Minnesota's Lake Superior Beach Monitoring and Notification Program Quality Assurance Project Plan

February 2006

Revision No. 4

Minnesota Pollution Control Agency
Duluth Office
Community and Area-Wide Unit
525 South Lake Avenue
Suite 400
Duluth, MN 55802

MINNESOTA LAKE SUPERIOR BEACH MONITORING PROJECT

Approval Sheet

Minnesota Pollution Control Agency

Effective Period: 3/31/06 – 3/31/11

Pat Carey, MPCA Northeast Regional Manager

Signature: _____ Date:_____

Cynthia Kahrmann, Watershed Unit Supervisor

Signature: _____ Date:_____

Heidi Bauman, MPCA Beach Program Project Leader

Signature: _____ Date:_____

Roger Fisher, MPCA Water Quality - Quality Assurance/Quality Control Coordinator

Signature: _____ Date:_____

1.2 TABLE OF CONTENTS

1.3 DISTRIBUTION LIST

Roger Fisher, MPCA Quality Assurance Coordinator

Holiday Wirick, USEPA Region 5 Technical Contact

1.4 PROJECT ORGANIZATION

The Minnesota Lake Superior Beach Monitoring Project is staffed by the MPCA with the following positions:

Water Policy and Coordination Section Manager .....Faye Sleeper
Duluth Regional Manager.....Pat Carey
Watershed Unit Supervisor.....Cynthia Kahrmann
Pollution Control Specialist.....Heidi Bauman

Beach Assessment/IT Resource Support Technician .....Melissa Rauner
Quality Assurance Coordinator.....Roger Fisher

The Beach Monitoring Project receives technical advice and review via a technical committee with the following membership:

BEACH Team:

Minnesota Pollution Control Agency (MPCA
- Program Coordinator .....Heidi Bauman
- Information Technology .....Melissa Rauner

Cook County Planning Department.....Tim Nelson
Lake County Health Department.....Deb Kosiak
St. Louis County Health Department .....Roger Bard
Minnesota Department of Health (MDH),
- Northeast District Epidemiologist.....Amy Westbrook

Minnesota Department of Natural Resources (DNR),
- Lake Superior Coastal Program.....Pat Collins

