130	790	35,000	570	4,900	15,000	320	ND	NA	NA	NA	1.7	19.3	3315
LB-01W	1235	200	200	2.6	30	7.7	9.8	66	3.6	1.4	NA	NA	NA	23.9	18.7	33.11(mS)
LB-02C	1237	740	520	1.3	13	6	4.2	37	2.2	0.94	NA	NA	NA	22.6	18.8	31.45(mS)
LB-03E	1239	100	100	0.97	5.9	6.7	4	190	1.3	1.1	NA	NA	NA	19.3	18.7	31.39(mS)
F1-MH4	1255	310	200	ND	1.9	1.7	44	13,000	1.6	0.86	NA	NA	0.06	0.1	17.5	238.6
H43-MH1	130	5,470	630	0.98	10	6.7	7.4	45	18	0.43	NA	NA	NA	0.2	20.9	489.2

* sampling conducted in dry weather

[1] Data compiled by EPA

E. coli - color key: Red ≥ 10,000 col/100ml, Orange ≥ 1260 col/100ml, Yellow ≥ 235 col/100ml, Black < 235 col/100ml
Entero - color key: Red ≥ 1000 col/100ml, Orange ≥ 350 Yellow ≥ 61 col/100ml, Black < 61 col/100ml
NH3 - color key: Red ≥ 6 mg/L, Orange ≥ 0.5 mg/L, Yellow ≥ 0.0 mg/L
Surfactants - color key: Red ≥ 1.0 mg/L, Orange ≥ 0.5 mg/L, Yellow ≥ 0.25 mg/L, Black < 0.25 mg/L *** may give false positive at salinity greater than 1 ppt
PPCP color key: Pink = Concentrations greater than background
Cl2 - color key: Red ≥ 1.0 mg/L, Orange ≥ 0.3 mg/L, Yellow ≥ 0.02 mg/L, Black < 0.02 mg/L

REPORTING LIMITS
E. coli = 4 MPN/100mL
Enterococcus = 10 MPN/100mL
Surfactants Field = 0.1 mg/L
Ammonia Field = 0.1 mg/L

ND – not detected above the associated detection limit
NA – not applicable (analyte not tested for at that site at this time)
(~) – data reported as estimate

Table 2.0 Dry Weather Conditions - E. Coli Concentrations

Site Location, Outfalls/Manholes Malden, MA

Sample Description: Water

Sample Designation	E. Coli (MF) (MPN/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	1/11/2012	4/13/2012	6/15/2012	9/11/2012[5]	9/27/2012	2/23/2013	4/5/2013
Malden River																				
MR-0	150	1,100	-	68	-	-	110	-	-	-	-	-	9,200	-	-	-	3,090	-	-	490
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	-	-	-	1,700	-	-	-	-	-	-
LSP-3	-	-	-	-	-	-	-	-	-	-	-	-	-	1,600	-	-	-	-	-	-
LSP-4	-	-	-	-	-	-	-	14,000	-	2,000	17,000	-	-	>242,000	-	100,000	-	-	-	-
LSP-5.1-Channel[2]	-	630	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LSP-9	-	-	-	-	-	-	-	-	-	-	-	34	-	84	-	-	-	-	-	-
LSP-10-Channel[2]	-	350	-	-	-	-	-	4,900	-	-	-	-	-	10,000	-	-	-	-	-	-
C39-MH0.1	-	-	-	-	-	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C46-MH19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	850	-	-	-
E28-MH8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (1.0)	-	-	-	-	-
E28-SP1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,100	-	740	-	-	-
E28-SP2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,200	-	310	-	-	-
E28-MH4A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-
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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NG-C1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P36-MH5	-	-	3,500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R18-MH1	-	-	-	-	-	290	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S29-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	160
S29-MH3	-	-	96	-	-	-	-	-	-	-	-	-	-	-	-	-	13,330	-	-	190
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	-	-	-	-	410	-	-	-
TL-13	30	70	-	-	-	-	-	-	-	-	-	ND (1.0)	-	-	-	-	-	-	-	-
TL-24	520	1,500	-	-	-	-	-	24,000	-	-	-	-	-	-	-	-	-	-	-	-
TL-BL-EV	440	740	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B53-MH7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	410	-	-	-
BP-MH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	-
S3-MH12[3]	-	2,200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,880	-	-	-
L23-MH1	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Saugus Branch																				
MR-2	-	ND (2.0)	-	-	-	-	220	-	-	1,100	-	-	1,200	-	-	-	-	-	-	-
Broadway/Eastern[4]	-	140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Linden Brook																				
C36-MH1	-	-	-	-	-	-	160	-	-	-	-	-	-	6.3	-	-	-	-	-	-
D17-MH1	-	-	-	-	-	-	1,200	-	360	-	-	-	-	460	-	-	-	-	-	-
F1-MH4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	310	-	-	12
H43-MH1	-	-	-	-	-	-	1,600	-	2,400	-	-	-	-	28,000	-	-	5,470	-	-	580
K6-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	49	-	-
L5-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	580
LBR-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	>241,920	-	<10	1
O10-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,300	-	650
P24-MH1	-	-	-	-	-	-	96	-	-	-	-	-	-	9.7	-	-	-	-	-	-
V1-MH1	-	-	-	-	-	-	-	-	15	-	-	-	-	5.2	-	-	-	-	-	-
W26-MH1	-	-	-	-	-	-	180	-	-	-	-	-	-	390	-	-	-	-	-	320

File No. 465.09

[1]2007 samples collected 9/25/07

[2]2007 samples collected on 6/21/07

[3]2007 samples collected 7/12/07

[4]2007 samples collected 9/12/07

[5]Samples collected by USEPA

NANGLE CONSULTING ASSOCIATES, INC

FIGURES

Environmental Engineering and Land Use Planning

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NANGLE CONSULTING ASSOCIATES, INC.
Environmental Engineering and Land Use Planning
960 Turnpike Street, Canton, Massachusetts 02021

Figure 1 - September 2012 Dry Weather Sampling Program

LINDEN BROOK - MALDEN, MASSACHUSETTS

0 375 750 1,125 1,500 Feet

NANGLE CONSULTING ASSOCIATES, INC

ATTACHMENT B

Environmental Engineering and Land Use Planning

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CITY OF MALDEN

Illicit Discharge Detection and Elimination Program
Semi-Annual Status Report

July 1, 2012 – December 31, 2012

Prepared by:

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

and

City of Malden Engineering Department
200 Pleasant Street
Malden, Massachusetts

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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 improvement 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 2012 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 dry weather flows, identification of potential illicit discharge and timely repairs to the storm drainage infrastructure. 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, enforced Best Management Practices (BMPs)/stormwater ordinances and completed repairs to components of the drainage infrastructure. A key component of this effort is the City of Malden's GIS mapping and catch basin cleaning/repair program, which is maintained by the MDPW.

The goals and objectives of this IDDE plan are directed towards the reduction in the historic bacteria levels that have been detected at selected outfalls within the City, particularly during wet weather conditions. In addition, as a "flow though" community, bacteria loadings entering into the City of Malden's infrastructure at upstream connections have also been quantified. 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. This has been further supported by detailed inspections and sampling events during this reporting period by both the City and representatives of the U.S. Environmental Protection Agency (USEPA), as described in Section 3.0 of this submittal.

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. In this regard, 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. This has included a restructuring of responsibilities and staffing to provide a greater involvement by engineering technical staff to assist the MDPW stormwater compliance crew.

This report has been prepared to document and summarize IDDE activities that have been undertaken by the City during the July 2012 through December 2012 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 initially developed by NCA has continued to be expanded for use by municipal departments under the direction of CDM Smith. 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, one potential illicit discharge was identified, in the form of a possible grease blockage within a sewer siphon located at the intersection of Salem and Lynn Streets that passes beneath Linden Brook. This structure is located at the City line between Malden and Revere. In addition, two (2) illicit connections have been identified on Pleasant Street. The first illicit connection is located at 100-110 Pleasant Street and involved the identification of a discharge pipe which appears to originate from the onsite building and is connected to a municipal catch basin located on South Washington Street. The second illicit connection was identified at 6 Pleasant Street and involved the connection of a sewer line to a roof drain that was connected to the City's stormwater system, which was found during detailed inspections directed towards the identification of the source for intermittent sewerage odors within this portion of the City. According to the City of Malden Plumbing Inspector, this illicit connection has been disconnected from the City's stormwater system. To assist in the review of the information contained within this report, 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 2012 – DECEMBER 2012)

In addition to outfall sampling, 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 and sampling by representatives of the Stormwater Compliance Team. In support of this dry weather inspection program, the USEPA, in collaboration with members of the Stormwater Compliance Team and representatives of NCA performed a dry weather sampling event in September of 2012.

