



**STORMWATER MANAGEMENT PLAN
ANNUAL REPORT**

**CITY OF MERIDEN
Meriden, Connecticut**

SEPTEMBER 2005



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1.0 INTRODUCTION

On December 8, 1999, the U.S. Environmental Protection Agency (USEPA) promulgated Phase II of its National Pollution Discharge Elimination System (NPDES) stormwater regulations. Phase I of the USEPA stormwater program established regulations for stormwater discharges from municipal separate storm sewer systems (MS4s) in municipalities with populations of 100,000 or greater, construction activities disturbing five or more acres of land, and ten categories of industrial facilities. The Phase II Final Rule expands the Phase I program by requiring smaller communities with MS4s in urbanized areas to implement programs and practices to control polluted stormwater runoff through the use of NPDES permits.

The City of Meriden is one of 130 municipalities in Connecticut that are located either completely or partially within an urbanized area. These communities were mandated to seek permit coverage with the Connecticut Department of Environmental Protection's (CT DEP) Phase II Stormwater Program. CT DEP issued the final *General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems* on January 9, 2004.

Compliance with the MS4 permit was a two-part process. The first part (Part A – General Permit Registration) was the submission of a registration form including primarily administrative information and basic mapping. The CT DEP issued the City of Meriden a General Permit for Stormwater – Small Municipal Separate Storm Sewer Systems (#GSM000038) on April 13, 2004. A copy of the permit is included as Appendix A. The second part of the process is the submission of a Stormwater Management Plan (SWMP) which was received by the CT DEP on July 8, 2004. Although the City of Meriden currently implements many of the elements of a successful Stormwater Management Program, to be fully compliant, the City must implement additional measures. The SWMP addresses how the City will comply with the six minimum control measures required by the NPDES permit. These six minimum measures include:

1. Public Education and Outreach
2. Public Participation/Involvement
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff Control
5. Post-Construction Runoff Control
6. Good Housekeeping/Pollution Prevention

As required by the MS4 General Permit, this first Annual Report outlines the City's compliance with the permit, provides an assessment of the appropriateness of the identified best management practices and the City's progress towards achieving the implementation of each minimum control measure, provides copies of all monitoring data which may have been collected and analyzed, summarizes stormwater activities the City plans to undertake during the next reporting cycle, and outlines any change in identified measurable goals, implementation dates, or other changes.

2.0 PUBLIC EDUCATION AND OUTREACH

2.1 Education to the Public

The City of Meriden is still in the process of developing program-specific material. However, the City, in partnership with other governmental agencies, businesses, concerned citizens and non-profit organizations such as the Quinnipiac River Watershed Association (QRWA), has extended its public education and outreach efforts to include:

Brochures on environmental topics protecting stormwater such as;

- Bristol Resource Recovery Facility Operating Committee and Tunxis Recycling Operating Committee, *Household Hazardous Product Disposal Information*

Newsletters to raise public awareness such as;

- Meriden Department of Health Semi-Annual Newsletter – "Food For Thought"
 - One of these newsletter pertains to the food services industry and topics such as cooking oil management as it pertains to water quality
- Meriden's Water Division Annual Water Quality Report. Although drinking water is the primary focus, sections of the flyer describe how humans affect the quality of water and indoors and well as outdoors water conservation tips. See Appendix B for a copy of the 2004 Report.

Storm drain stenciling by Meriden high school students

Articles in the local newspaper, *People's Press*, regarding environmental efforts in the community such as;

- Meriden's Department of Health submission of *Storm Drains: Where Does the Water Go?*

Monthly City Meetings, many of which pertain to stormwater and flood control and allow for monthly public comment on the City's activities and programs such as Phase II.

The City of Meriden received the recently published Connecticut Department of Education (CTDOE) *Core Science Curriculum Framework*. This curriculum includes educational units discussing "Land and Water Interactions," "Water Quality," the shaping effects of water, how water moving across and through the earth carries with it the products of human activities, how humans can improve water quality, and the accumulation of mercury, phosphates and nitrates in river, lakes, and oceans and its effects on water quality. The City has begun to integrate items not already addressed in its current school curriculum.

Copies of selected materials and the CT DOE curriculum available in 2004 are included in Appendix B.

2.2 Education Materials Distributed

The brochures and newsletters outlined in Section 2.1 have been distributed to citizens in Meriden. The *Household Hazardous Product Disposal Information* is available at the Department of Parks and Public Works administrative offices.

2.3 Workshops/Meetings Attended

Several workshops and meetings have been held to raise community awareness and involvement in the City's Stormwater Management Program. One such meeting was held by the City of Meriden and Fuss & O'Neill, Inc. on June 30, 2004 in preparing the City's Stormwater Management Plan.

2.4 Miscellaneous

In Year 1 of the permit, the stewardship of Dossin Beach was passed to the QRWA from the City. This area will be used for on-land and in-the-water (kayak & canoes) educational classes for primarily school age children. A phase of the linear trail program has been started and the final completion will include a trail system throughout the City. Associated with this long – term land lease, the City moved the dog pound that existed on this land, relocating it away from its prior location, which was in close proximity to a waterbody.

The QRWA also held a Canoe Race and annual clean up along the Quinnipiac River. There were many environmental awareness and educational components of these events. The QRWA events are discussed further in Section 3.3.

2.5 Modifications to Plan

There are no modifications to the public education component of the Stormwater Management Plan under consideration at this time.

2.6 Activities Scheduled for Next Year

- Stormwater related articles in the Meriden Department of Health newsletter, including those directed at the Food Services industry and cooking oil management
- Continue to collaborate with the local newspaper in order to publish future environmental articles in the *People's Press*.
- The City will continue to integrate topics in the recently published *Core Science Curriculum Framework*, including those related to water quality, into its school curriculum.
- Ensure that the Linear Trail program is developed. The program includes walking trails and educational resources along the Quinnipiac River and within the Quinnipiac Gorge. The program is being subsidized by Federal funds passing through the City.

3.0 PUBLIC PARTICIPATION

3.1 Public Meetings Conducted

- Phase II Stormwater Management Plan Meeting. City of Meriden and Fuss & O'Neill, Inc., June 30, 2004
 - The City of Meriden retained Fuss & O'Neill, Inc. to conduct a public workshop pertaining to the Phase II stormwater program and the Stormwater Management Plan that was prepared to meet CT DEP general permit requirements. This meeting was advertised on June, 26, 2004 in the *Record Journal*. See Appendix C for a copy of the public notice.
- Monthly City Meetings, many of which include issues pertaining to stormwater and flood control

3.2 Notices Published

- Public Notice in the *Record Journal*, June 26, 2004, inviting the public to the workshop led by Fuss & O'Neill, Inc. This meeting pertained to the Phase II stormwater program and development of the City's Stormwater Management Plan.

A copy of the Notice published in 2004 is included in Appendix C.

3.3 Public Events

The following activities were conducted in Meriden in the first year of the General Permit:

- QWRA Canoe Race
- QWRA Annual River Clean up – during this annual event approximately 16,000 lbs of material was removed from the watershed by hundreds of volunteers. Efforts were collaborated throughout the watershed, unaffected by City lines. The municipalities in the watershed shared in the cost of the disposal (approximately \$10,000). Pfizer also contributed to the event by donating t-shirts.
- City of Meriden High School – storm drain stenciling

3.4 Web Site

The City of Meriden's web site is currently ready to accept links to other web pages as well as to City documents (such as the Stormwater Management Plan and Annual Reports). It should be noted that the Quinnipiac River Watershed Association's watershed information, programs, and other educational items can be accessed at www.qrwa.org.

3.5 Modifications to Plan

There are no modifications to the public education component of the Stormwater Management Plan under consideration at this time.

3.6 Activities Planned for Next Year

- The City will continue to work with the partnership of governmental agencies, businesses, concerned citizens and non-profit organizations such as the QRWA and school system to participate in their environmental work as well as to sponsor and support clean up projects and environmental events.
- In Year 2, the Linear Trail program should be completed as well as the long term lease of Dossin Beach to QWRA from City ownership and the development of environmental education classes at this location. The program is being subsidized by Federal funds passing through the City.
- In Year 2, the City will provide links to the Stormwater Management Plan, annual reports (upon completion), and other water quality related information on the City's website.

4.0 ILLICIT DISCHARGE DETECTION/ELIMINATION

4.1 Illicit Discharge Investigation Activities

The City of Meriden is in the process of formalizing the process and procedures for logging and responding to complaints associated with illicit discharges. The City has incorporated procedures that include detection information received from the Meriden Board of Health and other government and citizen groups and agencies.

Illicit discharges will be recorded by the Department of Parks and Public Works in a log as they are detected and reported. The log will include but is not limited to the following information:

- Location
- Type
- Date Identified
- Identified By
- Estimated Flow
- Scheduled for Repair/Action

The log will be kept in the Department of Parks and Public Works administrative offices located at 460 Liberty Street, Meriden, Connecticut. The information will be accessible to the public during normal business hours Monday through Friday. The Department's clerical staff will be responsible for accepting and recording any public written or telephone complaints for all potential illicit discharges. These complaints will be referred through the Department of Parks and Public Works to field personnel for proper assessment and correction (as necessary). The Department of Parks and Public Works Engineering Services clerical staff will also receive and record illicit discharge detection information received from the Mayor's hotline, Board of Health, QRWA, and website. This is currently a public bulletin board on the City's website allowing citizens to post questions. These postings are read by MIS staff and directed to the appropriate department. In the case of stormwater questions/concerns, the Department of Parks and Public Works would be notified. The questions posted are answered directly on the website so all web visitors have access to the information.

4.2 Illicit Discharge Removal Activities

Once an illicit discharge has been detected and logged, the Department of Parks and Public Works, in conjunction with the Meriden Board of Health, Water Pollution Control, or other governmental agencies, as appropriate, will take all necessary actions to diagnose and eliminate the discharge as necessary. The actions taken to correct and/or eliminate the illicit discharges will then be recorded in a log that will include the following information:

- Location
- Type
- Date Removed
- Removed By
- Cost

4.3 Modifications to Plan

There are no modifications to the Illicit Discharge component of the Stormwater Management Plan under consideration at this time.

4.4 Planned for Next Year

- The City will continue to work with the partnership of governmental agencies, businesses, concerned citizens and non-profit organizations such as the QRWA to develop programs to detect and eliminate illicit discharges.
- The Meriden Department of Parks and Public Works will continue its efforts with the Meriden Department of Health and other City agencies to develop and implement the process and procedures for logging and responding to complaints associated with illicit discharges. The public will primarily continue to use the Mayor's hotline to make complaints known to City staff.
- Pipe outfalls (greater than 15" in diameter) and any illicit discharges found will be considered for layering in the City's GIS program. In order to complete this mapping, the City will purchase GPS equipment and complete training on that equipment in Year 2. In addition to mapping the outfalls, the Outfall Inventory Form found in Appendix D will be used to document the condition and characteristics of the outfall.
- The City's Code will be reviewed to ensure illicit detection and elimination requirements are being met, that the City has the ability to find and remove illicit discharges, and for necessary changes to comply with the SWMP and the MS4 General Permit.

5.0 CONSTRUCTION SITE RUNOFF CONTROLS

5.1 Construction Plans Reviewed

The Administrative Development Review Board reviews all construction plans for new construction, redevelopment projects, and/or alterations.

5.2 Construction Sites Inspected

On-site inspections are made by Engineering Services and Planning Department staff throughout the construction process (approximately weekly) to ensure compliance with the City's Soil Erosion and Sediment Control Ordinance. Sites were also inspected with regards the approved construction plans. Enforcement actions were taken when necessary and all items/concerns were addressed by the site contractors or developers.

5.3 Modifications to Plans

There are no modifications to the Construction Site Runoff component of the Stormwater Management Plan under consideration at this time.

5.4 Activities Planned for Next Year

- Continue inspections and enforcement of all current regulations, review regulations to consider including provisions for controlling construction wastes such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary wastes at the construction site that may cause adverse impacts to water quality.
- Construction plan submission and site inspection activity will be recorded in a log that will include the following information:
 - Name
 - Site
 - Type
 - Name of Department(s) that Reviewed
 - Certification that Plans Meet City Code
 - Date Reviewed
 - Date Commences
 - Date Inspected
- The City will log the number (per permit year) of construction plan submittals, construction commences, and construction inspections and report these numbers in their Phase II annual report.
- The City's regulations will be reviewed relative to soil erosion and sedimentation control requirements, and to ensure that construction projects resulting in land disturbance of greater than 1 acre will be tracked for compliance. The City's

regulations will be reviewed for necessary changes to comply with the SWMP and the MS4 General Permit.

6.0 POST CONSTRUCTION STORMWATER MANAGEMENT

6.1 Plan Review

The Administrative Development Review Board reviews all construction plans for post-construction stormwater management considerations as well as general water quality issues. Reviews are based on guidance contained in the *2004 Connecticut Stormwater Quality Manual*, as amended.

6.2 Structures Installed

It is unknown the exact number of stormwater control structures were installed including detention basins, water quality basins, gross particle separators, dry basins, and underground detention systems. Developers are required to put a maintenance agreement in the City's land records for all structural stormwater controls installed as part of a construction or reconstruction project. These agreements also require the owner to maintain and retain records of all maintenance activities on their structure(s).

6.3 Structures Inspected

The structural control measures noted above were inspected during and after completion for compliance with the approved plans. After the completion of a project, structures are inspected after approximately three (3) months and six (6) months of operation

6.4 Modifications to Plan

There are no modifications to the Post Construction component of the Stormwater Management Plan under consideration at this time.