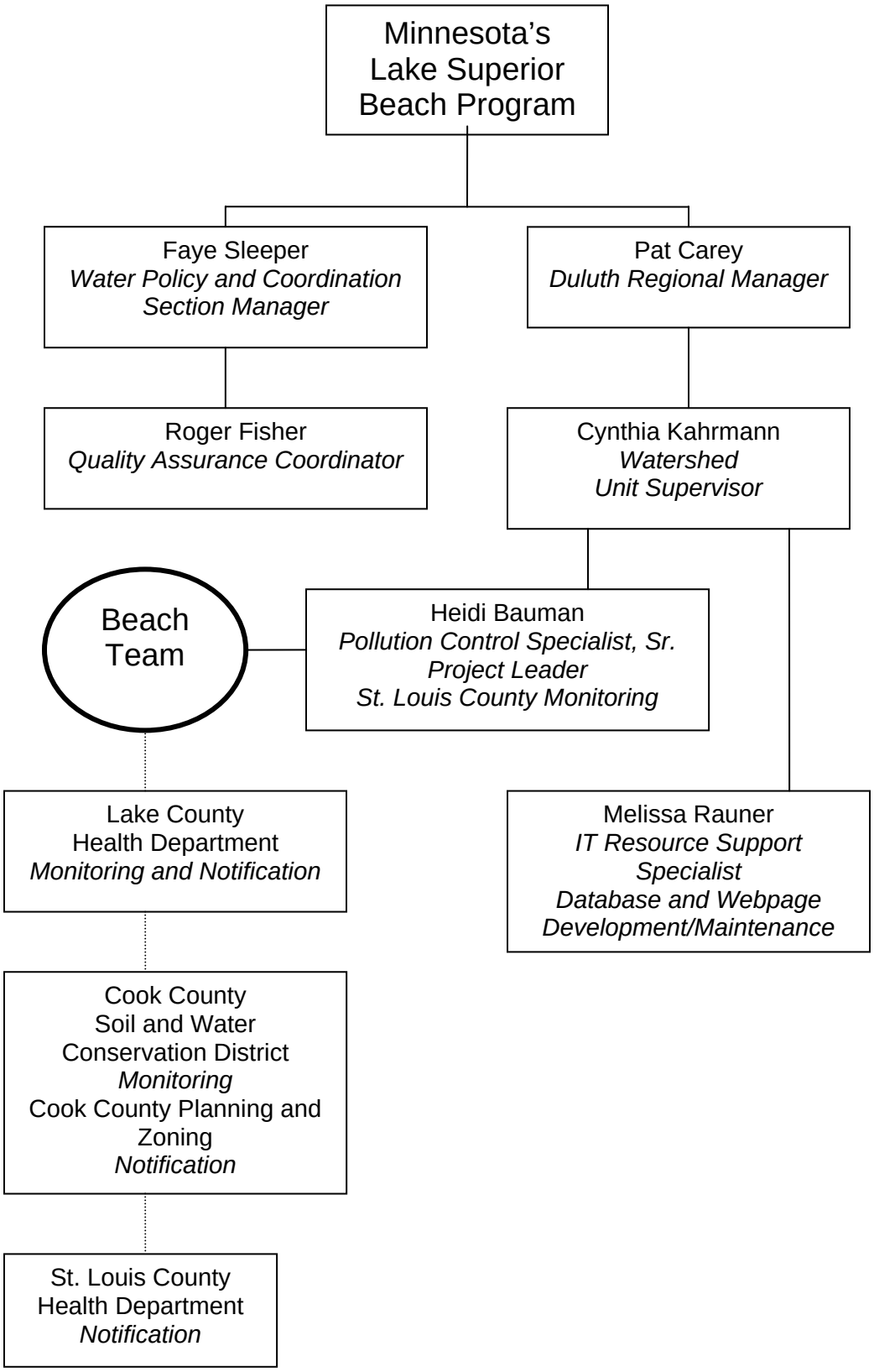
Western Lake Superior Sanitary District (WLSSD),
- Manager Environmental Services .....Joe Mayasich
- Information Officer Karen Anderson

City of Duluth
- Stormwater Utility .....Marion Lonsdale
- Parks and Recreation.....Julene Boe
- Information Office .....Jeff Papas

University of Minnesota Duluth (UMD),
- Department of Biology .....Randy Hicks
- Recreational Sports and Outdoor Programs.....
- Natural Resources Research Institute (NRRI) .....Rich Axler
- Minnesota Sea Grant College Program.....Jesse Schomberg

Park Point Community Club .....Kinnan Stauber
Duluth Boat Club.....Keith Stauber
City of Minneapolis.....
Clean Water Action.....Rosie Loefler-Kemp

Minnesota Pollution Control Agency (MPCA),
- Watershed Unit Supervisor.....Cynthia Kahrmann
- Lake Superior Basin Program Brian Fredrickson
- Water Quality Monitoring.....Jesse Anderson
- Lake Superior Basin Initiative Coordinator.....Marc Hershfield
- Information Officer.....Anne Moore


Minnesota's Lake Superior Beach Program
Faye Sleeper
Water Policy and Coordination Section Manager
Pat Carey
Duluth Regional Manager
Roger Fisher
Quality Assurance Coordinator
Cynthia Kahrmann
Watershed Unit Supervisor
Beach Team
Heidi Bauman
Pollution Control Specialist, Sr.
Project Leader
St. Louis County Monitoring
Lake County Health Department
Monitoring and Notification
Melissa Rauner
IT Resource Support Specialist
Database and Webpage Development/Maintenance
Cook County Soil and Water Conservation District
Monitoring
Cook County Planning and Zoning
Notification
St. Louis County Health Department
Notification

