THE CITY OF KNOXVILLE
TENNESSEE

NPDES Permit
Annual Report & Reapplication

National Pollution Discharge Elimination System
Stormwater Discharge Permit TNS068055
July 1, 1999 - June 30, 2000

Signature and Certification

NPDES STORMWATER PERMIT TNS068055
1999/2000 MUNICIPAL ANNUAL REPORT and REAPPLICATION

FOR: City of Knoxville, Tennessee

Federal regulations, 40 CFR 122.22 (a) (3) and 122.22 (d), require the application and reports for the NPDES permit to be signed and certified as follows:

> *For a municipality, State, Federal, or other public facility, by either a principal executive officer or ranking elected official.*
>
> *"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 evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering 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."*

_____ _____

Victor H. Ashe — Date
Mayor

_____ _____

Samuel L. Parnell, Jr., P.E. — Date
Director of Engineering

_____ _____

Michael Kelley — Date
Law Director

_____ _____

Randolph B. Vineyard — Date
Finance Director

TABLE OF CONTENTS

1.0 INTRODUCTION

The Tennessee Department of Environment and Conservation, Division of Water Pollution Control issued the City of Knoxville a National Pollution Discharge Elimination System (NPDES) Permit (TNS068055) for the discharge of stormwater from the municipal separate storm sewer system (MS4). Stormwater from the City of Knoxville discharges directly to the Tennessee River and to major creeks that drain to the Tennessee River. Only a small portion of the MS4 runoff will drain to sinkholes, ponds, and lakes throughout the area. The current NPDES Permit was issued on July 1, 1996 and will expire on June 28, 2001.

The NPDES Permit requires annual reporting of the progress of the Stormwater Management Program outlined in the Part I and Part II applications. The Annual Report was completed in accordance with the reporting requirements of Part VI of the permit and will complete the requirements for the fourth permit year from July 1, 1999 through June 30, 2000. As specified in the permit, this report will serve as the City's reapplication for a new five-year permit to be effective on July 1, 2001. The proposed new and ongoing stormwater management programs for the new permit are included in Section 5 of this report. Therefore, the narrative report typically found in section five has been replaced to simplify the reapplication report.

The Stormwater Quality Section of the City of Knoxville Engineering Department coordinated preparation and submittal of the system-wide Annual Report and Reapplication. Information for portions of the annual report was submitted by the Engineering Department, Public Service Department, Parks and Recreation Department, Knoxville Area Transit (KAT), Knoxville/Knox County Emergency Management Agency (KEMA), and the Knoxville Utilities Board (KUB). The Engineering Department compiled the available information into the format outlined in Part VI of the current NPDES Permit.

2.0 CONTACTS LIST

David Hagerman, E.I.T., *(Primary Contact for City of Knoxville NPDES Related Issues)*
NPDES Stormwater Management (865) 215-3251 dhagerman@ci.knoxville.tn.us

Brently Johnson, PE, *(Secondary Contact for City of Knoxville NPDES Related Issues)*
Engineering Planning Chief (865) 215-2148 bjohnson@ci.knoxville.tn.us

Samuel L. Parnell, Jr., PE, Director
Department of Engineering (865) 215-2148 sparnell@ci.knoxville.tn.us

Bob Whetsel, Director
Public Service Department (865) 215-2060 bwhetsel@ci.knoxville.tn.us

Ed Umbach, Solid Waste Manager (865) 215-2921 eumbach@ci.knoxville.tn.us

Mailing Address: City of Knoxville, P.O. Box 1631, 400 Main Street, Knoxville, TN 37901

3.0 STORMWATER MANAGEMENT PROGRAM (SWMP) EVALUATION

The objective of the City of Knoxville's SWMP is to protect the taxpayer's health, safety, and welfare through an economically viable comprehensive stormwater quality and quantity program. The City is proud to report some of the major accomplishments related to the SWMP that occurred during the fourth year of the NPDES permit term. Although it would be impossible to list all of the City's water quality related accomplishments in this report, the City has listed some of the significant water quality achievements during year four.

- The City of Knoxville began full implementation of the Development Certification program to insure that stormwater quality and quantity structures were actually constructed as designed and approved. Certifications must be submitted by a licensed professional Engineer, reviewed by City staff, and approved before bond release.

- Pre-construction conferences with the Engineers, developers, contractors, and inspectors were required and implemented before construction permits were issued. This meeting allowed the City to disseminate consistent information on regulations and expectations to all responsible parties before construction commenced. This will be an ongoing program.

- Two large Stormceptor stormwater treatment systems were installed at the Knoxville Area Transit (KAT) bus terminal. At a total project cost of approximately $300,000, this major retrofit will help protect First Creek (channel at right) from accidental spills or runoff containing oil, grease, grit, and other potential pollutants.

- The City of Knoxville, in partnership with other Water Quality Forum member agencies and professional societies (i.e. ASCE, WEA, SI, TVA, etc.), continued to provide seminars and workshops for Engineers, contractors, developers, planners, and regulators. One full-day workshop focussed specifically on erosion and sediment control while other workshops/seminars provided thorough overviews of the Phase I and Phase II water quality programs, including the uses of Best Management Practices and enforcement.

- The City of Knoxville continued to add or extend the greenways/buffers zones along the major waterways throughout the city. The City currently maintains 19.66 miles of trail distributed over 14 greenways. These linear parks help protect the adjacent waterways.

- The first edition of the City of Knoxville's new Best Management Practices manual has been completed. Approximately two-thirds of this manual are now on the City's web site and can be accessed at http://www.ci.knoxville.tn.us/engineering/ after January 5, 2001.

- In 1999, Knoxville collected 26,274 tons of yard waste, which was turned into mulch.

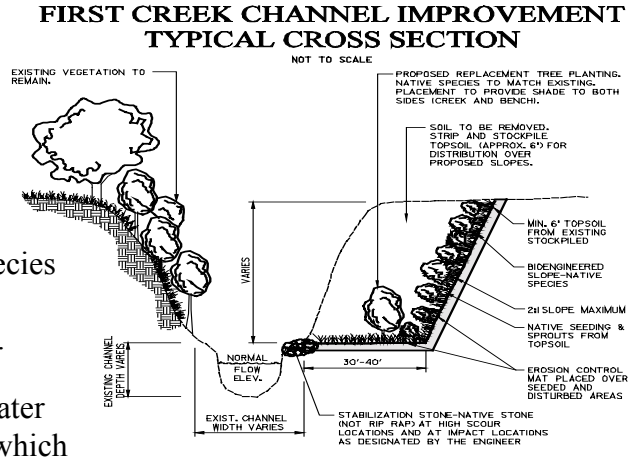
- The City continued to reduce illegal dumping into storm drains by raising awareness. The City distributed over 1,000 Water Quality Hotline magnets and an unknown amount of informational brochures. The Blue-Thumb program (stormdrain stenciling) was altered by adopting the use of small plastic disks glued to the curb irons in place of the painted "No Dumping" message. This should eliminate the inevitable discharge of paint as it eventually wears off.

- The City continues to sponsor and support an Americorps Water Quality team. The Water Quality team assists the City with community water quality education, creekbank stabilization projects, water quality testing, and creek cleanups. Americorps coordinates the Adopt-a-Watershed program in eight area schools.

- The City sponsored Ijams Nature Center to coordinate the 11th Annual River Rescue event to help cleanup trash and debris from the waterways throughout the area. The spring 2000 event attracted over 720 volunteers who collected approximately 27.5 tons of trash from the shores of the Tennessee River.

- Over 87.61 tons of Household Hazardous Waste (HHW) was processed last year at the permanent HHW facility. The facility is available to residents Tuesday through Saturday.

- Phase II and Phase III of the multi-year First Creek improvement project were initiated during year four at a cost of over $2.4 million dollars. The typical cross section (right) for the channel improvements include bioengineered slopes with native seeding and native species trees for shading. This project will be completed as funding becomes available.



During the first four years of the stormwater quality program, the City defined a baseline by which future improvements and/or degradations may be measured. Although the improvements can not be measured quantitatively at this time, many programs initiated during the first four years have undeniably made improvements in the state of water quality throughout the city. The long-term results should become apparent in future years. The City implemented many of the SWMP tasks beyond the minimum permit requirements and will continue to advance the water quality programs beyond the NPDES Permit requirements as economically feasible.

4.0 STORMWATER MANAGEMENT PROGRAM SUMMARY TABLE

SWMP activity summary tables for the fourth year of the NPDES permit program were compiled in accordance with the reporting requirements specified in Part VI(A)(2)(c) of the permit. Although the following summary tables concisely document many program activities, some activities could not be quantified and have therefore been omitted.

4.0 STORMWATER MANAGEMENT PROGRAM SUMMARY TABLE

MONITORING TASKS WET/DRY WEATHER	SCHEDULE OF ACTIVITIES	SCHEDULE FOLLOWED	ACTIVITIES ACCOMPLISHED	COMMENTS
Repeat High Parameter Sites	35 Outfalls repeated from Year Two	Yes	33	Each outfall tested at least four times this year
Field Screening Industrial Outfalls	Visits to all Industrial outfalls	Yes	53	Continued retesting outfalls from Industrial areas (four times)
Total Field Screening Outfalls	High Parameter repeats + 30 to 40	Yes	133	All field data sheets available for inspection. Outfalls tested four times this year.
Full Suite Stormwater Analysis (one station per year)	One Station pr year	Yes	1	This year's site was our First Creek Monitoring Station
Storms Sampled at 5 monitoring stations	3 to 4 Storms / Quarter / 5 Sites	Yes	63	Summer:13 storms, Fall: 11 storms, Winter: 21 storms, Spring: 18 storms

STORMWATER MANAGEMENT & INDUSTRIAL PROGRAM TASKS	SCHEDULE OF ACTIVITIES	SCHEDULE FOLLOWED	ACTIVITIES ACCOMPLISHED	COMMENTS
Stormwater Quantity Requests for Service (Received / Resolved)	As Needed	Yes	747/880	Complaints are investigated as received and resolved as solutions or resources are available
Stormwater Quality Requests for Service (Received / Resolved)	As Needed	Yes	332/328	Complaints are investigated as received and resolved as solutions or resources are available
Construction Site Erosion & Sediment Control Workshops	Annually	Yes	68 attendees	Included Engineers, contractors, developers, etc. involved in land disturbing activities.
Stormwater Quality / NPDES Program Summaries	As Required	Yes	Approx. 200 attendees at 4 presentations	Included Engineers, contractors, developers, planners, city managers, environmentalist, and other government officials
Spills Response & Emergency Management Coordination	As Required	Yes	2 spills responded to during Year 4	The Knoxville Emergency Mgmt. Agency responded to spills and trained COK staff.
Collect KUB Industrial Inspection Reports	Every Two Years	Yes	0	Collected in Years 1 and 3, so they will be collected again in Year 5
Collect NOI's for Industries	Collect in Year 1 plus ongoing	Yes	3	All NOI's were collected in Year 1. Three new NOI's were received this year.
Industrial Investigations	As Needed	Yes	12	These are a combination of random inspections and complaint based request for service.

4.0 STORMWATER MANAGEMENT PROGRAM SUMMARY TABLE

EDUCATIONAL PROGRAM TASKS	SCHEDULE OF ACTIVITIES	SCHEDULE FOLLOWED	ACTIVITIES ACCOMPLISHED	COMMENTS
Publicize Hotline Number	Within 24 Months	Yes	Undetermined	Hotline number has been published in phone book, on road signs, pamphlets, magnets, etc.
River Rescue	Annual Event	Yes	1 day event	27.5 tons of trash removed by 720 volunteers from 100 miles of shoreline at 35 sites.
Adopt-a-Creek	As Accepted	Yes	throughout year	50 community groups removed 142 tons of trash along 11 miles of urban creeks
Water Quality Forum	Meets Monthly and Quarterly	Yes	Undetermined	Three committees meet monthly to plan projects focused on urban water quality.
Storm Drain Stenciling	As Needed or by volunteers	Yes	Approx. 2300	Catch basins stencilled with blue paint "Dump No Waste-Drains to Stream"
Volunteer Creek Cleanups	Volunteers	Yes	Multiple days on several creeks	Over 27.4 tons collected by 217 volunteers, transported and disposed by COK.
Waterfest	Annual Event	Yes	1 day educational event	A unique community event dedicated to educate citizens about water quality. 750 youths and 100 adults participated.

NEW DEVELOPMENT PROGRAM TASKS	SCHEDULE OF ACTIVITIES	SCHEDULE FOLLOWED	ACTIVITIES ACCOMPLISHED	COMMENTS
Construction Sites Inspected	As Required	Yes	646	As Required
Building Permits Inspected	As Required	Yes	375	As Required
Grading Permits Inspected	As Required	Yes	115	As Required
Right of Way Permits Investigated	As Required	Yes	834	As Required
Citizen Concerns Investigated	As Required	Yes	156	Development Complaints include erosion, sediment, grading, dumping, etc.

4.0 STORMWATER MANAGEMENT PROGRAM SUMMARY TABLE

STRUCTURAL CONTROLS	SCHEDULE OF ACTIVITIES	SCHEDULE FOLLOWED	ACTIVITIES ACCOMPLISHED	COMMENTS
Biostabilization of Creek/River Banks for Erosion Control	As Needed	Yes	Over 5, 000 sq. ft.	Sponsored Americorps Volunteers to help enhance and restore over 4 urban streambanks & riparian zones
Street Cleaning	Daily/Bi-Weekly	Yes	36,412 Miles	Daily for downtown streets. Frequency varies for other streets.
Litter Pick-up, Hand	As Needed	Yes	106,223 Bags	Routine Schedule
Curb and Gutter Repair	As Needed	Yes	42 Feet	Per work order and requests
Catch Basin Cleaning and Repair	As Needed	Yes	5,129 Jobs	Per work order and requests
Ditching: Hand, Truck, & Track/Gradall	As Needed	Yes	60,492 Feet	Per work order and requests
Storm Sewer Installation & Repair	As Needed	Yes	313 Jobs	Per work order and requests
Brush & Leaf Pick-up	Bi-Weekly	Yes	25,738 Tons	Bi-weekly curb pick-up
Seed/Sod, ROW	As Needed	Yes	53 Feet	Per work order and requests
Storm Sewer Cleaning	As Needed	Yes	17,802 Feet	Per work order and requests
Grate Replacement	As Needed	Yes	25 Jobs	As needed
Field Inventory & Inspection of On-Site Detention Facilities	Within 60 Months	Yes	63% of City Completed	100% of City now complete. All new facilities are mapped after construction is completed on them.
Creek Cleaning by Creek Restoration Crew	As Needed	Yes	240 Jobs	Creeks are inspected and cleaned on a routine schedule
Tree and Plant Planting	When Applicable	Yes	6,362 Trees and Plants	About 82% planted by Americorp volunteers
Total Waste Recycled	As Brought In	Yes	Over 31,092 Tons	4,818.33 tons of paper, metal, plastic, glass, etc. and over 26,274.28 tons of yard wastes

5.0 REAPPLICATION PROPOSAL
IMPLEMENTATION SCHEDULE AND NARRATIVE SUMMARY

As required by the City's current NPDES permit, the narrative section of this fourth annual report will serve as the reapplication proposal for the next five-year NPDES permit. If approved, the permit will be effective July 1, 2001. From this point on in this proposal, all references to permit years, timeframes, or schedules will assume July 1, 2001 as day one and the beginning of year one for the new permit cycle.

The reapplication proposal includes implementation schedules followed by a narrative summary for each of the major programs. Although an Additional Educational Program has been included in the narrative summary, a separate implementation schedule for that supplemental program has not been included. Where ever appropriate, this proposal will update the original SWMP as described in the program element schedules listed in Part II of the first permit application and Part III of the permit. The proposed programs described in the schedules and narrative summary in this section are listed as follows:

5.1 Residential and Commercial Program (RC).
5.2 Illicit Discharges and Improper Disposal Program (ILL).
5.3 Industrial and Related Facilities Program (IN).
5.4 Construction Site Runoff Program (CS).
5.5 Ongoing Monitoring Program (MN).
5.6 Additional Educational Programs (narrative summary only).

Each of the above programs will be further divided into separate categories of program elements and related tasks that correspond to the specific requirements listed in 40 CFR 122.26(d)(2)(iv). Each specific task will be briefly discussed in the following narrative summaries.

SCHEDULE FOR DEVELOPMENT AND IMPLEMENTATION OF SWMP ELEMENTS AND PROGRAMS

PROGRAM OF STRUCTURAL AND SOURCE CONTROLS FOR REDUCIN(POLLUTANTS TO THE MUNICIPAL SEPARATE STORM SEWER SYSTEM 122.26(d)(2)(iv)(A)

The Residential and Commercial Program (RC)

Code	Activity	Schedule
RC-1	***Maintenance Activities for Structural Controls***	
	- Continue existing maintenance programs from Part 2 application, pp. 5-5 thru 5-8.	Ongoing
	- Develop improved stream restoration and channel maintenance program.	Complete within 12 months
	- Implement improved stream restoration and channel maintenance program.	Implement beginning in yr. 2
	- Require Standard Maintenance Agreement for on-site facilities.	Ongoing
	- Continue to coordinate with other agencies/organizations to develop, install, and maintain structural controls that prevent floating pollution (litter/oils/foam/etc) from entering the TN River.	Ongoing
	- Require routine / major maintenance of BMP facilities.	Ongoing
RC-2	***Planning for New Development***	
	- Review current Stormwater & Streets Ordinance to evaluate possible improvements to existing water quality and quantity requirements for new development.	Complete within 24 months
	- Require "No Dumping" message cast into all new curb irons and solid stormwater catch basin covers installed on new developments.	Immediately
	- Investigate and/or implement Pilot Master Plan on selected watershed(s). Emphasis will be on limiting impacts of new development/construction (i.e. buffer zones, wet ponds, etc.)	Full implementation within 60 months
	- Plan and site location for regional BMP facilities for areas of new developement.	Ongoing
	- Continue to review, update, and maintain guidance criteria for BMP's on City web page (http://www.ci.knoxville.tn.us/engineering)	Ongoing
RC-3	***Maintenance for Public Streets, Roads, and Highways***	
	- Continue street maintenance activities outlined in Part 2 application, p. 5-8.	Ongoing
	- Investigate benefits/feasibility of upgrading fleet with higher efficiency street sweepers.	Within 24 months
	- Evaluate current deicing program and study alternatives and improvements.	Within 36 months
RC-4	***Evaluation of Flood Management Projects***	
	- Continue to evaluate regional BMP facilities for water quality retrofits.	Ongoing
	- Maintain existing GIS inventory of on-site BMP facilities, including newly constructed facilities.	Ongoing
RC-5	***Monitoring of Solid Waste Facilities***	
	- See Program described in City's new management program for industrial areas.	See Code IN-3
RC-6	***Management of Pesticides, Herbicides, and Fertilizer***	
	- Evaluate possible improvements to existing public education program as part of illicit connection and improper disposal program. Educate City staff, public, etc.	Full implementation after 12 months
	- Reevaluate effect of fertilizers as part of the City's ongoing monitoring program.	Full implementation after 12 months
RC-7	***Annual Reporting***	
	- Annual reporting to TDEC concerning the progress of this program.	Within 6 Months after end of each year

SCHEDULE FOR DEVELOPMENT AND IMPLEMENTATION OF SWMP ELEMENTS AND PROGRAMS

PROGRAM TO DETECT AND REMOVE ILLICIT AND IMPROPER DISCHARGES TO THE MUNICIPAL STORM SEWER SYSTEM 122.26(d)(2)(iv)(B)

The Illicit Discharges and Improper Disposal Program (ILL)

Code	Activity	Schedule
ILL-1	***Ordinances***	
	- Evaluate possible revisions to the prohibitions and exemptions of non-stormwater discharges in the existing Stormwater & Streets Ordinance. Maintain authority for $5,000 penalty.	Complete within 24 months
	- Implement any new revisions to the Stormwater & Streets Ordinance.	Full implementation after 24 months
ILL-2	***Field Screening***	
	- Perform follow-up analysis at all high risk field screening sites.	Ongoing
	- Investigate 150 field sites four times per year (including the repeat high parameter sites above).	Annually
ILL-3	***Investigation of Storm Drain System***	
	- Evaluate & update procedures for mapping, field surveys, and upstream source identification.	Full implementation after 12 months
	- Implement updated procedures for mapping, field surveys and upstream source identification.	Full implementation after 12 months
	- Evaluate and update enforcement procedures, policies, and follow-up monitoring / inspections.	Full implementation after 24 months
	- Coordinate with Knoxville Utility Board (KUB) sanitary sewer inspections.	Ongoing
	- Inspect system-wide stormdrain system and maintain updated/corrected features on GIS.	Ongoing
ILL-4	***Spill Response Program***	
	- Coordinate with Knoxville Emergency Response Team (KERT) and Tennessee Department of Environment and Conservation (TDEC).	Ongoing
ILL-5	***Reporting of Illicit Discharges and Public Education Program***	
	- Continue to maintain, monitor, and publicize "Water Quality Hotline" for public reporting.	Ongoing
	- Post and maintain health hazard warning signs where appropriate on 303(d) listed creeks.	Within 6 months
	- Evaluate and redevelop an ongoing, comprehensive, and innovative public education program.	Full Implementation after 12 months
ILL-6	***Used Oil & Toxic Materials Program***	
	- Implementation and coordination of recycling program (managed by Solid Waste Division).	Ongoing
	- Maintain and operate household hazardous waste facility (managed by Solid Waste Division).	Ongoing
ILL-7	***Control Infiltration***	
	- Develop and implement new policies/ordinances to reduce cross connections between MS4 and sanitary sewer system (i.e. Floor Drain policies, laterals from demolisions and rehabs).	Immediately
	- Monitor KUB's collection system O&M program, ongoing sewer line repair & rehabilitation progress, 5-yr capital improvement plan and creek monitoring data.	Annually
	- Develop mechanisms for reporting illicit connections, breaks, surcharges, and general sanitary sewer system problems with potential to release to the municipal separate storm drain system.	Within 6 months
	- Maintain Legal Authority over KUB and other utilities for unpermitted discharges not otherwise regulated under their separate NPDES permits.	Ongoing
ILL-8	***Annual Reporting***	
	- Annual reporting to TDEC concerning the progress of this program.	Within 6 Months after end of each year

SCHEDULE FOR DEVELOPMENT AND IMPLEMENTATION OF SWMP ELEMENTS AND PROGRAMS

PROGRAM TO MONITOR AND CONTROL RUNOFF FROM TSD AND INDUSTRIAL FACILITIES SUBJECT TO SARA III, SECTION 313 122.26(d)(2)(iv)(C)

The Industrial and Related Facilities Program (IN)

Code	Activity	Schedule
IN-1	***Ordinances***	
	- Evaluate possible revisions to the prohibitions and exemptions of non-stormwater discharges in the existing Stormwater & Streets Ordinance.	Complete within 24 months
	- Implement any new revisions to the Stormwater & Streets Ordinance.	Full implementation after 24 months
IN-2	***Inspection Element***	
	- Develop inspection program for non-permitted commercial facilities (i.e. restaurants, service stations, grocery stores, car lots, etc.)	Full implementation During Year Three
	- Continue to collect and analyze KUB stormwater inspection reports. Assess impact to MS4.	Semi-annually
	- Identify potential industrial discharges through Illicit Connection and Improper Disposal Program. (Both SW and non-SW discharges)	Ongoing
	- Continue to collect and analyze NOIs from Industrial Permit applicants.	Ongoing
	- Review and update inspection program as part of Pollution Prevention Plans for Municipal Industrial Facilities. Conduct annual inspections at municipal industrial facilities.	Full implementation after 12 months
IN-3	***Monitoring Element***	
	- Collect monitoring data from permitted industrial stormwater dischargers and/or from TDEC. Assess impacts to the stormdrain system. (See Part 2 application, pp. 5-66 thru 5-67)	Ongoing
	- Develop ongoing monitoring program at non-permitted commercial facilities using guidelines pursuant to 40 CFR 122.26(d)(2)(iv)(c)(2). Identify pollutants and sources as applicable.	Within 24 months
	- Implement the ongoing monitoring program at non-permitted commercial facilities and analyze the results from ongoing commercial monitoring program.	Annually, beginning year 3
	- Maintain adequate legal authority to require monitoring and reports from TSDs and Industrial Facilities subject to SARA Title III, Section 313. Request monitoring/reports as necessary.	Ongoing
	- Evaluate and update the monitoring program for Municipal Industrial Facilities (MIFs) submitted with the 1st annual report (1997). Include new MIFs in the updated program.	Full implementation after 12 months
	- Manage and conduct monitoring program at Municipal Industrial Facilities.	Ongoing
IN-4	***Annual Reporting***	
	- Annual reporting to TDEC concerning the progress of this program.	Within 6 Months after end of each year

SCHEDULE FOR DEVELOPMENT AND IMPLEMENTATION OF SWMP ELEMENTS AND PROGRAMS

PROGRAM TO IMPLEMENT AND MAINTAIN BMP PLANS TO REDUCE CONSTRUCTION SITE RUNOFF TO THE MUNICIPAL STORM SEWER 122.26(d)(2)(iv)(D)

The Construction Site Runoff Program (CS)

Code	Activity	Schedule
CS-1	***Site Planning***	
	- Review and update the Stormwater & Streets Ordinance which requires construction sites greater than 10,000 sq.ft. to submit Erosion and Sediment (E&S) Control Plans.	Full implementation after 24 months
	- Require site plan submittals per the City of Knoxville BMP manual.	Immediately
	- Review & update minimum criteria for plan review and inspection checklists.	Full implementation within 12 months
	- Review, update, & continue Preconstruction Assistance Meetings with developer/contractors.	Immediately
CS-2	***BMP Requirements***	
	- Require Construction BMPs from the City of Knoxville BMP manual or equivalent.	Immediately
	- Evaluate additional BMP requirements and design modifications. Maintain the updated BMP requirements on the City's web page.	2nd half of each year.
	- Continue to require construction site "good housekeeping" practices.	Ongoing
CS-3	***Inspection / Enforcement***	
	- Maintain expanded inspections program including smaller construction sites (single family).	Ongoing
	- Implement routine site inspections on commercial and subdivision developments (e.g. rough grading, E&S control installation, final grading, and final stabilization.	Ongoing
	- Continue to require post-construction Development Certifications from licensed professional Engineers before bond release to insure the stormwater facilities were built as planned.	Ongoing
	- Evaluate and update enforcement procedures, policies, and follow-up monitoring / inspections.	Full implementation after 24 months
CS-4	***Training Programs***	
	- Co-sponsor E&S Control Practice Seminars for City staff, designers, developers, engineers, and contractors.	Annually
	- Continue to provide training for City plan review staff and inspectors.	Annually
CS-5	***Annual Reporting***	
	- Annual reporting to TDEC concerning the progress of this program.	Within 6 Months after end of each year

SCHEDULE FOR DEVELOPMENT AND IMPLEMENTATION OF SWMP ELEMENTS AND PROGRAMS

PROGRAM TO COLLECT QUANTITATIVE DATA TO DETERMINE THE IMPACTS OF URBAN STORMWATER ON THE NATURAL ENVIRONMENT 122.26(d)(2)(iii)(A)

The Comprehensive Monitoring Programs (MN)

Code	Activity	Schedule
MN-1	***Seasonal Storm Event Monitoring***	
	- Review and update the Standard Operating Procedures (SOP) for the Seasonal Sampling program (previously submitted with the first annual report during the first permit cycle).	Within 12 months
	- Maintain at least five (5) automatic monitoring stations at locations approved by TDEC.	Ongoing
	- Collect twenty (20) to thirty (30) flow weighted composite samples annually (minimum of one/quarter/station). Test each sample for at least the 13 routine parameters: pH, TSS, TDS, BOD5, COD, total ammonia nitrogen (as N), total ammonia plus organic nitrogen, nitrate plus nitrite nitrogen (as N), total nitrogen, total recoverable lead, total recoverable zinc, dissolved phosphorus, and total phosphorus. Laboratory analysis will be used in accordance with 40 CFR part 136 for all parameters except pH which will be tested in the field during sample collection.	Annually
	- Collect five (5) wet weather bacteria sample (fecal coliform). One sample/station/year.	Annually
	- Collect five (5) full-suite grab samples (One/station/permit term). Tests will include the 13 routine parameters listed above plus: oil & grease, and the pollutants listed in tables II & III of 40CFR Part 122 Appendix D (Volatiles, Pesticides, Acids, Base/Neutrals, Toxic Metals, Cyanide, and Total Phenol.	One Station per year
	- Analyze results from Ongoing Monitoring program.	Ongoing
MN-2	***Dry Weather Screening & Industrial/Commercial Site Monitoring***	
	- Dry Weather Screening as described in ILL-2.	Annually
	- Implement Commercial/Industrial Monitoring Programs as described in IN-3	Varies
MN-3	***Ambient, Biological, & Bacteriological Monitoring***	
	- An ongoing Ambient sampling program will be implemented at the five monitoring station sites at a minimum. The 13 routine parameters will be tested once per quarter per station.	Quarterly
	- Develop a Biological Monitoring program to supplement the current program administered by TVA. This program will focus on habitat assessments, bioassessments, etc.	Within 12 months
	- Implement the Supplemental Biological Monitoring program.	Annually Beginning year two
	- A Bacteriological Monitoring program will be developed and implemented. This program may be conducted by City, KUB, UTK, or volunteer personnel. (May be coordinated with ILL-7).	Full Implementation after 12 months
	- Develop and implement a QA/QC program for the Bacteriological Monitoring program.	Full Implementation after 12 months
MN-4	***Related Programs***	
	- Develop, calibrate, and maintain a water quality model to evaluate urban stormwater loading and transport processes and facilitate planning and additional pollution control strategies.	Within 60 months
	- Develop and Implement Training Program for Staff and/or Volunteers.	Annually
MN-5	***Annual and Public Reporting***	
	- Publish and maintain monitoring data (submitted by KUB/others) for public use on website.	Beginning Year Two
	- Annual reporting to TDEC concerning the progress of this program.	Within 6 Months after end of each year

5.1 RESIDENTIAL AND COMMERCIAL PROGRAM (RC)

Program of Structural and Source Controls for Reducing Pollutants to the Municipal Separate Storm Sewer System, 40 CFR 122.26(d)(2)(iv)(A).

