

# Section 1

## Introduction

### 1.1 Background

The City of Concord is undertaking a multi-purpose Storm Water Master Plan and Evaluation with the following objectives:

- This plan will be used as a tool the guide planned improvements to water quality of discharges from the City's storm water system, and if applicable, to meet the requirements of EPA's Phase II Storm Water permitting program. (Section 2).
- Developing a Geographic Information System (GIS) layer of the City's storm sewer system infrastructure to use as a tool in implementation of the Storm Water Master Plan. The GIS will act as a system inventory of the existing drainage system and a means to model the existing system for recommended improvements (Section 3).
- Conducting hydrologic and hydraulic analyses and field investigations of selected subbasins within the City, and recommending appropriate flood mitigation improvements (Sections 4. 5 and 6).
- Locating (for the GIS) and evaluating the conditions of drainage outfalls that discharge into the Merrimack River. This includes an evaluation of the water quality characteristics of dry weather discharges to prioritize detailed investigations of drainage systems tributary to outfalls in search of illicit connections to the storm sewer system (Section 7).
- Evaluating mechanisms for funding the operation and maintenance of storm water projects, including future capital projects (Section 8).
- Developing the basis of a Storm Water Capital Improvement Plan, based upon field investigations, hydrologic and hydraulic analyses, and the GIS database (Section 9).



*Concord wishes to improve the quality of storm water discharges*

The purpose of this report is to provide a summary of the work on this project to date.

At the beginning of the project, the City and CDM prepared a work plan to achieve the stated objectives. The work plan included the following tasks:

Task	Description
1. Data Collection	Collect plans, reports, and other information on the existing storm water system.
2. Field Survey	Collect additional system information where required, through field investigation.
3. Funding	Evaluate alternative methods of funding the City's storm water management program; apply for applicable grants.
4. Hydrology	Delineate select drainage basins in the City, and develop information about rainfall and runoff in these basins.
5. GIS	Develop a Geographic Information System (GIS) of the City's closed storm water system infrastructure.
6. Hydraulic Analysis	Create a computer simulation or spreadsheet model of select drainage basins in the City and/or perform TV or manhole inspections to evaluate the hydraulics of the system.
7. Develop Recommendations	Make recommendations to improve the system, based on the information collected and/or calculated through the above tasks, and based on input from the City.
8. Enterprise Fund	Evaluate the feasibility of funding the storm water capital improvements program with a storm water use fee.
9. NPDES Permitting	Determine whether the City will be a regulated community under EPA's Phase II Storm water permitting requirements; Prepare a storm water management plan suitable for fulfilling these requirements.
10. Project Meetings	Prepare for and attend meetings with Concord staff to present project progress and/or alternatives analysis. Prepare and distribute minutes for these meetings.
11. Report Preparation	Prepare and distribute draft reports presenting results and analysis. Revise the reports based upon comments from Concord staff. Prepare and distribute final reports.
12. Public Meeting	Prepare for and present information at a public meeting to present information about the City's storm water plan and funding alternatives. (This meeting has not yet taken place.)

**Table 1-1**  
**Project Tasks and Descriptions**

## 1.2 Review of Project Tasks

### *Data Collection and Field Survey*

Information gathered about the storm water system collected during task 1 and 2 was used to support all the other tasks. Field investigations included:

- Confirming pipe connectivity, delineating watershed basins, and estimating impervious surfaces in the Terrible Trapezoid. This is a drainage area located in downtown Concord. See Section 4 for more details.
- Dry weather screening of the outfalls discharging to the Merrimack River (CDM).

- Detailed manhole inspections in the Washington Street Basin (Severn Trent Pipeline Services under subcontract to CDM).
- TV Inspection of the “Spruce Street Brick Drain” in the Terrible Trapezoid (Severn Trent Pipeline Services under subcontract to CDM).
- TV Inspection of selected drains in the Terrible Trapezoid (City).
- Drainage area analysis performed on 10 other sections of the City. The drainage analysis consisted of existing pipe & culvery capacity analysis, connectivity, identified problems and recommendations. See Section 6 for more details.

### ***Funding and Enterprise Fund***

The first phase of tasks 3 and 8 was to produce a memorandum (Section 8) detailing the potential application of a storm water enterprise fund for the City of Concord, and to conduct preliminary discussions with City personnel.

In addition, grant applications were submitted to DES under the Non-Point Source Local Initiative Program and the Merrimack River Watershed Restoration Program for 2000 and 2001. These proposals did not receive funding.



*Dry Weather Screening of Outfalls north of the I-93 Bridge was conducted in the Summer of 2002*

The second phase has included further discussions with the City on funding its storm water management plan in the future. Section 8 summarizes the work done to date.

### ***Hydrology and Hydraulics***

Under the hydrology and hydraulics task, basins in the City were prioritized, and the higher priority basins were evaluated first. In this way, CDM and the City could tailor the evaluation to issues specific to each basin and adapt the evaluations as the task proceeded.

The City was broken into twelve basins, Fisherville, Heights, Horseshoe Pond, Hospital, Hoit, Oak Hill, Penacook, Terrible Trapezoid, Turkey Pond, Turkey River, Washington Street, and West Concord.

The first basin selected for evaluation was the area bounded by Pleasant Street, South Main Street, South Spring Street, and Allison Street. This area, informally known as the “Terrible Trapezoid”, has experienced flooding complaints from several residents, and is characterized by older brick pipes that tend to back up. This area was hydraulically modeled and scenarios for mitigating flooding were examined. Methods and

results of the study were presented in the report "*City of Concord, NH DRAFT Storm Water Master Plan Pilot Area – Terrible Trapezoid*," dated May 2, 2001. Subsequent to the 2001 memo, the City and Severn Trent performed TV inspections of some of the pipes in this basin. The results and recommendations of the work in this basin are finalized in Section 4 of this present report.