1.5 PROBLEM INDENTIFICATION

Fecal contamination of Lake Superior's recreational waters may originate from many sources, including shoreline development, wastewater collection and treatment facilities, on-site wastewater treatment systems, urban runoff, disposal of human waste from boats, swimmers themselves, animal feeding operations, pet wastes, and natural animal sources such as wildlife. People who swim and recreate in water contaminated with fecal pollution are at an increased risk of becoming ill because of pathogens from the fecal matter. For example, people could contract gastrointestinal disease; non-gastrointestinal disease, such as respiratory, ear, eye, and skin infections; or other illnesses such as meningitis or hepatitis (Rose et al., 1999).

In response to these concerns in the nation's recreation waters, the U.S. Environmental Protection Agency (EPA) announced its BEACH Program in 1997. The goal of the program was to assist states, tribes, and local government environmental and public health officials in reducing the risk of disease to users of U.S. recreation waters. The BEACH Program focused on four key objectives:

- Strengthening water quality standards for bathing beaches
- Improving state, tribal and local government beach programs
- Providing better information regarding beach water quality to the public
- Promoting scientific research to better protect the health of beach users

EPA also started its annual voluntary survey of state and local agencies that monitor water quality at beaches. The *National Health Protection Survey of Beaches* collects information to determine which local beaches are monitored and what agencies are responsible for beach programs. The survey also collects detailed information about advisories and closures at specific beaches. In March 1999 EPA published the *Action Plan for Beaches and Recreational Waters* (Beach Action Plan), a multiyear strategy that describes the Agency's programmatic and scientific research efforts to improve beach programs and research.

The BEACH Act was passed on October 10, 2000, and amended the Clean Water Act (CWA) by adding section 406. The BEACH Act addresses pathogens and pathogen indicators in coastal recreation waters and contains three significant provisions:

1. The BEACH Act amended the Clean Water Act to add section 303(I), which requires states and tribes that have coastal recreation waters to adopt new or revised water quality standards by April 10, 2004, for pathogens and pathogen indicators for which EPA has published criteria and CWA section 304(a). The BEACH Act amendments further direct the EPA to promulgate standards for states and tribes that fail to adopt such standards for such pathogens and pathogen indicators.
2. The BEACH Act amends the CWA to include section 104(v), which requires the EPA to study issues associated with pathogens and human health and to publish (by 2005) new or

revised CWA section 304(a) criteria for pathogens and pathogen indicators based on that study. Within 3 years after EPA's publication of the new or revised section 304(a) criteria, states and tribes that have coastal recreation waters must adopt new or revised water quality standards for all pathogens and pathogen indicators to which EPA's new or revised section 304(a) criteria apply.

3. The Beach Act amended the CWA to add section 406, which authorizes EPA to award grants to states and tribes to develop and implement a program to monitor and assess, for pathogens and pathogen indicators, coastal recreation waters adjacent to beaches or similar points of access that are used by the public and to notify the public if applicable water quality standards for pathogens and pathogen indicators are exceeded.

Minnesota's Lake Superior shoreline is lined with more than 79 beaches. These beaches are visited by thousands of people each year. Much of the state's beach water is subject to contamination from sources such as including shoreline development, wastewater collection and treatment facilities, on-site wastewater treatment systems, urban runoff, disposal of human waste from boats, swimmers themselves, animal feeding operations, pet wastes, and natural animal sources such as wildlife. This contaminated water is a potential cause of gastrointestinal illness and other diseases. Currently, the State of Minnesota does not have a consistently implemented monitoring and risk awareness strategy for such health risks. The Minnesota Lake Superior Beach Monitoring Project is an effort by the Minnesota Pollution Control Agency, in cooperation with state and local health officials and interested organizations, to address these health risks to beach users.

1.6. PROJECT DESCRIPTION

The overall objective of this Project is to develop a comprehensive beach monitoring and public notification plan for beaches adjacent to Lake Superior.