RC-1 Maintenance Activities for Structural Controls

SWMP Task: Continue Existing Maintenance Activities from Part 2 application, pp. 5-5 to 5-9.
Schedule: Ongoing

The City's Public Service Department (PSD) currently performs maintenance of the municipal stormwater system. The PSD has developed and maintains an extensive database to track work tasks performed during the year. The database not only tracks labor category (e.g., Equipment Operator) and labor hours devoted to each task, but also includes equipment type and costs. The PSD database produces summary reports for monthly and annual work production and costs. The database includes more than 80 task activities of which 18 were identified as relating directly or indirectly to stormwater management. Only a small portion of the stormwater conveyance system is located on public rights-of-way and city-held easements. The City generally assumes no responsibility for maintenance or improvements on private property even though the new creek crew may work in some of those areas.

Maintenance by the City within rights-of-way and easements is normally performed on an as-needed basis by the PSD. Approximately 75 percent of the storm drainage system maintenance work performed by the PSD is in response to direct calls from property owners and requests from the Engineering Department. The remainder of the storm drainage system maintenance work is in response to maintenance needs detected by the PSD, such as repairing collapsed pipes. Under normal conditions, the PSD can respond to all complaints that are the responsibility of the City as defined by the City's stormwater policy.

Under the current system, the PSD has divided the City into six geographic maintenance zones, for routine work. Duties performed in each zone relating to stormwater are brush collection, leaf collection, street sweeping, and the cleaning of curb inlets. Catch basins are inspected annually. Cleaning and maintenance of catch basins are performed "as-needed". Most drainage facility maintenance is performed in response to complaints or known problems. The PSD logs all complaints by address and by category into the computerized database. The Construction Division of the PSD performs non-routine storm drain maintenance and installation.

Two seven-person crews perform storm drain installation. Their primary responsibilities include installing various sizes of corrugated metal pipe and reinforced concrete pipe, major repair to existing storm drains, and building catch basins. Each of the two crews has seven employees, a backhoe, two single-axle dump trucks, and one 3/4-ton pickup truck. A 12-ton tool truck services both crews. These crews also provide emergency response in the event of flooding. The Storm Drain Maintenance Crew has five employees. They perform such tasks as: clearing culverts of debris, flushing storm drains, hand and mechanical ditching, and performing minor catch basin repair. A Storm Drain Vacuum Machine, a ditching machine, and a 3/4-ton pickup truck with a small crane are used to perform these tasks.

SWMP Task: Improved Existing Stream Restoration and Channel Maintenance Program.

Schedule: Complete within 12 months

Stream restoration and channel maintenance has been addressed with two new programs in the first permit cycle. These programs include stream bank stabilization projects to reduce erosion and sediment and a creek restoration crew to remove litter, debris, and flow blockages. Within the first year, the City will thoroughly evaluate possible improvements to this program and submit those changes in the first annual report.

Several bank stabilization projects have been completed with the help of TDEC, TVA, USCOE, UTK, and CAC Americorps along urban creeks throughout the city. The first demonstration project was completed Fall 1997 at Inskip Ball field by using natural fiber coconut rolls and jute fiber mats (right) and a synthetic mattress (left) to protect the grass and live stakes during high water.

Similar projects have been completed on Goose Creek at Mary James Park in South Knoxville, on First Creek at the new greenway site near Luttrell Street and Hoitt Avenue, and on Love Creek near Holston Middle School. Last year, a large project stabilized 700 feet of creek bank along Second Creek above the Worlds Fair Park.

Since sediment is one of the most common non-point source pollutants in our urban creeks, the City proposes to complete at least two bank stabilization projects per year during the new permit term. Although these projects will certainly vary in scope, biostabilization techniques will be used instead of concrete or riprap. Whenever possible, the adjacent riparian zone will be enhanced with trees and native vegetation to provide cooling effects and help restore habitat. The City will work with TDEC to obtain the appropriate ARAP permits before work begins.

The 4-person Creek Restoration Crew was added to the PSD in August 1996 and will continue in the new permit cycle. This crew is primarily responsible for implementing a routine schedule of inspections and maintenance on the major creeks and tributaries. It has a knuckle boom and a single-axle dump truck assigned to aid in performing these duties. The crew routinely removes trash and debris from habitual dumpsites and responds to citizen requests and specific work orders.

This program will continue to focus on stream restoration and channel maintenance along the major creeks and the riverfront in the city. The creek crew has a laminated GIS field book, which contains the every urban creek within the city limits. Each creek has been further divided into workable sections or map pages that show significant surrounding details such as topography,

planimetrics, stormwater features, outfalls, streets, and addresses. This allows the crew to efficiently inspect and clear each segment of the creek before moving on to the next task. The PSD field crews have been instructed to document and report signs or incidences of illicit discharges and/or improper disposal as they are identified. The creek crew's superintendent reports the progress of this crew at the Stormwater Management weekly planning meetings.

The City will continue to implement an "Adopt-a-Stream" program that organizes volunteers to periodically pick up trash and debris along stream reaches within the City. The PSD crews assist volunteers by providing receptacles for collecting trash and debris and removal of these receptacles. The City provides Adopt-a-Stream volunteers with safety information, trash bags, pickup sticks, and assistance with coordination. Because the Adopt-a-Stream volunteers are not able to handle larger items, the PSD crews use the appropriate equipment needed to remove these items. The Engineering Department will coordinate the Adopt-a-Stream program directly or by contract with Ijams Nature Center.

SWMP Task: Implement Improved Stream Restoration and Channel Maintenance Program.
Schedule: Beginning Year Two.

This improved program will be implemented in year two. During the first year, the existing creek restoration activities, creek cleaning crew and Adopt-a-Stream programs will continue as described above.

SWMP Task: Standard Maintenance Agreement for On-site Facilities. Schedule: Ongoing.

Since 1997, Permanent Maintenance Agreements have been required for all new stormwater detention facilities and special pollution abatement devices (i.e. oil/water separators). The Stormwater and Streets Ordinance section 22A-33 requires the owner of the property to sign a covenant and have that covenant recorded on the plat before the construction permit is approved. Although the ordinance will be updated in year two of the new permit, the requirements for maintenance agreements will remain or be updated, but not removed.

The City will retain the right to inspect and insure that the stormwater facilities are properly maintained, however, the responsibility for the maintenance of stormwater facilities will remain with the property owner unless legally transferred to another person or entity by a properly recorded legal agreement. If the property owner does not maintain the facility properly, the City may authorize the maintenance to be completed and place a lien against the property for double the cost. The standard agreement for underground facilities (i.e. detention or oil/water separators) requires a minimum of quarterly visual inspections, annual cleaning, and annual reporting.

SWMP Task: Continue to coordinate with other agencies/organizations to develop, install, and maintain structural/management controls that prevent floatables from entering the TN River.
Schedule: Ongoing.

Since the summer of 1999, the City has been coordinating with TVA, UTK, TDEC, USACOE, the Isaac Walton League, Keep America Beautiful and area businesses to reduce the

amount of floating pollution entering the river from the urban creeks. The City has studied and identified several possible solutions. Short-term solutions have included increasing the frequency of the creek crew maintenance at the mouths of the major creeks, adding more trash receptacles at bus stops, increasing public awareness, installing temporary skimmers, etc. Long-term solutions have been researched and may include permanent skimmers on the major creeks, increased manpower on the river, and improved public awareness/participation. Current activities include working with volunteers to distribute BMPs and pollution prevention information to area restaurants and businesses. The City has also purchased a new boat for Isaac Walton League volunteers to collect litter and debris along the riverfront within the city limits. Although the focus of this initiative has largely been to reduce unsightly trash from entering the river, two spills on First Creek were effectively detained by the floating trash skimmer at the mouth of the creek until remediation personnel could respond.

This ongoing cooperative effort will continue to be defined by the committee of Water Quality Forum member agencies that meet monthly to plan, discuss, and implement pollution controls. The progress of this floating pollution initiative will be reported annually.

SWMP Task: Require Routine / major maintenance of BMP facilities. Schedule: Ongoing.

All stormwater facilities constructed since 1997 must have maintenance agreements and must be maintained according to the specific requirements in that agreement. All other stormwater ponds or water quality facilities must be maintained as required by the Stormwater & Streets ordinance section 22A-33. At a minimum, woody vegetation must be cut annually and sediment must be removed as necessary to maintain proper function of the facility.

As described in the Part II application, the City may continue to investigate the feasibility of assuming direct maintenance responsibility for large regional structural detention ponds that serve multiple upstream developments. The current stormwater funding structure does not allow resources sufficient to maintain all BMP facilities at this time. The City may continue to evaluate the possibility of assisting property owners with maintenance in the future but currently the maintenance responsibility will remain with the property owner.

Sediment from the maintenance of detention/water quality ponds or from stream restoration activities must be removed from the stormwater facility and disposed in a proper classified landfill or used as fill outside the stormwater drainage system. The City does not propose to duplicate TDEC's efforts to regulate contaminated sediments.

RC-2 Planning for New Development

SWMP Task: Review the current Stormwater & Streets ordinance to evaluate possible improvements to existing water quality and quantity requirements for new development.
Schedule: Complete within 24 months.

The current ordinance may be accessed on the City of Knoxville Engineering Department web page at http://www.ci.knoxville.tn.us/engineering/ after January 5, 2001. During the first two years of the new permit, the City will review the existing ordinance and evaluate possible improvements to the water quality and quantity requirements for new development. The City

anticipated the need to review and update this ordinance once during each five-year NPDES permit term. The specific changes will be reported in year three. The current requirements and standards for stormwater detention and water quality control are briefly discussed below.

When a stormwater quantity detention pond is required, the engineer must design the pond to control the runoff from the 1-year, 2-year, 5-year, and 10-year storm events. In First Creek and Whites Creek, the 100-year storm must be controlled. Quantity ponds may not be mandatory on developments discharging directly into a main stream (i.e. TN River) if the engineer submits supporting hydrologic and hydraulic computations.

Water quality control is always required for development or redevelopment that includes one-half acre of impervious area. The standard management method includes first flush control outlets in the quantity pond or in a separate quality pond. The quality pond must be designed to collect the first one-half inch of direct runoff from the contributing drainage basin or the first 4000 cubic feet of stormwater runoff, whichever is greater, and attenuate that runoff for a minimum 24-hour period. Alternate treatment methods are accepted if they provide equivalent or better pollutant removal efficiencies than the standard first flush detention ponds. The target removal efficiencies for the first flush treatment were estimated from the chart provided by the Metropolitan Washington Council of Governments' 1987 report titled "Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs." The target removal efficiencies are as follows: TSS – 75%, Lead – 80%, Zinc – 44%, Total Phosphorus – 47%, COD – 40%, and Total Nitrogen – 32%.

In addition to first flush treatment, Section 22A-36 of the ordinance requires special pollution abatement for certain land uses that are known to contribute a disproportionate amount of stormwater pollution. The typical special pollution abatement requirement has been a minimum of an oil/water separator for large parking lots of 400 spaces or 120,000 square feet of area. Other special land uses include any type of vehicle maintenance, fueling, washing, storage, or scrap facilities. Most of these land uses are expected to have a much higher potential for oil, grease, or other floatable hydrocarbon runoff that will not be collected in a standard first flush pond. However, the City may include other development types when special control is warranted.

SWMP Task: Require new Standards for Curb Irons & Solid Stormwater Catch Basin Covers.

Schedule: Immediately

All major foundries that distribute stormwater curb irons and solid manhole covers to this area have been notified that the City standards will change in 2001. The new standard will require a "NO DUMPING…DRAINS TO RIVER" message cast into the structure. The City will allow existing iron stock to be used until the issuance of the City's new NPDES permit. The new cast messages should provide a lasting method to increase the public's awareness of the relationship between the stormdrain system and the community's waterways.

SWMP Task: Study and/or Implement a Pilot Master Plan on selected watershed(s).

Schedule: Full Implementation within 60 months

During the five-year permit term, the City proposes to investigate and/or implement a pilot master plan. The watershed(s) selection criteria for this study will include the potential of the basin for future development, the current and expected quality of the streams to be protected, and the current or planned zoning for the undeveloped portions of the watershed. Preference will be given to the watershed(s) with the greatest potential to protect or improve the quality of the existing streams through the implementation of new BMPs.

The City may choose to plan and implement proven BMPs on selected watersheds or all watersheds to satisfy this requirement. Current research has already indicated that basin-wide use of BMPs such as wet ponds or mandatory stream buffer zones may be more beneficial than the common use of dry detention ponds. During the permit term, the City will determine if further study is required or if information exists to support full implementation of preferred BMPs.

SWMP Task: Plan and site location for regional BMP facilities for areas of new development.

Schedule: Ongoing

During the term of the permit, the City will target large development projects or strategically located smaller developments that are suitable for siting regional BMPs. Regional BMPs would serve multiple upstream developments and typically have drainage areas ranging from 50 acres to several hundred acres. Currently the City is investigating the possibility of implementing a stormwater fee. If a stormwater utility is implemented, the City may consider offering incentives to developers to site regional BMP facilities. Incentives may include:

- cost share arrangements whereby the City contributes a share of the construction costs and recoups these costs from other upstream developments;
- City maintenance of regional BMPs;
- City provides assistance with design or other in-kind contributions.

Since most development activity within the City is primarily "infill" that occurs on the limited number of remaining vacant parcels, there are limited opportunities for siting regional BMPs without impacting existing developments.

In response to the unusual floods that hit Knoxville in the spring of 1998, the City has contracted a consultant to study the First Creek watershed for possible channel improvements and regional detention locations. The consultants May 1999 report identified five regional detention alternatives in the First Creek and Whites Creek watersheds that may relieve flooding. Future studies will be an ongoing portion of the City's stormwater management program.

SWMP Task: Continue to review, update, and maintain guidance criteria for BMP's.

Schedule: Ongoing

The City has successfully completed the first edition of a comprehensive BMP manual. Over two-thirds of the manual has been loaded on the Engineering web page and may be accessed at http://www.ci.knoxville.tn.us/engineering/ after January 5, 2001. The entire first

edition should be loaded for public use before the issuance of this permit in July 2001. The guidance criteria will describe acceptable types of BMPs, design standards, and maintenance requirements for BMPs to be used throughout the City to meet the requirements of the new Stormwater and Streets Ordinance. The guidance criteria will be kept on file in the Engineering Department and distributed to developers as the official reference to ensure proper selection, design and maintenance criteria for BMPs.

Because maintenance of BMPs is critical to their long-term effectiveness in reducing pollutant loading from stormwater, the guidance criteria will also incorporate maintenance considerations with the design criteria to ensure that effective and maintainable BMPs are constructed in the City. The guidance criteria will address the goals of the NPDES stormwater program by allowing only BMPs which are effective in reducing pollutants targeted in the NPDES stormwater regulations.

This manual is intended to be a live document that changes as new technology or future needs develop. Therefore, the website version will be the preferred method of distribution for free while CDs and paper copies will be made available for a fee at a local copy center. A "new updates" page will be added on the web after the entire manual has been loaded at least once. At that time the City will begin full promotion of the site to encourage the BMP usage citywide. The website and BMP content will be updated at least annually.

RC-3 Maintenance Activities for Public Streets, Roads, and Highways

SWMP Task: Continue Street maintenance activities outlined in Part 2 application, p. 5-8.
Schedule: Ongoing

Street cleaning is performed daily for downtown streets and less frequently for all other streets. Streets with curbing are swept, while streets without curbing are flushed. Mowing is performed on a two to four week schedule between the months of April and September.

Snow removal, anti-icing and de-icing of roadways is performed by the PSD and is an essential program to ensure public safety. Sodium chloride, stored undercover at the Loraine Street facility, mixed with liquid calcium chloride is applied to highways and streets by spreaders as necessary. Application of de-icing/anti-icing materials targets highways and major arteries first, and residential streets secondarily. Priorities follow the adopted Major Roads Plan of the City of Knoxville. Because of the importance of maintaining public safety and public commerce, the City aggressively pursues its road clearing operations.

SWMP Task: Investigate benefits/feasibility of upgrading to higher efficiency street sweepers.
Schedule: Within 24 months

The PSD is currently divided into six work zones. Two regenerative air sweepers and one multipurpose sweeper/vacuum are dedicated to zone one, which includes downtown. Zones two through six have two multipurpose sweeper/vacuums assigned for both street sweeping and catch basin vacuuming. The vacuums are assigned to leaf removal for about six weeks in the fall. All of the multipurpose trucks are scheduled for replacement in the next five years. The two regenerative air sweepers may be due to be replaced a few years later in the following permit

term. The City will use this opportunity to research the potential benefits and costs of upgrading the street sweeper fleet with new higher efficiency sweepers. The results of this study and/or new replacements will be reported after year two.

SWMP Task: Evaluate current deicing program and study possible alternatives & improvements. Schedule: Within 36 months

As described in the street maintenance section above, snow removal, anti-icing and de-icing of roadways is a public safety program performed by the PSD. Currently the PSD uses sodium chloride mixed with liquid calcium for deicing of roadways. The City is dedicated to keeping the roads safe for citizens while alert to the potential environmental impacts. Within the first 36 months of the permit term, the City will thoroughly research effective alternatives, if any, to the current deicing practices. Any viable alternatives will be reported to TDEC.

RC-4 Evaluation of Flood Management Projects

SWMP Task: Evaluate regional BMP facilities for water quality retrofit. Schedule: Ongoing

Only two regional detention facilities that were built prior to 1997 still exist today. Those facilities include the detention pond adjacent to Middlebrook Pike and Weisgarber Road at the Acker Place development and the detention pond located at Knoxville Center Mall. Although the regional detention basins were designed for flood control, it may be possible to retrofit these facilities to achieve additional water quality benefits. All ponds built since 1997 were required to comply with the water quality requirements for new development.

The City has studied the feasibility of adding other regional ponds to the First Creek watershed as part of a major flood control project. Any newly constructed regional ponds will address water quality in the design.

The City has assumed the responsibility of continued maintenance and water quality improvements at the large regional pond (Acker Place) in the Fourth Creek Watershed. The City restored a large section of Fourth Creek downstream of the pond in the first permit term. In order to reduce the vast amount of sediment in the stormwater effluent and to prevent future accumulation sediment down stream, two rock check dams and an 18-inch weir plate were placed in the pond's low flow channel. These velocity dissipaters allow the sediment time to settle out of the stormwater while still in the pond. The sediment is removed annually to prevent migration into Fourth Creek. A riparian zone vegetation farm been planted in the pond with red osier, silky dogwood, black willow, willow oak, and bank willow in addition to the existing species of white pine, cedar, and red oak trees. This new farm may provide a reliable source of viable cuttings for future bank stabilization and riparian zone projects.

SWMP Task: Maintain existing GIS inventory of on-site BMP facilities. Schedule: Ongoing.

In the first permit term, the City implemented a systematic method of inventorying the existing detention ponds by using a GIS grid of the city. Field crews inspected drainage features in each map grid and recorded the detention facilities in the GIS with a circled D. Since all new development must be certified to confirm that constructed facilities were built as planned, any new stormwater facilities will be properly recorded in the GIS after construction.

Engineering staff will maintain and update the existing inventory of ponds, pipes, water quality facilities and other drainage features as part of an ongoing GIS maintenance program.

RC-5 Monitoring of Solid Waste Facilities

This program is described in the management section IN-3 for industrial facilities.

RC-6 Management Program for Pesticides, Herbicides, and Fertilizer

SWMP Task: Evaluate effect of fertilizers as part of the City's ongoing monitoring program.
Schedule: Full Implementation after 12 months.

Pesticides, herbicides, and fertilizer used by the City are stored in a building at the Loraine Street Operations Center. This building is in compliance with all regulations regarding the storage of hazardous materials. The PSD Division of Horticulture and Grounds Maintenance is responsible for the application of pesticides, herbicides, and fertilizer. The herbicide "Roundup" is applied annually to City parks and rights-of-way to control unwanted weed growth. PSD personnel, who have been certified and licensed by the University of Tennessee, spray the herbicide. Fertilizer is only used for minor landscaping projects and stormwater runoff from these projects is not considered a threat to receiving water quality.

The City does not currently require registration by commercial applicators; however, commercial applicators must be licensed under State and Federal Regulations. There are no regulations restricting the use of these substances by individual land owners; however, a household hazardous waste collection facility has been opened to collect all types of hazardous wastes including pesticides, herbicides, and fertilizer.

For pesticide, herbicide, and fertilizer pollutants, the control program is difficult to define since the presence of pesticides, herbicides, and fertilizers in urban runoff is not always evident. Current problems with pesticide, herbicide, and fertilizer pollutants are not believed to be significant. As part of the ongoing stormwater monitoring program, the City will continue to monitor significance of these pollutants. Pesticides, PCBs, and nutrients are tested as part of the ongoing monitoring program described in Sections 5.5 and 6.0 or this report.

SWMP Task: Evaluate possible improvements to the existing public education program as part of the illicit connection and improper disposal program.

Schedule: Full implementation after 12 months.

Public education programs for pesticides, herbicides, and fertilizer use have already been implemented in conjunction with City public education programs for collection and recycling of household hazardous waste. In addition to the solid waste and household hazardous waste informational programs, the City has developed a stormwater pollution program that includes helpful information regarding pesticide and fertilizer use. These programs will continue throughout the next five-year permit term.

The HHW collection program, which includes collection of pesticide, herbicide, and fertilizer waste material, was officially implemented when the facility opened on April 22, 1997. More information about the HHW facility is included in the Illicit Discharges and Improper Disposal Program section ILL-6.

In year one of the new permit cycle, the City will evaluate possible improvements to this education program and begin implementation of those improvements no later than year two. Probable improvements may include education of City staff and the Public Building Authority as well as producing public service announcements for the community.

5.2 ILLICIT DISCHARGES AND IMPROPER DISPOSAL PROGRAM

Program to Detect and Remove Illicit and Improper Discharges to the Municipal Storm Sewer System, 40 CFR 122.26(d)(2)(iv)(B).

ILL-1 Ordinances

SWMP Task: Evaluate possible revisions to the prohibitions and exemptions of non-stormwater discharges in the existing Stormwater & Streets Ordinance. Schedule: Within 24 months.

The Stormwater and Street ordinance was developed during the first permit term to specifically prohibit non-stormwater discharges, increase penalties for illegal discharges, and to provide water quality regulations for new development. The ordinance may be accessed on the Internet at http://www.ci.knoxville.tn.us/engineering/ after January 5, 2001.

The ordinance section 22A-52 specifically prohibits illicit discharges and illegal dumping to any portion of the MS4 or any area draining to the MS4. Illicit discharges were defined according to 40 CFR 122.26(b)(2) as any non-stormwater discharge to the MS4. This definition, along with the $5,000 penalty for violations, has formed the cornerstone of our successful enforcement program and will remain in place during the next permit term.

Exemptions to this prohibition were listed in the ordinance in accordance with the list in 40 CFR 122.26(d)(2)(iv)(B)(1). Although most categories in this list were exempted in the first ordinance, the City will reevaluate these exemptions and update the ordinance if necessary.

City Council was advised that the ordinance may need to be updated approximately every five years to accommodate any changes or additional requirements in each new NPDES permit.

SWMP Task: Implement any new revisions to the Stormwater & Streets Ordinance.

Schedule: After 24 months.

Any revisions to the Stormwater & Streets Ordinance will become effective 17 days after City Council adopts the changes. The Engineering Department will implement and enforce any new revisions as soon as they become effective. Revisions will be advertised on the website.

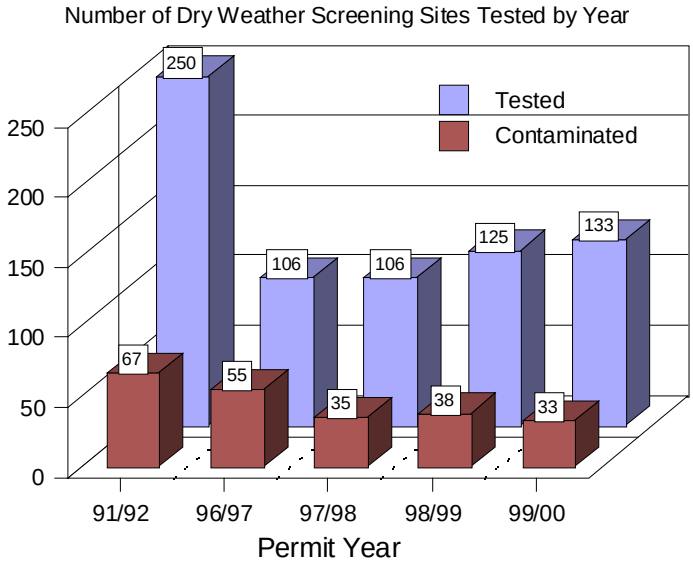
ILL-2 Field Screening

SWMP Task: Perform follow-up analysis at all high-risk field screening sites.

Schedule: Ongoing.

The Dry-Weather Screening Program was developed and implemented during the first permit term to evaluate both randomly chosen outfalls and high-risk outfalls that were tested the previous year. Each of the high-risk stormwater outfalls was checked for flow after a period of dry weather. If flow was present, the discharge was tested with a Chemetrics colorimetric field test kit for the following parameters: phenols, ammonia, detergents, copper, chlorine, pH, turbidity, color, temperature, and flow rate. The outfall test was repeated again between four and forty-eight hours after the first test. After one month, this process was repeated for each outfall for total of four tests each year per outfall.

Since this program has successfully identified many illegal dumps and illicit discharges during the first permit term, the City will continue to annually retest all sites that have high parameters or signs of illegal dumping until the outfall is clean during all four annual visits. Once the outfall has tested clean during four site visits in a single year, it will only be retested if randomly selected from the list of inventoried outfalls. The City has previously developed and submitted the standard inspection guidelines for investigating illicit connections or illegal dumping in the first year one annual report. Any changes to these standard guidelines will be reported as they are implemented. As illustrated by the bar graph, the number of high-risk outfalls continues to decrease each year since the program began in 1996.