(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.

The recent focus of the dry weather inspection program has been directed towards the Linden Brook watershed and central portions of the City. By design, observations recorded during the dry weather inspections, together with the results of infrastructure sampling, serve as the basis for future work plan tasks and modifications to the original IDDE plan. Accordingly, the IDDE program maintained by the City is regarded as 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 comprised 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. Increased involvement by engineering technical staff in the daily work practices of MDPW stormwater personnel is also intended to further this goal. 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. The current municipal leadership has made a significant effort to increase public awareness and participation through increased integration of digital and electronic media into daily practices. 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. 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.

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. Upon the identification of previously unknown dry weather flows, the Engineering Department and NCA are immediately notified by MDPW personnel and targeted mass balance sampling efforts are performed. Portions of the municipal infrastructure that have been addressed by the compliance team including these targeted subset areas are summarized on Figure 3.

During dry weather inspections completed under the IDDE program, several 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
Flow 12 – Kennedy Drive, proximate to Granada Highlands Apartments
Flow 13 – Orchard Street
Flow 14 – Exchange Street – Intermittent flows
Flow 15 – Lower Commercial Street

As a part of this investigation of dry weather flows contributing to Linden Brook, an inspection of the drainage system in the area of Kennedy Drive, a high point in the watershed, was performed. This revealed dry weather flows emanating from the area of the Grenada Highlands Apartment Complex (Flow 12). As discussed in Section 3.1.3, a sample collected from the manhole located at the intersection of Kennedy and Central Street (H6-MH1) revealed only trace of low levels of E. coli. Additional investigations also indentified dry weather flows (Flow 13) within Orchard Street, which were upstream and tributary to, the dry weather flows historically observed at sampling location H43-MH1 the intersection of Mingo and Home Streets. The further investigation of these conditions is ongoing.

During the scope of work associated with the presence of sewage odors along Exchange Street, an intermittent flow of probable potable water was observed within the drainage system located in Exchange Street (Flow 14). Inspection of the upstream infrastructure revealed no flow at any manhole locations. Inquiries by representatives of the MDPW suggests that this discharge may have been attributable potable water discharge during the repair/testing of a fire suppression system within a nearby building. Subsequent inspections have not revealed any additional flows and monitoring will be continued at this location.

Intermittent flows have also been identified at a manhole directly upstream of Little Creek, within lower Commercial Street (Flow 15). The evaluation of this dry weather flow was included within the September 2012 USEPA sampling event as discussed in further detail within Section 3.1.1 of this submittal.

To support the dry weather inspection program, the USEPA, in collaboration with members of the Stormwater Compliance Team and representatives of NCA performed a dry weather sampling event on 11 September 2012. This sampling effort was offered to the City to

help identify the infiltration and/or discharge of illicit sewage/human waste stream loadings to the municipal drainage system using a multiple lines of evidence testing approach. This included the evaluation of a comprehensive suite of parameters, including the following:

1. E. coli
2. Enterocossus
3. Atenolol
4. Acetaminophen
5. Cotinine
6. 1,7-Dimethylxanthine
7. Caffeine
8. Metoprolol
9. Carbamazepine
10. Surfactants
11. Chlorine
12. NH3
13. Salinity
14. Temperature
15. Conductivity

As stated above, the focus of this extensive USEPA analytical program was directed towards the isolation of representative human based contributions to dry weather flows, using an approach that greatly exceeds the limitations of simple bacteria sampling. Specifically, this approach was intended to resolve traditional limitations involving reliance upon bacteria analysis associated with animal waste contributions. Overall, a total of 17 samples were collected during the 11 September event. To assist in the evaluation of the results obtained relative to historic water quality data, the sample designations identified on Table 2.0 correspond to the following watershed designations.

A. Malden River
B. Linden Brook
C. Town Line Brook

The original focus of the IDDE program, and more specifically dry weather sampling efforts was directed towards those portions of the infrastructure that discharge to the Malden River. Since that time, the IDDE Program has been expanded to include the Town Line Brook, Linden Brook and the Saugus Branch systems. Observations and sampling results 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 dry weather sampling events, the City has identified significant base flow as surface waters, to the Malden River. 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. 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 by NCA, the regional watershed group, Mystic River Watershed Association (MyRWA) and more recently, the USEPA.

Sample locations selected by USEPA, with input from NCA, were designed to target previously identified areas of concern using the mass balance approach described within the IDDE Plan. The September 2012 sampling event was initiated through the collection of a sample at the Malden River headwall (MR-0, Table 2.0). The initial isolation of flows to MR-0 was performed at sample locations E28-SP1 and E28-SP2, which as shown on Figure 6, are situated upstream of the Malden River headwall, proximate to Exchange Street. As discussed in further detail below, significant sewage odors had been previously detected in this area of Exchange Street. While the apparent source for this condition was identified as the discharge of extremely high temperature effluent into the system from a nearby laundromat, the proximity of the main MWRA sewer trunk line and Malden system tie in was of additional concern.

As shown on Table 2.0, samples collected from E28-SP1 and E28-SP2 during the September 2012 sampling event, contained E. coli levels of 740 col/100ml and 310 col/100ml, respectively. Remaining parameters were relatively uniform and approaching the applicable regulatory guidance. As stated above, this area was originally characterized by the Stormwater Compliance Team in April of 2012, following odor complaints which appeared to be emanating from the open grate for Spot Pond Brook, represented by sample location E28-SP2. At that time, several water samples were collected and submitted for laboratory analysis of E. coli, revealing fairly uniform, though high levels at E28-SP1 (6,100 col/100ml) and E28-SP2 (5,200 col/100ml). This suggested that no flow contributions were entering into Spot Pond Brook between the sampling points. However, field observations noted during the April 2012 assessment program identified sewer gasses at E28-SP2 that were believed to be associated with the high temperature water discharges described above. No odor occurrences were noted during the EPA September 2012 sampling event and no odor complaints have been reported since the completion of the evaluation described above.

In addition to the investigation of possible sewer trunk line issues along Exchange Street, the downstream sample (E28-SP2) was also intended to quantify potential contributions from this segment of the drainage infrastructure that discharges to the outfall for the Malden River (MR-0). As summarized on Table 2.0, the concentrations of the constituents detected in sample E28-SP2 during the September 2012 sampling event were for the most part significantly lower than those observed at MR-0. To provide a similar isolation of flows contributing to the Malden River from Lower Spot Pond Brook, sample NG-C1 (National Grid property) was collected at the approximate location depicted on Figure 7. As shown on Table 2.0, an E. coli concentration of 510 col/100ml was identified, with concentrations for Acetaminophen, Cotinine, 1,7-Dimethylxanthine and Caffeine detected at levels greater than background.

A similar flow isolation investigation was also performed for West End Brook through the collection of sample S29-MH3 (Stadium Road) at the approximate location shown on Figure 7. It was also proposed to sample upstream of S29-MH3 however, no flow within the culvert was identified at the intended location. It should be noted that flows emanating from the Fells Reservation enter the West End Brook in the area of S29-MH3. As indicated from a review of Table 2.0, elevated E. coli levels were detected during the September 2012 sampling event in manhole S29-MH3, in contrast to prior sampling results. In addition, high levels of additional indicators of human waste contributions, most noticeably Acetaminophen, were also observed. A re-evaluation of this condition will be performed during the next reporting period, together with additional flow isolation studies, as warranted.

Previous dry weather inspections have identified dry weather flows within a segment of the drainage system at the manhole identified as C46-MH19 (Figure 8), which is located immediately to the north of Little Creek. Reference to Table 2.0 reveals that moderate levels of both bacteria and sewage flow contributions were detected during the September 2012 sampling event. Of further note however, was the detection of surfactants, chlorine and ammonia nitrogen levels.

The Stormwater Compliance Team has conducted numerous dry weather sampling events to investigate the elevated E. coli levels encountered previously at LSP-4, an outfall for the drainage system located within Eldrich Drive (Figure 9). Base flow, as groundwater, is consistently observed within this drainage network and to isolate potential sewage contributions to this base flow, a comprehensive evaluation of the flow conveyance network associated with LSP-4 was completed in 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 into 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 in March of 2012.