In accordance with BEACH Act performance criteria, further objectives include:
(1) Develop a risk-based beach evaluation and classification process
(2) Develop a tiered monitoring plan
(3) Develop a process for monitoring report submission and delegation
(4) Develop methods and assessment procedures
(5) Develop public notification and risk communication plans
(6) Determine measures to notify EPA and local governments of human health risks
(7) Develop measures to notify the public
(8) Develop a process for notification report submission and delegation
(9) Develop a process for public evaluation

Program Objective (1) - <u>Risk-Based Beach Evaluation and Classification</u>

a) Identify Coastal (Great Lakes) Recreational Waters

According to the BEACH Act, "coastal recreation waters" are defined as the Great Lakes and marine coastal waters (including coastal estuaries) designated under CWA section 303(c) by a state for use for swimming, bathing, surfing, or similar water contact activities. "Coastal recreation waters" do not include either inland waters or waters upstream of the mouth of a river or stream that has an unimpaired natural connection with the open sea. Minnesota Rule, Chapter 7050 designates Lake Superior for recreational use.

b) Identify Bathing Beaches

The BEACH Act requires the development of a beach monitoring and public notification plan for beaches bordering Lake Superior. For the purposes of this Project, the Beach Team works together to define the term "beach". Factors such as, geography, geology, the type of recreational use, and the type of access will be considered in the definition. We geo-locate and develop maps of each participating beach, indicating points of access, and potential contamination sources. We also determine actual beach area for each beach as well as determine actual beach miles along the coasts of Lake Superior.

c) Determine Legal Authority

An evaluation is being conducted to determine legal authority for administering monitoring and notification programs. Only public beaches will be considered in this project. We are investigating roles and responsibilities of involved agencies and interested parties with respect to beach regulation and management.

There is currently no established method for delegating responsibility of the state's efforts to local governments.

d) Beach Assessment - Review Available Information

A review of available information about each beach helps identify the most important issues and data gaps. We review all available information, including historical knowledge of the beach, its uses, and possible sources of fecal contamination. This includes determining the proximity of the waters to known point sources and non-point sources of pollution, and any effect of storm events on the waters.

We investigate source information located in state or local government agency files, literature and records in local libraries, beach management reports, community association reports, public health records, papers and journals available at colleges and universities, WEB sites and work performed by local nonprofit organizations. We also contact beach personnel and research beach records to obtain periods and locations of highest bather load during the swimming season, including any excess usage due to planned events, specific holidays, etc., and the general use of the beach (e.g., swimming, water sports, partial vs. full body contact, etc.)

e) Rank Beaches

A ranking process has been developed and documented along with all the factors used to classify each beach. The ranking is based on beach characteristics and takes into consideration all of the factors discussed in subsection (d), paying particular attention to 1) the amount of rainfall in the area, 2) the frequency of known and potential pollution sources such as combined sewer overflows (CSOs) or storm sewer overflows (SSOs), 3) the density of bathers, 4) the swimming season, 5) type of recreational activity and 6) public comment.

Identified beaches are ranked according to primary contact recreational use, extent of use and potential risk, and prioritized relative to high, medium, and low priority for monitoring purposes. Each beach is evaluated using the Beach Evaluation Checklist (Appendix A). The checklist evaluates available information, pollution threats, sanitary surveys, exposure considerations, monitoring data and other factors.

Program Objective (2) **–** Tiered Monitoring Plan

The overall purpose in monitoring beaches is to collect data that can be used in decision-making processes that protect the health of swimmers. While the ideal situation would be to perform continuous real-time monitoring, the reality is that monitoring is done intermittently and the data analyzed over time to make the appropriate public health decision. The intent of the Minnesota program is to require enough monitoring to make good decision without burdening the communities responsible for beach monitoring with unnecessary cost and effort.