6.5 Activities Planned Next Year

- The City of Meriden will continue to develop procedures for addressing post construction BMPs for all residential and commercial projects. Construction site inspection activity will be recorded in a log that will contain the following information:
 - Project
 - Site
 - Type Structure
 - Date Installed
 - Date Inspected
- The City will log the number (per permit year) of stormwater structures installed in the City and report this number in their Phase II annual report.
- The City's regulations will be reviewed relative to post construction stormwater management requirements, and to ensure that construction projects resulting in land disturbance of greater than 1 acre will be tracked for compliance. The City's

regulations will be reviewed for necessary changes to comply with the SWMP and the MS4 General Permit.

7.0 POLLUTION PREVENTION/GOOD HOUSEKEEPING

7.1 Employee Training Conducted

Meriden Fire Department staff members are trained for hazardous materials at the operational level. Three (3) fire fighters were trained to the technician level and sixty (60) were trained at the EPA technician level. This training allows Department staff to properly use spill containment equipment including booms, pads, and meters. Three (3) Fire Department staff members received “cameo” training, which is a computer aided spill response method that allows the operator to predict the flow of pollutants in the environment (e.g., air, water) and thereby react to a spill and evacuate residences (as necessary) in a more directed and effective manner.

As a result of implementing a Stormwater Pollution Prevention Plan (SWPPP) and Spill Prevention, Control and Countermeasure (SPCC) Plan for the Central Maintenance Garage, the garage employees received training and are equipped to address incidental oil or petroleum spills with on-site spill response resources. In Year 1, United Waste Oil Recovery was hired to provide education to the garage’s employees regarding spill response, containment, clean up, hazard assessment, and hazardous conditions. Department personnel will utilize the training and resources to address incidental off-site spills as well.

7.2 Street Sweeping

The City continues to sweep all streets at a minimum frequency of once each year beginning in the spring to remove winter road sand and other debris. There is a large effort in the early spring to sweep all roads in the City, and then one City sweeper and operator continues to sweep for the entirety of the spring, summer, and fall months. The additional sweeping focuses on downtown and low-lying areas (high sediment accumulation). All City roads typically are swept at least twice annually.

During Year 1, 189 miles of roads were swept at least once, representing 100% of City roadways. Approximately 4,000 cubic yards of material was removed from City streets during this process. Given that the City deposited approximately 5,500 cubic yards of sand during the winter leading into Year 1, street sweeping alone prevented over 70% of the winter sand from reaching waters of the State.

During Year 1, all street sweepings were properly disposed of at the City’s landfill.

7.3 Snow Removal

In Year 2, the City completed the re-roofing of the municipal salt dome. The City continues to use environmentally responsible sand/salt application practices. As stated above, the City of Meriden applied 5,500 cubic yards of sand during the winter leading into Year 1 (and removed over 70% of it through the City’s street sweeping efforts)

When there was an excessive amount of snow in Year 1, snow was stockpiled on a paved area (the “Hub”). Snow was not deposited into any waters or wetland areas.

7.4 Catch Basin Cleaning

Using the City's one vacuum truck, approximately 1,500 catch basins were cleaned and flushed during Year 1, thereby preventing sediment and debris from discharging to a waterbody. The catch basin cleaning effort primarily occurred between March and October, resulting in the collection of winter debris as well as portions of the fall leaf waste. In addition to general cleaning, approximately seventy-five (75) catch basins were rebuilt or otherwise repaired by the City. In some cases, an entirely new catch basin structure was inserted to replace the existing basin.

During Year 1, all catch basin sediments were properly disposed of at the City's landfill.

7.5 Construction Activities

During Year 1, the Highway Department conducted four (4) construction projects that required soil erosion and sediment controls. These controls were properly installed and maintained throughout the duration of the projects.

7.6 Complaint Responses

Complaints to the City regarding the general housekeeping of municipal facilities are directed to the appropriate department for investigation and response. Requests from the public are usually received in the early spring for prompt sweeping of winter road sand and cleaning of catch basins. The Department received no calls regarding "good housekeeping" of its roadway facilities in Year 1.

7.7 Spill Response Activities

All significant spills are handled by the Meriden Fire Department. CT DEP is notified of these situations as they happen. The Fire Department has a tactical unit that is prepared to respond to hazardous spills within the City. City staff (excluding fire fighters) did not participate in any significant spill response activities during Year 1.

Both the Highway Department facility and Central Maintenance Garage maintain spill containment supplies including speedi-dry, absorbent pads, and containment booms within the facilities.

7.8 Transfer Station

Managerial oversight of the City's Transfer Station falls under the jurisdiction of the Highway Department. All municipal residential bulk waste flows through the Transfer Station before being hauled to a certified facility for disposal. Freon is removed from all items containing it by a certified company prior to final disposal. Runoff from the facility is treated by an oil/water separator to ensure adequate water quality. The separator is inspected monthly and maintained as necessary.

7.9 Municipal Recycle

The City continues to promote City-wide residential materials recycling. All residential recyclables are picked up (curb-side) by a City-hired contractor.

7.10 Household Hazardous Waste Collection

In conjunction with other communities within the Bristol Resource Recovery Facility Operating Committee and Tunxis Recycling Operating Committee, there are several free household hazardous waste disposal events available to Meriden residents. Events are advertised in the local newspaper and brochures are available at the Department of Parks and Public Works administrative offices. Additional information is available on the organization's website.

7.11 Municipal Facility Inspection

The City performs routine inspections of its facilities to maintain them in a neat and orderly condition. The Highway Department performs weekly inspections and cleaning of their facilities. The Central Maintenance Garage foreman conducts weekly inspections. At the Central Garage, the foreman completes a checklist that addresses waste management areas, secondary containment, oil/water separator, and waste streams. Inspection records are maintained by the foreman in his office as part of the SWPPP/SPCC implementation program.

United Waste Oil Recovery prepared a Comprehensive Plan that documents the waste streams within the Central Garage Facility.

CT DEP inspected the Central Maintenance Facility in Year 1, and the recommendations of the inspection are being implemented as labor and funding become available. No enforcement actions (no citations) were taken by CTDEP as a result of the inspection.

7.12 Modification to Plan

There are no modifications to the Pollution Prevention/Good Housekeeping component of the Stormwater Management Plan under consideration at this time.

7.13 Activities Planned Next Year

- Highway Department is requesting funds to purchase an additional vacuum type catch basin cleaner
- Document all pertinent maintenance/cleaning operations.
- The Highway Department will maintain a list of complaints that it receives regarding road and highway maintenance concerns.
- Complete development of Training Program and conduct employee training.
- Perform preliminary work in locating and mapping outfalls and other components of stormwater drainage system.
- Put illicit discharge record system in place. Maintain records of all complaints and actions taken.

- Follow up on any problems identified through discharge sampling program.
- Continue sampling program.
- Install a leak detection system for the two (2) 10,000 gal underground storage tanks (1 – diesel, 1-unleaded fuel) at the Central Maintenance Garage.
- The Fire Department will send twenty (20) fire fighters to the NFPA 472 technical training school for hazardous wastes.

8.0 ANNUAL STORMWATER MONITORING

The CT DEP Phase II General Permit requires annual stormwater monitoring of at least two outfalls from each of three land uses (industrial, commercial, and residential) for a total of six (6) outfall locations. Monitoring parameters, procedures, and storm event criteria are described in the General Permit.

The City has selected sampling outfalls based on the land use(s) within the drainage areas of the outfalls as well as practical considerations including accessibility and proximity to other sampling locations. A field sampling plan describing the sampling objectives, outfall locations, sampling parameters, and monitoring procedures for the annual monitoring program is included as Appendix E. As of the date of this annual report, the 2004 stormwater samples have not been collected. City staff has been trained in the procedures for collection of outfall samples and the City is now prepared to collect samples during the next qualifying wet weather event. Outfall locations may be modified for future sampling events. Monitoring results will be included in Appendix F.

APPENDIX A

GENERAL PERMIT FOR STORMWATER – SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS (#GSM000038) – CITY OF MERIDEN



STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

TOTAL P. 01

Certificate of Registration

Issued To:

CITY OF MERIDEN

For The

**STORMWATER - SMALL MUNICIPAL SEPARATE STORM
SEWER SYSTEMS**

General Permit

Arthur J. Rocque, Jr.

Permit No. GSM000038

Facility Information

MERIDEN, CITY OF
MS4 PERMIT
MERIDEN CT 06450

Commissioner

Application No.: 200401130

Issue Date: 13-APR-04

Exp. Date: 08-JAN-09

Site No.: 80-266

APPENDIX B
EDUCATION MATERIALS



Core Science Curriculum Framework

An Invitation for Students and Teachers
to Explore Science and Its Role in Society

Approved October 2004 (edited January 2005)

INTRODUCTION

I. A Vision for Connecticut Science Education in the 21st Century

To articulate a vision to guide 21st century science education in Connecticut, the Connecticut State Department of Education engaged in discussions with science educators, school administrators, and university and corporate scientists. The consensus drawn from these discussions was that school science education should support the development of scientific literacy in all students, as well as motivate more students to pursue careers in science, technology and engineering. Science literacy, in the view of Connecticut science educators, is a combination of understanding major science concepts and theories, using scientific reasoning, and recognizing the complex interactions between science, technology and society.

Based on this vision, the department developed a new **Core Science Curriculum Framework**. This framework articulates the main conceptual themes and content standards that **all** students are expected to learn in their elementary, middle and high school science classes. Further, the framework describes the specific performances that will be assessed on the statewide science assessments.

What Is Meant By A “Core” Curriculum?

Since the current body of scientific knowledge represents the cumulative work of scientists over hundreds of years, it is unreasonable to expect K-12 students to learn it all. Therefore, Connecticut’s Core Science Curriculum Framework describes *some* of the major science concepts that all students in Connecticut schools can reasonably be expected to learn in order to develop and expand their scientific literacy. This framework does not attempt to spell out all of the science, mathematics and technology goals that can be included in a school science curriculum. Rather, it describes a baseline for what all Connecticut students should know by the end of Grade 10.

Decisions regarding the main science themes and the sequencing of the content standards were guided by the *National Science Education Standards* (National Research Council, 1996), *Project 2061 Benchmarks for Science Literacy* (American Association for the Advancement of Science, 1993), and Connecticut science educators. School districts may choose to go beyond the scope of these core concepts, but **all** students should have opportunities to learn the content expressed in this framework.

How Does The Framework Promote Scientific Literacy?

Being scientifically literate requires that a person have an essential understanding of key science ideas, along with a fluency in the language and terms used to describe them. The core curriculum articulated through the framework identifies the key ideas and levels of understanding that all students are expected to reach. Throughout the PreK-Grade10 core framework, fundamental concepts from the life, physical and earth sciences are woven together in order to support the holistic understanding required of a scientifically literate individual.

Scientific literacy requires the ability to apply critical thinking skills when dealing with science-related issues. The framework was designed to target the age-appropriate critical thinking – or inquiry – skills that should be infused in the learning of each of the content standards. Further, in limiting the number of content standards required to be taught, the framework allows for the implementation of a hands-on/minds-on science program in which students and teachers have time for in-depth explorations that build an understanding of the way in which scientific knowledge is created, validated and communicated.

Approved October 2004 (edited January 2005)

A scientifically literate person is able to transfer knowledge of the academic theories and principles of science to practical applications in the real world. To support this concept, Connecticut's Core Science Curriculum Framework is structured around these key real-world issues and technologies, rather than around the subdisciplines of the life, physical and earth sciences.

Scientific literacy also implies having the capacity to pose and evaluate arguments based on evidence and to apply logical conclusions from such arguments. Language arts and mathematics are the communication vehicles that people use to convey, critique and evaluate science-related ideas. Therefore, language arts and mathematics learning expectations are included in the framework as integral components of science learning.

In short, a foundation in scientific literacy prepares students to be confident and capable lifelong learners who are equipped with the skills needed to access, understand, evaluate and apply information in various contexts. Regardless of their academic standing, **all** students should have access to a rich and challenging science curriculum that will promote scientific literacy, while inspiring and supporting advanced study and science-related careers.

II. Role of the Connecticut Core Science Curriculum Framework

The science framework has three main roles:

1. **To articulate the core science ideas, knowledge and skills that all Connecticut students should learn.** Based upon significant science understandings and abilities defined in the *National Science Education Standards* and the *Project 2061 Benchmarks for Science Literacy*, this framework describes a conceptual scope and sequence to guide school districts and science educators in the development of their own science programs. The content standards for each grade level are based on conceptual connections among ideas in the life, physical and earth sciences, and related social and technological applications. District curriculum developers have flexibility to reorganize the content standards by grade level, so long as all students have opportunities to learn the content standards prior to taking the *Connecticut Mastery Test (CMT)* in Grades 5 and 8, and the *Connecticut Academic Performance Test (CAPT)* in Grade 10. Districts may include more content in their science programs, but the framework content standards express the *minimum* that should be learned by all students in Grades PreK to 10.

In addition to the life, physical and earth science standards, the Core Science Curriculum Framework includes standards and expected performances for inquiry and for science and technology in society. Inquiry performances include the abilities to apply science process skills, as well as the abilities to read and write science-related texts, search scientific databases and use mathematics to make sense out of data. The science and technology in society standards deal with applications of science to everyday and global issues, and reflect content and issues described in *Standards for Technological Literacy* (International Technology Education Association, 2000).