3.1.2 Town Line Brook Watershed

Town Line Brook in Malden begins at the Malden and Everett city boundary and is culverted until it daylights into an open concrete lined trapezoidal channel at Broadway. Significant tidal influences 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 10, a total of 29 outfalls to Town Line Brook in Malden have been identified. The historic monitoring data of Town Line Brook has revealed relatively uniform bacteria levels during dry weather sampling events. Several outfall locations have consistently exhibited bacteria loadings during dry weather sampling events, including S3-MH12, TL-0, TL-9 and Trifone Brook (TL-24). Manhole sample point S3-MH12 is the upstream sampling point for this section of the Brook as it enters the Malden system from Everett, while TL-0 is located at Broadway, where Town Line Brook daylights. TL-9 is located proximate to the terminus of Hadley Street in Malden and receives dry weather flows from the City of Everett, with Trifone Brook (TL-24), also flowing from Everett prior to discharging into Town Line Brook.

To further quantify the composition of discharges entering into the drainage system from the City of Everett in the area of TL-9, an attempt was made to collect a sample from the drainage manhole located at the intersection of Hadley and Miller Streets. However, due to the configuration of the inlet and flow volume present, a representative sample could not be collected at this location. As there are no additional contributions to the dry weather flow in Hadley Street between the above described manhole structure and outfall TL-9, a sample was collected at TL-9 during the September 2012 sampling event. As summarized on Table 2.0, elevated levels of Enterococcus bacteria, Acetaminophen and caffeine were detected, along with several additional constituents above normal background levels (Atenolol, Cotinine & Metoprolol); confirming human based contributions to this discharge.

Of further note with respect to water quality at outfall TL-9 was the presence of a large amount of sediment in the dry weather flow, which resulted in visual sediment distribution within Town Line Brook. During the attempt to sample the Hadley Street manhole, it was noted that municipal employees from Everett were in the process of performing repairs to portions of the upstream drainage infrastructure in Everett, which included the discharge of dewatering effluent into the drainage system. This discharge was determined to be directly responsible for the sediment discharge observed at TL-9 during the September 2012 sampling event and also confirms that dry weather flows observed in Hadley Street were indeed emanating from the City of Everett.

While a single stream dry weather flow condition exists at TL-9, there are several primary contributions to the outfall at Broadway (TL-0) and a Sketch Plan of Site depicting the sampling locations designed to isolate these flow contributions is depicted as Figure 11. As referenced previously, S3-MH12 is the upstream sampling point for this section of the Brook as it enters the Malden system from Everett. As summarized on Table 2.0, a sample from S3-MH12 and a duplicate sample both revealed consistent bacteria contributions entering into the Malden infrastructure. In addition, several indicators of human sewage contributions were also identified. As illustrated on Figure 11, there are two (2) culverted flows within the Malden drainage infrastructure that discharge at TL-0. While much lower bacteria levels were identified at sampling points BP-MH3 and B53-MH7, pharmaceuticals and detectable caffeine levels were also identified. These sampling points will be added to the coverall dry weather sampling program and in addition to re-sampling at these locations, upstream flows will also be investigated to isolate potential area of contribution.

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). Flow isolation studies performed to date within this portion of the City have not revealed any distinct source conditions for the results of prior sampling, which has included elevated bacteria levels at sample location H43-MH1 (Figure 12). As shown on Tables 2.0 and 3.0, while levels of E. coli bacteria were detected at H43-MH1 during the recent USEPA sampling event (5,470 col/100ml), they were substantially lower than those detected in January 2012 (28,000 col/100ml). Investigations to determine the source for the earlier results suggested that a compromise to the sewer line within upstream portions of the watershed may have contributed to this condition.

As an initial follow up to the 11 September 2012 sampling event, samples were collected by NCA at the locations that contribute dry weather flows into the Linden Brook system on 27 September 2012. These included a manhole on Orchard Street (O10-MH1) which is located upstream of location H43-MH1 and a sample from a manhole on Kennedy Drive (K6-MH1). The Kennedy Drive manhole is located at the entrance to the Grenada Highlands Apartment complex and represents the highest point in the tributary watershed to Linden Brook within this portion of the City. As indicated on Table 3.0, levels of E. coli levels at O10-MH1 (4,300 col/100ml) were compatible to those detected earlier in September at H43-MH1, while no significant bacteria levels were identified at Kennedy Drive.

During the September 2012 sampling event, representatives of the USEPA collected a water sample from outfall LBR-1, located in Revere, where distinct indications of sewage odors were noted. Three (3) additional samples were also collected by the USEPA in Revere from the open channel flow of Town Line Brook (Figure 12), the results of which are summarized on Table 2.0. Consistent with identification of strong sewage odors and immediately apparent from a review of Table 2.0 are the significant elevated levels of all sampling parameters, with the exception of Carbomazepine in sample LBR-1. It is important to note that the more uncommon drugs such as this tended to exhibit more variation within the overall sampling program in comparison to the more common constituents, caffeine and acetaminophen.

To investigate the elevated bacteria levels encountered at LBR-1, the City of Malden contracted with National Water Main Cleaning Company, under the supervision of CDM Smith. As summarized in the following excerpt from an email to the City of Malden from CDM Smith, it is believed that line blockage due to grease build up may have been a crucial factor for the conditions identified at LBR-1, in addition to a "minor" defect in the form of a leaky joint. Although maintenance is routinely performed on this siphon, the extent of grease build up indicates that a higher frequency of cleaning and maintaining is necessary to further understand the condition.

> As you know, National Water Main Cleaning Company along with CDM Smith staff were out on site on Tuesday November 6, 2012 to investigate the potential illicit connection into the Linden Brook Culvert at Salem Street near the Route 1 underpass. The following in a summary of the day's events. The following figure graphically represents the results of the work.
>
> National Water Main was onsite to clean and CCTV the siphon under the Old Linden Brook culvert. Upon arrival the condition of the sewers had not changed from the previous visit held 2 weeks prior: The downstream manhole (MH 3 in the attached figure) and a manhole upstream of the siphon (MH 1 in the figure) were completely plugged with heavy grease. A limited amount of liquid was passing through MH 3. Heavy cleaning of MH 3 and the sewer under the culvert took longer than expected. From MH 3 upstream to MH 1 an enormous amount of grease and sediment was removed. The pipe was 100% clogged with slugs of grease in several spots.
>
> The sewer between MH 1 and MH 2 was successfully CCTV'd with the aid of the jetter (upstream of the siphon). This pipe was found to be in good condition. The most notable defect was a leaking joint (runner) at 9pm 54-ft from MH 1 (while traveling downstream). This was a rather minor defect. Active I/I was observed, however, it is possible that when the siphon builds some head, a small amount of sewage could exfiltrate from this same joint.
>
> We discovered what appears to be an external drop connection just downstream of MH 2. This prevented us from CCTV'ing any further as the camera could not pass the vertical 90 degree bend. CCTV from the

upstream direction would require two jetters or bypass pumping, (one to keep MH 3 drained and one to intercept flow from upstream in MH 2). This vertical drop was heavily blocked with grease. Approximately 80% of the grease in this pipe was removed with a root cutter and the pipe is in much better condition.

Last we lowered the camera into the 12-in connection to the culvert that once housed a gate valve (in MH 3). It no longer houses any gate, instead there is a masonry plug that seems to be in good condition. As the intent of finding the definitive source of sewage into the culvert was inconclusive, we recommend that we resample the outfall and test for parameters consistent with sewage. If the results are consistent with the previous results we should develop a new approach to finding the source.

Based upon the "inconclusive finding" cited by CDM, future high frequency inspection of the siphon and related service connections is recommended to be performed during the next reporting period.

To assist in the review of the above, a profile sketch plan of the siphon that passes beneath the Linden Brook Culvert, together with associated sewage apparatuses prepared by CDM Smith is presents as Figure 13. In addition, a City of Malden sewer plan/profile for the siphon and upstream piping connections may be referenced as Figure 14. As shown on Figure 14, the sewer line entering from Revere is noted as being re-lain by the State.

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. 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 and outside technical staff to further investigate. As a part of the restructuring between MDPW and Engineering Department staff, representatives of the Engineering Department typically allocate one (1) work day per week to travel with the catch basin inspection team.

The information collected by MDPW is continually complied in a GIS stormwater drainage system database, which is currently being updated by CDM Smith to include record drawing information provided by the Department of Conservation and Recreation (DCR). Further, information collected during this process can also be utilized by MDPW to prioritize repairs and assist in Capital Improvement Planning. 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 Smith. The City of Malden has also completed a comprehensive Infiltration and In-flow (I&I) study for its municipal sewer system. CDM Smith, 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.