Once we have ranked the beaches and assigned a classification of Tier I, II, or III, we developed and implemented a pilot monitoring program based on the beach classification. The plan is composed of two parts; 1) a tiered sampling design and 2) other recommended elements addressing data quality, staffing, training, data management and program oversight. We also provide an opportunity for the public to review the beach classification method and the monitoring and notification plan.

a) Tiered Sampling Design

The tiered sampling design identifies the following:

- when basic sampling is conducted
- when additional sampling is conducted
- where samples are collected
- and the depth at which samples are collected

The plan is developed to meet the objective of protecting human health and depends upon the characteristics of the beaches.

b) Monitoring Plan

The monitoring plan provides monitoring frequency options based on beach classification and identify which parameters are monitored. It includes suggested monitoring frequencies, for high, medium and low priority beaches.

Program Objective (3) - Monitoring Report Submission & Delegation

We developed a process to compile and report beach water quality data in timely reports that describe any delegation of monitoring and notification responsibilities that may be made to local governments.

a) Delegation
We coordinate with local governments and delegate, as appropriate, responsibilities for monitoring programs to local governments. Local citizens and officials are more familiar with local problems, needs, and are in a better position to address local issues and formulate solutions.

b) Report Submission
We developed a process to report monitoring data to the public, EPA, and other agencies in a timely manner along with the actions taken to notify the public when water quality standards are exceeded.

Program Objective (4) - Methods and Assessment Procedures

- We developed assessment procedures for identifying short-term increases in pathogens and pathogen indicators.
- We evaluate the use of predictive models for beach monitoring.
- We identify methods and procedures for the beach-monitoring program. We determine the most appropriate sampling procedures based on our sampling design, facilities and equipment as well as the methods of sample handling and processing in the field.
- We develop Standard Operating Procedures (SOPs) that document the materials used and the steps taken for sample packaging, transfer of custody, shipment and submittal to the Laboratory.

a) Laboratory Analyses
Policies and procedures for obtaining necessary laboratory and analytical services are developed. Analytical laboratories should have the capability to analyze the quantity of samples requested within the required time period, the instrumentation/technical expertise to perform the required analyses, and the qualified staff to perform the analyses. SOPs covering general laboratory operations, as well as specific procedures are approved by the QA officer of the laboratory. Copies of all approved laboratory operations are kept on file.

b) Sample Collection Techniques
Strict adherence to specific procedures for sampling is critical to a successful monitoring program. This is accomplished through a SOP that documents the materials used and the steps taken for sample collection, shipment and delivery to the laboratory for analysis.

c) Data Verification and Validation
The data is be verified through a systematic process to determine if the data has been collected in accordance with the specification with respect to compliance with established standards and the QAPP, precision, accuracy, consistency, and completeness. We also assess whether the data quality objectives of this project have been met. Once the data have been confirmed to meet the standards, they are systematically examined to determine their technical usability with respect to the planned objectives. The data is assessed to determine whether they are of the right type, quality, and quantity to support the intended use.

Program Objective (5) - Public Notification and Risk Communication

The Public Notification and Risk Communication Plan adequately address the following aspects:

- Problem assessment and audience identification
- Content and procedures for public notification
- Evaluation of notification program's effectiveness
- Report submission and delegation

The program must assure that the public is provided an opportunity to review and comment on the monitoring and notification program.

Program Objective (6) - Measures to Notify EPA and Local Governments

We identify measures for prompt communication of any occurrence, nature, location, pollutants involved, and the extent of any exceeding of, likelihood of exceeding, applicable water quality standards for pathogens and pathogen indications. We identify how this information will be communicated to EPA and to a designated official of the local government having jurisdiction over the beach.

Program Objective (7) – Measures to Notify the Public

We investigate and address the posting of signs at beaches or similar points of access, or functionally equivalent communication measures that are sufficient to give notice to the public that the coastal recreation waters are not meeting or are not expected to meet applicable water quality standards for pathogens or pathogen indications.

Program Objective (8) - Notification Report Submission and Delegation

We compile the notification plans in timely reports and describe the delegation of notification responsibilities that has been made, or intends to make, to local governments.