2. **To define the knowledge, abilities and understandings that students are expected to demonstrate on the statewide science assessments.** Whereas content standards provide broad guidelines for the development of the core curriculum, expected performances identify the specific knowledge and skills selected from the core curriculum for which students will be accountable on statewide science assessments. Expected performances express the *maximum* that all students will be expected to demonstrate on the CMT and CAPT science assessments.

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3. **To influence the way science is taught and assessed.** Among the factors guiding the selection and organization of the framework's content were its potential to attract and hold the interest of students and inspire them to continue learning about science. While the framework defines key science concepts and skills, it does not dictate how to help students achieve these learning goals. The ways in which districts develop learning units and specific lesson plans will have a significant influence on students' attitudes toward science learning. Given opportunities for meaningful and authentic science experiences that incorporate the expected performances included in the framework, it is hoped that many students will develop the enthusiasm, interest and confidence to continue their science studies and pursue science-related careers. An enrichment science program designed to meet the needs of these advanced students, with suggested content standards for courses in biology, chemistry, physics and earth science, is found in the Appendix to this framework. Enrichment standards that are not included in high school Strands I through V will not be measured on the CAPT.

DEVELOPMENTAL ORGANIZATION
OF CORE SCIENCE CURRICULUM FRAMEWORK

- PreK-2:** Development of *wonder* about the natural world and the ability to observe, describe and apply basic process skills
- Grades 3-5:** Development of *descriptions* of basic natural phenomena and the ability to perform simple experiments and record accurate data
- Grades 6-8:** Development of basic *explanations* for natural phenomena, and the ability to ask good questions and apply experimental procedures to collect and analyze data
- Grades 9-10:** Development of *interest* in global issues and the ability to collect, analyze and use data to explore and explain related science concepts

ENRICHMENT CURRICULUM

Development of *deep understanding* of science concepts and principles; preparation for future studies and/or careers

CONCEPTUAL STRUCTURE OF FRAMEWORK

The science framework is organized around 11 conceptual themes and guiding questions in the earth, life and physical sciences, with suggested explorations of science-related questions and issues. Each theme is addressed by several content standards and related concepts that spiral through the grades, each time being treated with greater depth and breadth, in accordance with developmental appropriateness for the students. The content standards for Grades 9 and 10 are further organized around five topical strands. Strands I, II and III are related to the physical sciences, while Strands IV and V are related to the life science.

Listed below are the conceptual themes and guiding questions, together with the content standards in each of the grade levels, that contribute to students' eventual abilities to respond to the guiding questions.

I. Inquiry – How is scientific knowledge created and communicated?

- Scientific Inquiry (PK-2, 3-5, 6-8 and 9-10)
- Scientific Literacy (PK-2, 3-5, 6-8 and 9-10)
- Scientific Numeracy (PK-2, 3-5, 6-8 and 9-10)

II. Properties of Matter – How does the structure of matter affect the properties and uses of materials?

- Properties of Objects (K.1)
- Properties of Materials (2.1)
- States of Matter (3.1)
- Elements, Compounds and Mixtures (6.1)
- Chemical Reactions (9.4)
- Carbon Compounds (9.5)

III. Energy Transfer and Transformations – What is the role of energy in our world?

- Electricity and Magnetism (4.4)
- Sound and Light (5.1)
- Energy and Work (7.1)
- Energy Conservation and Transformation (9.1)
- Electrical Forces (9.2)

IV. Forces and Motion – What makes objects move the way they do?

- Position and Motion of Objects (1.1)
- Forces and Motion (4.1)
- Forces and Motion (8.1)

V. Matter and Energy in Ecosystems – How do matter and energy flow through ecosystems?

- Food Chains (4.2)
- Ecosystems (6.2)

- VI. Structure and Function – How are organisms structured to ensure efficiency and survival?**
- Needs of Living Things (1.2)
 - Life Cycles of Animals (1.3)
 - Life Cycles of Plants (2.2)
 - Responses to Stimuli (5.2)
 - Human Body Systems (7.2)
 - Cell Structure and Function (10.1)
- VII. Heredity and Evolution – What processes are responsible for life’s unity and diversity?**
- Characteristics of Living Things (K.2)
 - Adaptations (3.2)
 - Reproduction and Heredity (8.2)
 - Genetics (10.4)
 - Evolution (10.5)
- VIII. The Changing Earth – How do materials cycle through the Earth’s systems?**
- Properties of Soils (2.3)
 - Properties of Rocks and Minerals (3.3)
 - Cycles of Matter in Earth’s Systems (9.7)
- IX. Energy in the Earth’s Systems – How do external and internal sources of energy affect the Earth’s systems?**
- Weather Patterns (K.3)
 - Land and Water Interactions (4.3)
 - Weather and Seasons (6.3)
 - The Changing Earth (7.3)
- X. Earth in the Solar System – How does the position of Earth in the solar system affect conditions on our planet?**
- Earth, Moon and Sun (5.3)
 - The Solar System (8.3)
- XI. Science and Technology in Society – How do science and technology affect the quality of our lives?**
- Shelters (K.4)
 - Measuring Tools (1.4)
 - Food Resources (2.4)
 - Conservation of Materials (3.4)
 - Batteries, Bulbs and Magnets (4.4)
 - Optical Technologies (5.4)
 - Water Quality (6.4)
 - Food Technology (7.4)
 - Building Bridges (8.4)
 - Energy and Power Technologies (9.3)
 - Polymers (9.6)
 - Human Environmental Impacts (9.8, 9.9)
 - Living with Microorganisms (10.2)
 - Biotechnology (10.3)
 - Human Population Growth (10.6)

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USERS' GUIDE TO CORE SCIENCE CURRICULUM FRAMEWORK

The intent of this framework is to describe a core body of science knowledge that all students are expected to learn; knowledge that is assessed at the elementary, middle and high school levels. Although the framework introduces concepts from the life, physical and earth sciences at each grade level, schools may choose to design yearly courses that focus on one science discipline at a time, based on the needs of students and available instructional resources.

The framework is structured with the following components:

- **CONTENT STANDARDS** (the left-hand column of each page) are narrative statements of science concepts that guide the development of a rich and rigorous curriculum. They are marked with an identification code indicating the grade level and standard number (e.g., 3.2) and appear in bold type.

Content standards include the following:

- A **conceptual theme**, followed by an overarching **guiding question** (e.g., *Properties of Matter – How does the structure of matter affect the properties and uses of materials?*)
 - The **content standard**, a broad conceptual statement, identified with a numerical code that serves as a general learning goal for a unit of study.
 - One or two **supportive concepts**, identified with bullets, that provide more specific information about the focus of the learning unit.
- **EXPECTED PERFORMANCES** (the right-hand column of each page) identify the specific knowledge and abilities from the broader curriculum that will be assessed on the statewide tests given at Grades 5, 8 and 10.
 - **SCIENTIFIC INQUIRY, LITERACY AND NUMERACY** standards, although described separately for Grades PK-2, 3-5, 6-8 and 9-10, are intended to be learned, practiced and assessed within the context of learning the science content described for each grade level.
 - **UNDERSTANDING THE IDENTIFICATION CODES**
 - Each content standard is identified by a two-digit code (e.g., 2.3): The first digit refers to the grade level (second grade in the example), and the second digit identifies one of the four content standards for each grade level (standard 3 in the example).
 - Expected performances are identified by a letter (A, B, C or D) and a sequenced numeral (1 through 45) that indicates the number of expected performances within each gradespan:

A = Grades PK-2 (includes 24 expected performances)

B = Grades 3-5 (includes 25 expected performances)

C = Grades 6-8 (includes 30 expected performances)

D = Grades 9-10 (includes 45 expected performances)

Content Standards and Expected Performances

Core Science for Grades PreK-2



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THE STANDARDS FOR SCIENTIFIC INQUIRY, LITERACY AND NUMERACY ARE INTEGRAL PARTS OF THE CONTENT STANDARDS FOR EACH GRADE LEVEL IN THIS CLUSTER.

Grades PreK-2 Core Scientific Inquiry, Literacy and Numeracy

How is scientific knowledge created and communicated?

Content Standards	Expected Performances
<p>SCIENTIFIC INQUIRY</p> <ul style="list-style-type: none"> ◆ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena. <p>SCIENTIFIC LITERACY</p> <ul style="list-style-type: none"> ◆ Scientific literacy includes speaking, listening, presenting, interpreting, reading and writing about science. <p>SCIENTIFIC NUMERACY</p> <ul style="list-style-type: none"> ◆ Mathematics provides useful tools for the description, analysis and presentation of scientific data and ideas. 	<p>A INQ.1 Make observations and ask questions about objects, organisms and the environment.</p> <p>A INQ.2 Use senses and simple measuring tools to collect data.</p> <p>A INQ.3 Make predictions based on observed patterns.</p> <p>A INQ.4 Read, write, listen and speak about observations of the natural world.</p> <p>A INQ.5 Seek information in books, magazines and pictures.</p> <p>A INQ.6 Present information in words and drawings.</p> <p>A INQ.7 Use standard tools to measure and describe physical properties such as weight, length and temperature.</p> <p>A INQ.8 Use nonstandard measures to estimate and compare the sizes of objects.</p> <p>A INQ.9 Count, order and sort objects by their properties.</p> <p>A INQ.10 Represent information in bar graphs.</p>

PreK-Kindergarten

Core Themes, Content Standards and Expected Performances

Content Standards	Expected Performances
<p><i>Properties of Matter – How does the structure of matter affect the properties and uses of materials?</i></p> <p>K.1 - Objects have properties that can be observed and used to describe similarities and differences.</p> <ul style="list-style-type: none"> ◆ Some properties can be observed with the senses, and others can be discovered by using simple tools or tests. 	<p>A 1. Use the senses and simple measuring tools, such as rulers and equal-arm balances, to observe common objects and sort them into groups based on size, weight, shape or color.</p> <p>A 2. Sort objects made of materials such as wood, paper and metal into groups based on properties such as flexibility, attraction to magnets, and whether they float or sink in water.</p> <p>A 3. Count objects in a group and use mathematical terms to describe quantitative relationships such as: same as, more than, less than, equal, etc.</p>
<p><i>Heredity and Evolution – What processes are responsible for life’s unity and diversity?</i></p> <p>K.2 - Many different kinds of living things inhabit the Earth.</p> <ul style="list-style-type: none"> ◆ Living things have certain characteristics that distinguish them from nonliving things, including growth, movement, reproduction and response to stimuli. 	<p>A 4. Describe the similarities and differences in the appearance and behaviors of plants, birds, fish, insects and mammals (including humans).</p> <p>A 5. Describe the similarities and differences in the appearance and behaviors of adults and their offspring.</p> <p>A 6. Describe characteristics that distinguish living from nonliving things.</p>
<p><i>Energy in the Earth’s Systems – How do external and internal sources of energy affect the Earth’s systems?</i></p> <p>K.3 - Weather conditions vary daily and seasonally.</p> <ul style="list-style-type: none"> ◆ Daily and seasonal weather conditions affect what we do, what we wear and how we feel. 	<p>A 7. Describe and record daily weather conditions.</p> <p>A 8. Relate seasonal weather patterns to appropriate choices of clothing and activities.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>K.4 - Some objects are natural, while others have been designed and made by people to improve the quality of life.</p> <ul style="list-style-type: none"> ◆ Humans select both natural and man-made materials to build shelters based on local climate conditions, properties of the materials and their availability in the environment. 	<p>A 9. Describe the types of materials used by people to build houses, and the properties that make the materials useful.</p>

Grade 1

Core Themes, Content Standards and Expected Performances

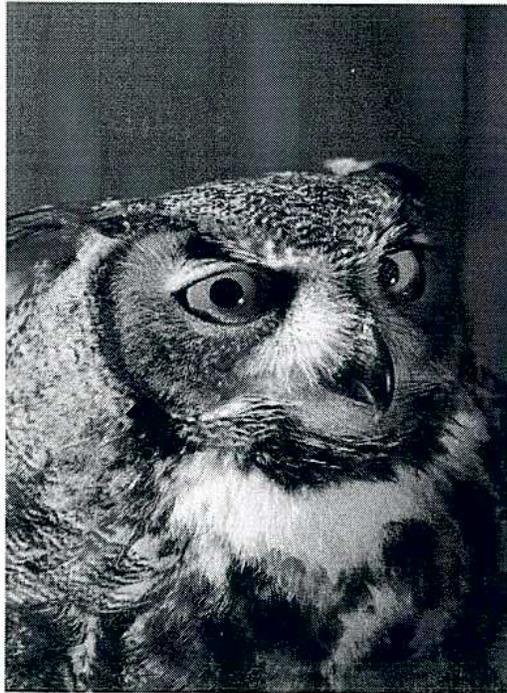
Content Standards	Expected Performances
<p><i>Forces and Motion – What makes objects move the way they do?</i></p> <p>1.1 - The sun appears to move across the sky in the same way every day, but its path changes gradually over the seasons.</p> <ul style="list-style-type: none"> ◆ An object’s position can be described by locating it relative to another object or the background. ◆ An object’s motion can be described by tracing and measuring its position over time. 	<p>A 10. Describe how the motion of objects can be changed by pushing and pulling.</p> <p>A 11. Describe the apparent movement of the sun across the sky and the changes in the length and direction of shadows during the day.</p>
<p><i>Structure and Function – How are organisms structured to ensure efficiency and survival?</i></p> <p>1.2 - Living things have different structures and behaviors that allow them to meet their basic needs.</p> <ul style="list-style-type: none"> ◆ Animals need air, water and food to survive. ◆ Plants need air, water and sunlight to survive. 	<p>A 12. Describe the different ways that animals, including humans, obtain water and food.</p> <p>A 13. Describe the different structures plants have for obtaining water and sunlight.</p> <p>A 14. Describe the structures that animals, including humans, use to move around.</p>
<p><i>Structure and Function – How are organisms structured to ensure efficiency and survival?</i></p> <p>1.3 - Organisms change in form and behavior as part of their life cycles.</p> <ul style="list-style-type: none"> ◆ Some organisms undergo metamorphosis during their life cycles; other organisms grow and change, but their basic form stays essentially the same. 	<p>A 15. Describe the changes in organisms, such as frogs and butterflies, as they undergo metamorphosis.</p> <p>A 16. Describe the life cycles of organisms that grow but do not metamorphose.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>1.4 - The properties of materials and organisms can be described more accurately through the use of standard measuring units.</p> <ul style="list-style-type: none"> ◆ Various tools can be used to measure, describe and compare different objects and organisms. 	<p>A 17. Estimate, measure and compare the sizes and weights of different objects and organisms using standard and nonstandard measuring tools.</p>