3.4 Drainage System Maintenance/Repair (MDPW)

As stated previously, a comprehensive restructuring of personnel and technical oversight has been undertaken between the Malden Engineering and Public Works Department to provide more daily oversight and technical assistance by Engineering staff. One of the specific goals of this restructuring is enhanced communication between field personnel and engineering staff to expedite system repairs and further the overall understanding of infrastructure needs. Through this process capital improvements can be better prioritized and integrated into a more comprehensive management plan.

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 obtained from the September 11 and 27, 2012 dry weather sampling events have identified two (2) key areas that warrant targeted flow isolation efforts. These include West End Brook in the area of Stadium Street (S29-MH3) and contributions to sampling location H43-MH1, which is located at the intersection of Home and Mingo Streets. Dry weather flow contributions have also been documented upstream of sample location H43-MH1 from Orchard Street (O10-MH1). The results obtained from the September 11, 2012 sampling event at S29-MH3 are in marked contrast to those obtained during prior sampling events. Additional sampling will be performed during the next reporting period, together with follow up flow isolation studies as necessary.

Through the assistance provided by USEPA, a more quantitative characterization of dry weather flows passing through the City of Malden's drainage infrastructure has been achieved. Of particular note is the apparent reliability of the human waste indicators, acetaminophen and caffeine, in comparison to the more exotic pharmaceuticals, relative to common bacteria measurements used in the past. In our opinion, the level of human waste indicators detected at LRB-1, or the open channel flow of Linden Brook in Revere, is reflective of conditions approaching raw sewage. The magnitude and suite of constituents identified strongly suggests that a compromise to the sewage network in either Malden, or Revere, exists immediately upstream of this outfall/discharge location. As the grease build-up identified within the Lynn Street siphon is to be acknowledged as a potential source, it is recommended that the inspection and monitoring frequency for this siphon that passes beneath Linden Brook and Lynn Street be increased to address possible blockage concerns.

At a minimum, it is recommended that the siphon at Lynn Street be inspected on a weekly basis. During this inspection program, recorded observations should include estimated flow volumes, upstream and downstream of the siphon, extent of grease buildup at the upstream manhole, depth to liquid in the downstream manhole, possible odors at the Linden Brook Outlet and any unusual conditions that may be present.

Overall, the City has greatly advanced its capacity to meet the goals of the IDDE program through the development of a dedicated stormwater team. 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, and the flow isolation studies described within this submittal, the following specific tasks are recommended for the next reporting period.

1) High frequency inspection of the siphon network at Lynn Street
2) Flow isolation and sampling in the area of Stadium Street
3) Sampling of LSP-4 and determination of base groundwater flows containing residual exfiltration from the repaired sewer laterals is occurring
4) Flow isolation and sampling of the dry weather flows identified at Orchid Street
5) Confirmation that the illicit connection (100-110 Pleasant Street) to the catch basin on South Washington Street has been removed
6) Flow isolation and dry weather sampling within the Neal Street drainage infrastructure that contributed to the flows identified at the intersection of Mingo and Home Street (H43-MH1)

NANGLE CONSULTING ASSOCIATES, INC

TABLES

Environmental Engineering and Land Use Planning

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Table 1.0 Summary of Illicit Connections/Discharges identifed as of 12/31/12

Illicit Connections

Illicit Connection Identification	Date Identified	Discharge Type	Estimated Volume	Date Removed	Location
ID-1	1/15/2009	Sewage	40 gpd	2/16/2009	33 Lodgen Ct., Unit 1F
ID-2	1/15/2009	Grey Water	100 gpd	3/2/2009	34 Hanover Street
ID-4	8/28/2009	Sewage	60 gpd	9/4/2009	2-4 Hancock Street
ID-9	5/18/2010	Sewage	60 gpd	5/19/2010	36 Charles Street
ID-12	Apr-12	No Flow	NA	Pending	100-110 Pleasant Street
ID-13	**Sep-12**	**Sewage**	**Unknown**	**Jan-13**	**Exchange Street**

Total Illicit Flow Removed to Date: ***260 gpd*** ***(94,900 gal/yr)***

Illicit Discharges

Illicit Discharge Identification	Date Identified	Discharge Type	Estimated Volume	Date Removed	Location
ID-3	8/11/2009	Oil Sheen	Unknown	n/a	Near 1081 Fellsway
ID-5	9/10/2009	#2 oil spill	<5 gallons	9/10/2009	269 Pearl Street
ID-6	9/21/2009	Poss. Washwater	Unknown	9/21/2009	120 Main Street
ID-7	12/9/2009	Trans. Dielectric fluid	<27 Gallons	12/10/2009	Near 6 Grove Street
ID-8	4/29/2010	Hydraulic Fluid	<10 Gallons	4/29/2010	496 Main Street
ID-10	2/10/2012	Sewage	Note 1	3/19/2012	1056 Erlich Drive
ID-11*	9/11/2012	Sewage	Unknown	11/6/2012	Linden Brook @ Lynn St.

1 - approximately 1 gallon per minute observed discharging at LSP-4 during dry weather

* Possible discharge due to grease blockage-Syphon still under investigation

Table 2.0 EPA New England Stormwater Outfall Inspection & Sampling Summary - Malden, MA 9/11/12[1]

Location				PPCP ng/L										YSI Meter		
Site Name	Time	E.coli (MPN/100ml)	Entero (MPN/100ml)	Atenolol	Acetaminophen	Cotinine	1,7-Dimethylxanthine	Caffeine	Metoprolol	Carbamazepine	Surfactants	Chlorine	NH3 (mg/l) Test St.	Salinity ppt	Temp C	Conductivity uS
Malden River Watershed																
MR-0	815	3,090	ND	7.8	340	12	80	560	ND	6	NA	NA	NA	0.4	17.1	763
E28-SP2	835	310	ND	ND	1.5	1.5	2.3	21	ND	12	0.25	0	0	0.5	15.1	1061
E28-SP1	855	740	100	ND	2.6	1.3	2	27	ND	14	NA	NA	NA	0.5	14	1059
C46-MH19	915	850	310	49	3.3	27	ND	12	6.9	ND	1	0.02	>6	3.9	20.5	7.13 (mS)
S29-MH3	950	13,330	410	3.7	1,900	2	220	190	8.9	0.29	NA	NA	NA	0.3	17.8	693
NG-C1	1015	510	ND	ND	38	1.4	24	220	ND	ND	NA	NA	NA	0.4	18.1	717
Town Line Brook Watershed																
TL-9	1100	410	2,380	2.8	480	31	16	7,200	57	0.27	NA	NA	NA	0.4	21.3	770
B53-MH7	1120	410	100	ND	62	43	99	470	0.84	1.5	NA	NA	NA	0.2	20.6	334.9
BP-MH3	1135	200	ND	1.6	29	9.6	5.9	68	ND	0.31	NA	NA	NA	0.6	20.5	1205
S3-MH12	1155	2,880	2,160	ND	2,500	43	49	100	ND	ND	NA	NA	NA	0.2	21.2	479.3
S3-MS12D	1155	2,980	1,610	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Linden Brook Watershed																
LB-R1	1220	>241,920	26,130	790	35,000	570	4,900	15,000	320	ND	NA	NA	NA	1.7	19.3	3315
LB-01W	1235	200	200	2.6	30	7.7	9.8	66	3.6	1.4	NA	NA	NA	23.9	18.7	33.11(mS)
LB-02C	1237	740	520	1.3	13	6	4.2	37	2.2	0.94	NA	NA	NA	22.6	18.8	31.45(mS)
LB-03E	1239	100	100	0.97	5.9	6.7	4	190	1.3	1.1	NA	NA	NA	19.3	18.7	31.39(mS)
F1-MH4	1255	310	200	ND	1.9	1.7	44	13,000	1.6	0.86	NA	NA	0.06	0.1	17.5	238.6
H43-MH1	130	5,470	630	0.98	10	6.7	7.4	45	18	0.43	NA	NA	NA	0.2	20.9	489.2

* sampling conducted in dry weather

[1] Data compiled by EPA

E. coli - color key: Red ≥ 10,000 col/100ml, Orange ≥ 1260 col/100ml, Yellow ≥ 235 col/100ml, Black < 235 col/100ml
Entero - color key: Red ≥ 1000 col/100ml, Orange ≥ 350 Yellow ≥ 61 col/100ml, Black < 61 col/100ml
NH3 - color key: Red ≥ 6 mg/L, Orange ≥ 0.5 mg/L, Yellow ≥ 0.0 mg/L
Surfactants - color key: Red ≥ 1.0 mg/L, Orange ≥ 0.5 mg/L, Yellow ≥ 0.25 mg/L, Black < 0.25 mg/L *** may give false positive at salinity greater than 1 ppt
PPCP color key: Pink = Concentrations greater than background
Cl2 - color key: Red ≥ 1.0 mg/L, Orange ≥ 0.3 mg/L, Yellow ≥ 0.02 mg/L, Black < 0.02 mg/L