Program Objective (9) - Measures for Public Evaluation

The public is provided an opportunity to review the program through public notice, review, and an opportunity to comment. This is accomplished through public comments and meetings.

1.7 DATA QUALITY OBJECTIVES FOR MEASUREMENT DATA

Contaminated water is a potential cause of gastrointestinal illnesses and other diseases. Currently, the State of Minnesota does not have a consistently implemented monitoring and risk awareness strategy for protecting users of the State's recreational waters.

1. The Decision

The decisions to be made from this project are to:

a) Determine when and if recreational use of a swimming area poses a health risk to users.

b) Determine the most efficient methods of communication risks to users.

2. Inputs to the Decisions

The following informational inputs are required to resolve the decision statements presented in 1.7:

a) *Conditions under which elevated levels of bacteria occur* - This data is gathered by sampling beach water, assessing potential sources of fecal contamination and reviewing bacteria levels during significant storm events and pollution discharge events. We also review historical data.

b) *Frequency and Type of Recreational Use* - Field staff determine bather load and types of use by visiting beaches, taking actual counts and observing activities. They also solicit information from beach staff on average bather loads, and peak periods of use.

c) *Potential Sources of Contamination* – Field staff review available information about each beach and conduct site visits to identify potential sources of contamination.

d) *Evaluation of Current Methods of Risk Communication* – This information is collected via a random survey of beach users to assess the effectiveness of current communication methods. In addition, field staff investigates how other states and beach communities inform the public of the risks of exposure to pathogenic bacteria.

e) Assessment of Population Demographics - Staff view census data from the US Census for information about the characteristics of the community in which the beach is located.

f) The Effectiveness of Current Notification Procedures - Field staff interview beach users to determine the effectiveness of current beach warning and posting procedures and obtain suggestions for improving risk notification to beach users.

g) Regulatory Standards - If fecal contamination indicators exceed the acceptable levels as determined by statistical analysis, an advisory (Appendix C) against recreational use of the beach are posted. Recommendations issued by the State of Minnesota and the U.S. Environmental Protection Agency for posting advisory signs at swimming beach areas will be based upon the *E. coli* bacteria content of water samples collected. Evaluation of water sample results is based on the EPA recommended standards for *E. coli*.

The standard for E. coli content indicates:

1. The geometric mean based on not less than five samples within a 30-day period shall not exceed 126 E. coli colonies per 100 ml of water; and
2. Content shall not exceed 235 E. coli colonies per 100 ml of water in a single sample.

3. Study Boundaries

All beach water sampling evaluations and assessments are conducted on beaches located along Lake Superior. Data is collected from the specific beaches during times of beach use. The tests of choice for determining fecal contamination shall be *E. coli* enumeration.

The tiered monitoring plan describes the proposed monitoring requirements for high, medium, and low priority beaches. Tier 1 beaches are those that receive the most use by the public for swimming, bathing, surfing, kayaking, or similar water contact activities and have the highest potential risk of pathogen pollution within the immediate area. Tier 2 coastal recreational water sites usually receive moderate use by the public for water contact recreational purposes and have fewer source of pathogen pollution in the area. Tier 3 sites typically receive sporadic use and few if any potential sources of pollution in the area.

Tier 1

Beach	**STORET**	**Location**
Park Point Beach House	16-0001-B003	St. Louis County
Park Point Harbor Parking Lot/ Sky Harbor Airport Area	16-0001-B004	St. Louis County
Park Point Southworth Marsh	16-0001-B036	St. Louis County

Park Pt Lafayette Community Center	16-0001-B005	St. Louis County
Park Point 20th Street/Hearding Island Canal Beach	16-0001-B037	St. Louis County
New Duluth Boat Club Boat Landing	16-0001-B007	St. Louis County
Tot Lot/13th Street South	16-0001-B006	St. Louis County
Lakewalk Beach	16-0001-B008	St. Louis County
Brighton Beach	16-0001-B012	St. Louis County