The number of high-risk outfalls that need to be retested each year will obviously vary depending on the tested results of the previous year.

SWMP Task: Investigate 150 field screening sites four times per year. Schedule: Annually.

To insure that all outfalls will eventually be tested, the City will continue to monitor a minimum of 150 outfalls each year. The tested outfalls will consist of all of the previous year's high-risk outfalls with the remainder randomly selected from the general outfall inventory. The randomly selected sites will be selected from areas of primarily industrial use and from areas that have not been previously tested. The City will select outfalls throughout the city with some preference given to the highly developed area. This method should continue well into the next permit term before all outfalls have been tested.

The Engineering Department has developed an outfall database to maintain the test data and site information for each outfall in the inventory. This outfall database is linked to the GIS to allow the user to access the testing data geographically for a single point or by using the report functions for many outfalls at a time. By maintaining a history of each outfall, illicit discharge trends may become apparent and therefore be resolved with education or enforcement.

The dry-weather-screening program has been one of the most successful programs in the current permit term and will continue to be a high priority in the new permit cycle.

ILL-3 Investigation of the Storm Drain System

SWMP Task: Evaluate and update procedures for mapping, field surveys, and upstream source identification. Schedule: Within 12 months.

The procedures for mapping, field surveys and upstream source identification were developed and included in the Part II Application section 5.3.5. These procedures were adopted as policy and successfully implemented during the first permit term. The City will continue to utilize and modify these procedures to increase the effectiveness of the Illicit Discharge and Illegal Dumping Program. These updated procedures for the first permit term were included for the Division's review in monitoring section 6.1.3 of the first annual report. Any updates during the first year of the new permit cycle will be included in the following annual report.

SWMP Task: Implement updated procedures for mapping, field surveys, and upstream source identification. Schedule: After 12 months.

Any changes to the current procedures will be implemented beginning in year two.

SWMP Task: Evaluate and update enforcement procedures, policies, and follow-up monitoring/ inspections. Schedule: Full implementation after 24 months.

The schedule for this task appropriately coincides with the schedule for ordinance updates. Depending on the new requirements, if any, in the new ordinance, the current enforcement policies and procedures may need to be amended. Under the current ordinance, the existing enforcement procedures and policies have been effective.

Depending on the violation, a first-time offender is usually educated and asked to remediate the damage or correct the violation if possible. This is usually followed up with a letter to inform the violator of the City's expectations and to provide helpful BMPs to prevent future problems. More severe or repeated violations will merit a Notice of Violation (NOV) which is issued in the field directly to the violator. Copies of the NOV are distributed to the property owner or developer, the City Law Department, and the Engineering Department. The NOV may order specific remedies and require the violator to submit reports and/or pollution prevention plans. Penalties, if any, are only issued after the NOV expires so the violation and remedies may be fully evaluated.

A violator may appeal their penalty before a five-member Environmental Appeals Board. The five volunteer members of the Environmental Appeals Board were appointed by the Mayor and consists of individuals with an expertise as follows:

1) One licensed professional engineer with civil engineering expertise.
2) One licensed professional engineer.
3) One representative of the development or industrial community.
4) One neighborhood representative.
5) One member at large.

Board members will serve a 5-year term and may be reappointed at the end of their term. Follow-up monitoring and inspections will be a combination of City, KUB, and self-inspections by industries. Enforcement actions resulting from the dry-weather screening program will be followed as defined within that program as a minimum. Any outfall that is tested for high parameters or identified as an illicit connection/ illegal dump source, will be tested four times a year, every year, until the outfall is dry or clean on all four visits. Sources of pollution identified by other means will be monitored as needed or specified for the individual situation.

Some research has already begun to determine appropriate penalties for discharges that can not be recovered but do not cause a fish kill or other quantifiable immediate damage. The City's current evaluation method does not account for contributions to the overall pollutant loading or degradation of the waterway.

SWMP Task: Coordinate with Knoxville Utility Board (KUB) sanitary sewer inspections.
Schedule: Ongoing.

The City will continues to coordinate with KUB to identify and correct sanitary sewer discharges. A standard procedure has been developed to insure that each possible contamination source is investigated after a problem is identified during dry weather screening. When high ammonia or fecal coliform levels are detected in the MS4, KUB and City personnel cooperate to identify the contamination source through dye testing or manhole by manhole testing. Once a source has been identified, KUB will correct problems in the main sanitary sewer system while the City will work with property owners to correct problems on private property.

The City also coordinates illicit connection investigations with KUB. These inspections have identified private residences, industries, and businesses that had plumbing or floor drains connected to the MS4 instead of the sanitary sewer system. This type of close coordination is essential for solving illicit discharges to the MS4 and will continue throughout the permit term.

SWMP Task: Inspect system-wide stormdrain system and maintain updated features on GIS.
Schedule: Ongoing.

The City is dedicated to updating and maintaining reliable stormdrain data on the GIS. This task is implemented by a concerted effort of the Engineering Department. All Engineers will submit their completed work orders to a designated GIS operator for update. That same operator personally inspects all new annexations to insure those new features are added to the system shortly after the parcel joins the city. All new developments are certified and the storm features are recorded on the GIS. Field personnel are instructed to log and report discrepancies to the GIS staff for proper updates.

Beginning in year one, one staff member will begin systematically inspecting the entire stormdrain system by grid to find and correct the parts of the system that may be in error. At the same time, the field inspector will document and report any pollution problems to the appropriate water quality inspector. Because maintaining the integrity of the GIS via field verification is extremely time-consuming, it is reasonable to believe this will be an ongoing task throughout the next permit term.

ILL-4 Spill Response Program

SWMP Task: Coordinate with Knoxville Emergency Response Team (KERT) and TDEC.
Schedule: Ongoing.

The City of Knoxville Stormwater Quality Section of the Engineering Department will continue to coordinate with both the KERT and TDEC during emergency situations. Each agency has specific roles to play during an emergency event. The City Stormwater Quality Section will assist in information gathering, investigations, GIS support, follow-up monitoring, and enforcement when necessary.

The Knoxville- Knox County Emergency Management Agency coordinates most major spills when they are called in to 911. KEMA also coordinates routine training and simulations

for various situations throughout the year. Workshops are provided to simulate real scenarios and allow coordination of the field teams and the Emergency Operations Center (EOC). Engineering Department staff participates in the EOC while the Fire Department, Police Department, and Rural Metro units perform the field exercises.

The City of Knoxville Fire Department and Engineering Department coordinate to respond to small spills and possible hazards as they are reported. The two departments will continue to work closely together to contain and remediate discharges in the street, stormdrain system, creeks or wherever necessary. The Knoxville Fire Department maintains a fire boat downtown on the waterfront to assist with spills discharging into the river. When a responsible party is identified, the Engineering Department staff will follow normal investigation and enforcement procedures to order the containment and remediation at the violator's expense.

Engineering staff will continue to closely coordinate with other emergency personnel at the monthly Local Emergency Planning Committee meetings and by maintaining a supervisor on call after hours and weekends to help respond to water quality emergencies as they occur.

ILL-5 Reporting of Illicit Discharges

SWMP Task: Continue to maintain and monitor "Water Quality Hotline" for public reporting.
Schedule: Ongoing.

The Water Quality Hotline for public reporting of water quality concerns was established as planned during the first permit term. The hotline was operational in November of 1996 but did not receive mass publicity until December 1996. The hotline phone number is a local Greater Knoxville Area number listed in the blue pages as (865) 215-4147.

The hotline has receives a variety of calls including industrial discharges, gray water discharges, broken laterals, commercial washing, neighbors dumping, etc. The hotline has been a popular and successful method for callers to anonymously report problems that they have witnessed or created. Common calls are from neighbors or dissatisfied employees of polluters. This program has been very successful and will be continued throughout the new permit term.

The Water Quality Hotline is a dedicated phone line attached to a phone in the Stormwater Quality Section of the Engineering Department. Employees in the section also have the hotline as a linked as a second line on their individual phones so anyone may answer the phone during the day. After hours and on weekends, the messages are recorded and routinely retrieved by the on-call supervisor. If the water quality concern is within the City limits, the Engineering Department investigates the problem. Otherwise, the problem is referred to the health department or TDEC field office.

SWMP Task: Develop innovative methods to publicize the "Water Quality Hotline".
Schedule: Ongoing.

The objective of this task is to increase the public awareness of the City's role in water quality issues and to create a quick and anonymous method for citizens to report water quality concerns. The publicity of the hotline has already provided a consistent and convenient resource for concerned citizens.

The City currently publicizes the Water Quality Hotline on the Engineering Departments website, which changes to http://www.ci.knoxville.tn.us/engineering/ after January 5, 2001, and in the blue pages of the Greater Knoxville Area BellSouth phone book.

The City has also included the hotline number in mass produced thousands of stormwater pollution prevention educational handouts such as the blue refrigerator magnet (shown left), classroom presentations, and routine correspondence with residents. The hotline is prominently displayed at the bottom of the Second Creek watershed boundary road signs to let travelers know where they may report water quality concerns.

In the new permit term the City will seek out and develop innovative methods to advertise this successful program as a method for anonymous reporting of citizen complaints. Future opportunities to advertise may include: utility bills, public access TV, radio PSAs, signs on city buses, refrigerator magnets, pamphlets, brochures, BMP manual CDs, permits, etc. The innovative methods of publicity will vary from year to year as opportunities for unique approaches are developed.

SWMP Task: Evaluate and redevelop an ongoing, comprehensive, and innovative public education program. Schedule: Full implementation after 12 months.

In the first year of the new permit, the City will evaluate the existing public outreach programs and redevelop an expanded and innovative water quality educational/outreach program for youth and adult audiences. This program will educate citizens about the new stormwater programs, services, and prohibitions while explaining what they can do to help improve water quality and the environment throughout the city. The City will consider public education/outreach programs including: brochures, videos, slide shows, newspaper articles and ads, TV shows or ads, KUB utility bill inserts, door hangers, stencils/plaques on storm drains, billboards, matchbook covers, visiting community groups, in school /university classes, adopt-a-stream, fact sheets, web sites, recreational guides, refrigerator magnets, posters, restaurant place mats, social training programs, library of educational materials, and water quality hotline. The hotline will be promoted through utility bills, KAT bus signs, brochures, phone book, etc.

During the first year of the permit, the City will produce PSAs for the local media which identify illicit and/or improper practices (i.e. dumping used motor oil, wastewater, pool discharges, fleet washing, etc.). The City will continue to coordinate with other MS4s in

Tennessee and around the country to create a uniform information campaign.

These new programs will be in addition to the current initiatives such as River Rescue, Stormdrain stenciling, and Adopt-a-Creek programs. The City is currently investigating several options for implementing these increased educational programs including additional staff, expanded contract with Ijams Nature Center, volunteers, and partnering with the University of Tennessee. The extent of the improved programs may depend on a successful partnership with the University to share resources needed to comply with common NPDES requirements.

ILL-6 Used Oil & Toxic Materials Program

SWMP Task: Implementation and Coordination of Recycling Program. Schedule: Ongoing.

The Solid Waste Division manages the City of Knoxville's recycling program. Their annual report of these programs is included in Appendix B of this report. For purposes of this report, some of the highlights of the 1999 recycling program are listed below:

- Knoxville recycled 27,304 tons of yard waste during the year.
- The City's twelve drop-off centers received 4,818.33 tons of recyclables.
- One-day promotional events are sponsored to promote backyard-composting bins.
- Oil, oil filters, and antifreeze are collected and recycled by Safety Kleen.
- Over 1000 people pledged to step up their recycling efforts on America Recycles Day.
- Tires are de-rimmed at the Transfer Station then taken to Knox County's temporary tire storage facility located at the Farmers Market. The tires are then transported to Signal Mountain Cement in Chattanooga and are burned as fuel.
- Transfer station employees also remove freon from old appliances and then recycle the old appliances as well as the freon.
- The Waste Watch educational newsletter is mailed to all property owners in the city.
- Over 200 school children toured the Solid Waste Management Facility and listened to a presentation at the Household Hazardous Waste Facility.
- The Solid Waste Division participates in numerous educational events during the year.

SWMP Task: Maintain and Operate Household Hazardous Waste Facility. Schedule: Ongoing.

The City continues to operate the Household Hazardous Waste (HHW) Collection Center, which first opened on April 22, 1997. This may still be the first and only existing HHW Collection Center in the State of Tennessee, which is open five days a week. The center accepts HHW from both Knoxville and Knox County residents. Knox County shares the annual costs of operation. The capital expenditures associated with construction of this facility were paid for through a $500,000 grant from the State of Tennessee. Activities at the center include:

- diverting reusable products;
- collecting, blending and recycling latex paint;
- collecting car batteries, oil and antifreeze;
- diverting selected acid and bases to waste water treatment;
- venting aerosol containers and recycling the empty containers;
- bulking flammable materials;

- packing miscellaneous HHW materials for safe shipment and disposal.

Upon entering the HHW Collection Center, individuals pull into a covered drive-through where staff removes HHW from vehicles. Material that is collected and is still "good" is separated and made available for pickup by the public free of charge. "Good" material includes containers that have never been opened or material that has not exceeded its useful shelf life. The staff then processes materials that are not reusable. This includes testing of unknown materials, diverting selected acids and bases to the wastewater treatment facility, venting aerosols, bulking flammable materials, lab packing, and blending paint. Latex paint is sent to a local firm to be re-manufactured and returned for use by the City. After the material is processed, it is put into 55-gallon drums, which are placed in one of two prefabricated storage units. Each of these units has electronic monitoring and security, fire suppression systems, and drainage/spill containment systems. The hazardous materials are then stored in the units and held until sufficient quantities are collected. The City has contracted with Clean Harbors for the transfer and disposal of the material and has hired a chemist and technician to operate the collection center. Due to the capital investment and success of this program, the facility will be maintained and operated throughout the next permit term.

ILL-7 Control Infiltration

SWMP Task: Monitor KUB's collection system O&M program, ongoing sewer line repair and rehabilitation progress, 5-year capital improvement plan and creek monitoring data.
Schedule: Annually.

Implementation of KUB's O&M and rehabilitation plans/studies will be the sole responsibility of KUB. The City's infiltration control program will be limited to coordinating inspections, as described in ILL-3, and to monitoring KUB's collection system O&M program, their ongoing sewer line repair and rehabilitation progress, their 5-year capital improvement plan and their bacteriological creek monitoring data. The City will collect annual reports and/or summaries from KUB including creek bacteriological monitoring data, 5-year projected capital improvement plan, and rehabilitation program progress reports. This data is essential to evaluating the current water quality improvement or degradation trends in the area waterways.

SWMP Task: Maintain adequate legal authority over KUB and other utilities for unpermitted discharges not otherwise regulated under their separate NPDES permits. Schedule: Ongoing.

Since the KUB and other small utilities maintain control and operation of the City's municipal sanitary sewer, compliance with the requirement to control infiltration is reflected in the City's maintenance of adequate legal authority over illicit discharges from the KUB and others. The City shall engage in ongoing communications with the utilities to resolve any such illicit connections or unauthorized discharges to the MS4 as they are identified. Currently, the Stormwater & Streets ordinance prohibits any non-stormwater discharges unless they are permitted or specifically exempted. Any ordinance alterations during the new permit term will ensure that adequate legal authority over all the utilities is maintained.

5.3 INDUSTRIAL AND RELATED FACILITIES PROGRAM (IN)

Program to Monitor and Control Runoff from TSD and Industrial Facilities Subject to SARA Title III, Section 313, requirements, 40 CFR 122.26(d)(2)(iv)(C).

IN-1 Ordinances

SWMP Task: Evaluate possible revisions to the prohibitions and exemptions of non-stormwater discharges in the existing Stormwater & Streets Ordinance. Schedule: Within 24 months.

The Stormwater and Street ordinance was developed during the first permit term to specifically prohibit non-stormwater discharges, increase penalties for illegal discharges, and to provide water quality regulations for new development. The ordinance may be accessed on the Internet at http://www.ci.knoxville.tn.us/engineering/ after January 5, 2001.

The ordinance section 22A-52 specifically prohibits illicit discharges and illegal dumping to any portion of the MS4 or any area draining to the MS4. Illicit discharges were defined according to 40 CFR 122.26(b)(2) as any non-stormwater discharge to the MS4. This definition, along with the $5,000 penalty for violations, has formed the cornerstone of our successful enforcement program and will remain in place during the next permit term.

Exemptions to this prohibition were listed in the ordinance in accordance with this list in 40 CFR 122.26(d)(2)(iv)(B)(1). Although most categories in this list were exempted in the first ordinance, the City will reevaluate these exemptions and update the ordinance if necessary.

City Council was advised that the ordinance may need to be updated approximately every five years to accommodate any changes or additional requirements in each new NPDES permit.

SWMP Task: Implement any new revisions to the Stormwater & Streets Ordinance.
Schedule: After 24 months.

Any revisions to the Stormwater & Streets Ordinance will become effective 17 days after City Council adopts the changes. The Engineering Department will implement and enforce any new revisions as soon as they become effective. Revisions will be advertised on the website.

IN-2 Inspection Element

SWMP Task: Develop inspection program for non-permitted commercial facilities (i.e. car lots, restaurants, service stations, grocery stores, etc.). Schedule: Full implementation in Year Three.

Over the course of the first permit term, the City has identified many common discharges from facilities not permitted under the TDEC multi-sector general stormwater permit program. The City is not proposing to duplicate the efforts of TDEC and EPA by monitoring existing permitted facilities. This program will be developed to fill in the gaps in the existing permit programs of those agencies with a local inspection program for non-permitted facilities.

The inspection program will be developed and implemented one year after the associated monitoring program described in section IN-3 below. By implementing the monitoring program

first, the City will be able to identify which business groups will benefit the most from our inspection and education efforts.

The program should focus on performing routine and/or random inspections on a variety of commercial sectors. The inspectors can work with the business to develop site specific pollution prevention plans, employee training and structural modifications, if needed. The City's BMP manual has a wide assortment of information for a variety of businesses. Since these businesses are not regulated in a permit program now, many of the operators are not focused on how their actions impact water quality in the area streams. The specific elements of this program will be defined after the monitoring program results are analyzed.

SWMP Task: Collect and analyze KUB inspection reports. Assess impact to the MS4.
Schedule: Semi-Annually.

KUB inspectors as part of the pretreatment program currently perform inspections of industrial facilities. KUB inspectors currently inspect approximately 2,000 commercial and industrial facilities per year for back flow preventor operation, approximately 1,700 facilities per year for fire protection, 42 large clients which have industrial discharge permits, and about 100 customers whose discharge to the wastewater sewer system contains high levels of BOD_5.

Industrial permit holders are subject to complete facility inspections annually. KUB personnel visit the industrial facility equipped with an industrial compliance inspection checklist. Some items on the checklist address impacts of potential contamination of storm drain runoff from the industrial sites.

As part of the inspections, KUB inspectors also try to identify obvious cases where runoff from industrial facilities could impact the stormwater quality, such as floor drains on loading docks which drain to creeks, or outdoor storage of chemicals or hazardous materials. The City will continue to collect and review all of the KUB industrial inspection forms every other year during the next permit cycle. This ongoing program will allow the City to help identify the possible sources of continuous discharges to the MS4.

If the City determines that a certain facility is a potential pollution source, the illicit connection/improper disposal field monitoring activities will target outfalls receiving these discharges. The City and KUB have cooperated to performed dye tests at facilities, which are suspected of having improper connections to the storm drain system.

SWMP Task: Identify potential industrial discharges through Illicit Connection and Improper Disposal Program. (stormwater & non-stormwater). Schedule: Ongoing.

The illicit connection and improper disposal program defined in the City's Part II NPDES stormwater permit application and in the previous section of this reapplication, primarily addresses runoff from industrial facilities. Illicit connections or improper disposal from industrial facilities which are discovered while inspecting the storm drain system under this program will be recorded in the facilities' file in the database. The City will contact the industrial facility directly, along with KUB or TDEC if necessary, to identify the problem and work on an appropriate solution. If enforcement action is necessary, the City will track the situation until the illicit connection is corrected, the illegal dumping stopped, or until the facility receives a valid

NPDES permit for the discharge.

In addition to the illicit connection and improper disposal program inspections, the City routinely performs inspections at commercial and industrial sites through a random selection process using the MPC inventory of industrial space and in response to citizen concerns reported to the water quality hotline. This will be an ongoing program in the new permit term.

SWMP Task: Collect and analyze NOIs from Industrial Permit applicants. Schedule: Ongoing.

The City will continue to coordinate with TDEC and industrial facilities to ensure that all Notices of Intent (NOIs) are submitted to the City. As the NOIs are received, the City reviews and evaluates the NOIs for the potential impact of stormwater runoff to the municipal storm drain system. In the past, the NOIs have been instrumental in locating and removing discharges from local industries. During inspections or enforcement actions with an industry, the City will verify that an NOI has been filed. If an NOI has not been filed, the City will provide the blank form and require the industry to submit the NOI to both the State and the City Engineering office. An electronic database will be completed during the next permit term that should allow geographical linkages to the GIS. A prototype has been developed but has not been completed at this time due to staff turnover. The current industrial information is maintained by hard copies on file.

SWMP Task: Review and update inspection program as part of Pollution Prevention Plans for Municipal Industrial Facilities. Conduct annual inspections at MIFs.
Schedule: Full implementation after 12 months.

The City developed an inspection and pollution prevention program for municipal industrial facilities during the first permit term. In the first year of the new permit term, the City will review the existing programs and update as necessary. Currently only four municipal industrial facilities are operated in the City. These facilities include:

- the Solid Waste Management Facility (SWMF) on Baxter Avenue, and
- the fleet truck & heavy equipment garage on Loraine Street, and
- the fleet and police garage at Prosser Road, and
- the Knoxville Area Transit (KAT bus station) on Magnolia Avenue.

Each facility has been evaluated and inspected regularly by Engineering personnel during the first permit term and will continue to be inspected at least annually in the future. Since the bus terminal is owned by the City but managed by KAT, they developed their own PPP, which was submitted in the first annual report in 1997.

Some structural pollution control measures have been implemented at several MIF sites. The bus station had two large Stormceptor stormwater treatment devices installed in November 1999. The total project cost was nearly $300,000. A strip of the concrete parking lot along First Creek was removed and replaced with a slope directed away from the creek. The reversed slope and a large curb prevent the runoff from entering First creek directly. The runoff is routed through the two oil/water separators before being discharged. Other measures at KAT include upgrading the fleet to new lower pollution models.

The SWMF has installed some above ground filters and catch basin inserts to mitigate potential pollution. The entire transfer facility is covered and the drain in the loading dock for

the transfer trucks is routed to the sanitary sewer system. Both garages have adopted spill protection policies and all mechanical work is done inside. A hydrocarbon absorbent boom has been installed in a trench drain at the police garage as a secondary control for emergency spills.

All of these facilities will be reevaluated and reported during year one.

IN-3 Monitoring Element

SWMP Task: Collect Monitoring Data from permitted industrial stormwater dischargers and/or from TDEC. Assess impacts to the storm drain system. Schedule: Ongoing.

As part of the NPDES Permit for stormwater discharges associated with industrial activity, applicants are required to monitor, at least annually, all stormwater outfalls identified on the facilities' Pollution Prevention Plans. Applicants must monitor in accordance with TDEC Rule 1200-4-10-.04. The City currently receives copies of the results of the industrial outfall self-monitoring from some of the regulated industries. The City will continue to work with TDEC or directly with the industrial discharger to obtain copies of the information, as it becomes available. The City will maintain this information in the City's industrial database, and will assess the impact of the monitored discharges on the water quality of the storm drain system on an annual basis. If the City determines that additional data needs to be provided in the monitoring program for an industry (reports on additional parameters, etc.), requirements for an expanded program for subsequent monitoring events will be coordinated with TDEC and/or the industrial discharger.

The City may require some monitoring from industries not covered under the TDEC programs whenever necessary. This will usually be in conjunction with some enforcement action.

SWMP Task: Develop ongoing monitoring program at non-permitted commercial facilities using guidelines pursuant to 40 CFR 122.26(d)(2)(iv)(c)(2). Identify pollutants/sources as applicable. Schedule: Within 24 months.

In the first permit cycle, the City's Ongoing Monitoring Program, defined in the Part 2 NPDES stormwater permit application, included the monitoring of stormwater runoff from two areas of industrial facilities (e.g. industrial parks). Stormwater samples were collected, analyzed, and recorded for 12 to 15 storms per year per site using flow weighted composites from ISCO monitoring stations. Each of the monitoring locations received runoff from small watersheds approximately 1/4 square mile with several different industries included. Therefore specific pollutants were not easily traced back to a specific industry but the general data did allow implementation of industry wide BMPs.

The TDEC multi-sector permit program does require specific groups of industries to sample their runoff, but the non-permitted commercial industries have fallen through the cracks. Preliminary investigations have shown that many of these non-permitted businesses may contribute a significant amount of pollutants to the storm runoff.

Rather than proposing to perform additional storm event monitoring for individual industrial facilities that are already performing samples for TDEC or EPA, the City is proposing

to initiate a new monitoring program that will address areas that are still unregulated.

This program will be fully defined and submitted for TDEC review in the second annual report. Sampling of the non-permitted facilities will begin in year three.

In addition to the stormwater sampling above, all outfalls from industrial areas have been tested as part of the dry weather field-screening program to identify potential specific sources of the pollutants. Each year the City will continue to choose random outfalls from industrial areas as the primary dry weather screening locations. These outfalls are tested with field screening kits.

SWMP Task: Implement the ongoing monitoring program at non-permitted commercial facilities and analyze the results. Schedule: Annually beginning year three.

As described above, this program will be fully defined and submitted for TDEC review in the second annual report. The field sampling of the non-permitted facilities will begin in year three. The sampling may be conducted by Engineering staff, volunteers, and/or the facility.

SWMP Task: Maintain adequate legal authority to require monitoring and reports from TSDs and Industrial facilities subject to SARA Title III, Section 313. Schedule: Ongoing.

The Stormwater & Streets ordinance Section 22A-54 states, *"The Director of Engineering may require any person engaging in any activity or owning any property, building or facility (including but not limited to a site of industrial activity) to undertake such reasonable monitoring of any discharge(s) to the stormwater system operated by the City and to furnish periodic reports of such discharges."* The City will maintain this legal authority to require monitoring from all facilities necessary if the Stormwater & Streets ordinance is updated in the next permit term. Additional monitoring may be required when a problem has occurred or still exists, when the City has reason to believe a pollution problem exists, when TDEC or EPA do not already require sufficient testing, or if the City is mandated to test and report those facilities.

SWMP Task: Evaluate and update the monitoring program at Municipal Industrial Facilities. Schedule: Full implementation after 12 months.

In the first year of the new permit term, the monitoring program for the four MIFs will be evaluated and updated as necessary. The City has implemented limited testing at these facilities including ambient monitoring, dry-weather screening, and industrial stormwater inspections conducted by the Engineering Department. Initial monitoring inspections resulted in some of the structural modifications mentioned above in section IN-2 as well as some management policies and procedures.

The City proposes to update this program in year one to include some laboratory analysis to help evaluate the effectiveness of those controls. For example, the large Stormceptors that were installed at the bus terminal may be monitored with a before and after treatment sample to determine the removal efficiency of that BMP. Obviously, the dry-weather screening program will continue to monitor these outfalls to insure that management controls are sufficient.

SWMP Task: Manage and Conduct a Monitoring Program at Municipal Industrial Facilities.
Schedule: Ongoing.

The monitoring program for the municipal industrial facilities was developed during the first permit term and was included in the 96/97 annual report. The program specified that the only municipal industries included in the City's monitoring program will be limited to the Knoxville Area Transit station, the Prosser Road fleet and passenger vehicle garage, and the Lorraine Street maintenance and storage facility. However, the City also began monitoring and testing the parking lot runoff from the Solid Waste Management Facility (SWMF) on Elm Street. This monitoring program was developed as a Best Management Practices test site to evaluate the usefulness and effectiveness of catch basin filters on ultra-urban land uses. The City partnered with the University of Tennessee Civil & Environmental Engineering Department and with Remedial Solutions to put two catch basin filters in place. One filter was also installed at the SWMF and one was located on Phillip Fulmer Way outside Neyland Stadium.