REPORTING LIMITS
E. coli = 4 MPN/100mL
Enterococcus = 10 MPN/100mL
Surfactants Field = 0.1 mg/L
Ammonia Field = 0.1 mg/L

ND – not detected above the associated detection limit
NA – not applicable (analyte not tested for at that site at this time)
(~) – data reported as estimate

Table 3.0 Dry Weather Conditions - Miscellaneous Laboratory Testing

Site Location, Linden Brook Culvert - Malden, MA

Sample Description: Water

Sample Designation	Nitrogen, Ammonia (mg/L)		Surfactants, MBAS (mg/L)		E. Coli (MF) (mpn/100ml)			
	350.1		425.1		9213D			
	ACTION LEVEL-0.5 mg/L		ACTION LEVEL-0.1 mg/L		ACTION LEVEL- 235 col/100ml			
	7/29/2010	1/11/2012	7/29/2010	1/11/2012	7/29/2010	8/10/2010	1/11/2012	9/27/2012
Linden Brook								
C36-MH1	0.195	0.12	ND (0.05)	ND (0.05)	160	-	6	-
D17-MH1	0.077	0.125	ND (0.05)	ND (0.05)	1,200	360	460	-
H43-MH1	0.122	0.182	0.07	ND (0.05)	1,600	2,400	28,000	-
K6-MH1	-	-	-	-	-	-	-	49
O10-MH1	-	-	-	-	-	-	-	4,300
P24-MH1	0.097	0.788	ND (0.05)	ND (0.05)	96	-	10	-
V1-MH1	-	0.102	-	ND (0.05)	-	15	5	-
W26-MH1	0.119	0.095	ND (0.05)	ND (0.05)	180	-	390	-

File No. 465.09

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FIGURES

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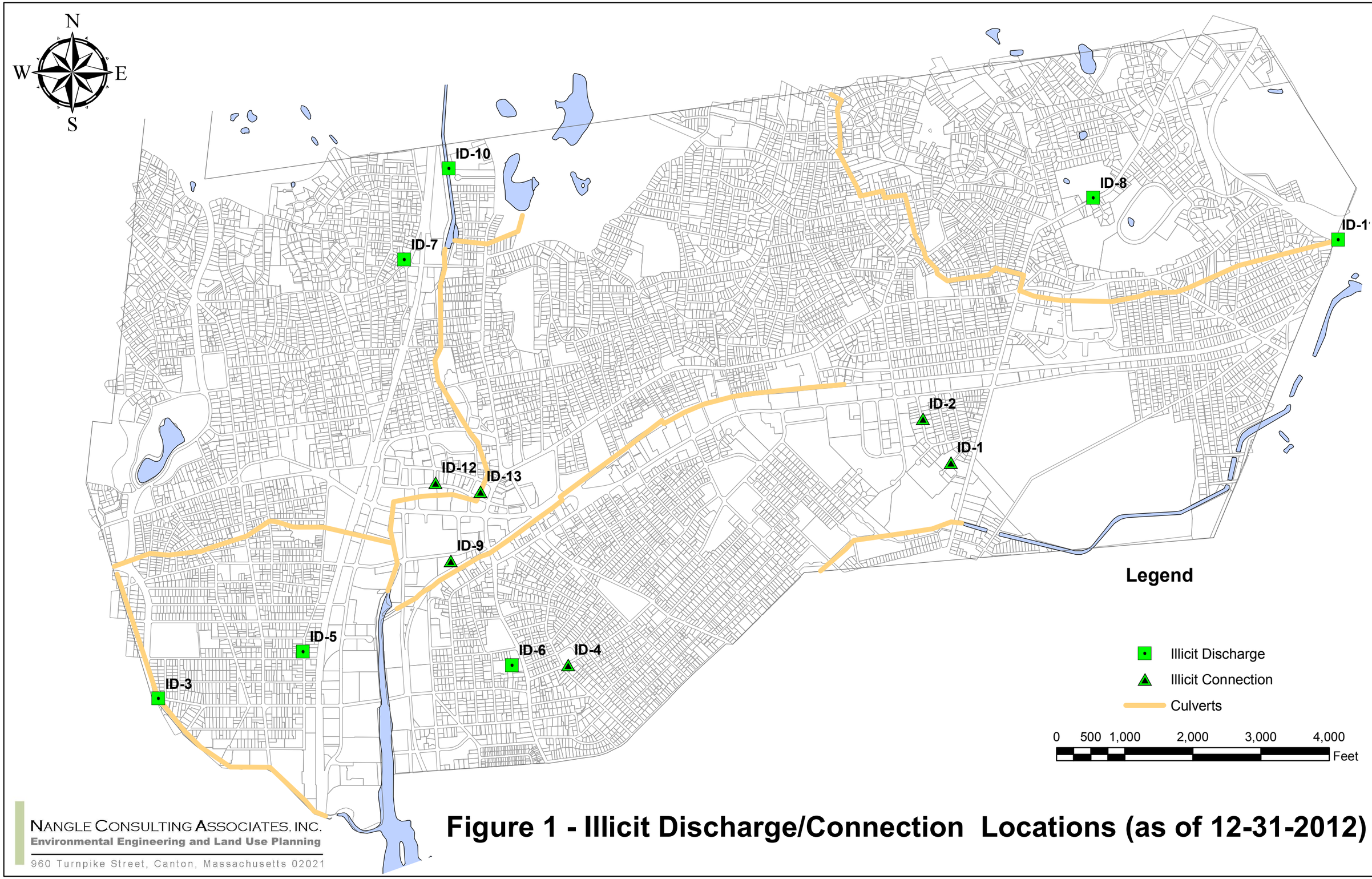

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Figure 1 - Illicit Discharge/Connection Locations (as of 12-31-2012)

N
W
E
S

Legend

Dry_Weather_Insp

Culverts

0 500 1,000 2,000 3,000 4,000

Feet

Figure 2 - Dry Weather Inspection Areas (12-31-2012)

N

W E

S

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.

0 500 1,000 2,000 3,000 4,000

Feet

Figure 3 - Dry Weather Inspection Areas NCA/MDPW (12-31-2012)

N
W
E
S
Flow 1
Flow 2
Flow 3
Flow 4
Flow 5
Flow 6
Flow 7
Flow 8
Flow 9
Flow 10
Flow 11
Flow 12
Flow 13
Flow 14
Flow 15
Legend
Dry Weather Flow
Dry_Weather_Insp
Culverts
0 500 1,000 2,000 3,000 4,000
Feet

Figure 4 - Dry Weather Flow Areas (12-31-2012)

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Figure 5 - Malden River Outfalls

0 50100 200 300 400
Feet

0 75 150 225 300 Feet

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Figure 6 - Exchange Street Detail - Dry Weather Sampling Program

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Figure 7 - September 2012 Dry Weather Sampling Program