Tier 2

Beach	**STORET**	**Location**
Boy Scout Landing	16-0001-B001	St. Louis County
Clyde Ave – West Duluth	16-0001-B002	St. Louis County
Leif Erickson Park	16-0001-B009	St. Louis County
Lakewalk East/16th Avenue East	16-0001-B038	St. Louis County
42nd Avenue East	16-0001-B010	St. Louis County
Lester River	16-0001-B011	St. Louis County
French River	16-0001-B013	St. Louis County
Bluebird Landing	16-0001-B014	St. Louis County
Stony Point	16-0001-B015	St. Louis County
Knife River Marina Beach	16-0001-B035	Lake County
Agate Bay	16-0001-B039	Lake County
Burlington Bay	16-0001-B016	Lake County
Flood Bay	16-0001-B017	Lake County
Stewart River Beach	16-0001-B018	Lake County
Gooseberry Falls State Park	16-0001-B019	Lake County
Twin Points Public Access	16-0001-B020	Lake County
Split Rock River	16-0001-B021	Lake County
Split Rock Lighthouse State Park	16-0001-B022	Lake County
Silver Bay Marina	16-0001-B023	Lake County
Tettegouche State Park	16-0001-B024	Lake County
Sugar Loaf Cove	16-0001-B025	Cook County
Schroeder Town Park	16-0001-B026	
Temperance River State Park	16-0001-B027	Cook County
Cutface Creek Wayside Rest	16-0001-B028	Cook County
Grand Marais Campground	16-0001-B029	Cook County
Grand Marais Downtown	16-0001-B030	Cook County
Old Shore Road Beach Area	16-0001-B031	Cook County
Durfee Creek Area	16-0001-B032	Cook County
Kadunce Creek Outpost Motel Area	16-0001-B033	Cook County
Paradise Beach	16-0001-B034	Cook County

Tier 3

Beach	STORET	Location
Morgan Park Beach	16-0001-B040	St. Louis
Smithville Park Beach	16-0001-B041	St. Louis
Indian Point Campground Beach	16-0001-B042	St. Louis
Waterfront Trail/Riverside Beach	16-0001-B043	St. Louis
Waterfront Trail/Radio Towers Beach	16-0001-B044	St. Louis
Waterfront Trail/Interlake Beach	16-0001-B045	St. Louis
Blatnik Fishing Pier Beach	16-0001-B046	St. Louis
Bayfront Park Beach	16-0001-B047	St. Louis
Minnesota Point Harbor Beach	16-0001-B048	St. Louis
Lakewalk East/26th Avenue East Beach	16-0001-B049	St. Louis
Glensheen Cemetary Beach	16-0001-B050	St. Louis
North Shore Drive Wayside Rest/72nd Avenue East Beach	16-0001-B051	St. Louis
Lakewood Pump Station Beach	16-0001-B052	St. Louis
North Shore Drive Wayside Rest/Cant Road Beach	16-0001-B053	St. Louis
McQuade Road Safe Harbor Beach	16-0001-B054	St. Louis
Stony Point Wayside Rest Beach	16-0001-B055	St. Louis
Two Harbors City Park Beach	16-0001-B056	Lake
Silver Creek Beach	16-0001-B057	Lake
Silver Cliff Beach	16-0001-B058	Lake
Split Rock Lighthouse State Park/Split Rock Point Beach	16-0001-B059	Lake
Split Rock Lighthouse State Park/Crazy Bay Beach	16-0001-B060	Lake
Split Rock Lighthouse State Park/Corundum Point Beach	16-0001-B061	Lake
Split Rock Lighthouse State Park/Gold Rock Point Beach	16-0001-B062	Lake
Blueberry Hill Beach	16-0001-B063	Lake
Palisade Beach	16-0001-B064	Lake
Tettegouche State Park/Baptism River Beach	16-0001-B065	Lake
Tettegouche State Park/Crystal Bay Beach	16-0001-B066	Lake
Manitou River Beach	16-0001-B067	Lake
Temperance River State Park East Beach	16-0001-B068	Cook
Ray Berglund Wayside Rest Beach	16-0001-B069	Cook
Cascade State Park West Beach	16-0001-B070	Cook
Cascade State Park Campground Beach	16-0001-B071	Cook