Grade 2
Core Themes, Content Standards and Expected Performances

Content Standards	Expected Performances
<p><i>Properties of Matter – How does the structure of matter affect the properties and uses of materials?</i></p> <p>2.1 - Materials can be classified as solid, liquid or gas based on their observable properties.</p> <ul style="list-style-type: none"> ◆ Solids tend to maintain their own shapes, while liquids tend to assume the shapes of their containers, and gases fill their containers fully. 	<p>A 18. Describe differences in the physical properties of solids and liquids.</p>
<p><i>Structure and Function – How are organisms structured to ensure efficiency and survival?</i></p> <p>2.2 - Plants change their forms as part of their life cycles.</p> <ul style="list-style-type: none"> ◆ The life cycles of flowering plants include seed germination, growth, flowering, pollination and seed dispersal. 	<p>A 19. Describe the life cycles of flowering plants as they grow from seeds, proceed through maturation and produce new seeds.</p> <p>A 20. Explore and describe the effects of light and water on seed germination and plant growth.</p>
<p><i>The Changing Earth – How do materials cycle through the Earth's systems?</i></p> <p>2.3 - Earth materials have varied physical properties which make them useful in different ways.</p> <ul style="list-style-type: none"> ◆ Soils can be described by their color, texture and capacity to retain water. ◆ Soils support the growth of many kinds of plants, including those in our food supply. 	<p>A 21. Sort different soils by properties, such as particle size, color and composition.</p> <p>A 22. Relate the properties of different soils to their capacity to retain water and support the growth of certain plants.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>2.4 - Human beings, like all other living things, have special nutritional needs for survival.</p> <ul style="list-style-type: none"> ◆ The essential components of balanced nutrition can be obtained from plant and animal sources. ◆ People eat different foods in order to satisfy nutritional needs for carbohydrates, proteins and fats. 	<p>A 23. Identify the sources of common foods and classify them by their basic food groups.</p> <p>A 24. Describe how people in different cultures use different food sources to meet their nutritional needs.</p>

Content Standards and Expected Performances

Core Science for Grades 3-5



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THE STANDARDS FOR SCIENTIFIC INQUIRY, LITERACY AND NUMERACY ARE INTEGRAL PARTS OF THE CONTENT STANDARDS FOR EACH GRADE LEVEL IN THIS CLUSTER.

Grades 3-5 Core Scientific Inquiry, Literacy and Numeracy

How is scientific knowledge created and communicated?

Content Standards	Expected Performances
<p>SCIENTIFIC INQUIRY</p> <ul style="list-style-type: none"> ◆ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena. <p>SCIENTIFIC LITERACY</p> <ul style="list-style-type: none"> ◆ Scientific literacy includes speaking, listening, presenting, interpreting, reading and writing about science. <p>SCIENTIFIC NUMERACY</p> <ul style="list-style-type: none"> ◆ Mathematics provides useful tools for the description, analysis and presentation of scientific data and ideas. 	<p>B INQ.1 Make observations and ask questions about objects, organisms and the environment.</p> <p>B INQ.2 Seek relevant information in books, magazines and electronic media.</p> <p>B INQ.3 Design and conduct simple investigations.</p> <p>B INQ.4 Employ simple equipment and measuring tools to gather data and extend the senses.</p> <p>B INQ.5 Use data to construct reasonable explanations.</p> <p>B INQ.6 Analyze, critique and communicate investigations using words, graphs and drawings.</p> <p>B INQ.7 Read and write a variety of science-related fiction and nonfiction texts.</p> <p>B INQ.8 Search the Web and locate relevant science information.</p> <p>B INQ.9 Use measurement tools and standard units (e.g., centimeters, meters, grams, kilograms) to describe objects and materials.</p> <p>B INQ.10 Use mathematics to analyze, interpret and present data.</p>

Grade 3
Core Themes, Content Standards and Expected Performances

Content Standards	Expected Performances
<p><i>Properties of Matter – How does the structure of matter affect the properties and uses of materials?</i></p> <p>3.1 - Materials have properties that can be identified and described through the use of simple tests.</p> <ul style="list-style-type: none"> ◆ Heating and cooling cause changes in some of the properties of materials. 	<p>B 1. Sort and classify materials based on properties such as dissolving in water, sinking and floating, conducting heat, and attracting to magnets.</p> <p>B 2. Describe the effect of heating on the melting, evaporation, condensation and freezing of water.</p>
<p><i>Heredity and Evolution – What processes are responsible for life's unity and diversity?</i></p> <p>3.2 - Organisms can survive and reproduce only in environments that meet their basic needs.</p> <ul style="list-style-type: none"> ◆ Plants and animals have structures and behaviors that help them survive in different environments. 	<p>B 3. Describe how different plants and animals are adapted to obtain air, water, food and protection in specific land habitats.</p> <p>B 4. Describe how different plants and animals are adapted to obtain air, water, food and protection in water habitats.</p>
<p><i>The Changing Earth – How do materials cycle through the Earth's systems?</i></p> <p>3.3 - Earth materials have different physical and chemical properties.</p> <ul style="list-style-type: none"> ◆ Rocks and minerals have properties that may be identified through observation and testing; these properties determine how earth materials are used. 	<p>B 5. Describe the physical properties of rocks and relate them to their potential uses.</p> <p>B 6. Relate the properties of rocks to the possible environmental conditions during their formation.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>3.4 - Earth materials provide resources for all living things, but these resources are limited and should be conserved.</p> <ul style="list-style-type: none"> ◆ Decisions made by individuals can impact the global supply of many resources. 	<p>B 7. Describe how earth materials can be conserved by reducing the quantities used, and by reusing and recycling materials rather than discarding them.</p>

Grade 4
Core Themes, Content Standards and Expected Performances

Content Standards	Expected Performances
<p><i>Forces and Motion – What makes objects move the way they do?</i></p> <p>4.1 - The position and motion of objects can be changed by pushing or pulling.</p> <ul style="list-style-type: none"> ◆ The size of the change in an object’s motion is related to the strength of the push or pull. ◆ The more massive an object is, the less effect a given force will have on its motion. 	<p>B 8. Describe the effects of the strengths of pushes and pulls on the motion of objects.</p> <p>B 9. Describe the effect of the mass of an object on its motion.</p>
<p><i>Matter and Energy in Ecosystems – How do matter and energy flow through ecosystems?</i></p> <p>4.2 - All organisms depend on the living and non-living features of the environment for survival.</p> <ul style="list-style-type: none"> ◆ When the environment changes, some organisms survive and reproduce, and others die or move to new locations. 	<p>B 10. Describe how animals, directly or indirectly, depend on plants to provide the food and energy they need in order to grow and survive.</p> <p>B 11. Describe how natural phenomena and some human activities may cause changes to habitats and their inhabitants.</p>
<p><i>Energy in the Earth’s Systems – How do external and internal sources of energy affect the Earth’s systems?</i></p> <p>4.3 - Water has a major role in shaping the Earth’s surface.</p> <ul style="list-style-type: none"> ◆ Water circulates through the Earth’s crust, oceans and atmosphere. 	<p>B 12. Describe how the sun’s energy impacts the water cycle.</p> <p>B 13. Describe the role of water in erosion and river formation.</p>
<p><i>Energy Transfer and Transformations – What is the role of energy in our world?</i></p> <p>4.4 - Electrical and magnetic energy can be transferred and transformed.</p> <ul style="list-style-type: none"> ◆ Electricity in circuits can be transformed into light, heat, sound and magnetic effects. ◆ Magnets can make objects move without direct contact between the object and the magnet. 	<p>B 14. Describe how batteries and wires can transfer energy to light a light bulb.</p> <p>B 15. Explain how simple electrical circuits can be used to determine which materials conduct electricity.</p> <p>B 16. Describe the properties of magnets, and how they can be used to identify and separate mixtures of solid materials.</p>

Grade 5
Core Themes, Content Standards and Expected Performances

Content Standards	Expected Performances
<p><i>Energy Transfer and Transformations – What is the role of energy in our world?</i></p> <p>5.1 - Sound and light are forms of energy.</p> <ul style="list-style-type: none"> ◆ Sound is a form of energy that is produced by the vibration of objects and is transmitted by the vibration of air and objects. ◆ Light is a form of energy that travels in a straight line and can be reflected by a mirror, refracted by a lens, or absorbed by objects. 	<p>B 17. Describe the factors that affect the pitch and loudness of sound produced by vibrating objects.</p> <p>B 18. Describe how sound is transmitted, reflected and/or absorbed by different materials.</p> <p>B 19. Describe how light is absorbed and/or reflected by different surfaces.</p>
<p><i>Structure and Function – How are organisms structured to ensure efficiency and survival?</i></p> <p>5.2 - Perceiving and responding to information about the environment is critical to the survival of organisms.</p> <ul style="list-style-type: none"> ◆ The sense organs perceive stimuli from the environment and send signals to the brain through the nervous system. 	<p>B 20. Describe how light absorption and reflection allow one to see the shapes and colors of objects.</p> <p>B 21. Describe the structure and function of the human senses and the signals they perceive.</p>
<p><i>Earth in the Solar System – How does the position of Earth in the solar system affect conditions on our planet?</i></p> <p>5.3 - Most objects in the solar system are in a regular and predictable motion.</p> <ul style="list-style-type: none"> ◆ The positions of the Earth and moon relative to the sun explain the cycles of day and night, and the monthly moon phases. 	<p>B 22. Explain the cause of day and night based on the rotation of Earth on its axis.</p> <p>B 23. Describe the monthly changes in the appearance of the moon, based on the moon's orbit around the Earth.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>5.4 - Humans have the capacity to build and use tools to advance the quality of their lives.</p> <ul style="list-style-type: none"> ◆ Advances in technology allow individuals to acquire new information about the world. 	<p>B 24. Compare and contrast the structures of the human eye with those of the camera.</p> <p>B 25. Describe the uses of different instruments, such as eye glasses, magnifiers, periscopes and telescopes, to enhance our vision.</p>

Content Standards and Expected Performances

Core Science for Grades 6-8



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THE STANDARDS FOR SCIENTIFIC INQUIRY, LITERACY AND NUMERACY ARE INTEGRAL PARTS OF THE CONTENT STANDARDS FOR EACH GRADE LEVEL IN THIS CLUSTER.