WEST END/ SPOT POND BROOK CULVERTS - MALDEN, MA

0 60 120 180 240

Feet

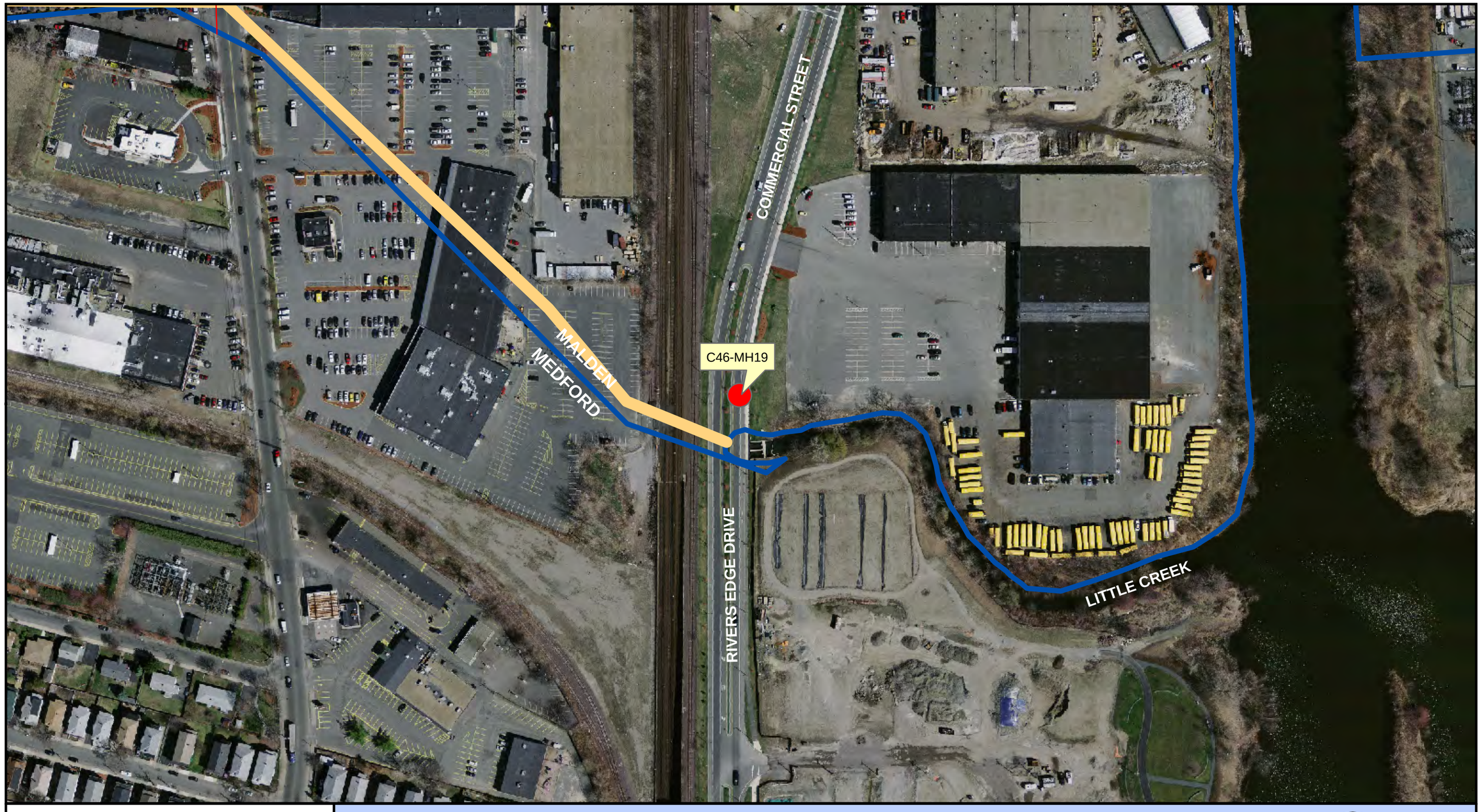

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Figure 8 - September 2012 Dry Weather Sampling Program

COMMERCIAL STREET - MALDEN, MASSACHUSETTS

0 75 150 225 300
Feet

Figure 9 - Lower Spot Pond Brook Outfalls

Figure 10 - Town Line Brook Outfalls

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Figure 11 - September 2012 Dry Weather Sampling Program

TOWNLINE BROOK CULVERT - MALDEN, MASSACHUSETTS

0 150 300 450 600

Feet

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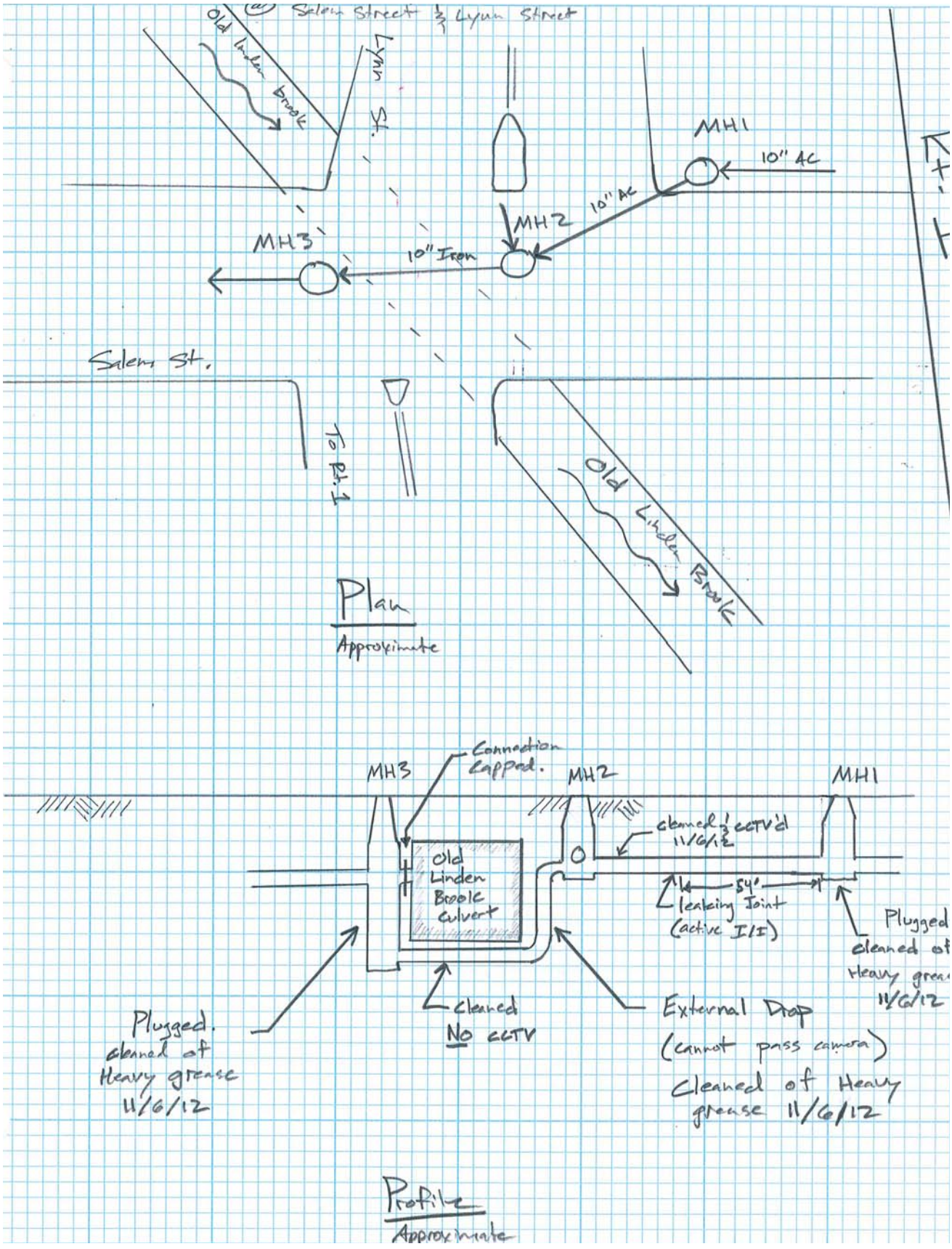
Figure 12 - September 2012 Dry Weather Sampling Program

LINDEN BROOK - MALDEN, MASSACHUSETTS

0 375 750 1,125 1,500 Feet

N



SKETCH SHOWING SEWER SYPHON AT
LYNN STREET - MALDEN/REVERE CITY LINE

REFERENCE: Sketch prepared by CDM Smith 11/6/12

Date: FEB 2013

Job No: 763.01

Figure 13

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ST.

Everett St.

Salem St.

LINDEN BROOK

Linden Block

#634

#620

#617

#621

#616

Culvert

10" Pipe

OLD 10' SEWER ABANDONED

NEW 10" SEWER LAID BY STATE

SEE PROFILE BELOW

SEE PROFILE ABOVE

SEE YNN ST PROFILE ABOVE

Everett St.

LAID BY CITY

LAID BY STATE

1 : 900

69+69.25

71+06.73

71+79.45

72+11.23

73+66.62

75+23.15

CITY OF MALDEN SEWER MAP
LYNN ST - MALDEN/REVERE CITY LINE

REFERENCE: Malden Sewer Map

Date: Feb 2013

Job No: 465.09

Figure 14

NCA Nangle Consulting Associates, Inc. 960 Turnpike Street Canton, Massachusetts

CITY OF MALDEN

Illicit Discharge Detection and Elimination Program
Semi-Annual Status Report

January 1, 2012 – June 30, 2012

Prepared by:

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

and

City of Malden Engineering Department
200 Pleasant Street
Malden, Massachusetts

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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 improvement 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 January through 30 June 2012 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 dry weather flows, identification of potential illicit discharge and timely repairs to the storm drainage infrastructure. 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, enforced Best Management Practices (BMPs)/stormwater ordinances and completed repairs to components of 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. In addition, as a flow though community, bacteria loadings from adjacent communities have also been quantified. 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. During this reporting period, a restructuring of responsibilities and staffing was implemented which has resulted in greater involvement by engineering technical staff to assist the MDPW stormwater compliance crew. It is anticipated that this increased integration of technical and field services will assist in advancing 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 January 2012 through June 2012 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, has continued under the direction of Camp, Dresser and McKee (CDM) and has included the scanning of existing plans and documentation into the user file network. 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, one illicit discharge in the form of a compromise to sewer lateral connections for a residential complex was 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 (JANUARY 2012 – JUNE 2012)

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.