All monitoring at MIFs during the next permit term will be conducted by Engineering staff, volunteers, and/or some other designated agent. This monitoring will be conducted at least annually.

5.4 CONSTRUCTION SITE RUNOFF PROGRAM (CS)

Program to Implement and Maintain BMP Plans to Reduce Construction Site Runoff to the Municipal Storm Sewer System, 40 CFR 122.26(d)(2)(iv)(D).

CS-1 Site Planning

SWMP Task: Review & update the Stormwater & Streets Ordinance which requires construction sites greater than 10,000 sq. ft. to submit Erosion and Sediment (E&S) Control Plans.
Schedule: Full implementation after 24 months.

The Stormwater and Street ordinance was developed during the first permit term to specifically require construction sites greater than 10,000 square feet to provide an erosion and sediment control plan according to section 22A-28(4)(c). The ordinance may be accessed on the Internet at http://www.ci.knoxville.tn.us/engineering/ after January 5, 2001.

During the first two years, the City will reevaluate and update the ordinance if necessary.

SWMP Task: Require Site Plans Submittals per the City of Knoxville BMP Manual.
Schedule: Immediately.

The Stormwater and Streets ordinance requires site plans submittals to comply with the Erosion and Sediment Control Handbook produced by TDEC, dated July 1992, or as amended by TDEC or its successor and any supplemental regulations by the Engineering Department.

Beginning in year one of the new permit, the City will change this requirement to require plan submittals as per the City's new BMP manual. The BMP manual should be completely loaded on to the City's web site at http://www.ci.knoxville.tn.us/engineering/ in January.

SWMP Task: Review & update minimum criteria for plan review and checklists.
Schedule: Full implementation within 12 months.

Although the TDEC Erosion and Sediment Control Handbook does provide a checklist for review of Erosion and Sediment Control Plans, the City developed a list of minimum criteria to supplement the State checklist for various categories of site plans (residential, commercial, etc.). The minimum criteria and checklists are used by the City plans review staff to ensure consistency in the plan review process. The current plans review checklist will be reviewed and will likely be revised due to new permit or ordinance requirements or BMP manual revisions.

SWMP Task: Review, update, & continue to require Pre-construction Assistance Meetings with Developers and Contractors. Schedule: Immediately.

Since 1999, the City of Knoxville requires a Pre-construction Assistance Meeting with the Developer, contractors, design Engineers, and the City staff before a Site Development Permit is issued. This meeting is scheduled after the Site Development plans are ready for approval but before construction begins. The meeting insures that all parties involved with the construction project are equally aware of the City's expectations. Topics covered in the meeting may include:

- the Development Inspection Checklist,
- the Stormwater & Streets Ordinance,
- the Engineering Department Enforcement Policy,
- Construction Best Management Practices,
- Inspection Schedules,
- State of Tennessee Erosion & Sediment Control Handbook,
- Special notes and considerations for the particular site, and
- Other important information relevant to the project.

A record of the pre-construction meeting, including all attendees, is microfilmed with the permit.

The Pre-construction Assistance Meeting format will continue to be reviewed and updated throughout the permit term as new policies, procedures, BMPs, and other regulations necessitate. The City has recently hired a new construction inspection manager, who will likely update the format and content of the assistance meetings immediately in year one or sooner. Since the assistance meetings have been successful, they will be continued throughout the permit term.

CS-2 BMP Requirements

SWMP Task: Require Construction BMPs from the City of Knoxville BMP manual.
Schedule: Immediately.

As outlined in the new Stormwater and Street ordinance section 22A-28(b)(4), all erosion and sediment control plans must comply with the Erosion and Sediment Control Handbook produced by TDEC, dated July 1992, or as amended by TDEC or its successor and any supplemental regulations by the Engineering Department.

Beginning in year one of the new permit, the City will change this requirement to require construction BMPs as per the City's new BMP manual or equivalent.

SWMP Task: Evaluate additional BMP requirements and design modifications and maintain the updates on the City's web page. Schedule: 2nd Half of each year.

The new BMP manual is intended to be a live document with the latest recommended BMPs included. Each year, the City will evaluate necessary updates/modifications to the BMP manual to insure that any new regulations, policies, and or technologies are reflected in the manual. This practice will allow the City greater flexibility and control over the BMP requirements for new development than the existing TDEC Handbook. Any changes will be announced and implemented the following year. The BMP manual will be maintained on the City's web site at http://www.ci.knoxville.tn.us/engineering/ after January 5, 2001.

SWMP Task: Continue to require construction site "good housekeeping" practices.
Schedule: Ongoing.

To ensure that construction sites are kept clean and orderly, and to minimize pollutants in stormwater runoff as a result of other construction activities, the City will continue to require good housekeeping measures on all active construction sites. The good housekeeping regulations may require that site plans address the following considerations:

- Designated areas for construction equipment maintenance and repair and prohibiting discharges of oil and grease into the storm drain system or receiving waters.
- Designated areas for construction equipment washing provided with a gravel or rock base and ensuring the wash waters are discharged to a regularly maintained temporary holding basin or sediment control device.
- Provision of storage areas for construction materials and receptacles for liquids (solvents, paints, acids) and solids in accordance with manufacturers recommendations.
- Provision of adequate waste storage areas and ensuring that the locations for collection of waste materials do not receive concentrated runoff.
- Provision of adequate sanitary facilities on construction sites in accordance with Health Department Regulations.

Many of these "good housekeeping" issues will be reviewed with the contractor, engineer, and developer during the pre-construction assistance meeting.

CS-3 Inspection / Enforcement

SWMP Task: Maintain expanded inspections program including small single family sites.
Schedule: Ongoing.

In the first permit term, the City of Knoxville expanded new development construction inspections to include at least one inspection at all single family residential sites. These single-family residential inspections will continue as an ongoing program during the next permit term.

SWMP Task: Implement routine site inspections on commercial and subdivision developments. Schedule: Ongoing.

The Engineering Department will continue to implement site inspections for subdivision and commercial developments throughout the next permit term. These inspections are not a new program and have been occurring since at least 1994. Routine inspections are typically performed during rough grading, erosion & sediment control installation, final grading, and at final stabilization. Although the site inspections are not scheduled with the contractor or developer, the City staff will typically visit the sites approximately every week. The time frame for some project inspections may vary due to the specific project.

These inspections are performed to insure compliance with the erosion and sediment control plan, good housekeeping, and the approved design plan.

SWMP Task: Continue to require post-construction Development Certifications from a licensed professional Engineer before bond release. Schedule: Ongoing.

Since 1999, the City required all developments with a bond to submit to a post-construction Development Certification before the bond is released. A licensed professional Engineer must certify that the roads and stormwater features (quality & quantity) were built as permitted. Some deviation from the permitted plan may be allowed during construction as long as the final project still meets the City's minimum requirements. If the final certified project does not meet the minimum requirements, further adjustments must be made before the entire bond is released to the developer. This program does require a second plan review by the Engineering Department after construction has finished to insure proper results in the field. This program has been successful and will be continued throughout the next permit term.

SWMP Task: Evaluate and update enforcement procedures, policies, and follow-up monitoring/ inspections. Schedule: Full implementation after 24 months.

The schedule for this task appropriately coincides with the schedule for ordinance updates. Depending on the new requirements, if any, in the new ordinance, the current enforcement policies and procedures may need to be amended. Under the current ordinance, the existing enforcement procedures and policies have been effective.

Depending on the violation, a first-time offender is usually educated and asked to remediate the damage or correct the violation if possible. This is usually followed up with a letter to inform the violator of the City's expectations and to provide helpful BMPs to prevent future problems. More severe or repeated violations will merit a Notice of Violation (NOV) which is issued in the field directly to the violator. Copies of the NOV are distributed to the property owner or developer, the City Law Department, and the Engineering Department. The NOV may order specific remedies and require the violator to submit reports and/or pollution prevention plans. Penalties, if any, are only issued after the NOV expires so the violation and remedies may be fully evaluated.

A violator may appeal their penalty before a five-member Environmental Appeals Board. The five volunteer members of the Environmental Appeals Board were appointed by the Mayor

and consists of individuals with an expertise as follows:

1) One licensed professional engineer with civil engineering expertise.
2) One licensed professional engineer.
3) One representative of the development or industrial community.
4) One neighborhood representative.
5) One member at large.

Board members will serve a 5-year term and may be re-appointed at the end of their term. Follow-up monitoring and inspections will be a combination of City, KUB, and self-inspections by industries. Enforcement actions resulting from the dry-weather screening program will be followed as defined within that program as a minimum. Any outfall that is tested for high parameters or identified as an illicit connection/ illegal dump source, will be tested four times a year, every year, until the outfall is dry or clean on all four visits. Sources of pollution identified by other means will be monitored as needed or specified for the individual situation.

Some research has already begun to determine appropriate penalties for discharges that can not be recovered but do not cause a fish kill or other quantifiable immediate damage. The City's current evaluation method does not account for contributions to the overall pollutant loading or degradation of the waterway.

CS-4 Training Programs

SWMP Task: Co-Sponsor E&S Control Practice Seminars for City staff, developers, Engineers and contractors. Schedule: Annually.

The City and other Water Quality Forum members have developed and presented free erosion and sediment control workshops during the first permit term. To maximize participation the workshops are typically presented in the early spring or late fall while construction activities are least intense. The workshops have been very successful and will be continued annually. In addition to the City of Knoxville, the Water Quality Forum partners involved with the planning, sponsorship, and presentation of the workshops have included: TVA, TDEC, TDOT, NRCS, Knox County, Ijams Nature Center, UTK, and the UT Water Resources Research Center. Private sponsors have included consulting firms and erosion control product vendors.

The future workshops may be varied to targeted contractors and homebuilders in one while emphasizing Engineering design in another. The City also plans to promote and/or sponsor the new erosion control certification program under development at TDEC at this time.

SWMP Task: Provide training for City plans review staff. Schedule: Ongoing.

In an effort to keep the Stormwater Management staff fully trained and up to date, the City will continue to participate in seminars around the region. Most staff members at the Engineer level will attend at least one seminar or training workshop annually. In addition to the stormwater management seminars attended, the Engineering staff have sponsored, planned, and presented a series of workshops/seminars to better educate the staff and development community about the development and plans review processes.

The City will continue to provide training to the Engineering staff by participating in

seminars locally and outside the city; in-house training by professional engineers; tuition reimbursement for university engineering classes; cooperating with TDOT, TDEC, TVA, and other agencies to provide professional training for the staff. Training of the plans review and inspections staff will continue to be an ongoing program within the Engineering Department.

5.5 ONGOING MONITORING PROGRAM (MN)

Program to Collect Quantitative Data to Determine the Impacts of Urban Stormwater on the Natural Environment, pursuant to 40 CFR 122.26(d)(2)(iii)(A).

MN-1 Seasonal Storm Event Monitoring

SWMP Task: Review and update the Standard Operating Procedures (SOP) for the seasonal sampling program. Schedule: Within 12 months.

The original SOP was developed and submitted with the first annual report during the first permit cycle. Once again the SOP will be updated to reflect any changes in procedures, equipment, software, or requirements that become effective in the new permit. The new version of the SOP will be included in the first annual report.

SWMP Task: Maintain at least five (5) automatic monitoring stations. Schedule: Ongoing.

In 1999, the City relocated the four of the five ISCO automatic monitoring stations to sites on First Creek (pictured), Second Creek at UTK, Love Creek, and Fourth Creek. The specific locations were pre-approved by TDEC and are noted on the large inventory map in the appendix and also on the detailed maps in section 8.0 of this report. The fifth station remained in the original location at the outlet of the large regional pond at Acker Place.

Each monitoring station consists of a tipping bucket rain gage, an automatic sampler with 24 individual bottles, and a flow meter/data logger. The intake line and flow sensors are installed in the low flow path for constant monitoring. Modems and cell phones were installed to allow City staff to remotely monitor the conditions and station activity. After each rain event, a technician will interrogate the sampler from the office and calculate the appropriate flow-weighted composite sample. The information is then used in the field to prepare the actual sample from the individual bottles. The composite sample is prepared, it is immediately transported to the KUB laboratory for analysis.

The City is committed to maintaining this investment throughout the next permit term. The stations may be moved during the next five years due to sampling problems, private property owner request, vandalism, or other valid reason. TDEC will be notified of future proposed sites.

SWMP Task: Collect twenty (20) to thirty (30) flow-weighted composite storm samples annually. Schedule: Ongoing.

Each year, the automatic sampling stations will collect twenty (20) to thirty (30) flow-weighted composite storm samples. Each of the five monitoring stations should collect four (4) to six (6) storm samples each year with at least one storm sample per quarter to help distribute the sampling events seasonally. During dry weather, the stations will also collect ambient samples as described below in section MN-3.

Each of the flow-weighted storm samples will be analyzed for thirteen (13) routine parameters. Only pH will be recorded in the field. The remaining routine parameters will be analyzed and recorded in the laboratory in accordance with 40 CFR part 122.26 and 40 CFR part 136. The routine parameters to be tested in the laboratory are listed in the table below:

Routine Parameters for Laboratory Analysis		
Total Suspended Solids (TSS)	Nitrate + Nitrite Nitrogen (as N)	Total Recoverable Lead
Total Dissolved Solids (TDS)	Total Nitrogen	Total Recoverable Zinc
Total Ammonia Nitrogen (as N)	Biochemical Oxygen Demand (BOD_5)	Dissolved Phosphorus
Total Ammonia + Organic Nitrogen	Chemical Oxygen Demand (COD)	Total Phosphorus

SWMP Task: Collect five (5) wet weather bacteria samples (fecal coliform). Schedule: Annually.

Five bacteria samples will be collected each year. One grab sample will be collected by hand at each monitoring station during a qualified storm event. Since the grab samples are currently tested for fecal coliform, the City proposes to continue with that parameter until further research indicates a better alternative. The City will research alternatives to fecal coliform testing as part of the supplemental bacteriological sampling program described in MN-3 below. If a viable alternative is found, the City will submit the proposal to TDEC for approval.

SWMP Task: Collect five (5) full-suite grab samples (one/station/permit). Schedule: Ongoing.

Each year, one monitoring station will be selected for a full-suite grab sample. The five stations will be rotated throughout the permit term to allow one sample from each location.

In addition to the 13 routine parameters listed above, the full-suite grab sample will include analysis for oil & grease and all the pollutants listed in Tables II & III of 40 CFR Part 122 Appendix D including: volatiles, pesticides, acids, base/neutrals, toxic metals, total phenol, and cyanide.

SWMP Task: Analyze Results from Ongoing Monitoring Program. Schedule: Ongoing.

Sampling data will continue to be collected, evaluated, and analyzed by City staff as part of the ongoing seasonal monitoring program. The updated seasonal pollutant loading and event mean concentration for the major watersheds within the MS4 may be estimated from the City monitoring data and/or from other regional data, which may include:

- NURP study,

- USGS Open-File Report 94-68 titled "Rainfall, Streamflow, and Water-Quality Data for Five Small Watersheds, Nashville, Tennessee, 1990-1992",
- USGS Water-Resources Investigations Report 95-4140,
- USGS Open-File Report 93-xxx titled "Stormwater Data for Knoxville, TN '91-'92.
- Any available TVA data,
- Any available EPA data, and
- Any available State of Tennessee data.

The estimates of the seasonal loading and event mean concentrations will be included in the fifth annual report. An estimate of the total annual runoff from each of the major watersheds within the City will be provided in each annual report (see Section 6.2.4 in this report). Due to ongoing annexations, watersheds or portions of watersheds may be added each year.

MN-2 Dry Weather Screening & Industrial/Commercial Site Monitoring

SWMP Task: Dry Weather Screening as described in ILL-2. Schedule: Annually.

SWMP Task: Implement Commercial/Industrial Monitoring Programs in IN-3.
Schedule: Varies.

MN-3 Ambient & Biological Monitoring

SWMP Task: Implement ongoing Ambient sampling program. Schedule: Quarterly.

At least twenty (20) ambient samples will be collected each year at a rate of one sample per quarter from each of the five monitoring station locations (detailed by map in section 8.0 and on the inventory map attached). The City has already implemented a quarterly ambient sampling program that will continue throughout the next permit term.

The samples may be collected either by a single grab sample or by using the automatic samplers for a timed composite. Each ambient sample collected will be analyzed for the 13 routine parameters listed in MN-1. This new program was implemented after all of the monitoring stations were moved to their new locations. Since all of the new locations have some flow in ambient conditions, the samples can be retrieved at the same location as the storm event samples. This is an added convenience for direct comparison of storm event and ambient samples as well as allowing more options for collecting samples automatically.

SWMP Task: Develop and Implement a Biological-monitoring program to supplement the program currently administered by TVA. Schedule: Full Implementation within 12 months.

During the first permit term, the City collected, summarized, and reported the results of previous biological assessments conducted within the city. The City also coordinated with TVA to conduct at least two biological monitoring events in the city per year. Since the Engineering Department does not have any biologists on staff, coordination was limited to assisting in the field, sponsoring Americorps teams to assist in the field, and by collecting and summarizing data.

Within the first year of the next permit term, a supplemental Biological-monitoring program will be developed. The supplemental program will be submitted to TDEC in the first annual report and sampling will commence in year two.

The City will continue to advocate biological sampling that is compatible with previous studies performed within the city by the University of Tennessee, the Tennessee Wildlife Resource Agency, and the Tennessee Valley Authority using EPA Rapid Bioassessment protocols (RBP) or Index of Biotic Integrity (IBI) approaches.

The supplemental program may involve sponsoring additional sampling by TVA contractors, partnering with the UTK, using volunteers, training Engineering Department staff, or any combination of the above. The extent of the supplemental program may depend on the level of partnership developed with the UTK to help the university comply with their new NPDES permit requirements. Although an agreement has not been reached at this time, the City has initiated discussion regarding sharing resources to comply with common permit requirements.

SWMP Task: Develop and Implement a Bacteriological-monitoring program.

Schedule: Full Implementation after 12 months.

The City does not currently collect any bacteriological data. Although many of the urban creeks are listed for bacteriological contamination above contact limits, current data is not available to the City. The City proposes to develop a program or coordinate with other agencies programs to obtain some consistent bacteriological data as an indicator of improving or deteriorating bacteria sources throughout the city. This program may be conducted by a partnership between the City and UTK, USGS, TVA, TDEC, EPA, or volunteer personnel unless KUB and the other utilities in this area develop a satisfactory program to provide this data.

The details of this proposed monitoring initiative will be submitted in the first annual report for TDEC approval. Sampling will begin in year two.

MN-4 Training Programs

SWMP Task: Develop and Implement Monitoring Training Program for staff and/or volunteers.

Schedule: Annual Training.

The City has proposed continue some ongoing monitoring programs and initiate new monitoring programs. To accomplish this the City will provide the additional training for the Engineering Department staff while partnering with others to provide training for volunteers. Currently, volunteers are used for dry-weather screening, ambient sampling, and biological monitoring. The annual training will be adequate to insure that proper sampling protocols are used for each program in this section.

5.6 EDUCATIONAL ACTIVITIES and PUBLIC OUTREACH

Watershed Boundary and Creek Crossing Signs

During the first permit term, the City has attempted to increase public awareness of our

natural resources by strategically placing creek crossing signs where major roads cross over the urban creeks. To date, signs have been placed in each major watershed. This program will continue and expand as new watersheds are included in the future city limits.

Water Quality Education activities at Ijams Nature Center Schedule: Ongoing.

Ijams Nature Center facilitates and coordinates several water quality education programs in the Knoxville/Knox County area. Each program has a specific water focus and targets a community-based audience. Ijams is an 80-acre City park and environmental education center located within the city limits of Knoxville, Tennessee. The mission of Ijams Nature center is to increase the knowledge, understanding, and appreciation of the natural world by providing quality educational experiences throughout the region. In the last permit term, the City of Knoxville has sponsored the following programs through an annual contract with Ijams Nature Center.

Adopt-a-Creek

The Adopt-a-Creek program was implemented as a compliment to the annual River Rescue program (see next item) to raise awareness of the state of our waterways in the community and to begin to address the problem through volunteer work in and near the creeks and streams that feed the Tennessee River. The long-term goal of the Adopt-a-Creek program is to have every accessible section of creek adopted by neighborhood, school, business, and civic groups. Adoption responsibilities include:

- a one year commitment to do two cleanups,
- monitoring physical conditions after each cleanup, and
- keeping a record of participants and debris weight from each cleanup.

In the six years since the inception of this volunteer program, eleven miles of stream have been adopted and more than 142 tons of litter and debris have been picked up. Several adopters have performed water testing and population studies to further their knowledge of their adopted section. Adopt-a-Creek is supported by the City of Knoxville and coordinated by Ijams.

River Rescue Schedule: Ongoing

The year 2000 is the 10th year for the River Rescue. The spring 2000 River Rescue attracted over 720 volunteers who collected almost 27.5 tons of trash and debris from the shores of the Tennessee River. This annual event is coordinated through Ijams Nature Center in cooperation with the City of Knoxville and Sea Ray Boats and more than 20 other partners, including members of the business community, government agencies, private organizations, and individuals. There are 35 sites or "zones" that stretch from the forks of the river above Knoxville to Fort Loudoun Dam. River Rescue is also held in partnership with Lake User groups on Watts Bar Lake, Melton Hill Lake, and the Clinch River. Ijams Water Quality Specialists plan for this event throughout the year by recruiting volunteers, surveying river bank conditions, securing additional sponsors, and pinpointing areas in need of cleanup.

Operation Storm Drain — Schedule: Ongoing

This ongoing program was started in 1994 by the Blue Thumb Coalition. As of June 30, 2000, over 10,600 drains have been stenciled. Volunteer groups are recruited by the Water Quality Specialists at Ijams. Volunteers raise community awareness of water flowing from our storm drains directly into the creeks, streams, and rivers of East Tennessee. In partnership with the City of Knoxville and the Tennessee Valley Authority, Ijams has introduced curb markers to be used in conjunction with stencils. These brightly colored plastic disks are affixed to the curbs and carry the message "Dump no Wastes, Drains to Stream." By stenciling a message that states "Dump No Waste - Drains to Stream", Operation Storm Drain attempts to educate citizens and reduce the amount of pollutants dumped into our waterways.

Water Quality Forum — Schedule: Ongoing

The Water Quality Forum was initiated in 1990 by the City of Knoxville as a cooperative network of organizations and agencies charged with monitoring and regulating regional water quality. Currently the Forum consists of 35 participating groups including but not limited to the City, CAC Americorps, TVA, KUB, UTK-WRRC, USGS, NRCS, TDEC, KKB, etc. The Forum meets quarterly as a large group and monthly within the committees.

Adopt-a-Watershed — Schedule: Ongoing

Currently, ten area high schools are participating in the program. The City of Knoxville has helped provided training, participation, and supplies to the schools and has helped implement the goals of the program and increase public awareness of water quality issues. The primary goals of the program include:

- Characterizing the school's watershed using, at minimum, two AAW characterization tools (e.g., watershed inventory, watershed mapping, windshield survey, stream walk).
- Monitor the school's watershed stream(s), conducting, at minimum, chemical testing twice and a biological (i.e. macroinvertebrate and/or fish) assessment once.
- Conduct at least one water quality improvement activity (e.g., tree planting, storm drain stenciling, stream cleanup, stream bank restoration, presentations to school groups/community organizations on the "state of the watershed" as determined by the students' characterization/monitoring efforts).

The City will continue working with the schools and provide support such as information, solid waste support for cleanups, GIS maps, stencils, testing supplies, training, and etc.

6.0 MONITORING REPORTS SUMMARY

6.1 DRY-WEATHER SCREENING PROGRAM - NEW OUTFALL INVENTORY

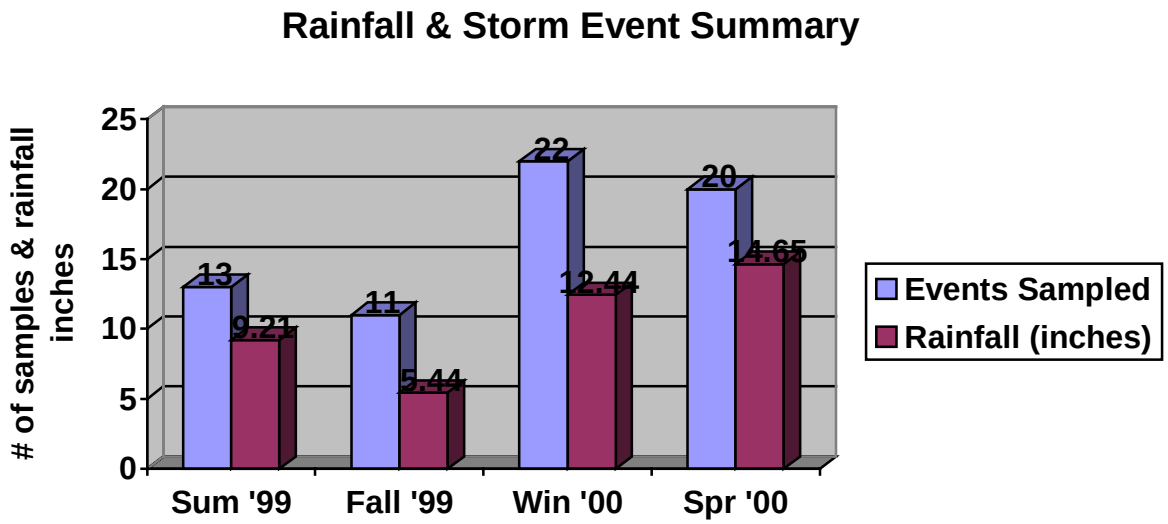
During the past permit year, three outfalls were added to the City's outfall inventory. The first outfall was numbered 71-400-0605 and it collects runoff from Interstate 75. The other outfalls are numbered 01-300-0143 and 01-300-0149. Both of these outfalls on First Creek discharge from the Stormceptor devices that were installed at Knoxville Area Transit (KAT) Authority bus station. All outfalls are clearly marked on the inventory map located in Appendix C of this report.

The dry weather screening of major outfalls throughout the MS4 did provide some indication on improvements since the baseline data was collected at the outfalls during the permit application process in 1991/1992. Please refer to section 5.2 of this report for details on the program.

6.2 ONGOING STORMWATER MONITORING PROGRAM

6.2.1 Area Rainfall Data & Storm Event Summary.

During the July 1, 1999 to June 30, 2000 monitoring period an average of 41.31 inches of rain was recorded and 66 storm events were sampled from the City's five ISCO monitoring stations. The sampling frequency requirements as described in section V of the NPDES Permit were met or exceeded for the year. The graph below shows the relationship between the amount of rainfall and the number of events sampled per season. Notice the number of storm events sampled are proportional to the amount of rain and rain events occurring during that quarter. Monitoring data summaries for each of the sampling locations are included for TDEC's review on the following pages.