Grades 6-8 Core Scientific Inquiry, Literacy and Numeracy	
<i>How is scientific knowledge created and communicated?</i>	
Content Standards	Expected Performances
<p>SCIENTIFIC INQUIRY</p> <ul style="list-style-type: none"> ◆ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena. ◆ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation. ◆ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists. <p>SCIENTIFIC LITERACY</p> <ul style="list-style-type: none"> ◆ Scientific literacy includes speaking, listening, presenting, interpreting, reading and writing about science. ◆ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media. <p>SCIENTIFIC NUMERACY</p> <ul style="list-style-type: none"> ◆ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas. 	<p>C INQ.1 Identify questions that can be answered through scientific investigation.</p> <p>C INQ.2 Read, interpret and examine the credibility of scientific claims in different sources of information.</p> <p>C INQ.3 Design and conduct appropriate types of scientific investigations to answer different questions.</p> <p>C INQ.4 Identify independent and dependent variables, and those variables that are kept constant, when designing an experiment.</p> <p>C INQ.5 Use appropriate tools and techniques to make observations and gather data.</p> <p>C INQ.6 Use mathematical operations to analyze and interpret data.</p> <p>C INQ.7 Identify and present relationships between variables in appropriate graphs.</p> <p>C INQ.8 Draw conclusions and identify sources of error.</p> <p>C INQ.9 Provide explanations to investigated problems or questions.</p> <p>C INQ.10 Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.</p>

Grade 6
Core Themes, Content Standards and Expected Performances

Content Standards	Expected Performances
<p><i>Properties of Matter – How does the structure of matter affect the properties and uses of materials?</i></p> <p>6.1 - Materials can be classified as pure substances or mixtures, depending on their chemical and physical properties.</p> <ul style="list-style-type: none"> ◆ Mixtures are made of combinations of elements and/or compounds, and they can be separated by using a variety of physical means. ◆ Pure substances can be either elements or compounds, and they cannot be broken down by physical means. 	<p>C 1. Describe the properties of common elements, such as oxygen, hydrogen, carbon, iron and aluminum.</p> <p>C 2. Describe how the properties of simple compounds, such as water and table salt, are different from the properties of the elements of which they are made.</p> <p>C 3. Explain how mixtures can be separated by using the properties of the substances from which they are made, such as particle size, density, solubility and boiling point.</p>
<p><i>Matter and Energy in Ecosystems – How do matter and energy flow through ecosystems?</i></p> <p>6.2 - An ecosystem is composed of all the populations that are living in a certain space and the physical factors with which they interact.</p> <ul style="list-style-type: none"> ◆ Populations in ecosystems are affected by biotic factors, such as other populations, and abiotic factors, such as soil and water supply. ◆ Populations in ecosystems can be categorized as producers, consumers and decomposers of organic matter. 	<p>C 4. Describe how abiotic factors, such as temperature, water and sunlight, affect the ability of plants to create their own food through photosynthesis.</p> <p>C 5. Explain how populations are affected by predator-prey relationships.</p> <p>C 6. Describe common food webs in different Connecticut ecosystems.</p>
<p><i>Energy in the Earth's Systems – How do external and internal sources of energy affect the Earth's systems?</i></p> <p>6.3 - Variations in the amount of the sun's energy hitting the Earth's surface affect daily and seasonal weather patterns.</p> <ul style="list-style-type: none"> ◆ Local and regional weather are affected by the amount of solar energy these areas receive and by their proximity to a large body of water. 	<p>C 7. Describe the effect of heating on the movement of molecules in solids, liquids and gases.</p> <p>C 8. Explain how local weather conditions are related to the temperature, pressure and water content of the atmosphere and the proximity to a large body of water.</p> <p>C 9. Explain how the uneven heating of the Earth's surface causes winds.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>6.4 - Water moving across and through earth materials carries with it the products of human activities.</p> <ul style="list-style-type: none"> ◆ Most precipitation that falls on Connecticut eventually reaches Long Island Sound. 	<p>C 10. Explain the role of septic and sewage systems on the quality of surface and ground water.</p> <p>C 11. Explain how human activity may impact water resources in Connecticut, such as ponds, rivers and the Long Island Sound ecosystem.</p>

Grade 7
Core Themes, Content Standards and Expected Performances

Content Standards	Expected Performances
<p><i>Energy Transfer and Transformations – What is the role of energy in our world?</i></p> <p>7.1 - Energy provides the ability to do work and can exist in many forms.</p> <ul style="list-style-type: none"> ◆ Work is the process of making objects move through the application of force. ◆ Energy can be stored in many forms and can be transformed into the energy of motion. 	<p>C 12. Explain the relationship among force, distance and work, and use the relationship ($W=F \times D$) to calculate work done in lifting heavy objects.</p> <p>C 13. Explain how simple machines, such as inclined planes, pulleys and levers, are used to create mechanical advantage.</p> <p>C 14. Describe how different types of stored (potential) energy can be used to make objects move.</p>
<p><i>Structure and Function – How are organisms structured to ensure efficiency and survival?</i></p> <p>7.2 - Many organisms, including humans, have specialized organ systems that interact with each other to maintain dynamic internal balance.</p> <ul style="list-style-type: none"> ◆ All organisms are composed of one or more cells; each cell carries on life-sustaining functions. ◆ Multicellular organisms need specialized structures and systems to perform basic life functions. 	<p>C 15. Describe the basic structures of an animal cell, including nucleus, cytoplasm, mitochondria and cell membrane, and how they function to support life.</p> <p>C 16. Describe the structures of the human digestive, respiratory and circulatory systems, and explain how they function to bring oxygen and nutrients to the cells and expel waste materials.</p> <p>C 17. Explain how the human musculo-skeletal system supports the body and allows movement.</p>
<p><i>Energy in the Earth's Systems – How do external and internal sources of energy affect the Earth's systems?</i></p> <p>7.3 - Landforms are the result of the interaction of constructive and destructive forces over time.</p> <ul style="list-style-type: none"> ◆ Volcanic activity and the folding and faulting of rock layers during the shifting of the Earth's crust affect the formation of mountains, ridges and valleys. ◆ Glaciation, weathering and erosion change the Earth's surface by moving earth materials from place to place. 	<p>C 18. Describe how folded and faulted rock layers provide evidence of the gradual up and down motion of the Earth's crust.</p> <p>C 19. Explain how glaciation, weathering and erosion create and shape valleys and floodplains.</p> <p>C 20. Explain how the boundaries of tectonic plates can be inferred from the location of earthquakes and volcanoes.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>7.4 - Technology allows us to improve food production and preservation, thus improving our ability to meet the nutritional needs of growing populations.</p> <ul style="list-style-type: none"> ◆ Various microbes compete with humans for the same sources of food. 	<p>C 21. Describe how freezing, dehydration, pickling and irradiation prevent food spoilage caused by microbes.</p>

Grade 8
Core Themes, Content Standards and Expected Performances

Content Standards	Expected Performances
<p><i>Forces and Motion – What makes objects move the way they do?</i></p> <p>8.1 - An object’s inertia causes it to continue moving the way it is moving unless it is acted upon by a force to change its motion.</p> <ul style="list-style-type: none"> ◆ The motion of an object can be described by its position, direction of motion and speed. ◆ An unbalanced force acting on an object changes its speed and/or direction of motion. ◆ Objects moving in circles must experience force acting toward the center. 	<p>C 22. Calculate the average speed of a moving object and illustrate the motion of objects in graphs of distance over time.</p> <p>C 23. Describe the qualitative relationships among force, mass and changes in motion.</p> <p>C 24. Describe the forces acting on an object moving in a circular path.</p>
<p><i>Heredity and Evolution – What processes are responsible for life’s unity and diversity?</i></p> <p>8.2 - Reproduction is a characteristic of living systems and it is essential for the continuation of every species.</p> <ul style="list-style-type: none"> ◆ Heredity is the passage of genetic information from one generation to another. ◆ Some of the characteristics of an organism are inherited and some result from interactions with the environment. 	<p>C 25. Explain the similarities and differences in cell division in somatic and germ cells.</p> <p>C 26. Describe the structure and function of the male and female human reproductive systems, including the process of egg and sperm production.</p> <p>C 27. Describe how genetic information is organized in genes on chromosomes, and explain sex determination in humans.</p>
<p><i>Earth in the Solar System – How does the position of Earth in the solar system affect conditions on our planet?</i></p> <p>8.3 - The solar system is composed of planets and other objects that orbit the sun.</p> <ul style="list-style-type: none"> ◆ Gravity is the force that governs the motions of objects in the solar system. ◆ The motion of the Earth and moon relative to the sun causes daily, monthly and yearly cycles on Earth. 	<p>C 28. Explain the effect of gravity on the orbital movement of planets in the solar system.</p> <p>C 29. Explain how the regular motion and relative position of the sun, Earth and moon affect the seasons, phases of the moon and eclipses.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>8.4 - In the design of structures there is a need to consider factors such as function, materials, safety, cost and appearance.</p> <ul style="list-style-type: none"> ◆ Bridges can be designed in different ways to withstand certain loads and potentially destructive 	<p>C 30. Explain how beam, truss and suspension bridges are designed to withstand the forces that act on them.</p>

Content Standards and Expected Performances

Core Science for Grades 9-10



THE STANDARDS FOR SCIENTIFIC INQUIRY, LITERACY AND NUMERACY ARE INTEGRAL PARTS OF THE CONTENT STANDARDS FOR EACH GRADE LEVEL IN THIS CLUSTER.

Grades 9-10 Core Scientific Inquiry, Literacy and Numeracy

How is scientific knowledge created and communicated?

Content Standards	Expected Performances
<p>SCIENTIFIC INQUIRY</p> <ul style="list-style-type: none"> ◆ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena. ◆ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation. ◆ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists. <p>SCIENTIFIC LITERACY</p> <ul style="list-style-type: none"> ◆ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science. ◆ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media. <p>SCIENTIFIC NUMERACY</p> <ul style="list-style-type: none"> ◆ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas. 	<p>D INQ.1 Identify questions that can be answered through scientific investigation.</p> <p>D INQ.2 Read, interpret and examine the credibility and validity of scientific claims in different sources of information.</p> <p>D INQ.3 Formulate a testable hypothesis and demonstrate logical connections between the scientific concepts guiding the hypothesis and the design of the experiment.</p> <p>D INQ.4 Design and conduct appropriate types of scientific investigations to answer different questions.</p> <p>D INQ.5 Identify independent and dependent variables, including those that are kept constant and those used as controls.</p> <p>D INQ.6 Use appropriate tools and techniques to make observations and gather data.</p> <p>D INQ.7 Assess the reliability of the data that was generated in the investigation.</p> <p>D INQ.8 Use mathematical operations to analyze and interpret data, and present relationships between variables in appropriate forms.</p> <p>D INQ.9 Articulate conclusions and explanations based on research data, and assess results based on the design of the investigation.</p> <p>D INQ.10 Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.</p>

Grade 9

Core Themes, Content Standards and Expected Performances

Strand I: Energy Transformations

Content Standards	Expected Performances
<p><i>Energy Transfer and Transformations – What is the role of energy in our world?</i></p> <p>9.1 - Energy cannot be created or destroyed; however, energy can be converted from one form to another.</p> <ul style="list-style-type: none"> ◆ Energy enters the Earth system primarily as solar radiation, is captured by materials and photosynthetic processes, and eventually is transformed into heat. 	<p>D 1. Describe the effects of adding energy to matter in terms of the motion of atoms and molecules, and the resulting phase changes.</p> <p>D 2. Explain how energy is transferred by conduction, convection and radiation.</p> <p>D 3. Describe energy transformations among heat, light, electricity and motion.</p>
<p><i>Energy Transfer and Transformations – What is the role of energy in our world?</i></p> <p>9.2 - The electrical force is a universal force that exists between any two charged objects.</p> <ul style="list-style-type: none"> ◆ Moving electrical charges produce magnetic forces, and moving magnets can produce electrical force. ◆ Electrical current can be transformed into light through the excitation of electrons. 	<p>D 4. Explain the relationship among voltage, current and resistance in a simple series circuit.</p> <p>D 5. Explain how electricity is used to produce heat and light in incandescent bulbs and heating elements.</p> <p>D 6. Describe the relationship between current and magnetism.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>9.3 - Various sources of energy are used by humans and all have advantages and disadvantages.</p> <ul style="list-style-type: none"> ◆ During the burning of fossil fuels, stored chemical energy is converted to electrical energy through heat transfer processes. ◆ In nuclear fission, matter is transformed directly into energy in a process that is several million times as energetic as chemical burning. ◆ Alternative energy sources are being explored and used to address the disadvantages of using fossil and nuclear fuels. 	<p>D 7. Explain how heat is used to generate electricity.</p> <p>D 8. Describe the availability, current uses and environmental issues related to the use of fossil and nuclear fuels to produce electricity.</p> <p>D 9. Describe the availability, current uses and environmental issues related to the use of hydrogen fuel cells, wind and solar energy to produce electricity.</p>

Grade 9

Core Themes, Content Standards and Expected Performances

Strand II: Chemical Structures and Properties

Content Standards	Expected Performances
<p><i>Properties of Matter – How does the structure of matter affect the properties and uses of materials?</i></p> <p>9.4 - Atoms react with one another to form new molecules.</p> <ul style="list-style-type: none">◆ Atoms have a positively charged nucleus surrounded by negatively charged electrons.◆ The configuration of atoms and molecules determines the properties of the materials.	<p>D 10. Describe the general structure of the atom, and explain how the properties of the first 20 elements in the Periodic Table are related to their atomic structures.</p> <p>D 11. Describe how atoms combine to form new substances by transferring electrons (ionic bonding) or sharing electrons (covalent bonding).</p> <p>D 12. Explain the chemical composition of acids and bases, and explain the change of pH in neutralization reactions.</p>
<p><i>Properties of Matter – How does the structure of matter affect the properties and uses of materials?</i></p> <p>9.5 – Due to its unique chemical structure, carbon forms many organic and inorganic compounds.</p> <ul style="list-style-type: none">◆ Carbon atoms can bond to one another in chains, rings and branching networks to form a variety of structures, including fossil fuels, synthetic polymers and the large molecules of life.	<p>D 13. Explain how the structure of the carbon atom affects the type of bonds it forms in organic and inorganic molecules.</p> <p>D 14. Describe combustion reactions of hydrocarbons and their resulting by-products.</p> <p>D 15. Explain the general formation and structure of carbon-based polymers, including synthetic polymers, such as polyethylene, and biopolymers, such as carbohydrate.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>9.6 - Chemical technologies present both risks and benefits to the health and well-being of humans, plants and animals.</p> <ul style="list-style-type: none">◆ Materials produced from the cracking of petroleum are the starting points for the production of many synthetic compounds.◆ The products of chemical technologies include synthetic fibers, pharmaceuticals, plastics and fuels.	<p>D 16. Explain how simple chemical monomers can be combined to create linear, branched and/or cross-linked polymers.</p> <p>D 17. Explain how the chemical structure of polymers affects their physical properties.</p> <p>D 18. Explain the short- and long-term impacts of landfills and incineration of waste materials on the quality of the environment.</p>