The second basin selected for evaluation, informally known as the "Washington Street Basin," is the area roughly bounded by Franklin Street and Bishopsgate to the north, Ridge Road and Westbourne Street to the west, Warren Street and Concord Street to the south, and the river to the east. For this basin, a manhole field inspection program was conducted to assess sediment buildup and structural conditions within the basin. Severn Trent Pipeline Services, Inc, was retained to perform detailed manhole inspections. The information collected will also be useful to the GIS task. The findings and recommendations of the inspection program are found in Section 5 of this report.

After evaluation of these first two basins, a spreadsheet model was prepared to assess capacity issues in storm water collection pipes and culverts in the remaining City drainage basins. The model incorporated the rational method looking at the larger drainage basins in the 10 other sections of the City. The existing storm water pipes were evaluated to determine their capacity as compared to the flows which they would encounter during a rain event. Under sized pipes were identified and determine to be an issue. Also, information regarding known potential problem locations in these basins was tabulated. These locations include observed periodic flooding, collapsed pipes, erosion, or blockage. The results and recommendations of the work to-date for these basins are found in Section 6 of this report.

All of the potential problem locations identified through the above analysis for all of the basins were then ranked based on criteria discussed with the City. The ranked locations form the basis for recommendations on system improvements, as summarized in Section 9 of this report.

### ***Geographical Information Systems (GIS)***

During the first phase of this task, CDM updated the City's GIS information to include all of the stormwater and sewer pipes shown on the 1983 sewer separation plans, which provide partial coverage of the City. CDM and the City field checked and updated the GIS mapping in the Terrible Trapezoid.

The second phase was field-checking the GIS database. This involved field-locating manholes, lamp-holes, and catchbasins and placing these structures as accurately as possible in the database. Accuracy is desirable when searching for a manhole under snow, for instance. Field checking was also necessary to determine that:

- The information on the 1983 sewer separation plans was accurately entered into the GIS database.
- The database reflects the system as it was built, not just as it was planned.

- Updates made to the system since 1983 are included in the database.
- Any system information not available on plans, but known by City staff, is included to the extent practicable in the GIS database.

To complete this phase, the City contracted separately with Chas Sells Inc. to conduct aerial photography and data entry. This will captured 80% of the structures in the field. CDM and the City used the Sells data to update the GIS mapping and performed inspections to verify that the data is accurately shown on the maps.

The final phase for this task is use of the GIS database by the City. The database is currently being used to schedule CIP projects, track catchbasin cleaning and pipe repair, etc.

***NPDES Permit***

To date, neither EPA nor NHDES has added Concord to the list of New Hampshire communities that will be required to apply for a Phase II NPDES Storm Water permit. However, the storm water management plan that would be the foundation for the permit is being prepared. This plan will be available if EPA or NHDES require the City to obtain a permit, and will also provide the foundation for solid storm water management whether or not the City is required to obtain a permit.

### 1.3 Summary of Work Completed

The work completed to date is summarized in Table 1-2 below. This work is detailed in Sections 2 through 9 of this report.

**Table 1-2: Work Completed by Project Task**

Task	Description
1. Data Collection	Collected plans, reports, and other information on the existing storm water system.
2. Field Survey	Collected additional system information in Terrible Trapezoid and Washington Street basins, through field investigations.  Conducted dry weather screening of the outfalls to the Merrimack River.
3. Funding	Wrote and submitted four (2 in 2000; 2 in 2001) grant applications for the City's storm water management program.
4. Hydrology	Delineated drainage basins in the City, and collected information about soils, rainfall and runoff in these basins.
5. GIS	Developed a preliminary Geographic Information System (GIS) of the City's closed storm sewer system infrastructure based on information

Task	Description
	gathered to date.
6. Hydraulic Analysis	<p>Created a computer simulation model of Terrible Trapezoid. Evaluated potential projects to mitigate flooding.</p> <p>Performed TV inspection and evaluation of storm water drains in the Terrible Trapezoid, including the cross-country Spruce drain.</p> <p>Conducted manhole inspections to evaluate the hydraulics of the Washington Street Basin.</p> <p>Conducted hydraulic analysis of the remaining basins in the City.</p> <p>Identified and ranked potential problem locations in the City. Compiled a list of prioritized potential problems.</p>
7. Develop Recommendations	Made recommendations relevant to tasks completed to date.
8. Enterprise Fund	Evaluated and discussed an enterprise fund as a method of funding storm water system improvements.
10. Project Meetings	Prepared for and attended meetings with City of Concord personnel. Presented project progress and/or alternatives analysis. Prepared and distributed minutes for these meetings.
11. Report Preparation	<p>Prepared and distributed draft reports presenting results and analysis including:</p> <ul style="list-style-type: none"> <li>• Pilot Area – Terrible Trapezoid, report dated May 2, 2001</li> <li>• Dry Weather Screening Program, report dated October 2, 2001</li> <li>• Evaluating Funding Mechanisms For a Storm Sewer Enterprise, memo dated June 2001</li> <li>• Review of TV Tapes of Drains in Trapezoid, Concord, NH, memo dated January 9, 2002</li> </ul>

**Table 1-2 (cont'd)**  
**Work Completed by Project Task**