Following the passage of the winter months, a primary focus of the dry weather inspection program was directed towards the Linden Brook watershed and central portions of the City which discharge to the Malden River. By design, the observations recorded during this and subsequent reporting periods serve as the basis for future work plan tasks and modifications to the original IDDE plan. Accordingly, the IDDE program maintained by the City is regarded as 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. The increased involvement by engineering technical staff in the daily work practices of MDPW stormwater personnel is also intended to further this goal. 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.

As described in Section 3.1.1 a compromise to sewer service connections was identified at a residential complex located on Eldrich Drive. This condition was identified during a program implemented to identify bacteria sources for the levels detected at LSP-4, which is referenced to as Dry Weather Flow 11 below. 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 the restructuring of responsibilities and staffing at the MDPW. Overall portions of the municipal infrastructure that have been addressed by the compliance team including the targeted subset areas are summarized on Figure 3.

As stated above, 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 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. 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).

In response to odor complaints in the central downtown area and to further assess flows into the Malden River, a characterization of the Spot Pond Brook Culvert in the area of Exchange Street was performed by the Stormwater Compliance Team in April of 2012. The focus of this investigation involved that portion of the drainage infrastructure located within and proximate to Exchange Street, including the culverted flows of Spot Pond Brook that flow in an easterly direction parallel to Exchange Street as shown on Figure 6. According to City personnel a strong sewerage odor was identified on several occurrences emanating from the grated cover over the Spot Pond Brook culvert located in the parking lot on the corner of Jackson and Exchange Streets (Figure 6). To investigate potential sources for this condition the entire drainage system within the area depicted on Figure 6 was inspected. This revealed no flows as a source condition, however, one (1) no-flow illegal connection to a catch basin located at the corner of Exchange and Washington Streets was identified. Over the course of the investigation program, which was carried out on multiple days, intermittent odors were confirmed at the culvert location of concern (E28-SP2).

Based upon the absence of contributing flows upstream, the focus of the investigation was directed to a laundromat located adjacent to the upstream grated cover (E28-SP1), as well as the regional sewer main that passes by E28-SP2. An interior inspection of the laundromat indicated the presence of a high temperature discharge to the sewer main that runs parallel to the Brook. Through continued monitoring it was determined that these high temperature discharges were likely causing off gassing of sewer gasses between the grated covers to Spot Pond Brook. To support this condition samples were collected from the locations depicted on Figure 6 and submitted for laboratory analysis for E. coli. As shown on Table 2.0, fairly uniform, though high levels were identified at E28-SP1 (6,100 col/100ml) and E28-SP2 (5,200 col/100ml). This

suggested that no flow contributions were entering into Spot Pond Brook between the sampling points. However, field observations noted during the April assessment program identified sewer gasses entering the culvert, as they were being detected at E28-SP2. It is to be noted that no odor occurrences have been reported since the completion of the evaluation described above.

During this reporting period, the Stormwater Compliance Team conducted several dry weather sampling events to investigate the elevated E. coli levels encountered previously at LSP-4, an outfall for the drainage system located within Eldrich Drive. It is to be noted that base flow, as groundwater, is consistently observed within this drainage network and to isolate potential sewage contributions to this base flow, a comprehensive evaluation of the flow conveyance network associated with LSP-4 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 into 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 in March of 2012. Following a period of rainfall events, NCA performed a dry weather sampling event on 15 June 2012, at outfall LSP-4. Prior to sewer line replacement, E coli levels >242,000 mpn/100ml were detected and an approximate 50% reduction was observed during the most recent sampling event. Due to remaining compromises within the drainage network within the area of the reconstructed sewer lines, it is likely that infiltration of residual bacterial levels in shallow groundwater is entering the drainage system associated with the LSP-4 outfall. It has been recommended that the owner of the apartment complex be advised that the drain line remains an issue of concern, given that repairs were only made to the sewer laterals.

3.1.2 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). A dry weather sampling event was performed within the Linden Brook Culvert on 11 January 2012. As shown on Table 2.0, elevated E. coli levels were detected within the middle portions of the culvert (D17-MH1 and H43-MH1). The mass balance flow isolation of dry weather discharges contributing to this condition is a primary task to be undertaken during the next reporting period.

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. As indentified 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 complied in a GIS stormwater drainage system database, which is currently being updated by CDM Smith to include record drawing information provided by the Department of Conservation and Recreation (DCR). 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 Smith. The City of Malden has also completed a comprehensive Infiltration and In-flow (I&I) study for its municipal sewer system. CDM Smith, 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.

3.4 Drainage System Maintenance/Repair (MDPW)

As stated previously a comprehensive restructuring of personnel and technical oversight has been undertaken between the Malden Engineering and Public Works Department to provide more daily oversight and technical assistance by Engineering staff. At this time documentation and record retention practices area being reviewed and upgraded to assist in Capital Planning and infrastructure needs analyses. Repairs and maintenance tasks completed by MDPW personnel for the non-winter months within this reporting period will be included in the next status report.

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 2011 – 2012 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. Through the recent restructuring of staff personnel and greater involvement by engineering technical staff, it is anticipated that 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 following:

- Further monitoring of LSP-4 to evaluate the influence of groundwater infiltration through areas previously impacted by compromises to the sewage network
- Flow isolation and possible dye tracing of the Linden Brook system,
- Targeted dry weather inspections of the Saugus Branch watershed
- Isolation of dry weather flows to Little Creek.

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TABLES

Environmental Engineering and Land Use Planning

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Table 1.0 Summary of Illicit Connections/Discharges identifed as of 6/30/12

Illicit Connections

Illicit Connection Identification	Date Identified	Discharge Type	Estimated Volume	Date Removed	Location
ID-1	1/15/2009	Sewage	40 gpd	2/16/2009	33 Lodgen Ct., Unit 1F
ID-2	1/15/2009	Grey Water	100 gpd	3/2/2009	34 Hanover Street
ID-4	8/28/2009	Sewage	60 gpd	9/4/2009	2-4 Hancock Street
ID-9	5/18/2010	Sewage	60 gpd	5/19/2010	36 Charles Street

Total Illicit Flow Removed to Date: ***260 gpd*** ***(94,900 gal/yr)***

Illicit Discharges

Illicit Discharge Identification	Date Identified	Discharge Type	Estimated Volume	Date Removed	Location
ID-3	8/11/2009	Oil Sheen	Unknown	n/a	Near 1081 Fellsway
ID-5	9/10/2009	#2 oil spill	<5 gallons	9/10/2009	269 Pearl Street
ID-6	9/21/2009	Poss. Washwater	Unknown	9/21/2009	120 Main Street
ID-7	12/9/2009	Trans. Dielectric fluid	<27 Gallons	12/10/2009	Near 6 Grove Street
ID-8	4/29/2010	Hydraulic Fluid	<10 Gallons	4/29/2010	496 Main Street
ID-10	2/10/2012	Sewage	Note 1	3/19/2012	1056 Erlich Drive

1 - approximately 1 gallon per minute observed discharging at LSP-4 during dry weather

Table 2.0 Dry Weather Conditions - E. Coli Concentrations: January - June 2012

Site Location, Outfalls/Manholes Malden, MA

Sample Description: Water

Sample Designation	E. Coli (MF) (col/100ml)		
	9213D		
	ACTION LEVEL- 235 col/100ml		
	1/11/2012	4/13/2012	6/15/2012
Malden River			
LSP-0-Channel	1,700	-	-
LSP-3	1,600	-	-
LSP-4	>242,000	-	100,000
LSP-9	84	-	-
LSP-10-Channel	10,000	-	-
E28-MH8	-	ND (1.0)	-
E28-SP1	-	6,100	-
E28-SP2	-	5,200	-
E28-MH4A	-	1.0	-
Linden Brook			
C36-MH1	6.3	-	-
D17-MH1	460	-	-
H43-MH1	28,000	-	-
P24-MH1	9.7	-	-
V1-MH1	5.2	-	-
W26-MH1	390	-	-