Grade 9

Core Themes, Content Standards and Expected Performances

Strand III: Global Interdependence

Content Standards	Expected Performances
<p><i>The Changing Earth – How do materials cycle through the Earth's systems?</i></p> <p>9.7 - Elements on Earth move among reservoirs in the solid earth, oceans, atmosphere and organisms as part of biogeochemical cycles.</p> <ul style="list-style-type: none"> ◆ Elements on Earth exist in essentially fixed amounts and are located in various chemical reservoirs. ◆ The cyclical movement of matter between reservoirs is driven by the Earth's internal and external sources of energy. 	<p>D 19. Explain how chemical and physical processes cause carbon to cycle through the major earth reservoirs.</p> <p>D 20. Explain how solar energy causes water to cycle through the major earth reservoirs.</p> <p>D 21. Explain how internal energy of the Earth causes matter to cycle through the magma and the solid earth.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>9.8 - The use of resources by human populations may affect the quality of the environment.</p> <ul style="list-style-type: none"> ◆ Emission of combustion by-products, such as SO₂, CO₂ and NO_x by industries and vehicles is a major source of air pollution. ◆ Accumulation of metal and non-metal ions used to increase agricultural productivity is a major source of water pollution. 	<p>D 22. Explain how the release of sulfur dioxide (SO₂) into the atmosphere can form acid rain, and how acid rain affects water sources, organisms and human-made structures.</p> <p>D 23. Explain how the accumulation of carbon dioxide (CO₂) in the atmosphere increases Earth's "greenhouse" effect and may cause climate changes.</p> <p>D 24. Explain how the accumulation of mercury, phosphates and nitrates affects the quality of water and the organisms that live in rivers, lakes and oceans.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>9.9 - Some materials can be recycled, but others accumulate in the environment and may affect the balance of the Earth systems.</p> <ul style="list-style-type: none"> ◆ New technologies and changes in lifestyle can have positive and/or negative effects on the environment. 	<p>D 25. Explain how land development, transportation options and consumption of resources may affect the environment.</p> <p>D 26. Describe human efforts to reduce the consumption of raw materials and improve air and water quality.</p>

Grade 10

Core Themes, Content Standards and Expected Performances

Strand IV: Cell Chemistry and Biotechnology

Content Standards	Expected Performances
<p><i>Structure and Function – How are organisms structured to ensure efficiency and survival?</i></p> <p>10.1 - Fundamental life processes depend on the physical structure and the chemical activities of the cell.</p> <ul style="list-style-type: none">◆ Most of the chemical activities of the cell are catalyzed by enzymes that function only in a narrow range of temperature and acidity conditions.◆ The cellular processes of photosynthesis and respiration involve transformation of matter and energy.	<p>D 27. Describe significant similarities and differences in the basic structure of plant and animal cells.</p> <p>D 28. Describe the general role of DNA and RNA in protein synthesis.</p> <p>D 29. Describe the general role of enzymes in metabolic cell processes.</p> <p>D 30. Explain the role of the cell membrane in supporting cell functions.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>10.2 - Microorganisms have an essential role in life processes and cycles on Earth.</p> <ul style="list-style-type: none">◆ Understanding the growth and spread patterns of viruses and bacteria enables the development of methods to prevent and treat infectious diseases.	<p>D 31. Describe the similarities and differences between bacteria and viruses.</p> <p>D 32. Describe how bacterial and viral infectious diseases are transmitted, and explain the roles of sanitation, vaccination and antibiotic medications in the prevention and treatment of infectious diseases.</p> <p>D 33. Explain how bacteria and yeasts are used to produce foods for human consumption.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>10.3 - Similarities in the chemical and structural properties of DNA in all living organisms allow the transfer of genes from one organism to another.</p> <ul style="list-style-type: none">◆ The principles of genetics and cellular chemistry can be used to produce new foods and medicines in biotechnological processes.	<p>D 34. Describe, in general terms, how the genetic information of organisms can be altered to make them produce new materials.</p> <p>D 35. Explain the risks and benefits of altering the genetic composition and cell products of existing organisms.</p>

Grade 10

Core Themes, Content Standards and Expected Performances

Strand V: Genetics, Evolution and Biodiversity

Content Standards	Expected Performances
<p><i>Heredity and Evolution – What processes are responsible for life’s unity and diversity?</i></p> <p>10.4. - In sexually reproducing organisms, each offspring contains a mix of characteristics inherited from both parents.</p> <ul style="list-style-type: none"> ◆ Genetic information is stored in genes that are located on chromosomes inside the cell nucleus. ◆ Most organisms have two genes for each trait, one on each of the homologous chromosomes in the cell nucleus. 	<p>D 36. Explain how meiosis contributes to the genetic variability of organisms.</p> <p>D 37. Use the Punnet Square technique to predict the distribution of traits in mono- and di-hybrid crossings.</p> <p>D 38. Deduce the probable mode of inheritance of traits (e.g., recessive/dominant, sex-linked) from pedigree diagrams showing phenotypes.</p> <p>D 39. Describe the difference between genetic disorders and infectious diseases.</p>
<p><i>Heredity and Evolution – What processes are responsible for life’s unity and diversity?</i></p> <p>10.5 - Evolution and biodiversity are the result of genetic changes that occur over time in constantly changing environments.</p> <ul style="list-style-type: none"> ◆ Mutations and recombination of genes create genetic variability in populations. ◆ Changes in the environment may result in the selection of organisms that are better able to survive and reproduce. 	<p>D 40. Explain how the processes of genetic mutation and natural selection are related to the evolution of species.</p> <p>D 41. Explain how the current theory of evolution provides a scientific explanation for fossil records of ancient life forms.</p> <p>D 42. Describe how structural and behavioral adaptations increase the chances for organisms to survive in their environments.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p>10.6 - Living organisms have the capability of producing populations of unlimited size, but the environment can support only a limited number of individuals from each species.</p> <ul style="list-style-type: none"> ◆ Human populations grow due to advances in agriculture, medicine, construction and the use of energy. ◆ Humans modify ecosystems as a result of rapid population growth, use of technology and consumption of resources. 	<p>D 43. Describe the factors that affect the carrying capacity of the environment.</p> <p>D 44. Explain how change in population density is affected by emigration, immigration, birth rate and death rate, and relate these factors to the exponential growth of human populations.</p> <p>D 45. Explain how technological advances have affected the size and growth rate of human populations throughout history.</p>



This annual "consumer confidence report" also includes information on topics such as where our water comes from, what is being done to improve the water system, and how you can help preserve our water supply.

In 2004, water supplied by the Meriden Water Division met or surpassed all federal and state standards. See inside for the results of our tests on a wide range of contaminants.

2004 Annual Water Quality Report

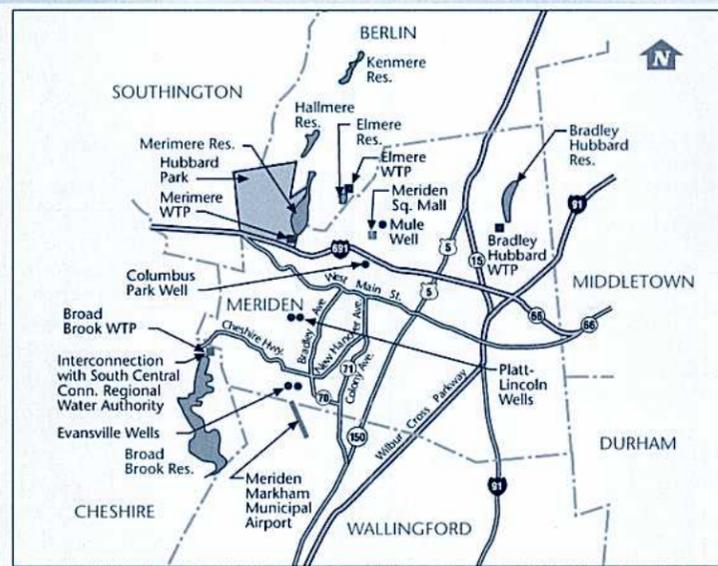


City of Meriden, Connecticut

Meriden Water Division Answers Your Drinking Water Questions

Q-Where does my water come from?

A-Water supplied to you from the Meriden Water Division actually has several different sources. Each of these sources is shown on the map below. These sources include four reservoirs on the Meriden-Berlin town line, the Broad Brook Reservoir on the Meriden-Cheshire town line, the Bradley-Hubbard Reservoir in the north-east corner of Meriden, and six groundwater wells located throughout the City. Depending on system requirements, the City also purchases water from the South Central Connecticut Regional Water Authority. Water from the reservoirs is treated at one of Meriden's four water treatment plants. Water from each well is treated at each individual well field. After water is treated, it is distributed to city homes and businesses through a vast network of underground pipelines.



performed to clean the pipes of iron and other deposits that accumulate over time. Capital improvement projects also can improve the water. For instance, we have developed a hydraulic and water quality computer model of our distribution system, a water improvement master plan and a Supervisory Control And Data Acquisition (SCADA) system for our existing water treatment and distribution facilities that is helping us prioritize system needs and better deliver water to you. Other projects include continued implementation of water main cleaning and lining programs to improve water quality and reduce operating costs.

Q-Why does the taste and odor of my water vary?

A-Water naturally varies in taste and odor at different times of the year and will vary due to different sources. Typically, taste and odor compounds in water sources are more common during the summer. Because Meriden utilizes different sources based on the need and time of

Q-What is being done to improve the system?

A-The Meriden Water Division is constantly trying to enhance both the quality and taste of your water. We do this through maintenance and capital improvement projects.

Routine maintenance such as water main flushing is

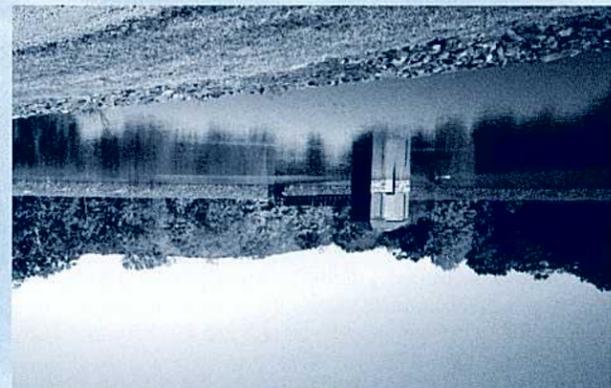
- You can conserve outdoors as well:**
- Water the lawn and garden in the early morning or evening.
 - Use mulch around plants and shrubs.
 - Repair leaks in faucets and hoses.
 - Use water-saving nozzles and sprinkler heads.
 - Use water from a bucket to wash your car and save the hose for rinsing.

- Fix leaking faucets, pipes, and toilets.
- Install water-saving devices in faucets, toilets and appliances.
- Replace high-water-use fixtures.
- Wash only full loads of laundry.
- Do not use the toilet for trash disposal.
- Take shorter showers.
- Do not let the water run while shaving or brushing teeth.
- Run the dishwasher only when full.

Conservation measures you can use inside your home:

Conservation is an important first step in preserving our water supply. Using these measures can also save you money by reducing your water and sewer bills. Here are a few suggestions.

Water Conservation Tips



Reservoir Intake

The SDWA requires that we provide you with detailed information on water quality each year. We are happy to do this, because customers who are informed are our best allies in supporting improvements necessary for the long-term health of our water system. And remember – our City Council meetings are open to the public. You are always welcome to attend and to voice your views on our drinking water. For information on meeting times and location, please contact the City Clerk at (203) 630-4030.

The public has a part to play too

Through the federal Safe Drinking Water Act (SDWA), the U.S. Environmental Protection Agency (U.S. EPA) sets national limits for hundreds of substances in drinking water and also specifies various treatments that water systems must use to remove those substances. The Meriden Water Division continually monitors for these substances, using sophisticated equipment and advanced procedures.

The Water Division is constantly checking water quality

Together We Can Safeguard Our Water Supply

the year, certain customers will notice the different tastes and odors as the sources and seasons change. Taste and odor changes do not pose any health concerns.

Q-Could there be lead in my water?

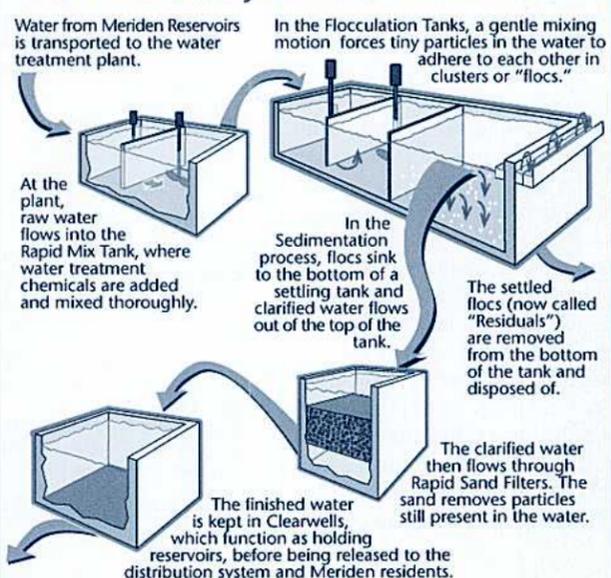
A-Lead has not been detected in the frequent tests we run on finished water at our treatment plants. The Meriden Water Division adds a phosphate-based corrosion inhibitor that aids in reducing lead and copper corrosion in the distribution system. Regularly monitored levels of the corrosion inhibitor were consistently within the range desired for corrosion control. The addition of this chemical helps to provide the safest drinking water possible.

Even though we use a corrosion inhibitor, it is possible that lead can leach from common household plumbing fixtures. Older homes are more likely to have fixtures that contain lead. To minimize exposure to lead in your tap water, run the water until it is cold (about 30 to 60 seconds) if it has been standing in the pipes for more than six hours.