6.2.2 Laboratory Analysis Summary - Seasonal Sampling Program
July 1, 1999 thru June 30, 2000

Site	Quarter	pH	# of Events	Average Sampled Volume	Average Rainfall per Event	BOD	COD	TSS	TDS	Nitrate + Nitrite nitrogen	Total ammonia nitrogen	Organic nitrogen + total ammonia	Total Nitrogen	Total phenols	Total recoverable lead	Total recoverable zinc	Dissolved phosphorus	Total phosphorus
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
AP I1	Sum. '99	8.2	2	552913	0.31	12	35.25	222.5	152	1.2	0.3	0.28	2.4	0	0.015	0.287	0.053	0.17
	Fall '99	8.2	1	2661164	1.08	3	19.9	29	70	0.4	0	0.56	1.4	0	0.009	0.116	0.071	0.08
	Wtr. '00	8.5	1	*********	*******	2	11	78	140	0.3	0	2.8	0	******	0.007	0.136	<0.01	0.04
	Spr. '00	8.6	9	116704	0.32	8	6.83	105	105	0.5	0	0.75	1.8	******	0	0.168	0.053	0.067
*FRSTCR	Sum. '99	8.55	2	106019	0.2	8	19.65	91	168	0.7	0	0.42	1.6	0	0.017	0.166	0.156	0.151
	Fall '99	8.25	2	413640	0.81	4	8.8	62.5	109	0.55	0	0.42	3.4	0	0.009	0.108	0.16	0.234
	Wtr. '00	7.67	5	373473	0.8	4.2	6.9	116.6	118	0.6	0	1.176	2.52	0	0.009	0.076	0.059	0.188
	Spr. '00	8.05	4	429964	0.43	5.79	5.02	436.5	188.5	0.93	0	1.4	1.33	********	0	0.09	0.08	0.32
TC I2	Sum. '99	8.05	2	526624	0.38	4	45.45	274	147	1.15	0	0	2.2	0	0.01	0.19	0.09	0.21
	Fall '99	8.07	3	130553	0.64	3.33	10.1	99	102	0.6	0	0.747	1.3	0	0.01	0.126	0.097	0.289
	Wtr. '00	8.08	6	213495	0.59	3.05	6.13	84	96	0.63	0	1.49	3.3	*****	0.01	0.11	0.04	0.17
	Spr. '00	8.5	2	40817	0.68	5.5	4.5	71	80	0.4	0	0.84	0.6	*****	0	0.097	0.04	0.09
WE C1	Sum. '99	8.03	3	149328	0.51	10.5	45.07	86.67	119.67	0.77	0	0.75	1.23	0	0.01	0.23	0.11	0.11
	Fall '99	8.15	3	478980	0.81	4.5	15.75	40.5	91	0.7	0	0.28	5.25	0	0.009	0.156	0.233	0.117
	Wtr. '00	7.74	5	579241	0.83	2.6	5.6	23.8	56.8	0.46	0	1.51	1.93	0	0.01	0.14	0.04	0.12
	Spr. '00	8	2	227378	0.25	7	11	32	27.5	0.55	0	0	1.5	0	0	0.158	0.025	0.045
*WD	Fall '99	7.53	3	495882	0.54	4.67	8.67	265.67	64.26	0.4	0	1.03	2.13	0	0.01	0.13	0.08	0.41
	Wtr. '00	7.84	5	2113582	0.81	3.4	6.8	230	113.4	0.58	0	1.34	2	0	0.007	0.141	0.061	0.177
	Spr. '00	7.93	3	1586365	0.57	2.67	3.3	91	143	0.63	0	0.467	1.2	0	0	0.083	0.047	0.09
*FNTCTY R1	Sum. '99	7.275	1	16537	1.605	3.5	20.65	12	105.5	0.9	0	0	1.3	0	0.003	0.107	0.145	0.535
*GV R2	Sum. '99	8.25	2	198643	1.52	7	36.8	1601.5	156.5	0.9	0	0.98	3.45	0	0.02	0.17	0.09	0.37
National NURP Study Average						11.9	90.8	na	na	na	*****	2.35	3.31	na	0.18	0.176	0.16	0.46
Characteristics of Urban Stormwater Range						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 0.2	0.0 - 1.9	na	0.1 - 10	0.1 - 125

* Note : -During this permit year, the "Gallaher View" station was moved to the "Walden Drive" site and the "Fountain City" station was moved to the "First Creek" site.
-The above chart is comprised of seasonal averages from the data collected from each individual storm event.
-Winter (Jan., Feb., and March); Spring (April, May, and June); Summer (July, Aug., and Sept.); Fall (Oct., Nov., and Dec.)
-The Characteristics of Urban Stormwater and National NURP Study Average data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS
-AP = Acker Place Monitoring Station -WE = Wellington Drive Monitoring Station
-FRSTCR = First Creek Monitoring Station -WD = Walden Drive Monitoring Station
-TC = Third Creek Monitoring Station -FNTCTY = Fountain City Monitoring Station
-GV = Gallaher View Monitoring Station

6.2.2 Acker Place Monitoring Site

Quarter	Date and Sample ID #	Type	pH	Flow	Rainfall amount	BOD	COD	TSS	TDS	Nitrate + Nitrate nitrogen	Total ammonia nitrogen	Organic nitrogen + Total nitrogen	Total nitrogen	Total phenols	Total Recoverable lead	Total Recoverable zinc	Dissolved phosphorus	Total phosphorus
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
SUMMER 1999	Ap082399	Composite	8.4	485464	0.29	12	29.80	265.0	155	1.0	< 0.2	0.00	1.3	< 0.0	0.011	0.315	0.070	0.090
	Ap092199	Composite	8.0	620361	0.32		40.70	180.0	149	1.3	0.3	0.56	3.5	< 0.01	0.018	0.258	0.036	0.249
Quarter Average			8.2	552913	0.31	12	35.25	222.5	152	1.2	0.3	0.28	2.4	0	0.015	0.287	0.053	0.170
FALL 1999	Ap100999	Composite	8.2	2661164	1.08	3	19.90	29.0	70	0.4	< 0.2	0.56	1.4	< 0.01	0.009	0.116	0.071	0.080
Quarter Average			8.2	2661164	1.08	3	19.90	29.0	70	0.4	< 0.2	0.56	1.4	0	0.009	0.116	0.071	0.080
***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	na	0.18	0.176	0.16	0.46
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 0.2	0.0 - 1.9	na	0.1 - 10	0.1 - 125

Quarter	Date and Sample ID #	Type	pH	Flow	Rainfall amount	BOD	COD	TSS	TDS	Nitrate + Nitrate nitrogen	Total ammonia nitrogen	Organic nitrogen + Total nitrogen	Total nitrogen	Total phenols	Total Recoverable lead	Total Recoverable zinc	Dissolved phosphorus	Total phosphorus
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
WINTER 2000	Ap031900	Non-comp.	8.5			2	11.00	78.0	140	0.3	< 0.2	2.80	< 0.6		0.007	0.136	< 0.01	0.040
Quarter Average			8.5			2	11.00	78.0	140	0.3	< 0.2	2.80	< 0.6		0.007	0.136	< 0.01	0.040
SPRING 2000	Ap041100	Composite	8.5	108070		4	9.00	42.0	82	0.2	< 0.2	1.68	2.5		0.008	0.200	0.050	0.020
	Ap041700	Composite	8.5	16336	0.09	12	7.00	91.0	167	0.4	< 0.2	0.00	0.6		< 0.007	0.184	0.060	0.030
	Ap042400	Composite	8.6	436894	0.89	4	5.00	186.0	98	0.3	< 0.2	0.00	0.8		0.007	0.193	0.060	0.100
	Ap042800	Composite	9.0	106471	0.31	3	3.00	59.0	64	0.3	< 0.2	0.00	3.3		<0.007	0.099	0.040	0.060
	Ap050300	Non-comp.	8.1	1678	0.14	10	7.00	163.0	96	0.9	< 0.2	0.00	2.7		< 0.007	0.214	0.020	0.070
	Ap052300	Non-comp.	8.8	30774	0.16	14	9.98	89.0	122	0.8	< 0.2	2.80	1.1		< 0.007	0.116	0.090	0.120
	Ap061500	Non-comp.	8.5	23614	0.17	4	9.99	121.0	158	1.3	< 0.2	1.12	1.7		0.012	0.269	0.100	0.280
	Ap061700	Composite	8.3	24067	0.15	6	2.54	4.0	149	0.3	< 0.2	1.40	2.1		0.013	0.263	0.050	0.070
	Ap062200	Composite	8.8	325997	0.72	3	3.30	302.0	126	0.3	0.3	1.96	2.2		0.017	0.228	0.020	0.300
Quarter Average			8.6	116704	0.32	8	6.83	105.0	105	0.5	0	0.75	1.8		0.000	0.168	0.053	0.067
***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	na	0.18	0.176	0.16	0.46
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 0.2	0.0 - 1.9	na	0.1 - 10	0.1 - 125

* Data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS.

6.2.2 First Creek Monitoring Station

Quarter	Date and Sample ID #	Type	pH	Flow	Rainfall amount	BOD	COD	TSS	TDS	Nitrate + Nitrate nitrogen	Total ammonia nitrogen	Organic nitrogen + Total nitrogen	Total nitrogen	Total phenols	Total Recoverable lead	Total Recoverable zinc	Dissolved phosphorus	Total phosphorus
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
SUMMER	FC092199	Composite	8.40	97795	0.20	----------	23	125.0	122	1.0	<0.2	0.00	2.7	<0.01	0.015	0.106	0.170	0.241
1999	FC092999	Composite	8.70	114243	----------	8	16	57.0	214	0.4	<0.2	0.84	0.5	<0.01	0.018	0.226	0.142	0.060
Quarter Average			8.6	106019	0.20	8	20	91.0	168	0.7	<0.2	0.42	1.6	<0.01	0.017	0.166	0.156	0.151
Fall	FC100999	Composite	8.20	405243	0.80	4	13	22.0	44	0.6	<0.2	0.00	1.3	<0.1	0.010	0.114	0.279	0.257
1999	FC110299	Composite	8.30	422036	0.81	4	5	103.0	174	0.5	<0.2	0.84	5.5	<0.01	0.008	0.102	0.040	0.210
Quarter Average			8.3	413640	0.81	4	9	62.5	109	0.6	<0.2	0.42	3.4	<0.055	0.009	0.108	0.160	0.234
***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	na	0.18	0.176	0.160	0.460
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 0.2	0.0 - 1.9	na	0.1 - 10	0.1 - 125

Quarter	Date and Sample ID #	Type	pH	Flow	Rainfall amount	BOD	COD	TSS	TDS	Nitrate + Nitrate nitrogen	Total ammonia nitrogen	Organic nitrogen + Total nitrogen	Total nitrogen	Total phenols	Total Recoverable lead	Total Recoverable zinc	Dissolved phosphorus	Total phosphorus
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Winter 2000	FC010300	Composite	7.70	518820	1.02	7	9	210.0	77	0.5	<0.2	0.84	2.4	<0.01	0.018	0.124	0.060	0.370
	FC010900	Composite	7.40	663652	1.06	2	6	132.0	91	0.4	<0.2	1.12	1.2	<0.01	0.010	0.122	0.049	0.133
	FC011700	Composite	----------	264204	0.68	2	7	58.0	122	0.9	<0.2	1.40	3.1	<0.1	0.001	0.045	0.045	0.131
	FC012000	Composite	----------	145361	0.35	3	7	45.0	149	0.6	<0.2	0.00	0.6	<0.01	0.002	0.031	0.049	0.148
	FC021100	Composite	7.90	275330	0.88	7	6	138.0	151	0.6	<0.2	2.52	5.3	----------	0.016	0.060	0.090	0.160
Quarter Average			7.9	210346	0.62	5	6	91.5	150	0.6	<0.2	1.26	3.0	<0.03	0.009	0.046	0.070	0.154
Spring 2000	FC050400	Composite	8.10	1054726	0.66	7	5	1576.0	158	0.4	<0.2	5.32	1.6	----------	<0.007	0.035	0.030	0.510
	FC051000	Grab	7.80	----------	----------	5	5	7.0	224	1.8	<0.2	0.00	1.2	----------	<0.007	0.064	0.220	0.350
	FC052300	Composite	8.20	42650	0.19	5	6	80.0	221	1.2	<0.2	0.00	1.2	----------	<0.007	0.116	0.060	0.140
	FC060500	Composite	8.10	192515	0.45	6	4	83.0	151	0.3	< 0.2	0.28	< 0.6		0.024	0.139	0.020	0.260
Quarter Average			8.2	117583	0.32	6	5	81.5	186	0.8	<0.2	0.14	1.2	--------	<0.0113	0.128	0.040	0.200
***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	na	0.18	0.176	0.160	0.460
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 0.2	0.0 - 1.9	na	0.1 - 10	0.1 - 125

* Data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS.

6.2.2 Third Creek Monitoring Station

Quarter	Date and Sample ID #	Type	pH	Flow	Rainfall amount	BOD	COD	TSS	TDS	Nitrate + Nitrate nitrogen	Total ammonia nitrogen	Organic nitrogen + Total nitrogen	Total nitrogen	Total phenols	Total Recoverable lead	Total Recoverable zinc	Dissolved phosphorus	Total phosphorus
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Summer	TC082399	Composite	8.0	55548	0.40	4	44	432.0	145.0	1.10	<0.2	0.00	2.4	<0.01	0.00	0.192	0.040	0.170
1999	TC092199	Composite	8.1	49699	0.35	-------	47	116.0	148.0	1.20	0.3	0.00	2.0	<0.01	0.01	0.195	0.133	0.249
Quarter Average			8.1	52624	0.38	4	45	274.0	146.5	1.15	<0.25	0.00	2.2	<0.01	0.01	0.19	0.09	0.21
	TC100999	Composite	8.3	163805	0.78	3	18	11.0	77.0	0.40	<0.2	0.84	1.0	<0.01	0.01	0.072	0.091	0.308
Fall 1999	TC110299	Composite	8.1	176899	0.81	4	6	238.0	88.0	0.60	<0.2	0.00	1.6	<0.01	0.01	0.193	0.140	0.270
	TC120599	Composite	7.8	50954	0.32	3	6	48.0	140.0	0.80	0.5	1.40	1.3	<0.01	0.01	0.113	0.060	0.290
Quarter Average			8.1	130553	0.64	3	10	99.0	101.7	0.60	<0.45	0.75	1.3	<0.01	0.01	0.126	0.097	0.289
***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	na	0.18	0.176	0.16	0.46
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 0.2	0.0 - 1.9	na	0.1 - 10	0.1 - 125

Quarter	Date and Sample ID #	Type	pH	Flow	Rainfall amount	BOD	COD	TSS	TDS	Nitrate + Nitrate nitrogen	Total ammonia nitrogen	Organic nitrogen + Total nitrogen	Total nitrogen	Total phenols	Total Recoverable lead	Total Recoverable zinc	Dissolved phosphorus	Total phosphorus
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
	TC010900	Composite	7.6	451358	0.93	2	3	99.0	67.0	0.40	<0.2	0.00	4.4	<0.01	0.00	0.121	0.034	0.114
	TC011700	Composite	------	174390	0.55	2	11	34.0	80.0	1.00	<0.2	0.00	<0.6	<0.1	0.01	0.060	0.042	0.107
Winter	TC012000	Composite	------	105140	0.32	5	8	69.0	87.0	0.80	<0.2	0.00	<0.6	<0.01	0.01	0.080	0.030	0.270
2000	TC021100	Composite	7.6	212793	0.70	2	3	123.0	164.0	0.40	<0.2	0.84	2.6	----------	<0.002	0.142	0.070	0.310
	TC022700	Composite	8.5	74524	0.42	2	9	56.0	59.0	0.50	<0.2	5.04	2.9	----------	0.00	0.109	<0.01	0.100
	TC032700	Composite	8.6	262767	0.60	5	3	123.0	119.0	0.70	<0.2	3.08	<0.6	----------	0.01	0.158	0.010	0.140
Quarter Average			8.1	213495	0.59	3	6	84.0	96.0	0.63	0.0	1.49	3.3	0.00	0.01	0.11	0.04	0.17
Spring	TC040200	Composite	8.5	30073	0.96	4	2	74.0	76.0	0.50	<0.2	0.56	<0.6	----------	0.01	0.073	<0.01	0.130
2000	TC041100	Composite	8.5	51561	0.40	7	7	68.0	84.0	0.30	<0.2	1.12	0.6	----------	<0.007	0.120	0.040	0.050
Quarter Average			8.5	40817	0.68	6	5	71.0	80.0	0.40	0.0	0.84	0.6	0.00	0.00	0.097	0.040	0.090
***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	na	0.18	0.176	0.16	0.46
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 0.2	0.0 - 1.9	na	0.1 - 10	0.1 - 125

* Data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS.

6.2.2 Wellington Drive Monitoring Station

Quarter	Date and Sample ID #	Type	pH	Flow	Rainfall amount	BOD	COD	TSS	TDS	Nitrate + Nitrate nitrogen	Total ammonia nitrogen	Organic nitrogen + Total nitrogen	Total nitrogen	Total phenols	Total Recoverable lead	Total Recoverable zinc	Dissolved phosphorus	Total phosphorus
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Summer	WE082599	Composite	8.2	360060	1.00	14	78.3	180.0	81	0.7	<0.2	0.00	0.9	<0.01	0.017	0.192	0.050	0.120
1999	WE092199	Composite	7.9	65669	0.24	-------	33.0	56.0	141	1.3	0.300	1.40	2.2	<0.01	0.007	0.283	0.191	0.164
	WE092999	Composite	8.0	22256	0.28	7	23.9	24.0	137	0.3	<0.2	0.84	0.6	<0.01	0.017	0.222	0.087	0.032
Quarter Average			8.0	149328	0.51	11	45.1	86.7	120	0.8	0.00	0.75	1.2	<0.01	0.01	0.23	0.11	0.11
Fall	WE100999	Composite	8.1	553760	0.82	3	22.5	35.0	110	0.4	<0.2	0.00	4.0	<0.01	0.005	0.121	0.355	0.084
1999	WE110299	Composite	8.2	404199	0.79	6	9.0	46.0	72	1.0	<0.2	0.56	6.5	<0.01	0.012	0.190	0.110	0.150
Quarter Average			8.2	478980	0.81	5	15.8	40.5	91	0.7	0.000	0.28	5.3	<0.01	0.009	0.156	0.233	0.117
***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	na	0.18	0.176	0.16	0.46
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 0.2	0.0 - 1.9	na	0.1 - 10	0.1 - 125

Quarter	Date and Sample ID #	Type	pH	Flow	Rainfall amount	BOD	COD	TSS	TDS	Nitrate + Nitrate nitrogen	Total ammonia nitrogen	Organic nitrogen + Total nitrogen	Total nitrogen	Total phenols	Total Recoverable lead	Total Recoverable zinc	Dissolved phosphorus	Total phosphorus
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Winter	WE010300	Composite	7.60	566434	1.02	4	4	44.0	28.0	0.5	<0.2	0.280	2.100	<0.01	0.005	0.150	0.030	0.110
1999	WE010900	Composite	7.50	611756	1.08	1	3	26.0	39.0	0.3	<0.2	0.000	<0.6	<0.01	0.007	0.125	0.060	0.040
	WE021100	Composite	7.40	797160	0.86	2	8	27.0	88.0	0.3	<0.2	1.120	2.600	----------	0.005	0.107	0.050	0.100
	WE022700	Composite	8.10	500862	0.45	2	7	10.0	65.0	0.6	<0.2	2.800	1.100	----------	0.002	0.113	<0.01	<0.01
	WE032700	Composite	8.10	419995	0.72	4	6	12.0	64.0	0.6	<0.2	3.360	<0.6	----------	0.015	0.229	0.020	0.230
Quarter Average			7.74	579241.40	0.83	3	6	23.8	56.8	0.46	<0.2	1.51	1.93	0.00	0.01	0.14	0.04	0.12
Spring	WE040200	Composite	8.20	139774	0.21	7	16	10.0	27.0	0.600	<0.2	0.000	<0.6	----------	0.007	0.243	0.020	0.060
2000	WE050300	Composite	7.80	314981	0.28	7	6	54.0	28.0	0.500	0.500	0.000	1.500	----------	<0.007	0.073	0.030	0.030
Quarter Average			8.00	227378	0.25	7	11	32.0	27.5	0.550	0.000	0.000	1.500	0.000	0.000	0.158	0.025	0.045
***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	na	0.18	0.176	0.16	0.46
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 0.2	0.0 - 1.9	na	0.1 - 10	0.1 - 125

* Data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS.

6.2.2 Walden Drive Monitoring Station

Quarter	Date and Sample ID #	Type	pH	Flow	Rainfall amount	BOD	COD	TSS	TDS	Nitrate + Nitrate nitrogen	Total ammonia nitrogen	Organic nitrogen + Total nitrogen	Total nitrogen	Total phenols	Total Recoverable lead	Total Recoverable zinc	Dissolved phosphorus	Total phosphorus
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Fall 1999	WD110299	Composite	8.10	611739	0.86	5	5	516	115.00	0.5	<0.2	1.68	1.6	<0.01	0.013	0.178	0.190	0.680
	WD120599	Composite	7.80	303712	0.32	6	18	40	0.79	0.3	<0.2	0.56	2.6	<0.01	0.004	0.102	0.030	0.130
	WD121099	Composite	6.70	572196	0.43	3	3	241	77.00	0.4	<0.2	0.84	2.2	<0.01	0.010	0.115	0.010	0.430
Quarter Average			7.53	495882	0.54	4.7	8.7	265.7	64.26	0.4	<0.2	1.03	2.1	<0.01	0.01	0.13	0.08	0.41

***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	na	0.18	0.176	0.16	0.46
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 0.2	0.0 - 1.9	na	0.1 - 10	0.1 - 125

Quarter	Date and Sample ID #	Type	pH	Flow	Rainfall amount	BOD	COD	TSS	TDS	Nitrate + Nitrate nitrogen	Total ammonia nitrogen	Organic nitrogen + Total nitrogen	Total nitrogen	Total phenols	Total Recoverable lead	Total Recoverable zinc	Dissolved phosphorus	Total phosphorus
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Winter 2000	WD010900	Composite	7.4	3236023	1.03	2	6	266	56.0	0.3	<0.2	0.28	0.8	<0.01	0.001	0.136	0.039	0.274
	WD011700	Composite	7.4	636661	0.58	2	6	107	116.0	0.9	<0.2	0.28	<0.6	<0.01	0.002	0.082	0.074	0.093
	WD021100	Composite	7.8	2422510	0.77	6	8	378	150.0	0.3	<0.2	0.56	2.9	----------	0.007	0.133	0.070	0.360
	WD031000	Composite	8.4	2144929	1.00	3	12	230	101.0	0.6	<0.2	3.08	2.3	----------	<0.007	0.117	<0.01	0.140
	WD032700	Composite	8.2	2127788	0.65	4	2	169	144.0	0.8	<0.2	2.52	<.6	----------	0.017	0.236	<0.01	0.020
Quarter Average			7.8	2113582	0.81	3	7	230	113.4	0.6	0.000	1.344	2	0.000	0.007	0.141	0.061	0.177

Spring 2000	WD040200	Composite	8.5	638052	0.34	2	2	36	158.0	0.9	<0.2	0.560	<0.6	----------	<0.007	0.028	0.010	0.100
	WD042400	Composite	7.4	3366967	1.13	3	5	104	130.0	0.4	<0.2	0.840	1.000	----------	0.019	0.189	0.060	0.060
	WD050300	Composite	7.9	754075	0.23	3	3	133	141.0	0.6	<0.2	0.000	1.400	----------	<0.007	0.033	0.070	0.110
Quarter Average			7.9	1586365	0.57	3	3	91	143.0	0.6	<0.2	0.467	1.200	0.000	0.000	0.083	0.047	0.090

***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	na	0.18	0.176	0.16	0.46
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 0.2	0.0 - 1.9	na	0.1 - 10	0.1 - 125

* Data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS.

6.2.2 Fountain City Monitoring Station

Quarter	Date and Sample ID #	Type	pH	Flow	Rainfall amount	BOD	COD	TSS	TDS	Nitrate + Nitrate nitrogen	Total ammonia nitrogen	Organic nitrogen + Total nitrogen	Total nitrogen	Total phenols	Total Recoverable lead	Total Recoverable zinc	Dissolved phosphorus	Total phosphorus
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
SUMMER	Fc071299	Composite	6.75	29356	2.25	2	20.4	12	100	0.5	<0.2	0	0.4	<0.01	0.005	0.079	0.06	0.84
1999	Fc082599	Composite	7.8	3717	0.96	5	20.9	12	111	1.3	<0.2	0	2.2	<0.01	0.001	0.135	0.23	0.23
Quarter Average			7.275	16537	1.605	3.5	20.65	12	105.5	0.9	<0.2	0	1.3	<0.01	0.003	0.107	0.145	0.535

***National NURP Study Average**	11.9	90.8	na	na	na	*****	2.35	3.31	na	0.18	0.176	0.16	0.46
***Characteristics of Urban Stormwater Range**	1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 0.2	0.0 - 1.9	na	0.1 - 10	0.1 - 125

* Data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS.

6.2.2 Gallaher View Road Monitoring Station

Quarter	Date and Sample ID #	Type	pH	Flow	Rainfall amount	BOD	COD	TSS	TDS	Nitrate + Nitrate nitrogen	Total ammonia nitrogen	Organic nitrogen + Total nitrogen	Total nitrogen	Total phenols	Total Recoverable lead	Total Recoverable zinc	Dissolved phosphorus	Total phosphorus
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Summer	GV072099	Composite	8.30	333482	2.01	9.000	52.200	798.000	121.000	0.900	<0.2	0.000	2.400	<0.01	0.007	0.130	0.110	0.270
1999	GV082599	Composite	8.20	63804	1.03	5.000	21.400	######	192.000	0.900	<0.2	1.960	4.500	<0.01	0.023	0.216	0.070	0.460
Quarter Average			8.25	198643	1.52	7.00	36.80	1601.50	156.50	0.90	<0.2	0.98	3.45	<0.01	0.02	0.17	0.09	0.37

***National NURP Study Average**	11.9	90.8	na	na	na	*****	2.35	3.31	na	0.18	0.176	0.16	0.46
***Characteristics of Urban Stormwater Range**	1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 0.2	0.0 - 1.9	na	0.1 - 10	0.1 - 125

* Data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS.

6.2.3 Noncompliance.

The City of Knoxville has complied with all permit requirements during year four.

6.2.4 Estimated Runoff from Major Watersheds within the MS4 Area.

Part VI (A)(2)(e)(i)(3) of the NPDES permit requires an estimate of the total volume of urban runoff discharged by the City of Knoxville for the year. This estimate is to be based on total rainfall for the year and the estimated imperviousness of different land uses. The total rainfall for year four was determined to be an average of the annual rainfall recorded during year four from the five City of Knoxville monitoring stations located throughout the city. The year four average annual rainfall amount is 41.74 inches.

To accomplish this task, the City has utilized the GIS to determine approximate areas for each watershed within the city limits along with the corresponding land uses. Each land use is assigned an approximated impervious percentage according to the Camp Dresser and McKee Watershed Management Model described in the Part 2 application, pages 4-14 to 4-18.

It was assumed for each watershed that 95 percent of the rainfall from the impervious fraction, and 15 percent of the rainfall from the pervious fraction of each land use was converted to runoff. Therefore the impervious runoff coefficient and the pervious runoff coefficient were assumed to be 0.95 and 0.15, respectively. For example, based upon an average annual rainfall volume of 42.99 inches/year, the average annual runoff from a single family residential land use (25% impervious) is 15.05 in/yr (42.99*[(0.15*0.75)+(0.95*0.25)]). The runoff coefficient for a single land use is the sum of the impervious percentage multiplied times the impervious runoff coefficient plus the pervious percentage multiplied by the pervious runoff coefficient. For the previous example, the average runoff coefficient for the single family residential land use is 0.35 ([0.15*0.75]+[0.95*0.25]). For a watershed, the average runoff coefficient is an area weighted average of each land use runoff coefficients times the percentage of the area of each land use.

The runoff from the major watersheds within the MS4 area was estimated by a formula in Camp Dresser & Mckee's Watershed Management Module shown below:

$Qi = P \times Ci \times Ai$

Where,

P = total precipitation (inches/year) = 41.74 in./yr. = 3.4783 ft./yr.

C = land use area weighted runoff coefficient = 0.15*Pervious% + 0.95*Impervious%

A = drainage area (acres) = acres x (4.35E4 ft2/acre) = ft2

$Q = \Sigma Qi$ = total runoff rate / E6 = Mgal

Please find the analysis for the each watershed and for the entire city in the table following this page.