File No. 465.09

NANGLE CONSULTING ASSOCIATES, INC

FIGURES

Environmental Engineering and Land Use Planning

960 Turnpike Street, Canton, MA 02021 Telephone (781) 821-0521 email: nangle@ncaenv.com Facsimile (781) 821-4182

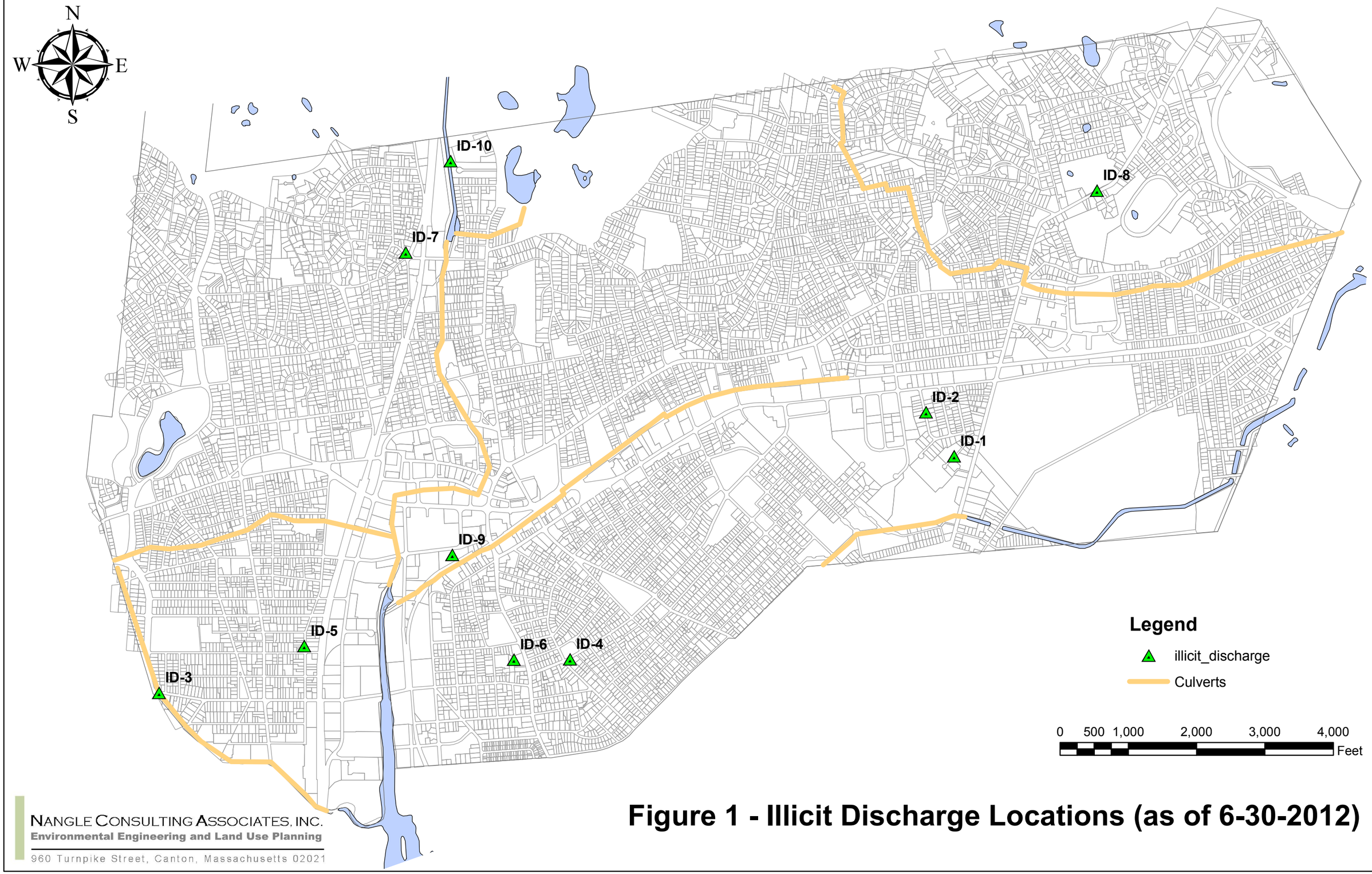

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Figure 1 - Illicit Discharge Locations (as of 6-30-2012)

N
W
E
S

Legend

Dry_Weather_Insp

Culverts

0 500 1,000 2,000 3,000 4,000

Feet

Figure 2 - Dry Weather Inspection Areas (6-30-2012)

N

W E

S

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

Legend

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

0 500 1,000 2,000 3,000 4,000

Feet

Figure 3 - Dry Weather Inspection Areas NCA/MDPW (6-30-2012)

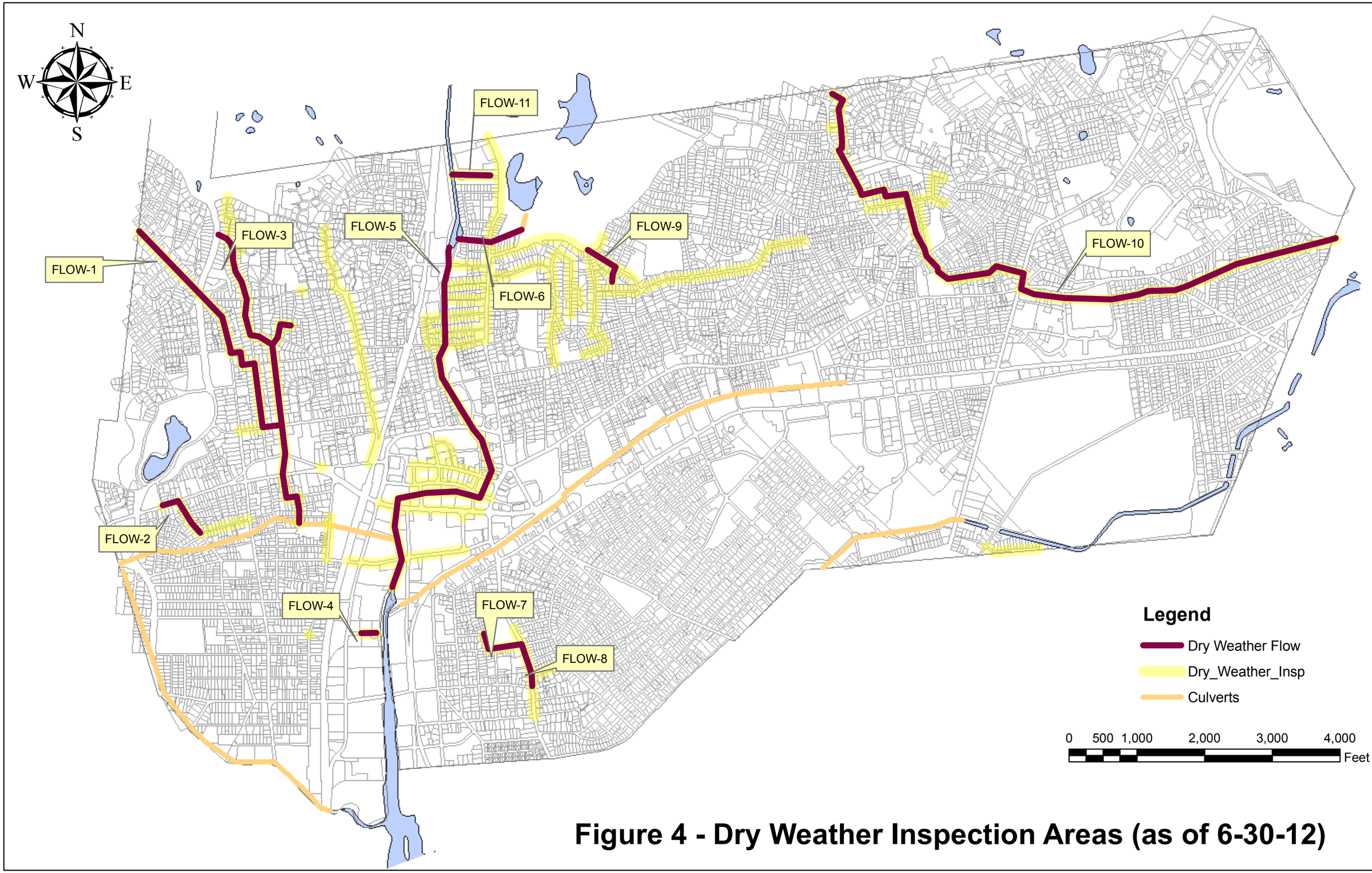

Figure 4 - Dry Weather Inspection Areas (as of 6-30-12)

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Figure 5 - Malden River Outfalls

0 50100 200 300 400
Feet

0 75 150 225 300 Feet

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Figure 6 - Exchange Street Detail - Dry Weather Sampling Program