Q-Does our water contain fluoride?

A-Fluoride is added to your water to help prevent tooth decay. Levels of fluoride are consistently within limits set by state and federal regulation.

How we treat your reservoir water



What's In My Water? - Meriden Water-Quality Analysis

Contaminant	Date Tested	Unit	MCL	MCLG	Highest Detected Level	Range	Major Sources	Violation
Inorganic Contaminants								
Copper	2004	ppm	AL=1.3	1.30	0.412	<0.004-0.412	Corrosion of household plumbing systems; Erosion of natural deposits; Leaching from wood preservatives	NO
Lead	2004	ppb	AL=15	0	3	<1-3	Corrosion of household plumbing systems; Erosion of natural deposits	NO
Fluoride	2004	ppm	4	4	1.79	<0.10-1.79	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories.	NO
Nitrate	2004	ppm	10	10	3.6	<0.05-3.6	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits	NO
Nitrite	2004	ppm	1	1	0.08	<0.01-0.08	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits	NO
Barium	2004	ppm	2	2	0.29	0.005-0.29	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits	NO
Sodium	2004	ppm	AL=28+	n/a	324	1.76-324	Stormwater runoff containing road salt	NO ⁽¹⁾
Chlorine	2004	ppm	4.0	4.0	3.00	0-3.00	Water additives used to control microbes	NO
Sulfate	2004	ppb	250 ⁽²⁾	n/a	37	6.0-37	Naturally occurring	NO
Asbestos	2000 ⁽³⁾	mfl	7	7	0.53	ND-0.53	Decay of asbestos cement water mains; Erosion of natural deposits	NO
Chloride	2004	ppm	250	n/a	250	4.1-250	Water additives used to control microbes	NO
Nickel	2004	ppm	4.0	n/a	0.004	<0.001-0.004	Discharge from steel and pulp mills, erosion of natural deposits	NO
Radioactive Contaminants								
Alpha emitters	2004	pci/L	15	0	1.9	0-1.9	Erosion of natural deposits	NO
Radium (combined)	2004	pci/L	5	0	1.63	0-1.63	Erosion of natural deposits	NO
Uranium	2004	pci/L	30	0	1.9	0-1.9	Erosion of natural deposits	NO
Microbiological Contaminants								
Turbidity (combined filter effluent)	2004	%>0.3/MO NTU	TT ⁽⁴⁾ 0.3 ⁽⁴⁾	n/a n/a	0 0.144	0 0.018-0.144	Soil runoff	NO NO
Turbidity (system)	2004	NTU	5 ⁽⁴⁾	n/a	1.54	0.05-1.54	Soil runoff	NO
Total Coliform	2004	%POS/MO	5% ⁽⁵⁾	0	0.52%	0-0.52%	Naturally present in the environment	NO
Heterotrophic Plate Count	2004	cfu/mL	500	n/a	173	0-173	Measures a range of bacteria that are naturally present in the environment	NO
Volatile Organic Contaminants								
Tetrachloroethylene	2004	ppb	5	0	1.7	<0.5-1.7	Discharge from factories and dry cleaners	NO
Trichloroethylene	2004	ppb	5	0	0.85	<0.5-0.85	Discharge from metal degreasing sites and other factories	NO
1,1,1-Trichloroethane	2004	ppb	200	200	1.5	<0.5-1.5	Discharge from metal degreasing sites and other factories	NO
TTHMs [Total Trihalomethanes]	2004	ppb	80 ⁽⁶⁾	n/a	54	32-54	By-product of drinking water disinfection	NO
HAAs [Haloacetic acids]	2004	ppb	60 ⁽⁶⁾	n/a	48	24-48	By-product of drinking water disinfection	NO

We are pleased to report that during the past year, the water delivered to your home or business complied with, or did better than, all state and federal drinking water requirements. Each year we analyze thousands of water samples for bacteria, turbidity, inorganic contaminants, lead and copper, nitrate, volatile organic contaminants, total trihalomethanes, and synthetic organic contaminants. For your information, we have listed in the table on the left the substances that were detected in our drinking water during the year. Although all of the substances listed are under the Maximum Contaminant Level (MCL) set by U.S. EPA, we believe it is important that you know exactly what was detected and how much of the substance was present in the water.

Notes To Table

- ⁽¹⁾ Although sodium does not have a MCL, the State requires that the water supplier provide notification to customers of levels exceeding 28.0 ppm. Therefore, if levels of sodium were recorded from a supply source in your area, you were previously provided notification of the event. Elevated levels of sodium were believed to be caused by road salt.
- ⁽²⁾ The National Secondary Drinking Water Guideline for sulfate.
- ⁽³⁾ Asbestos is not tested for every year; the most recent results available are given.
- ⁽⁴⁾ Turbidity: As of January 1, 2002, for conventional and direct filtration combined filter effluent, turbidity may never exceed 1 NTU, and must not exceed 0.3 NTU in 95% of daily samples in any month. At no time can turbidity at any point in the system exceed 5 NTU.
- ⁽⁵⁾ No more than 5% of monthly samples can be positive in any given month for total coliform.
- ⁽⁶⁾ As of January 1, 2002, these standards refer to running annual averages. Data from the last three quarters of 2004 is included in figuring these averages.

Key To Table

AL = Action Level
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
NTU = Nephelometric Turbidity Units
ppm = parts per million, or milligrams per liter (mg/l)
ppb = parts per billion, or micrograms per liter (µg/l)
TT = Treatment Technique
pci/l = Picocuries per liter
mfl = Million fibers per liter
cfu/mL = bacterial colonies per milliliter

Understanding Contaminants

To ensure that tap water is safe to drink, U.S. EPA prescribes regulations limiting the amount of certain contaminants in water provided by public water systems. U.S. Food and Drug Administration regulations establish limits for contaminants in bottled water, which must provide the same protection for public health. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of these contaminants does not necessarily indicate that the water poses a health risk.

The sources of both tap and bottled drinking water include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water from these sources travels over the surface of the land or through the ground, it can acquire naturally occurring minerals (which in some cases could be radioactive) and substances resulting from the presence of animals or from a wide variety of human and industrial activities. Substances that may be present in source water include:

Inorganic Contaminants, such as salts and metals, which can be naturally occurring or may result from such things as urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, or mining. This category of contaminants also includes the pesticides and herbicides used primarily in agriculture.

Radioactive Contaminants, which can be naturally occurring or may be the result of oil and gas production and mining activities.

Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations or wildlife.

Volatile Organic (and Synthetic) Contaminants, which are typically by-products of industrial processes and petroleum production, and may also come from gas stations, urban stormwater runoff, and septic systems.

As the table above demonstrates, the Meriden Water Division removes these contaminants prior to distribution. Meriden water meets or surpasses all state and federal drinking water requirements.

For more information about contaminants and potential health effects, call the U.S. EPA's Safe Drinking Water Hotline at 800-426-4791.

Regulated Contaminants

Meriden Water Division tests for a large number of contaminants, though only detected contaminants are noted. Every regulated contaminant that we detected in the water is listed in the water-quality table above. In 2004, the Meriden Water Division's drinking water met or surpassed all federal and state drinking water standards.

Unregulated Contaminants

Meriden Water Division was not required to test for *Cryptosporidium* in 2004.

Health Matters

The presence of contaminants in drinking water does not necessarily indicate that the water poses a potential health threat.

A few contaminants, like copper, are in fact essential nutrients at appropriate, very low concentrations. However, some people who drink water that contains copper in excess of the EPA's Action Level could experience gastrointestinal distress over a relatively short period of time. Over many years, ingesting water that contains copper in excess of the Action Level could lead to liver or kidney damage. People with Wilson's disease should consult their personal doctor about their water consumption.

Lead is also a concern. Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink water containing lead in excess of the action level over many years could develop kidney problems or high blood pressure.

Some people may be more vulnerable to contaminants in drinking water than is the general population. Immunocompromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ

transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* are available from the Safe Drinking Water Hotline (800-426-4791).

Source Water Assessment

Source Water Assessment Reports were completed by the Department of Public Health, Drinking Water Division for the Meriden Water Division. The assessment report can be found at <http://www.dph.state.ct.us/BRS/Water/SWAP/SWAP.htm>.

The assessment found that Meriden's surface water sources (Bradley Hubbard, Broadbrook, Kenmere and Merimere) have a LOW susceptibility to potential sources of contamination. Meriden's groundwater sources (Evansville, Platt-Lincoln, Mule, Columbus Park) ratings vary from MODERATE to HIGH, resulting from zoning regulations, aquifer protection regulations and potential contaminants in the source water.

The ratings are not a measure of the quality of water supplied to the consumers. They provide valuable direction to further securing our water sources.

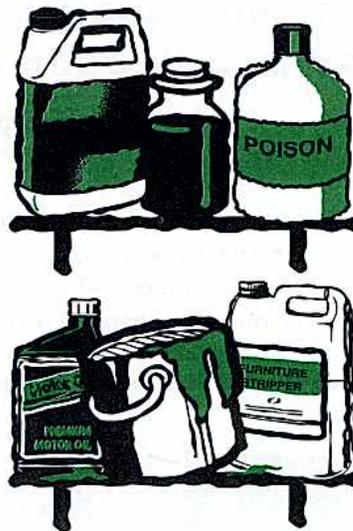


Kenmere Reservoir

Do You Have Hazardous Waste Hiding in Your Home?

Get Rid of It!

Household hazardous products can pose serious risks to your family's health and the health of our environment. Luckily, getting rid of them safely can be easy. Just bring unused portions of the hazardous products in the checklist below to one of the Household Hazardous Waste Collection Days listed in this brochure. Be sure to keep products in their original containers and don't mix them. And always keep materials in a safe place away from children, pets and heat.



When Using Household Hazardous Products...

Check the label.

If the product you are using is toxic, corrosive, reactive, explosive or flammable it can be hazardous to you and our environment.

- NEVER throw leftover chemicals down the drain, in stormdrains, on the ground or in the trash.
- Give leftover or extra product to someone who can use it or bring it to a HHW collection day.
- Recycle used motor oil at your town's designated collection site.
- Recycle lead-acid car batteries by bringing them to a scrap metal dealer or battery retailer.
- Buy only what you need - use all of what you buy.
- Use non-toxic or less toxic substitutes for hazardous products.



Household Hazardous Products Checklist

These items should be brought to Hazardous Waste Collection Days. Be careful! Make sure products are sealed. Pack them in a sturdy crate or cardboard box. Leave in your car only as long as necessary, and never smoke while handling.

In the Kitchen and Bathroom:

- Non-empty aerosol cans
- Household batteries
- Furniture, floor & metal polishes
- Laundry products like bleach & spot removers
- Oven, drain & household cleaners
- Bug sprays
- Disinfectants & mildew removers

In the Garage and Garden:

- Oil-based paint, varnishes, shellac, stains, thinners & paint strippers
- Pool and photographic chemicals
- Lawn care chemicals such as pesticides & fertilizers
- Auto fluids such as motor oil, & antifreeze
- Car waxes and cleaners

Miscellaneous:

- Mercury (including thermometers and thermostats), waste fuel, moth balls, cosmetics, hobby supplies

DO NOT bring:

- Latex paint
- Empty aerosol cans
- Ammunition & other explosives
- Smoke detectors & radioactive materials
- Propane tanks
- Medicines
- Commercial or industrial waste
- Tires
- Appliances such as air conditioners, television sets, and computers

Electronics:

- Electronics are not collected at TROC Household Hazardous Waste collections. Watch for local notice of an upcoming "electronics only" collection day, or visit our web site at www.brrfoc.org

NO WASTE FROM BUSINESSES
5 Gallon per person limit.



Residents of Washington and Warren may attend the following collection day.

Fall 2005* in New Milford

Water Pollution Control Facility

Residents of Morris may attend the following collection day:

October 2005*

Torrington Water Pollution Control Facility

* Look for local notice in Fall 2005

See back panel for more collection days in your area



Collection Days

Residents of Berlin, Bristol, Burlington, Meriden, New Britain, Plainville, Plymouth Prospect, Southington and Wolcott may attend any of the following collections:

All collections: 9:00am-2:00pm

2005

April 16 Burlington

Town Highway Garage
Belden Rd. (off Route 4)

May 7 Plainville

Roadways Garage
Granger Lane (off Route 177)

September 17 Southington

Town Highway Garage
Della Bitta Dr. (off Mulberry St.)

September 24 Prospect

Public Works Garage
221 Cheshire Rd.

October 1 Bristol

Town Public Works Yard
Vincent P. Kelly Rd. (Off Route 229)

October 22 New Britain/Berlin

Willow Brook Park/Beehive Stadium
South Main St. Entrance (Route 71)

Plymouth

For more information, call 860-585-0419
or visit www.brrfoc.org/news_events.htm

Resident I.D. is required.

Why Household Hazardous Waste Collection Days?

Bringing your hazardous household products to a collection day is a great way to:

- Reduce the chances of accidental poisoning
- Prevent damage to sewage systems
- Help protect surface and ground water
- Reduce the risk of harmful fumes or fires



Moving??

If you are moving before a collection day try to get a neighbor, friend or family member to bring your hazardous products to a collection day for you.

How to dispose of Latex Paints

- Add kitty litter or speedi-dry or waste paint hardener. When completely dry dispose of paint with regular garbage leaving the cover off the paint can.