6.2.4 ESTIMATED RUNOFF FROM MAJOR WATERSHEDS WITHIN THE MS4

Watershed	Agricul./ Forest/ Vacant, Public Parks	Vacant (>10)	Rural Res.	Single Family Res.	Private Rec., Public Land	Multi-Family Res., Church	Insti-tutional	Mining, Office/ Service	Manu-facturing/ Whole-sale	Commer., Trans./ Utility/ Commun.	Major Roads/ Hwys/ ROWs	Under Const.	Not Loaded	Total Acres in Watershed	Acres in the City Limits	Est. % Imperv-ious	C Value	Rainfall during Permit year 99/00 (in./yr)	Total Runoff for 99/00 (Mgal/yr)
Baker Cr.	412	2	107	640	90	77	32	1	1	3	269	13	27	1,674	1,674	32	0.41	41.74	773
East Fork	313	0	10	475	302	78	73	31	195	235	584	33	180	2,509	2,509	53	0.57	41.74	1626
First Cr.	724	0	300	3,152	544	501	110	157	127	556	1,412	51	116	7,750	7,750	44	0.50	41.74	4378
Fourth Cr.	965	57	423	2,026	468	406	93	206	201	568	881	61	414	6,769	5,920	41	0.48	41.74	3199
Goose Cr.	639	40	126	669	213	67	8	21	77	131	327	34	29	2,381	1,755	35	0.43	41.74	850
Grassy Cr.	2,230	176	561	610	215	24	0	14	31	95	211	39	95	4,301	433	17	0.29	41.74	140
Holston R.	2,362	69	371	1,222	417	45	5	2	219	33	805	32	50	5,632	2,455	28	0.37	41.74	1032
Inman Br.	563	33	214	138	4	12	0	0	0	0	145	0	34	1,143	99	21	0.31	41.74	35
Knob Cr.	1,719	195	481	843	125	84	1	19	1	29	296	4	169	3,966	989	19	0.30	41.74	341
Knob Fork	1,659	26	398	675	182	56	5	93	6	124	257	19	252	3,752	823	22	0.33	41.74	305
Love Cr.	1,735	102	505	1,625	311	212	51	94	178	408	1,038	46	103	6,408	5,090	36	0.44	41.74	2541
Second Cr.	443	0	90	1,281	346	247	29	107	140	542	1,161	35	82	4,503	4,498	53	0.57	41.74	2907
Sinking Cr.	1,614	146	459	1,266	284	90	17	33	31	267	881	12	347	5,447	2,434	33	0.41	41.74	1143
Swanpond C	3,892	303	833	604	121	36	4	79	240	232	457	65	285	7,151	499	19	0.30	41.74	172
Ten Mile Cr.	1,879	0	638	3,421	165	895	55	115	58	615	1,500	24	641	10,006	3,921	38	0.45	41.74	1999
Third Cr.	1,757	79	436	3,003	406	512	184	124	225	443	1,252	98	220	8,739	8,417	37	0.45	41.74	4256
TN River	7,197	503	2,269	4,681	2,910	403	187	72	170	238	990	121	1,113	20,854	8,232	22	0.33	41.74	3050
Toll Cr.	535	69	154	222	42	26	1	0	37	4	93	42	4	1,229	767	22	0.32	41.74	280
Turkey Cr.	3,353	235	603	2,693	264	343	121	104	91	442	1,161	68	738	10,216	1,677	29	0.38	41.74	730
Whites Cr.	2,733	154	782	1,298	575	59	31	11	49	126	608	51	578	7,055	1,634	23	0.34	41.74	623
Williams Cr.	358	11	47	561	46	96	125	17	10	61	276	3	30	1,641	1,605	37	0.45	41.74	817
Woods Cr.	1,220	106	281	371	0	26	0	2	140	43	261	1	157	2,608	143	23	0.33	41.74	54
Sink-East	1,226	0		728	9	17	0	17	3	27	0	0	0	2,027	91	12	0.24	41.74	25
Beaver Cr	21,174	0	0	21,230	1,292	845	4	259	283	712	0	160	0	45,959	162	16	0.28	41.74	51
Tuckahoe	4,293	0	0	1,829	18	14	0	8	2	1	0	4	0	6,169	229	8	0.22	41.74	56
Fr.Broad riv	8,954	0	0	2,744	73	40	24	24	497	117	0	166	0	12,639	551	11	0.24	41.74	149
COK Total	73,949	2,306	10,088	58,007	9,422	5,211	1,160	1,610	3,012	6,052	14,865	1,182	5,664	192,528	64,357	25	0.35	41.74	31532

The runoff from the major watersheds within the MS4 area was estimated by a formula in Camp Dresser & Mckee's Watershed Management Module. Q = P x C x A

where, P = total precipitation (inches/year) = 41.74 in./yr. = 3.4783 ft./yr.

C = land use area weighted runoff coefficient = 0.15*Pervious% + 0.95*Impervious%

A = drainage area (acres) = acres in watershed x (4.35E4 ft2/acre) = Ai ft2

Q = total runoff rate = sum of each watershed's Qi.

Total estimated runoff for Year Four = 31,532 Mgal

Approximate area and land use for each watershed was determined through the City's GIS. Total yearly rainfall amount was determined by averaging the amount of rain collected from the City's five monitoring stations located throughout the city (refer to map in appendix). Runoff coefficient (C) was calculated by adding 15 % of the pervious fraction to 95% of the impervious fraction in each watershed. This assumes that the fraction of rainfall producing runoff is 15% and 95% from pervious and impervious surfaces respectively. The summary of the runoff calculations are provided in the table above. Calculations for some of the watersheds were left out due to the insignificant amount of runoff that would be produced.

6.3 IN-STREAM AMBIENT MONITORING PROGRAM

To aid in the assessment of the water quality of local streams, the City has instituted an ancillary program for the collection of ambient water quality data along several urban creeks. The program, established in July 1997 and expanded in 1999, was developed to provide site-specific data that may help to develop a baseline to monitor the future water quality impacts of the SWMP on major watersheds in the city.

The current Ambient Monitoring program is performed through a partnership with CAC Americorps volunteers. The volunteers perform monthly testing of five to six sites in five different watersheds including: Williams Creek, First Creek, Third Creek, Baker Creek, and Goose Creek. The individual monitoring sites are located on the five watershed maps on the following pages.

Chemetrics field test kits are used to test the ambient parameters, which include: phenols, ammonia, chlorine, copper, color, detergents, temperature, turbidity, pH. Bacteriological testing may be included in the future monitoring programs described in section MN-3 of this report.

6.4 BIOLOGICAL SAMPLING PROGRAM

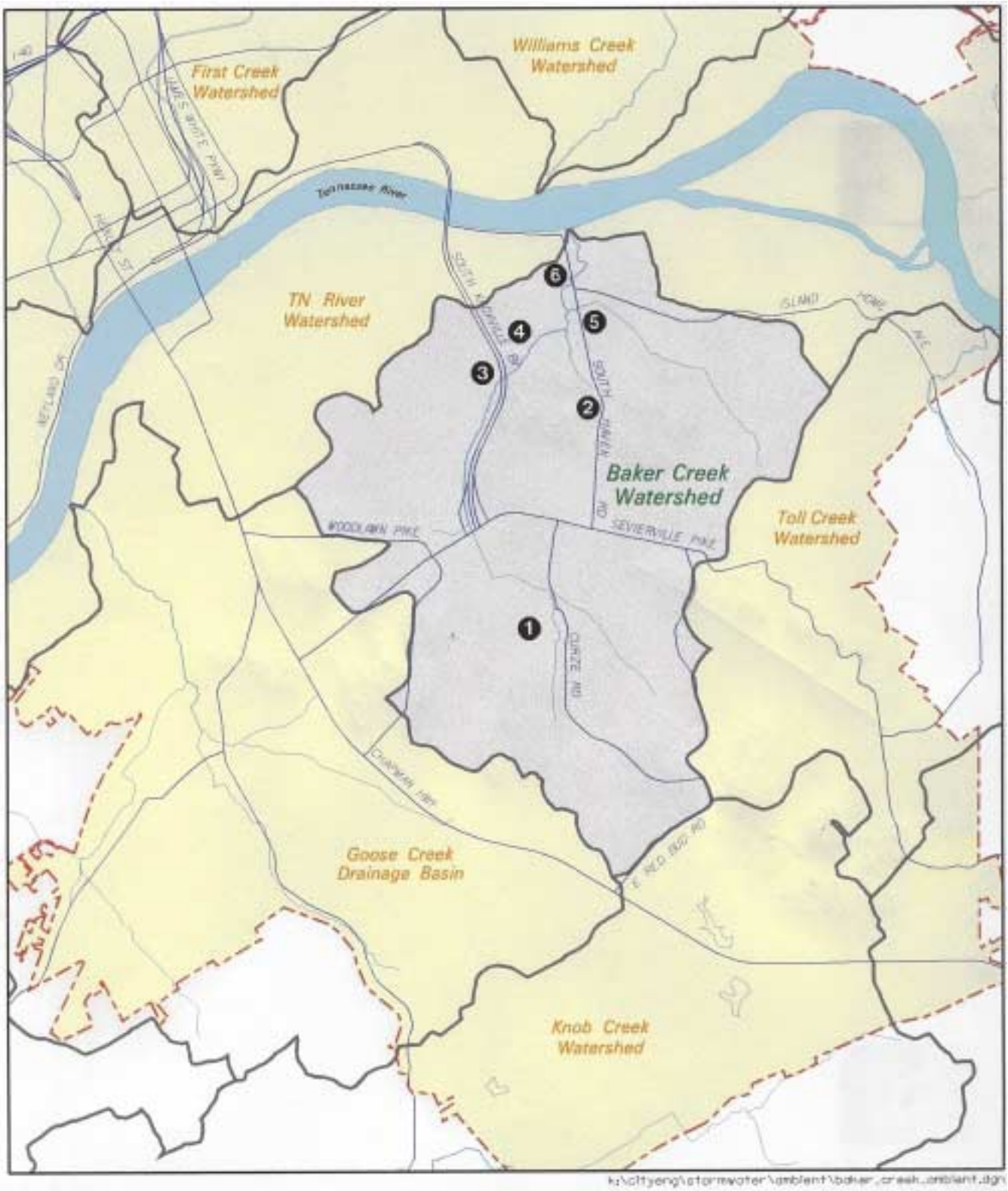
During year four, the City continued to rely on IBI study data performed by TVA. Two sites were sampled and evaluated within the city limits. The streams sampled included Sinking Creek and the Holston River. These sites are tested approximately every four years.

The site on Sinking Creek received a score of 32 (poor) in March of 2000. At this time, the City of Knoxville does not have any data of prior IBI testing of this stream. Only a small section of this stream lies inside the City Limits. The remainder of the stream and the vast majority of the watershed are located within Knox County outside of the City of Knoxville.

The Holston River was sampled below the overpass where Interstate 40 passes over the river. It received a score of 54 (good/excellent) in 2000. At this time, the City of Knoxville does not have any data of prior IBI testing of this stream.

The City will continue to ally with TVA and other agencies to obtain IBI scores on at least two urban creeks per year. Those activities and results will be analyzed and reported annually. The results will help update the comprehensive summary of biological assessments conducted within the city limits prior to 1997. The data prior to 1997 data was collected and compiled in the first permit term and will continue to be maintained each year during the new permit cycle.

Within the first year of the new permit, the City of Knoxville will identify opportunities to expand or supplement the existing TVA biological sampling. A supplemental plan will be developed and reported in year one. The actual implementation of the supplemental program will begin in year two. The supplemental program should increase the number of streams sampled and samples within the city limits. Presently, several options are being considered to determine the organization to study the streams that will best suit Knoxville's needs. The additional biological monitoring may be coordinated by expanding the existing TVA program in the city or by organizing an additional sampling program with City staff, UTK students, and/or volunteers.



h:\cityeng\stormwater\ambient\baker_creek_ambient.dgn

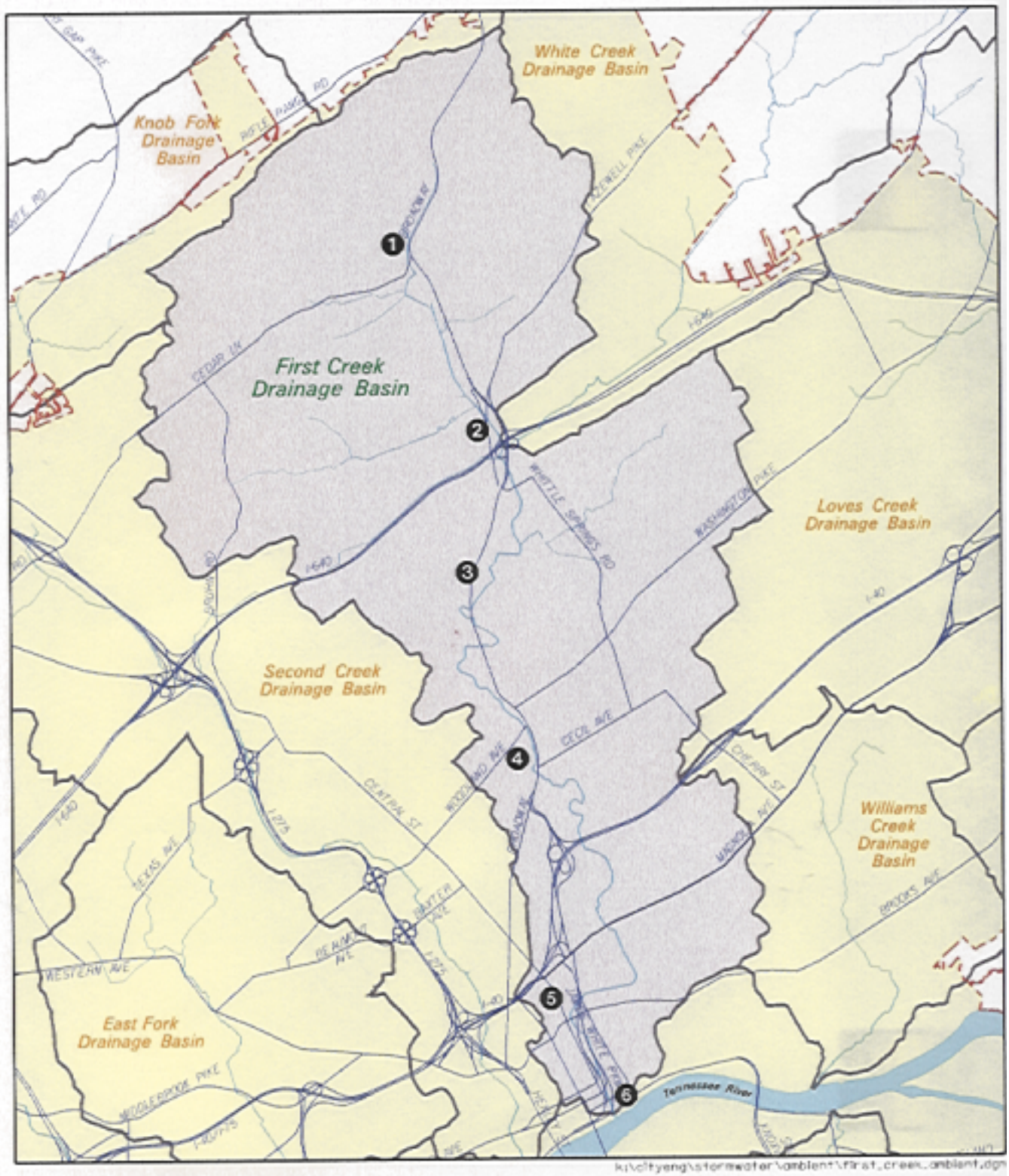
Baker Creek
Ambient Monitoring Locations

City of Knoxville
Dept. of Engineering
Planning Division

Date: Dec. 19, 2000

SCALE: 1" = ½ MILE (AT FULL SCALE)

0 ½ 1



k:\city\eng\stormwater\ambient\first_creek_ambient.dgn

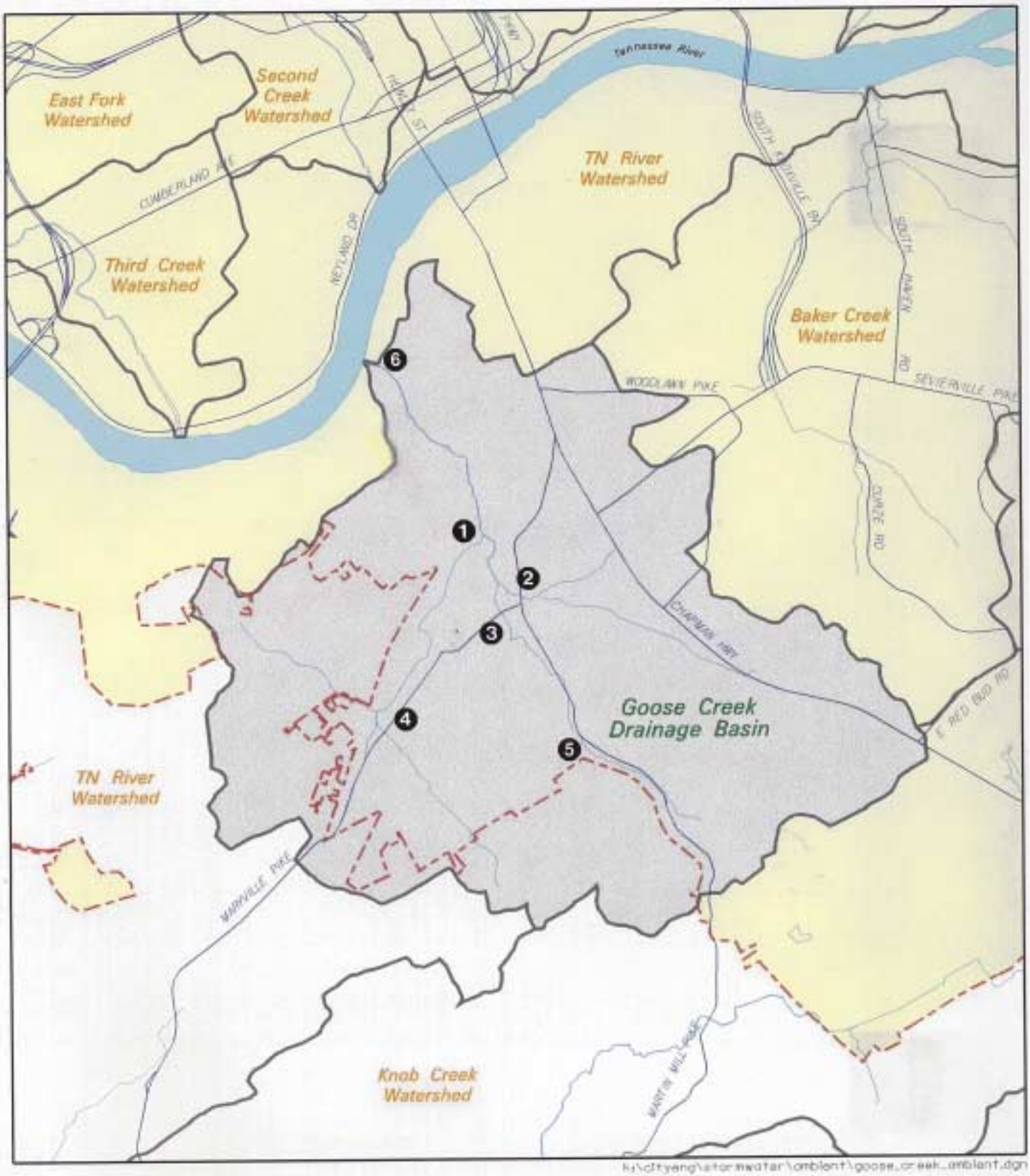
First Creek
Ambient Monitoring Locations

City of Knoxville
Dept. of Engineering
Planning Division

Date: Dec. 19, 2000

SCALE: 1" = 0.8 MILE (AT FULL SCALE)

0 0.8 1.6



k:\cityeng\stormwater\ambient\goose_creek_ambient.dgn

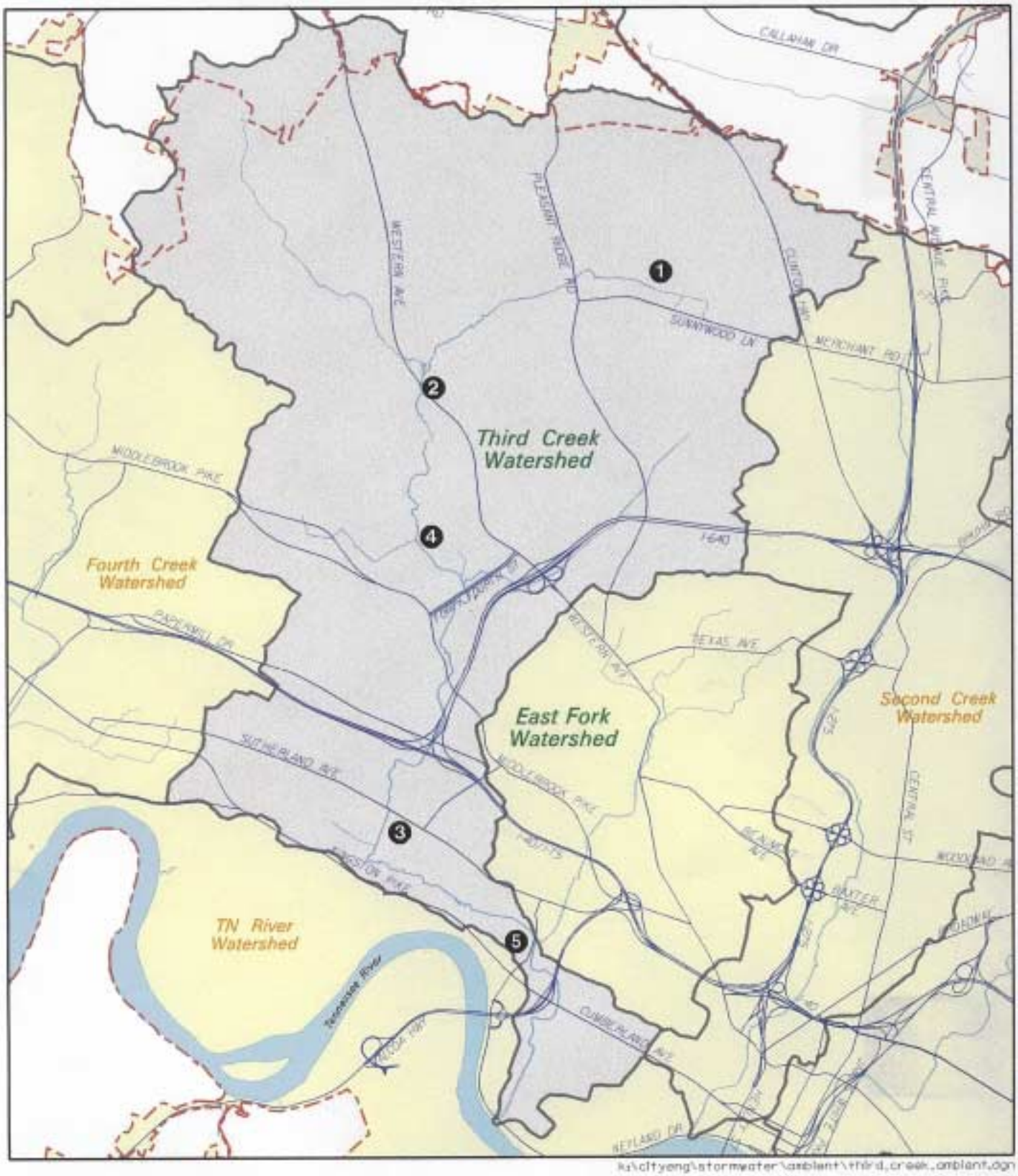
Goose Creek
Ambient Monitoring Locations

City of Knoxville
Dept. of Engineering
Planning Division

Date: Dec. 19, 2000

SCALE: 1" = ½ MILE (AT FULL SCALE)

0 ½ 1



k:\cityeng\stormwater\ambient\third_creek_ambient.dgn

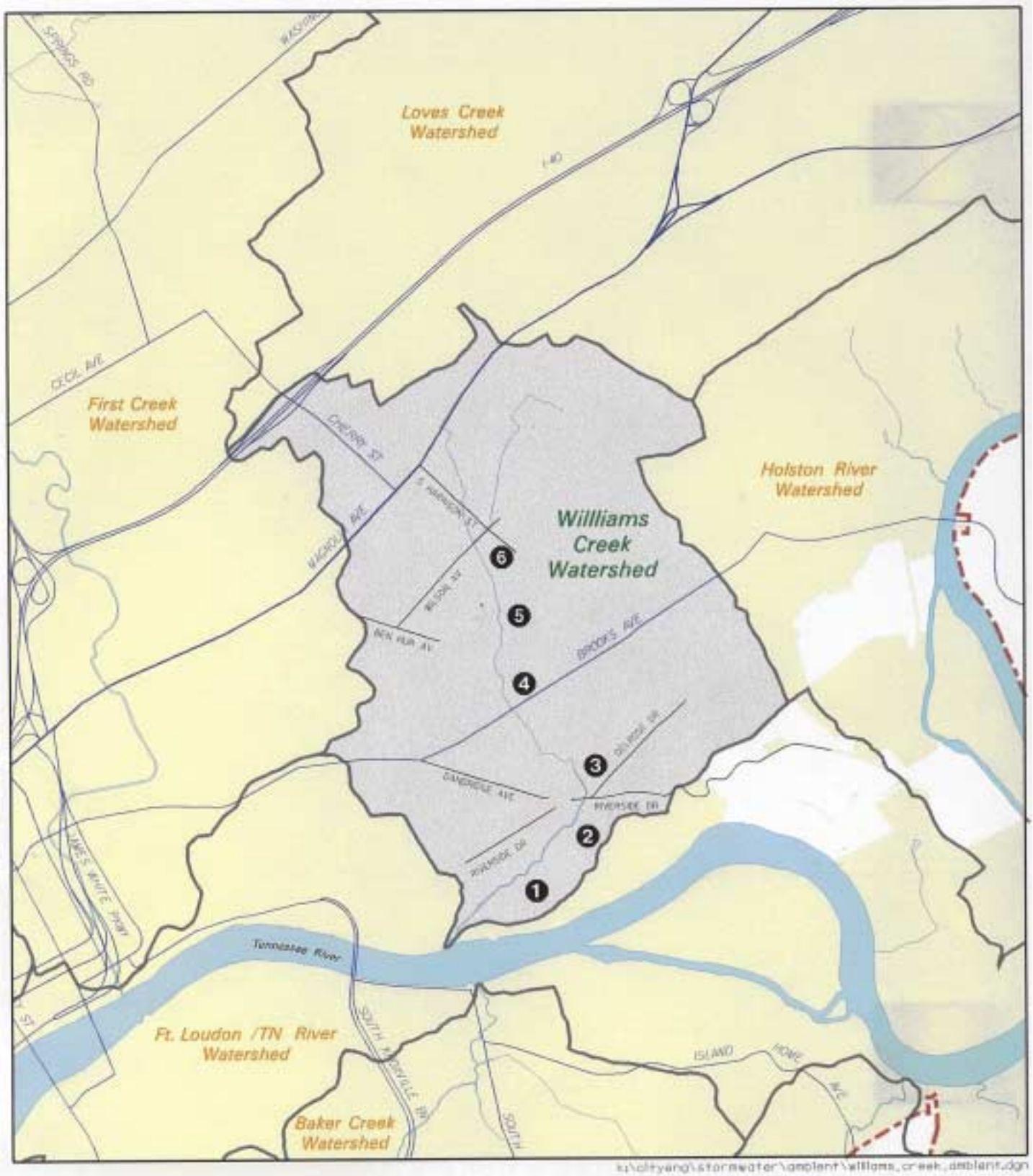
Third Creek and East Fork Ambient Monitoring Locations

City of Knoxville
Dept. of Engineering
Planning Division

Date: Dec. 19, 2000

SCALE: 1" = 0.8 MILE (AT FULL SCALE)

0 0.8 1.6



s:\cityeng\stormwater\amplant\williams_creek_amblant.dgn

Williams Creek
Ambient Monitoring Locations

63

City of Knoxville
Dept. of Engineering
Planning Division

Date: Dec. 14, 2000

SCALE: 1" = ½ MILE (AT FULL SCALE)

0 ½ 1

7.0 ASSESSMENT OF CONTROLS: ESTIMATED POLLUTANT LOADING REDUCTIONS FROM THE MS4

During the first four years of the NPDES permit, the City of Knoxville has developed and implemented all of the programs scheduled. The Ongoing Monitoring Program was started in January of 1997 and resulted in the collection of 42 months of storm event data through year four. The dry weather-screening program was implemented in year one and has continued throughout the permit term.