For more information call your town's recycling contact or Tunxis Recycling at: 860-585-0419 or 860-225-9811

or visit www.brrfoc.org



Tunxis Recycling

43 Enterprise Drive
Bristol, CT 06010
www.brrfoc.org

Printed on recycled paper.



Household Hazardous Product Disposal Information



Tunxis Recycling

www.brrfoc.org

860-585-0419 or 860-225-9811

Helping to Make Homes Healthier in Berlin, Bristol, Burlington, Meriden, Morris, New Britain, Plainville, Plymouth, Prospect, Southington, Warren, Washington and Wolcott.

Storm Drain: Where Does the Water Go?

Do you know that difference between a "storm drain" and a "sewer drain"? Most people don't realize that these are two separate systems. The sewer drain carries sewage from your house and is processed and treated at the Water Pollution Control Facility. The large circular plates you see in the middle of the street are actually manhole covers for the sewer lines.

Storm drains or catch basins are the open or grated drains you see at the sides of the road by the curb. These drains collect all the water run-off from street to help in flood control. The big difference between these systems is that this water is NOT processed or treated. This water goes directly to streams, brooks and rivers. Some of these water sources are actually part of the public drinking water system.

Many people ask "so why put a storm drain in an areas that have the potential to directly pollute our water ways". The answer is that storm drains are designed to reduce the potential for road flooding, including parking lots and highways. It is the responsibility of all residents to protect the water, both drinking and recreational.

How do we do this? Simple: Don't put anything directly into the storm drains that could pollute the water. Some examples include waste oil or other auto fluids generated from routine car maintenance, leaves that you remove from your property, litter and dog feces. These items are also called "non-point source pollution".

So what do you do with your auto fluids, leaves and dog feces? Auto fluids and yard waste should be properly recycled, contact the Public Works Dept. (630-4259) concerning the location and operation times of the landfill. Dog feces should be bagged and placed with your normal household garbage. Teach young children not to throw gum wrappers or other litter into the street.

What should you do if you see someone dumping in a catch basin? First, try to educate the person, maybe they don't realize that they are polluting the water. Also contact the health department (630-4226) so that we may educate the person dumping. If the person continues to dump, they may face legal action. You should also contact the Public Works Department if you notice a catch basin in need of cleaning.

Safe and clean water is everyone responsibility.

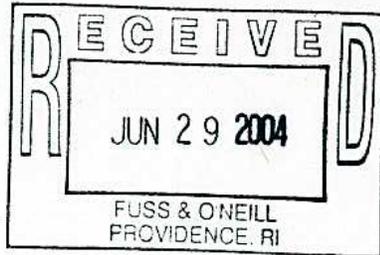
APPENDIX C
PUBLIC NOTICES



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COPY

CITY OF MERIDEN
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

CITY HALL
142 EAST MAIN STREET, ROOM 19
MERIDEN, CONNECTICUT 06450
(203) 630-4018
FAX (203) 630-4025



MARK G. ZEBORA, DIRECTOR
PARKS & PUBLIC WORKS

PIERRE L. BLANCHET, P.E./L.S.
CITY ENGINEER

June 25, 2004

Record-Journal
Crown Street Square
Meriden, Connecticut 06450
Attn: Legal Advertising Department

RE: Public Notice- Storm Water Plan

Dear Sir or Madam:

Please publish the attached Public Notice in the Record-Journal on Saturday, June 26, 2004.

Kindly send the invoice to the Engineering Department, Room 19, 142 East Main Street, Meriden, Connecticut, 06450. In addition, please send an Affidavit of Publication to my attention in Engineering.

Very truly yours,

Marguerite Burris
Administrative Secretary

/mb

Attachment

cc: Mark G. Zebora, Director of Parks and Public Works, w/o attachment
Robert T. Mercaldi, Assistant Director, Water Pollution Control Facility, with attachment
Pierre L. Blanchet, P.E./L.S., City Engineer, with attachment
Robert J. Bass, P.E., Associate City Engineer, with attachment
✓ Jay Brolin, Fuss & O'Neill, 275 Promenade Street, Suite 350, Providence, R.I. 02908, with attachment
Project File-NPDES, with attachment
File

Informational Meeting - Storm Water Plan

The City of Meriden will be conducting a Public Informational Meeting on Wednesday, June 30, 2004, at 6:00 PM in the Engineering Conference Room 28, Ground Floor, City Hall, 142 East Main Street, Meriden, Connecticut. Copies of the report are available for review between the hours of 8:00 A.M. and 5:00 P.M. in the Engineering Office, Room 19, Ground Floor.

Written comments regarding the Storm Water Plan may be submitted to Robert J. Bass, P.E., Associate City Engineer until the close of business on Friday, July 2, 2004.

APPENDIX D
IDDE OUTFALL INVENTORY FORM

OUTFALL RECONNAISSANCE INVENTORY/ SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

Subwatershed:		Outfall ID:	
Today's date:		Time (Military):	
Investigators:		Form completed by:	
Temperature (°F):	Rainfall (in.):	Last 24 hours:	Last 48 hours:
Latitude:	Longitude:	GPS Unit:	GPS LMK #:
Camera:		Photo #s:	
Land Use in Drainage Area (Check all that apply):			
<input type="checkbox"/> Industrial		<input type="checkbox"/> Open Space	
<input type="checkbox"/> Ultra-Urban Residential		<input type="checkbox"/> Institutional	
<input type="checkbox"/> Suburban Residential		Other: _____	
<input type="checkbox"/> Commercial		Known Industries: _____	
Notes (e.g., origin of outfall, if known):			

Section 2: Outfall Description

LOCATION	MATERIAL	SHAPE	DIMENSIONS (IN.)	SUBMERGED
<input type="checkbox"/> Closed Pipe	<input type="checkbox"/> RCP <input type="checkbox"/> CMP <input type="checkbox"/> PVC <input type="checkbox"/> HDPE <input type="checkbox"/> Steel <input type="checkbox"/> Other: _____	<input type="checkbox"/> Circular <input type="checkbox"/> Single <input type="checkbox"/> Elliptical <input type="checkbox"/> Double <input type="checkbox"/> Box <input type="checkbox"/> Triple <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____	Diameter/Dimensions: _____	In Water: <input type="checkbox"/> No <input type="checkbox"/> Partially <input type="checkbox"/> Fully With Sediment: <input type="checkbox"/> No <input type="checkbox"/> Partially <input type="checkbox"/> Fully
<input type="checkbox"/> Open drainage	<input type="checkbox"/> Concrete <input type="checkbox"/> Earthen <input type="checkbox"/> rip-rap <input type="checkbox"/> Other: _____	<input type="checkbox"/> Trapezoid <input type="checkbox"/> Parabolic <input type="checkbox"/> Other: _____	Depth: _____ Top Width: _____ Bottom Width: _____	
<input type="checkbox"/> In-Stream	(applicable when collecting samples)			
Flow Present?	<input type="checkbox"/> Yes <input type="checkbox"/> No <i>If No, Skip to Section 5</i>			
Flow Description (If present)	<input type="checkbox"/> Trickle <input type="checkbox"/> Moderate <input type="checkbox"/> Substantial			

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS				
PARAMETER	RESULT	UNIT	EQUIPMENT	
<input type="checkbox"/> Flow #1	Volume		Liter	Bottle
	Time to fill		Sec	
<input type="checkbox"/> Flow #2	Flow depth		In	Tape measure
	Flow width	____' ____"	Ft, In	Tape measure
	Measured length	____' ____"	Ft, In	Tape measure
	Time of travel		S	Stop watch
Temperature		°F	Thermometer	
pH		pH Units	Test strip/Probe	
Ammonia		mg/L	Test strip	

Outfall Reconnaissance Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only

Are Any Physical Indicators Present in the flow? Yes No (If No, Skip to Section 5)

INDICATOR	CHECK if Present	DESCRIPTION	RELATIVE SEVERITY INDEX (1-3)		
Odor	<input type="checkbox"/>	<input type="checkbox"/> Sewage <input type="checkbox"/> Rancid/sour <input type="checkbox"/> Petroleum/gas <input type="checkbox"/> Sulfide <input type="checkbox"/> Other:	<input type="checkbox"/> 1 – Faint	<input type="checkbox"/> 2 – Easily detected	<input type="checkbox"/> 3 – Noticeable from a distance
Color	<input type="checkbox"/>	<input type="checkbox"/> Clear <input type="checkbox"/> Brown <input type="checkbox"/> Gray <input type="checkbox"/> Yellow <input type="checkbox"/> Green <input type="checkbox"/> Orange <input type="checkbox"/> Red <input type="checkbox"/> Other:	<input type="checkbox"/> 1 – Faint colors in sample bottle	<input type="checkbox"/> 2 – Clearly visible in sample bottle	<input type="checkbox"/> 3 – Clearly visible in outfall flow
Turbidity	<input type="checkbox"/>	See severity	<input type="checkbox"/> 1 – Slight cloudiness	<input type="checkbox"/> 2 – Cloudy	<input type="checkbox"/> 3 – Opaque
Floatables -Does Not Include Trash!!	<input type="checkbox"/>	<input type="checkbox"/> Sewage (Toilet Paper, etc.) <input type="checkbox"/> Suds <input type="checkbox"/> Petroleum (oil sheen) <input type="checkbox"/> Other:	<input type="checkbox"/> 1 – Few/slight; origin not obvious	<input type="checkbox"/> 2 – Some; indications of origin (e.g., possible suds or oil sheen)	<input type="checkbox"/> 3 – Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

Are physical indicators that are not related to flow present? Yes No (If No, Skip to Section 6)

INDICATOR	CHECK if Present	DESCRIPTION	COMMENTS
Outfall Damage	<input type="checkbox"/>	<input type="checkbox"/> Spalling, Cracking or Chipping <input type="checkbox"/> Peeling Paint <input type="checkbox"/> Corrosion	
Deposits/Stains	<input type="checkbox"/>	<input type="checkbox"/> Oily <input type="checkbox"/> Flow Line <input type="checkbox"/> Paint <input type="checkbox"/> Other:	
Abnormal Vegetation	<input type="checkbox"/>	<input type="checkbox"/> Excessive <input type="checkbox"/> Inhibited	
Poor pool quality	<input type="checkbox"/>	<input type="checkbox"/> Odors <input type="checkbox"/> Colors <input type="checkbox"/> Floatables <input type="checkbox"/> Oil Sheen <input type="checkbox"/> Suds <input type="checkbox"/> Excessive Algae <input type="checkbox"/> Other:	
Pipe benthic growth	<input type="checkbox"/>	<input type="checkbox"/> Brown <input type="checkbox"/> Orange <input type="checkbox"/> Green <input type="checkbox"/> Other:	

Section 6: Overall Outfall Characterization

<input type="checkbox"/> Unlikely <input type="checkbox"/> Potential (presence of two or more indicators) <input type="checkbox"/> Suspect (one or more indicators with a severity of 3) <input type="checkbox"/> Obvious

Section 7: Data Collection

1. Sample for the lab?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
2. If yes, collected from:	<input type="checkbox"/> Flow	<input type="checkbox"/> Pool	
3. Intermittent flow trap set?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	If Yes, type: <input type="checkbox"/> OBM <input type="checkbox"/> Caulk dam

Section 8: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?

APPENDIX E
FIELD SAMPLING PLAN

FIELD SAMPLING PLAN

City of Meriden
Phase II Stormwater General Permit

Sampling Event Description: 2004 and 2005 Annual Phase II Stormwater Sampling

Projected Sampling Date: Summer 2005

Sampling Objective:

To comply with the monitoring requirements of the General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems.

Samples will be collected consistent with the General Permit; at least two outfalls apiece shall be monitored from areas of primarily industrial development, commercial development and residential development, respectively, for a total of six (6) outfalls monitored.

Sampling Locations:

Residential Land Use

- **Outfall 1:** David Drive
- **Outfall 2:** Hanover opposite Park Place

Commercial Land Use

- **Outfall 3:** East Main Street immediately east of Research Parkway
- **Outfall 4:** Cook Avenue near Summer Street

Industrial Land Use

- **Outfall 5:** End of Milk Street
- **Outfall 6:** Center Street @ Spartan Tool (adjacent to North Colony)

Parameters:

Parameters to be monitored shall be tested according to methods prescribed in Title 40, CFR, Part 136 (1990) and shall include:

- pH (SU) – of both sample and uncontaminated rainfall
- Hardness (mg/L)
- Conductivity (umhos)
- Oil and Grease (mg/L)
- Chemical Oxygen Demand (mg/L)
- Turbidity (NTU)
- Total Suspended Solids (mg/L)
- Total Phosphorous (mg/L)
- Ammonia (mg/L)
- Total Kjeldahl Nitrogen (mg/L)
- Nitrate plus Nitrite Nitrogen (mg/L)
- E. Coli (col/100 mL)

Stormwater Monitoring Procedures:

Samples shall be collected from discharges resulting from a storm event that is greater than 0.1 inch in magnitude and that occurs at least 72 hours after any previous storm event of 0.1 inch or greater. Runoff events resulting from snow or ice melt cannot be used to meet the minimum annual monitoring requirements. Grab samples shall be used for all monitoring. Grab samples shall be collected during the first 6 hours of a storm event discharge. The uncontaminated rainfall pH measurement shall also be taken at this time. Samples for all discharges shall be taken during the same storm event.

Storm event information including the date, temperature, time of start of the discharge, time of sampling, and magnitude (in inches) of the storm event sampled shall be collected for the storm events monitored.

APPENDIX F
STORMWATER MONITORING RESULTS