Any quantitative estimates of pollutant loading reductions or groundwater impacts from the MS4 may still be premature or impossible to make at this point in the program. However, as described in the dry weather-screening program (ILL-2), noticeable reductions in contaminated outfalls have been observed in the first four years.

Although no testing data is available to substantiate all the illicit discharges and illegal dumping problems resolved, the qualitative effect on water quality within the MS4 and waters-of-the State is irrefutable. Several industries have removed illicit discharges, sections of leaking or broken sanitary sewers have been repaired and/or replaced, the last known sections of the combined sewers have been separated, unknown combined sewer systems have been located and planned for repair, creek restoration and cleanup activities have begun, and many educational and volunteer programs have been sponsored, conducted, and/or coordinated to reduce dumping.

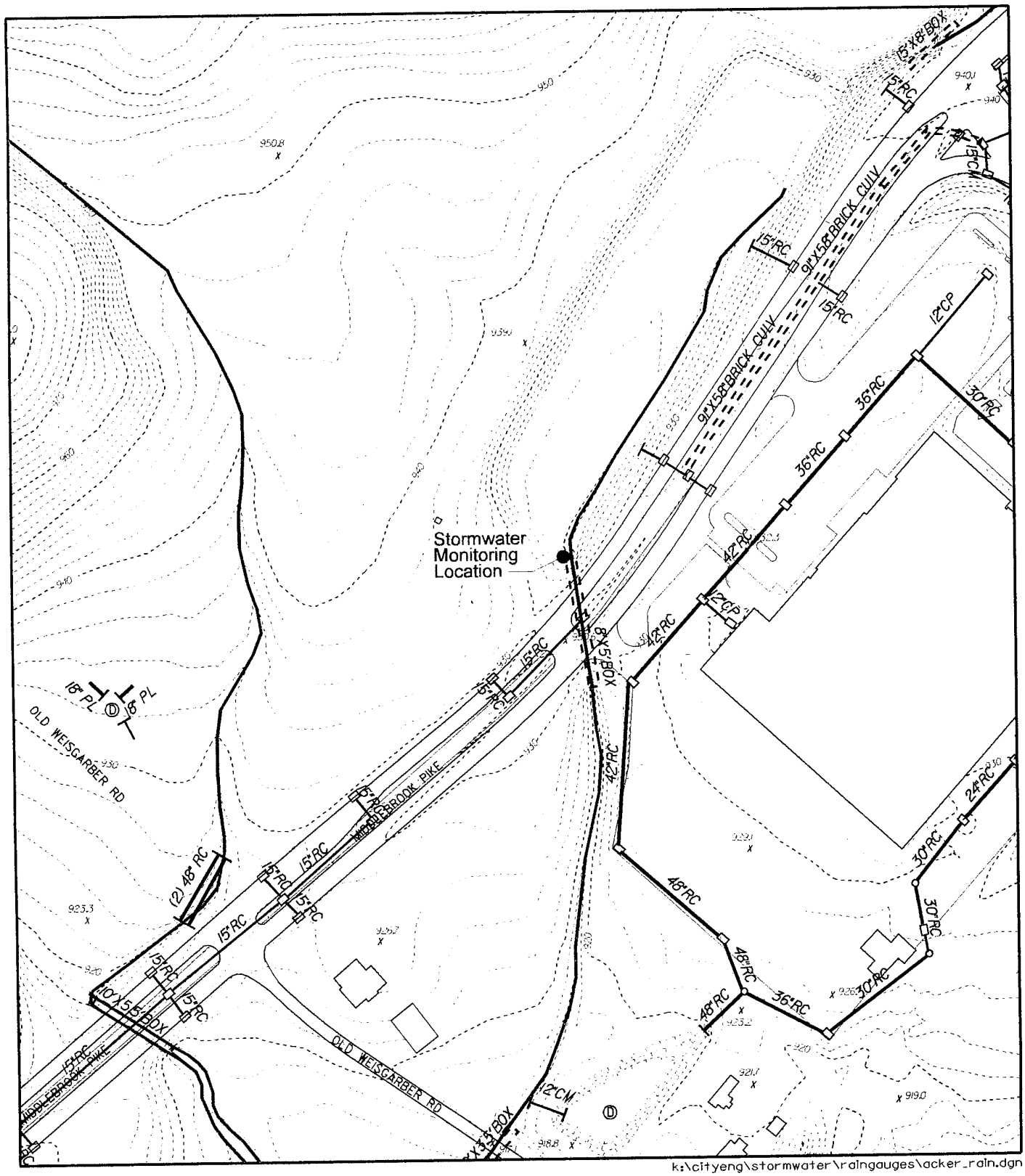
Recent structural controls include the two Stormceptor oil/water separators installed at the KAT facility on First Creek, trash skimmers near the mouth of First Creek, and two catch basin inserts at the Solid Waste Transfer Station and outside Neyland Stadium. All new development of over ½ acre since 1997 has been required to install some structural controls for water quality control. These water quality facilities must be maintained and/or replaced forever.

All of the programs implemented to improve water quality in the creeks and river throughout the city should provide some quantitative evidence of improvement in future years. This data will be reported as it becomes apparent. The fifth annual report will contain an estimated seasonal pollutant loading and event mean concentrations for the major watersheds throughout the city. Some indication of the effectiveness of the current SWMP may be obtained when the year five estimate is compared to the estimate provided in the permit application.

8.0 SUMMARY OF MODIFICATIONS TO THE SWMP

No modifications of the SWMP are planned for year five. Future modifications to the SWMP will be made in accordance with 40 CFR 122.62, 122.63, 124.5 and with Part VIII of the NPDES Permit or as negotiated before the new permit is issued in 2001.

During year four, the City relocated four of the storm event monitoring as proposed and approved in the previous annual report. The new locations will remain in service throughout the new permit unless new sites are requested and approved prior to relocation. To verify the specific locations of the current monitoring stations, five maps have been provided on the following pages for TDEC review.



k:\cityeng\stormwater\raingauges\acker_rain.dgn

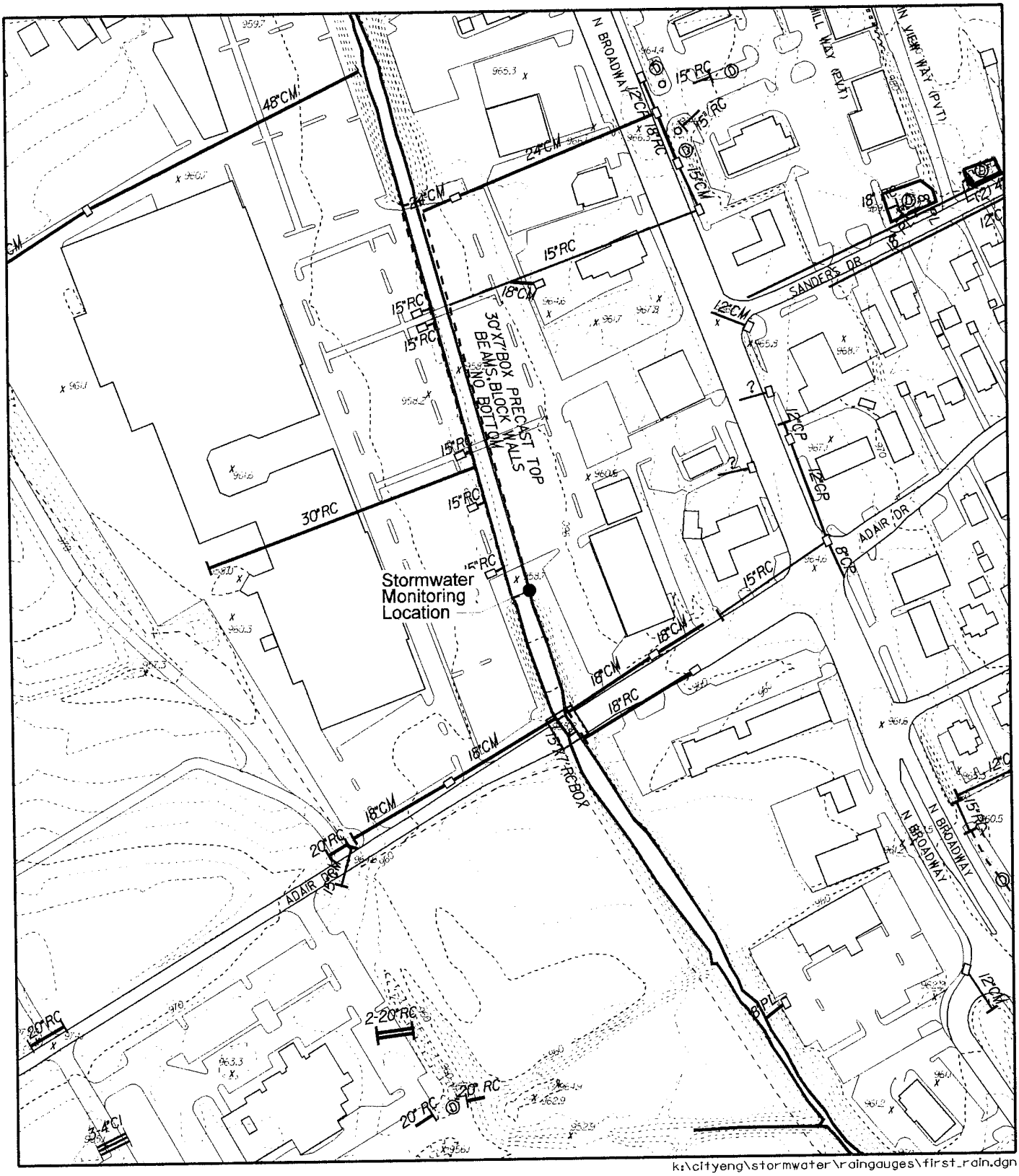
Stormwater Sampling Locations
Fourth Creek Watershed (Acker Place)
Middlebrook Pike at Old Weisgarber Rd

City of Knoxville
Dept. of Engineering
Planning Division

Date: Nov. 29, 2000

SCALE: 1" = 200' (AT FULL SCALE)

0 200' 400'



k:\cityeng\stormwater\raingauges\first_rain.dgn

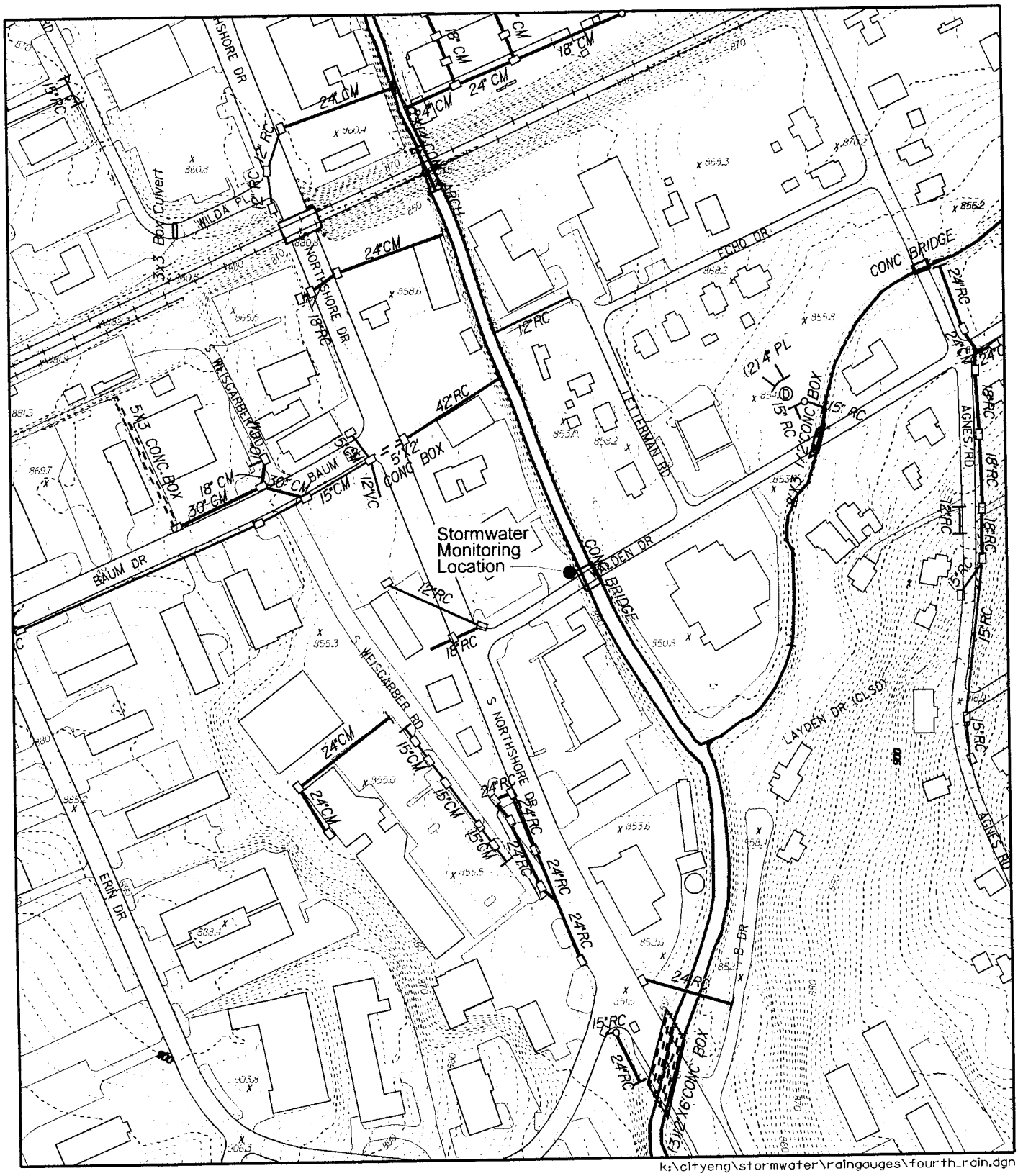
Stormwater Sampling Locations
First Creek Watershed
N Broadway at Adair Dr

City of Knoxville
Dept. of Engineering
Planning Division

Date: Nov. 29, 2000

SCALE: 1" = 200' (AT FULL SCALE)

0 200' 400'



k:\cityeng\stormwater\raingauges\fourth_rain.dgn

Stormwater Sampling Locations
Fourth Creek Watershed
S Northshore Dr at Walden Dr

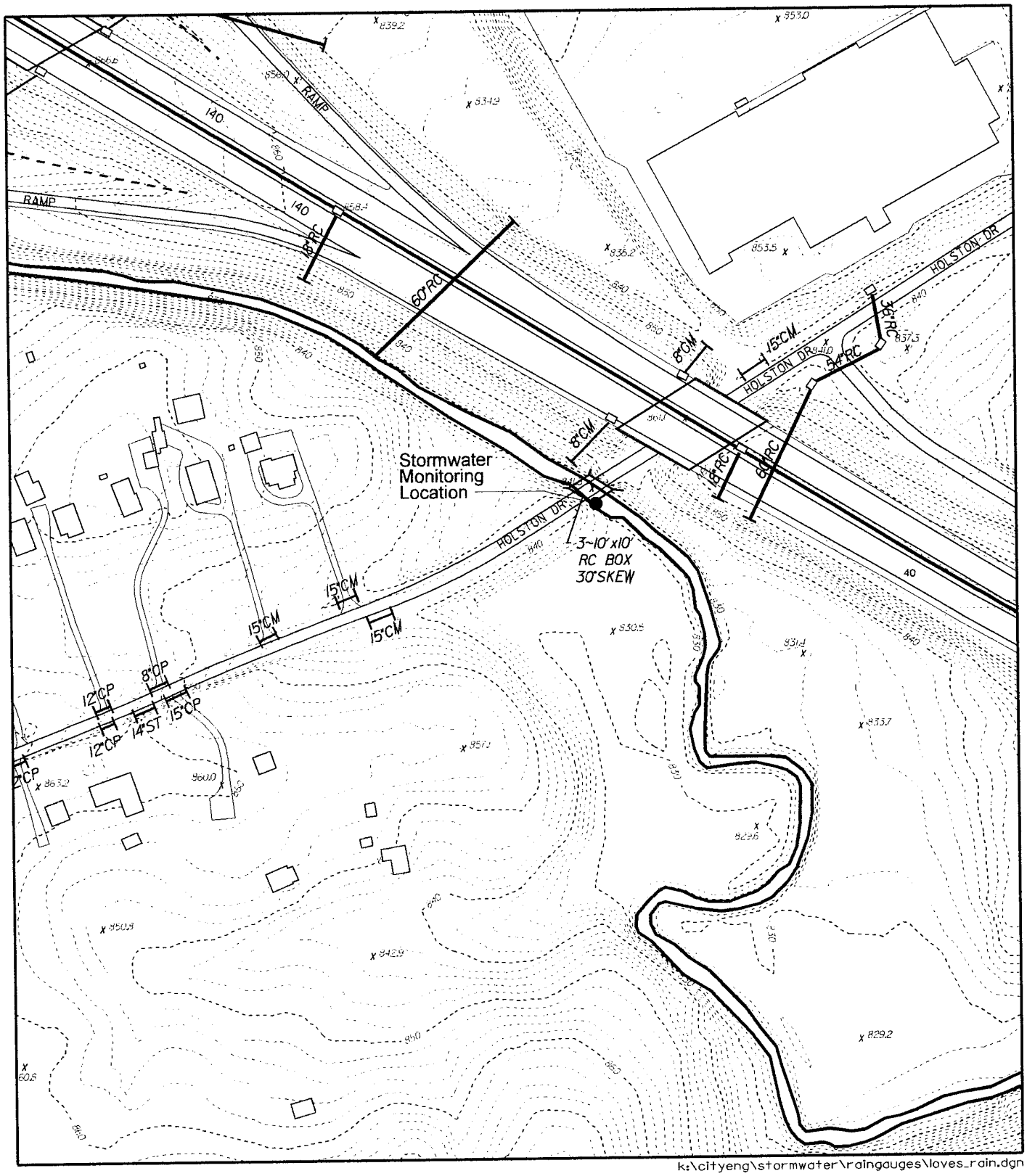
N

City of Knoxville
Dept. of Engineering
Planning Division

Date: Nov. 29, 2000

SCALE: 1" = 200' (AT FULL SCALE)

0 200' 400'



k:\cityeng\stormwater\raingauges\loves_rain.dgn

Stormwater Sampling Locations
Loves Creek Watershed
Holston Dr at I–40

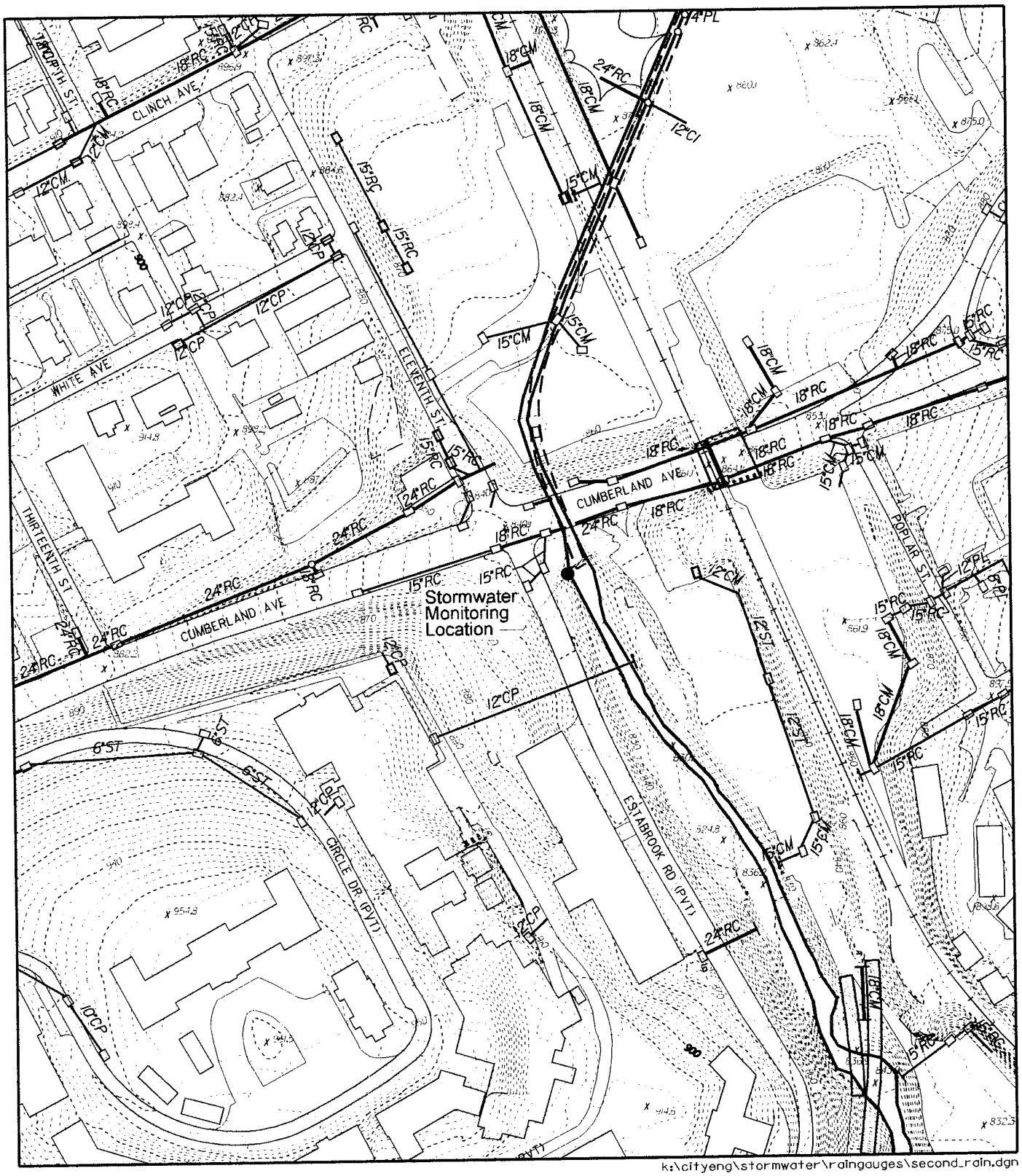
N

City of Knoxville
Dept. of Engineering
Planning Division

Date: Nov. 29, 2000

SCALE: 1" = 200' (AT FULL SCALE)

0 200' 400'



k:\cityeng\stormwater\raingauges\second_rain.dgn

Stormwater Sampling Locations
Second Creek Watershed
Cumberland Ave at Eleventh St

69

N

City of Knoxville
Dept. of Engineering
Planning Division

Date: Nov. 29, 2000

SCALE: 1" = 200' (AT FULL SCALE)

0 200' 400'

9.0 FISCAL ANALYSIS

The Fiscal Analysis for the fourth annual report will list the fourth permit year budget sources and amounts along with estimates for year five. Sources of funds are listed for each major program. Due to complexity, all of the support activities such as purchasing, payroll, legal support, information systems, fleet management, and human resources are not reflected in the table. Actual funding sources for future years are subject to change in the new permit cycle due to the possibility of implementing a stormwater utility fee.

Program Description	**Fund Source**	**Actual FY 99/00**	**Est. FY 00/01**
Solid Waste Recycling (includes: composting, education, staff, etc.)	General Fund	$ 1,202,000	$ 1,300,000
Household Hazardous Waste Facility & Operation	General & Grant Funds	$ 121,472	$ 125,000
Stormwater Management Operating expenses	501 Fund	$ 576,772	$ 656,880
Service Department Operating/Maint. Maintenance (including: brush, leaf, & litter pickup; street cleaning; curb & gutter repair; catch basin cleaning and repair; ditching; storm drain repair, installation, & cleaning; seed/ sod in R.O.W.; grate replacement; water pumping; tree trimming, removal, and planting.	General Fund	$ 2,412,671	$ 2,533,000
Sequoyah Hills Combined Sewer	Bond Funds	$ 0	$ 750,000
Knoxville Area Transit (Bus Terminal) Stormwater Treatment Retrofit Project	General & Grant Funds	$ 281,023	$ 500
First Creek Flood Improvement Project	Bond Funds	$ 2,454,987	$ 1,045,013
Other Capital Improvements	Bond Funds	$ 269,690	$ 250,000
Total Estimated Stormwater Management Program Costs		**$ 7,318,615**	**$ 6,660,393**

NOTE: Knoxville Utility Board activities are funded directly by ratepayers for gas, water, wastewater, and electric utility services. All of the KUB activities in the City's NPDES Permit and SWMP are duplicate activities that KUB had previously committed to accomplish either by regulation or policy before the issuance of the City of Knoxville NPDES Permit. Since the KUB funding structure is separate and not dedicated to the SWMP specifically, the KUB fiscal analysis is not included in this annual report.

APPENDIX A

Table of Contents for BMP Manual Draft

Best Management Practices (BMP) Manual August 2000

City of Knoxville Engineering Department

Note 1: The BMP Manual is still under construction at this time. The main text and 28 of the BMPs are posted in August 2000, which represents approximately half of the BMP Manual. The remainder of the BMPs are still being edited and will be released in a few months.

Note 2: When completed at a future date, the BMP Manual will be for sale on a CD-ROM or as a paper copy through the Engineering Department, Room 480, City-County Building, Knoxville TN 37902. However, most users are encouraged to use this website to obtain the entire BMP manual or particular portions that they may be interested in and to check often for updates and revisions.

Note 3: The various portions of the BMP Manual are in Adobe Acrobat file format (as signified by *.pdf filenames). The Acrobat files can viewed on screen or printed using the free software called Acrobat Reader. The following link will allow you to download Acrobat Reader Version 4.

Note 4: If you are downloading Acrobat, be sure to edit the settings or preferences in your web browser (such as Netscape or Internet Explorer) that allow you to view files with PDF extension using Acrobat Reader 4. It is also recommended that you choose a browser setting that views PDF files in a separate window, and that you choose a browser setting which supplies a decision prompt prior to downloading or saving.

Note 5: Please contact the Planning Division, Room 480 in the City/County Building, with written comments or suggestions. Be specific concerning the page number and location. Comments may also be e-mailed to koliver@ci.knoxville.tn.us.

Section 1 - Main Text of BMP Manual

File name	Size (kb)	Revision Date	Title
BMPTITLE.pdf	40 kb	08 / 00	**Title Page**
BMPTOC.pdf	66 kb	08 / 00	**Table of Contents**
BMPABBR.pdf	45 kb	08 / 00	**List of Abbreviations and Acronyms**
BMPCH1.pdf	91 kb	08 / 00	**Chapter 1 – Introduction**
BMPCH2.pdf	100 kb	08 / 00	**Chapter 2 – Erosion and Sediment Control**
BMPCH3.pdf	92 kb	08 / 00	**Chapter 3 – Stormwater Pollutants**
BMPCH4.pdf	123 kb	08 / 00	**Chapter 4 – Selecting BMPs**
BMPCH5.pdf	155 kb	08 / 00	**Chapter 5 – Erosion and Sediment Control Plan**
BMPCH6.pdf	112 kb	08 / 00	**Chapter 6 – Stormwater Pollution Prevention Plan**
BMPCH7.pdf	26 kb	08 / 00	**Chapter 7 – Special Pollution Abatement Permit**
BMP7FORM.pdf	42 kb	08 / 00	**Application Form for SPAP (Chapter 7)**
BMPCH8.pdf	91 kb	08 / 00	**Chapter 8 – List of Related Websites**
BMPCH9.pdf	133 kb	08 / 00	**Chapter 9 – Glossary of Terms**
BMPCH10.pdf	248 kb	08 / 00	**Chapter 10 – List of References**

Section 2 - BMPs for Activities and Methods (AM)

The BMPs listed in this section are generally applicable to all types of land uses. Although generally written for the point of view of construction activities and operations, these BMPs also pertain to existing developed properties such as commercial and industrial facilities, schools and institutions, houses and apartment buildings, etc. These BMPs focus on good housekeeping measures that reduce or eliminate stormwater pollutants.

File name	Size (kb)	Revision Date	Title
AM-01.pdf	115 kb	08 / 00	**Employee Training**
AM-01TAB.pdf	71 kb	08 / 00	**Table - Quick Reference for Disposal Alternatives**
AM-02.pdf	91 kb	08 / 00	**Construction Scheduling**
AM-03.pdf	145 kb	08 / 00	**Preservation of Existing Vegetation**
AM-03TAB.pdf	46 kb	08 / 00	**Table – Knoxville Tree Protection Ordinance**
AM-04.pdf	80 kb	08 / 00	**Maintenance of Existing Drainage Systems**
AM-05.pdf	101 kb	08 / 00	**Storm Drainage System Flushing**
AM-06.pdf	159 kb	08 / 00	**Material Delivery and Storage**
AM-07.pdf	117 kb	08 / 00	**Spill Prevention and Control**
AM-07TAB.pdf	10 kb	08 / 00	**Table - Emergency and Regulatory Contacts**
AM-08.pdf	125 kb	08 / 00	**Waste Management and Recycling**
AM-09.pdf	101 kb	08 / 00	**Sanitary and Septic Waste Management**
AM-10.pdf	106 kb	08 / 00	**Contaminated Soil Management**
AM-11.pdf	110 kb	08 / 00	**Dust Control**
AM-12.pdf	320 kb	08 / 00	**Dewatering Operations**
AM-13.pdf	107 kb	08 / 00	**Pesticide, Herbicide and Fertilizer Use**
AM-14.pdf	160 kb	08 / 00	**Vehicle and Equipment Cleaning**
AM-15.pdf	123 kb	08 / 00	**Vehicle and Equipment Fueling**
AM-16.pdf	130 kb	08 / 00	**Vehicle and Equipment Maintenance**
AM-17.pdf	93 kb	08 / 00	**Paving Operations**
AM-18.pdf	95 kb	08 / 00	**Concrete Waste Management**
AM-19.pdf	106 kb	08 / 00	**Structure Construction and Painting**

Section 3 - Proposed BMPs for Erosion and Sediment (ES)

The proposed BMPs listed in this section will focus predominantly on erosion and sediment control, which is one of the most significant issues for construction projects. It takes a coordinated effort on the part of many individuals to implement erosion and sediment controls correctly.

NOT ISSUED YET

File name	Size (kb)	Revision Date	Title
ES-01.pdf	--	xx	**Stabilized Construction Entrance**
ES-02.pdf	--	xx	**Tire Washrack**
ES-03.pdf	--	xx	**Construction Road Stabilization**
ES-04.pdf	--	xx	**Gradient Terraces**
ES-05.pdf	--	xx	**Surface Roughening**
ES-06.pdf	--	xx	**Topsoil**
ES-07.pdf	--	xx	**Mulch**
ES-08.pdf	--	xx	**Seeding**
ES-09.pdf	--	xx	**Sodding**
ES-10.pdf	--	xx	**Shrubs and Trees**
ES-11.pdf	--	xx	**Erosion Control Matting**
ES-12.pdf	--	xx	**Geotextiles**
ES-13.pdf	--	xx	**Check Dams**
ES-14.pdf	--	xx	**Silt Fence**
ES-15.pdf	--	xx	**Straw Bale Barrier**
ES-16.pdf	--	xx	**Sand Bag Barrier**
ES-17.pdf	--	xx	**Brush or Rock Filter Berm**
ES-18.pdf	--	xx	**Temporary Sediment Trap**
ES-19.pdf	--	xx	**Temporary Sediment Basin**
ES-20.pdf	--	xx	**Bank Stabilization and Soil Bioengineering**
ES-21.pdf	--	xx	**Diversions and Swales**
ES-22.pdf	--	xx	**Channel Linings**
ES-23.pdf	--	xx	**Riprap**
ES-24.pdf	--	xx	**Temporary Inlet Protection**
ES-25.pdf	--	xx	**Outlet Protection**
xx = not issued yet			

Section 4 - BMPs for Industrial and Commercial (IC)

The BMPs listed in this section are applicable to industrial and commercial properties. However, they may also apply to other land uses wherever material handling and large-scale maintenance items occur.

Industrial and commercial facilities will also want to consult the BMPs listed in Section 2 (AM), which are generally useful for eliminating or reducing pollution generation.

File name	Size (kb)	Revision Date	Title
IC-01.pdf	89 kb	08 / 00	**Non-Stormwater Discharges to Storm Drains**
IC-02.pdf	97 kb	08 / 00	**Outdoor Loading and Unloading of Materials**
IC-03.pdf	101 kb	08 / 00	**Outdoor Container Storage of Liquid Materials**
IC-04.pdf	92 kb	08 / 00	**Outdoor Process Equipment Operations**
IC-05.pdf	110 kb	08 / 00	**Grounds Construction and Maintenance**
IC-06.pdf	98 kb	08 / 00	**Over-Water Operations**
IC-07.pdf	101 kb	08 / 00	**Food Service and Handling**
IC-08.pdf	88 kb	08 / 00	**Power or Pressure Washing**
IC-09.pdf	62 kb	08 / 00	**Swimming Pools and Spas**

Section 5 - Proposed BMPs for Stormwater Treatment (ST)

The BMPs listed in this section represent permanent stormwater treatment practices that generally achieve both stormwater quantity and stormwater quality objectives.

NOT ISSUED YET

File name	Size (kb)	Revision Date	Title
ST-01.pdf	--	xx	**Dry Detention Basins**
ST-02.pdf	--	xx	**Wet Detention Basins**
ST-03.pdf	--	xx	**Infiltration Systems**
ST-04.pdf	--	xx	**Constructed Wetlands**
ST-05.pdf	--	xx	**Filter Strips and Swales**
ST-06.pdf	--	xx	**Media Filtration Systems & Water Quality Inlets**
ST-07.pdf	--	xx	**Oil / Water Separators**
ST-08.pdf	--	xx	**Underground Detention**
xx = not issued yet			

APPENDIX B

City of Knoxville Solid Waste Office Annual Report

CITY OF KNOXVILLE
SOLID WASTE OFFICE
1999 ANNUAL REPORT

Victor Ashe, Mayor
Bob Whetsel, Public Service Director
Ed Umbach, Solid Waste Manager

Printed on Recycled Paper

INTRODUCTION

In 1999 we continued to show positive progress in the development of our solid waste programs. This year we expanded downtown collection service to twice daily, instituted household battery collection at our drop-off centers, continued active enforcement of the solid waste ordinances, and handled 50% more material in our second full year of operations at the Household Hazardous Waste Facility. All of these programs have been successful and demonstrate the continued interest in and growth of our comprehensive solid waste management program.

The residential waste stream charts reflect the following statistics:

- The total waste stream decreased by 358.13 tons in 1999.
- The diversion rate increased to 54.83% from 51.16% in 1998.
- The recycling rate decreased to 24.28% from 24.42% in 1998.

These numbers indicate that Knoxvillians continue to take advantage of our residential recycling programs at a steady rate and our efforts to minimize the total waste stream through education are starting to achieve the desired effect. In addition, we were able to divert more than 54% of that waste stream from the Class I landfill.

The City's contract with Waste Management for municipal solid waste (MSW) collection will expire in 2000. In 1999 we issued an RFP and received competitive proposals that were based on use of the City's Transfer Station which was expanded in 1997. Negotiations are on-going, but the increased competition has already resulted in lower disposal costs. This process indicated that future acquisition of other solid waste assets would be beneficial.

I. RECYCLING

A total of 4,818.33 tons of recyclables was collected in 1999 at the City's twelve drop-off recycling centers, including one at the Solid Waste Management Facility (SWMF). This number is up 12% from 1998. All commodities increased except steel and plastic, with paper products and aluminum showing the largest gains.

Contracts for operating the centers with BFI and Goodwill Industries have been renewed for one year.

As part of the renovations at the SWMF on Elm Street, we built a small Materials Recovery Facility (MRF). Here, the City bales cardboard collected from the drop-off centers or brought in to the the SWMF; we are then able to market this material locally. Businesses, in particular, are encouraged to bring recyclables to the SWMF free of charge. These facilities are beginning to be used more heavily and there was a 4.6 % increase in materials over the previous year.

II. GARBAGE (MSW)

A total of 43,043.35 tons of garbage was collected from Knoxville homes in 1999 as part of the weekly garbage collection service the City offers via its contractor, BFI. This number reflects a 2% increase from the previous year. We are currently in a five year contract with BFI that expires in 2001. The City's collection costs per this contract are:

- Curbside Collection $3.29 / house / month
- Backdoor Collection $5.38 / house / month
- Central Business District $12,744.22 / month

In December, collection in the Central Business District was expanded to twice per night in an effort to keep our streets clean for tourists and those attending downtown events. The City is providing containers to restaurants for keep food wastes off the streets.

All garbage is disposed of at the Chestnut Ridge Landfill operated by Waste Management. The City is currently in a 10 year contract with Waste Management that expires in 2000. Disposal costs for 1999 were as follows:

- Jan. - Oct. $25.78 / ton
- Nov. - Dec. $26.36 / ton

III. COMPOSTING

A total of 26,274.28 tons of yard waste was collected by city crews in 1999. This number is down by about 1,030 tons from the previous year but shows almost no change compared to 1996. The Solid Waste Office believes this fluctuation is due largely to weather conditions. All yard waste is taken to Shamrock Organic Products where it is turned into mulch and compost products. The City is currently in negotiation for an extension to our contract with Shamrock that would expire in 2006. Costs for disposal in 1999 at Shamrock were:

- Jan. - Sept. $31 / ton
- Oct. - Dec. $32 / ton

IV. SOLID WASTE MANAGEMENT FACILITY

Following the 1997 renovations to the SWMF, located at 1033 Elm Street, this complex received national recognition and continues to be visited by government representatives from across the Southeast region. The complex contains three major facilities: the Transfer Station, the Materials Recovery Facility, and the Household Hazardous Waste Collection Center.

Transfer Station

When the Transfer Station was redesigned, one of our goals was to be able to separate construction waste (C&D) from MSW. This would allow us to save money by sending C&D waste to a Class III landfill and also enable us to comply with the State mandate calling for a reduction in the volume of waste placed in Class I landfills. In 1999 we diverted almost 29,000 tons of C&D waste to a Class III landfill. This was nearly 63% of the waste received at the Transfer Station.

Materials Recovery Facility (MRF)

See Recycling (Section I)

Household Hazardous Waste (HHW) Collection Center

In April 1997, the City of Knoxville opened the first permanent site in Tennessee for collecting and disposing of HHW. The initial capital expenditures were provided by a $500,000 grant from the state of Tennessee. The State is also paying half of the operational costs. In addition, an inter-municipal agreement was signed with Knox County that allows county residents to use the facility. The City then bills the County Solid Waste Office based on the number of non-city customers. In 1999 we serviced a total of 3908 cars, with 57% of them being from the City of Knoxville and 43% from Knox County. A total of 87.61 tons of HHW was processed in 1999. This represents a volume of nearly triple that of our first year of operation in 1997!

V. SOLID WASTE INSPECTORS

In an effort to promote cleaner neighborhoods, a Solid Waste Inspection Division was formed in 1998. Their primary focus is enforcing regulations concerning the garbage can ordinance, construction and demolition debris, illegal dumping, and oversight of the recycling drop-off centers. In 1999 over 108 citations were written for solid waste code violations and we have achieved a 81% conviction rate with 18 cases pending. This program has been well received by the public and is having a noticeable impact on cleaning up neighborhoods. In 1999 a surveillance camera was purchased to enhance the program and improve our conviction rate. The camera has resulted in additional citations and also increased media exposure which will help to reduce the amount of illegal dumping in our community.

VI. EDUCATION

The Solid Waste Office engaged in many activities and special programs throughout 1999 to educate Knoxvillians about waste reduction, recycling, composting, and other solid waste issues.

America Recycles Day - The City of Knoxville, along with several other organizations, participated in the third annual America Recycles Day, a national education campaign aimed at increasing citizens' commitment to recycling and buying recycled goods. Over

1,000 people in Knoxville/Knox County signed pledges as part of the campaign, promising to step up their current recycling efforts. Staff from the Solid Waste Office also participates on the statewide steering committee for America Recycles Day.

Telephone Book Recycling - Once again this year the Solid Waste Office coordinated the Knoxville/Knox County telephone book recycling program. Fifty-eight (58) Knox County schools competed for cash prizes donated by BellSouth and Kroger. Over 185 tons of old books were collected from the schools and 6 City recycling drop-off centers.

Composting Bin Sale - The fourth annual composting bin sale was held in February, with 982 backyard compost bins sold from three locations. The total bins sold in four years is now over 5,000. This will divert an estimated 1,200 tons of organic waste from the landfill each year.

Other - In 1999, the Solid Waste Office continued to produce and distribute educational information, including the fourth edition of its *WasteWatch* newsletter which was mailed to all property owners in Knoxville. Brochures about recycling, composting, and other solid waste issues are also now available for citizens at City Hall at the Mall (Knoxville Center). Members of the Solid Waste Office participated in several educational events in 1999 including Kids Day America/International, the Dogwood Arts' House and Garden Show, Business Expo, Earth Day Events, and First Creek First Cleanup. Over 200 school children toured the SWMF and listened to a presentation at the HHW facility. Solid Waste educational presentations were given to numerous community groups and organizations.

Drop Off Centers	Aluminum	Steel	Plastic	Newspaper	Brown Glass	Green Glass	Clear Glass	Cardboard		Mixed Paper	Total
								BFI	City		
2217 Broadway	5460 lbs	14520 lbs	30540 lbs	276380 lbs	29750 lbs	20260 lbs	31103 lbs	0 lbs	56280 lbs	186800 lbs	325.55 tons
4409 Chapman Highway	13016 lbs	27004 lbs	43620 lbs	378740 lbs	59300 lbs	29840 lbs	50320 lbs	62640 lbs	0 lbs	264660 lbs	464.57 tons
9305 Kingston Pike	13115 lbs	21510 lbs	47680 lbs	444480 lbs	28320 lbs	24240 lbs	40840 lbs	166580 lbs	0 lbs	414900 lbs	600.83 tons
4400 NW Western Ave	4830 lbs	10850 lbs	19980 lbs	222071 lbs	21500 lbs	9180 lbs	24780 lbs	44420 lbs	0 lbs	144440 lbs	251.03 tons
5941 Kingston Pike (FC)	1250 lbs	270 lbs	1720 lbs	65740 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	34.49 tons
2939 Alcoa Highway (FC)	960 lbs	480 lbs	2460 lbs	58620 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	31.26 tons
8526 Kingston Pike (FC)	13140 lbs	31800 lbs	47700 lbs	519580 lbs	49500 lbs	44220 lbs	73920 lbs	94420 lbs	0 lbs	538250 lbs	706.27 tons
5003 Broadway	12440 lbs	30640 lbs	50658 lbs	616600 lbs	38490 lbs	26980 lbs	67459 lbs	6180 lbs	83790 lbs	378650 lbs	655.94 tons
4501 Asheville Highway	5240 lbs	12580 lbs	25080 lbs	295380 lbs	15760 lbs	16720 lbs	29540 lbs	61340 lbs	0 lbs	195640 lbs	328.64 tons
5425 Clinton Highway	10780 lbs	23220 lbs	54960 lbs	485360 lbs	24540 lbs	16921 lbs	43500 lbs	4280 lbs	84200 lbs	352141 lbs	549.95 tons
4918 Kingston Pike	16465 lbs	28740 lbs	57900 lbs	543220 lbs	62120 lbs	60560 lbs	77420 lbs	121030 lbs	0 lbs	593128 lbs	780.29 tons
								280.45 tons	112.14 tons		
Drop Off Center Totals	48.35 tons	100.81 tons	191.15 tons	1,953.09 tons	164.64 tons	124.46 tons	219.44 tons	392.58 tons		1,534.30 tons	4,728.82 tons

KPD / Loraine St. Carboard	12.35 tons
Downtown Recycling	104.75 tons

Phone Books	185.22 tons

	Leaves	Brush	Total
Compost Site	8,029.15 tons	18,245.13 tons	26,274.28 tons

	Scrap Metal	Cardboard	Recy. Tir. / Backing	HHW REC.	Tires	C&D	Compacted	Shredded	Total
Transfer Station	309.26 tons	71.90 tons	17.61 tons	38.76 tons	126.47 tons	28,618.00 tons	16,242.85 tons	0.00 tons	45,424.84 tons

HHW Divert.
48.87 tons

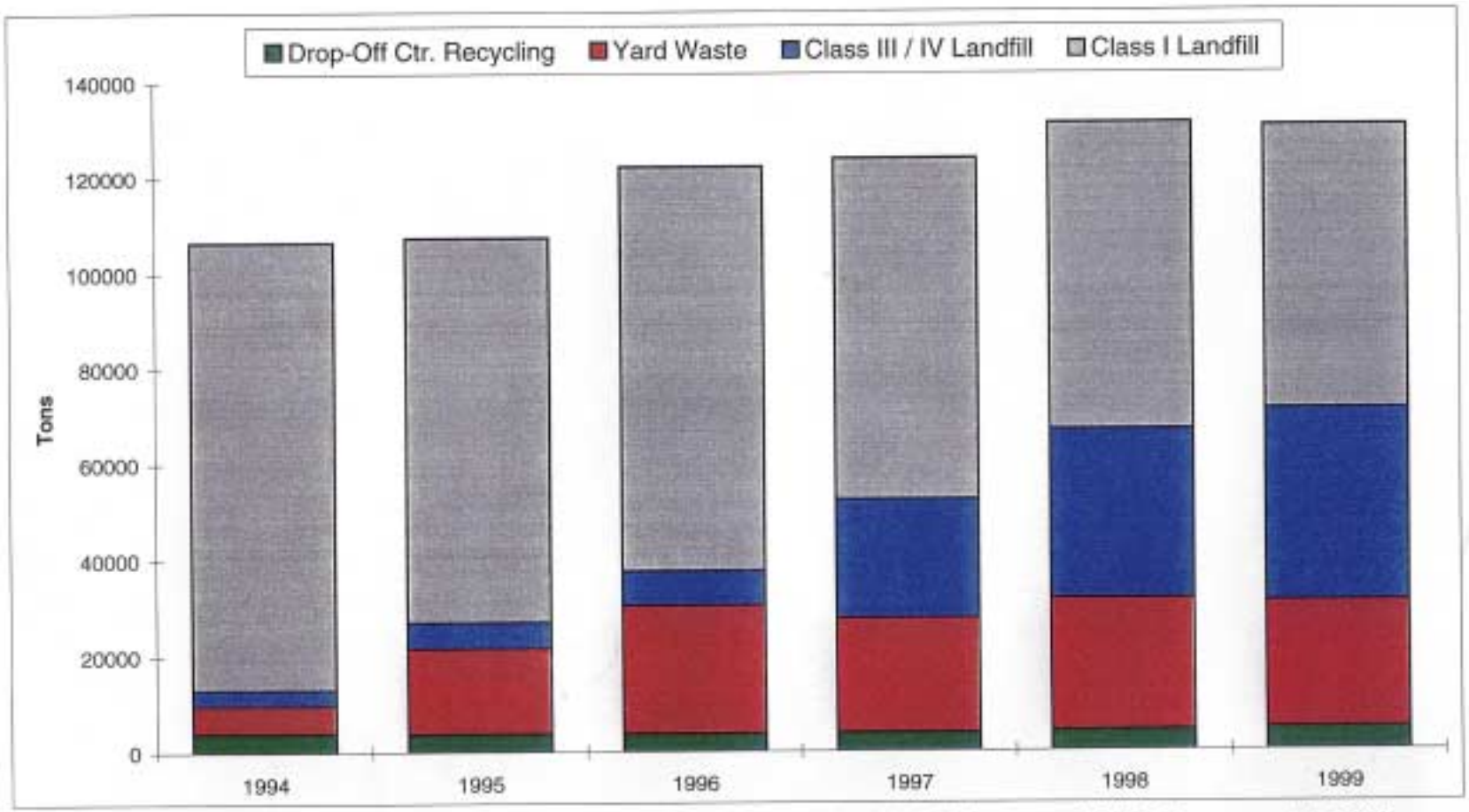
	HH Trash
Landfill Class I	43,043.35 tons

	Transfer Station	Construction	Total
Landfill Class III	28,618.00 tons	11,419.00 tons	40,037.00 tons

Total Waste Recycled	31,869.41 tons
Total Waste Diverted, Class III & Recy.	71,955.28 tons
Total Waste Landfilled, Class I	59,286.20 tons
Total Wastestream	131,241.48 tons

Recycling	24.28%
Diversion	54.83%

Destination of Knoxville's Residential Waste Stream, 1994 - 1999



	1994	1995	1996	1997	1998	1999
Diversion Rate	**12.68%**	**25.50%**	**31.04%**	**42.36%**	**51.16%**	**54.83%**
Recycling Rate	**9.59%**	**20.44%**	**25.20%**	**22.51%**	**24.42%**	**24.28%**

APPENDIX C

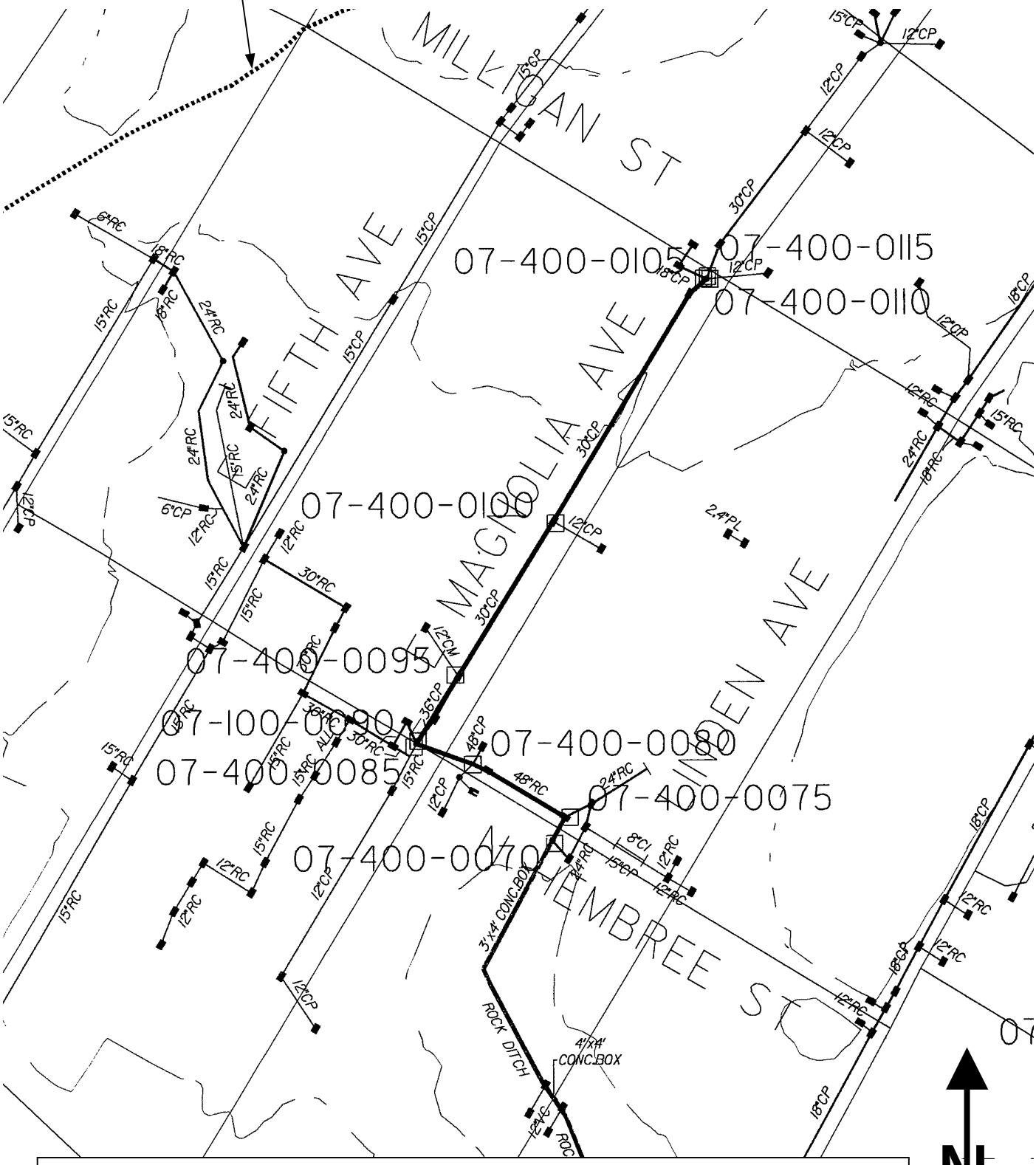
NPDES Permit Program Inventory Map

(Attached separately)

The inventory map is not reproduced as part of the online version of this report (in Adobe Acrobat format). The entire inventory map is approx 66" x 32" (or 33 x 16 miles) at a scale of 1 inch equals 0.5 miles.

The following two pages show typical outfall information on the inventory map:

- ***Closeup of the headwaters for one branch of Williams Creek (Magnolia Avenue near Austin-East HS) with city permit outfalls shown.***
- ***Description of the outfall numbering system and the NPDES Inventory Map legend (with listings for Watershed ID and Outfall Type).***



Excerpt from the NPDES Permit Program Inventory Map:

(approximate scale: 1" = 230')

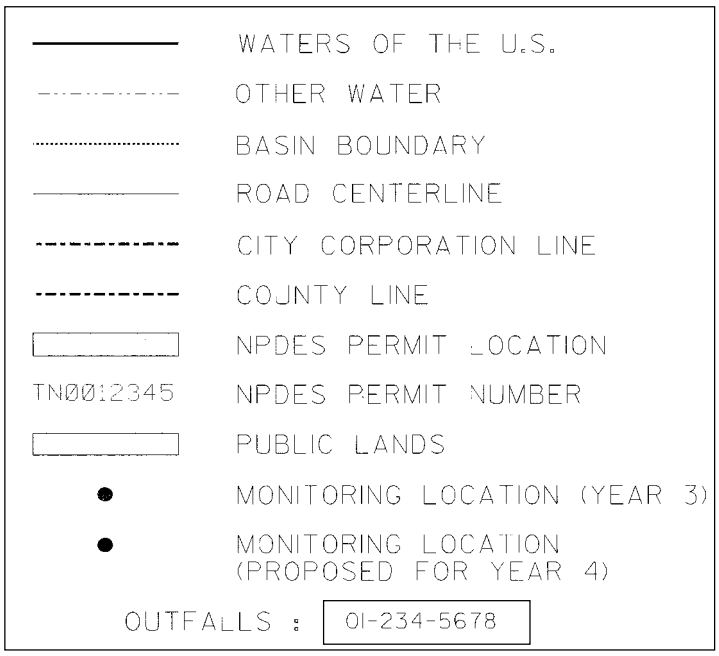
0 115' 230'

This excerpt shows the headwaters for one branch of Williams Creek. The approximate beginning of the blue-line stream is the corner of Magnolia Ave and Milligan St. The initial portion of the stream is enclosed in pipes before outletting into a rock ditch west of Hembree St.

Watershed ID	Watershed Name
00	Tennessee River
01	First Creek
02	Second Creek
03	Third Creek
04	Fourth Creek
05	Goose Creek
06	Baker Creek
07	Williams Creek
08	Knob Creek
09	Toll Creek
10	Ten Mile Creek
11	Whites Creek
12	Turkey Creek
13	East Fork
15	Spring Creek
16	DeArmond Spring Branch
18	Sinking Creek
30	French Broad River
50	Holston River
51	Swanpond Creek
52	Inman Branch
53	Loves Creek
54	Woods Creek
70	Clinch River
71	Beaver Creek
77	Grassy Creek
79	Knob Fork
90	Little River
91	Stock Creek
99	Unnamed Creek (McClure Ln)

Description of outfall numbers for NPDES Permit Program Inventory Map (Appendix C) within Annual Report - Year 4

LEGEND for NPDES Inventory Map:



Outfall Type	Description	Criteria for Type
100	Major Pipe	Pipe diameter >= 36"
200	Major Channel	Drainage area >= 50 acres
300	Major Industrial	Pipe diameter >= 12" or zoned industrial & drainage area > 2 acres
400	Minor Pipe	Pipe diameter < 36"
500	Minor Channel	Drainage area < 50 acres