Butterwort Cliffs Beach	16-0001-B072	Cook
Croftville Beach	16-0001-B073	Cook
Red Cliff Beach	16-0001-B074	Cook
Coville Creek Beach	16-0001-B075	Cook
Judge C.R. Magney State Park West Beach	16-0001-B076	Cook
Judge C.R. Magney State Park East Beach	16-0001-B077	Cook
Chicago Bay Boat Launch Beach	16-0001-B078	Cook
Horseshoe Bay Boat Launch Beach	16-0001-B079	Cook

4. Decision Rules

a) The single sample maximum shall not exceed 235 cfu/100mL for *E. coli*.

b) The geometric mean of 5 most recent samples collected during a 30 day period shall not exceed 126 cfu/100mL for *E. coli*.

c) Beach advisory signs will be posted and removed based on indicator data.

5. Limits on Decision Errors

The geometric mean values specified in Table 3 are based on specific levels of risk of acute gastrointestinal illness of no more than 8 illnesses per 1000 swimmers. EPA has determined that when these water quality criteria are implemented in a conservative manner, they are protective for the prevention of a gastrointestinal illness resulting from primary contact recreation. For this reason it is essential that data be carefully examined in view of the quality assurance procedures detailed in this Plan. Only clear, accurate results will be used to calculate the geometric mean. Uncertain or missing results due, for example, to collector or laboratory accident will not be used in the calculation.

The use of the single sample maximum is important because it is assumed that environmental conditions such as rainfall, wind, currents, and temperature will vary temporally and spatially. The single sample maximums, also specified in Table 3, are based on specific levels of risk of acute gastrointestinal illness of no more than 8 illnesses per 1,000 swimmers. If a sample result exceeds the established maximums, an advisory against recreational use will be posted at all points of access at the beach and sampling will be conducted daily. Advisories can be removed when bacteria counts are determined to have returned to acceptable levels.

Selection of the appropriate predictive model is critical to the beach-monitoring program. The decision errors for the model will drive the model selection. Once the appropriate model is selected, beach advisories will be based on the output of the predictive model

because correlation with bacteria data will not be known until 24 to 48 hours after the water sample has been collected.

6. Design Optimization

a) The use of the Beach Evaluation and Classification Checklist to classify and rank beaches for establishing a monitoring frequency generally results in a level of testing adequate to protect the public.

b) The evaluation of data from other past and present monitoring efforts that have similar sampling and analytical protocols assists in our effort to assess short-term trends due to storm events.

1.8 TRAINING REQUIREMENTS/CERTIFICATION

The MPCA staff is sampling St. Louis County sites. The Lake Health Department (LHD) staff is sampling the 10 Lake County Sites and Cook County Planning Department (CPD) staff is sampling the 11 Cook County Sites. Lake and Cook Counties staff include collected by State Registered Sanitarians, Public Health Nurses, Interns under the direction of Sanitarians and/or personnel trained on proper field sampling techniques.

Sample analyses are performed by certified laboratory personnel, trained and experienced in current laboratory procedures for bacteria analysis. Laboratories certified by the Minnesota Department of Health perform all testing.

Sample result evaluation and analysis, notification of results to project participants and the public, as well as any accompanying recommendations, are under the direct supervision of the MPCA Project Manager.

- *Beach Project Manager* - The candidate has research experience and demonstrates the ability to work independently. Qualified candidate has course work or job experience, which shows they possess a basic understanding of the use of fecal coliforms as indicators for the presence of pathogens and the associated risks to human. Comprehensive IT GIS skills plus related field experience is also required for this position. The candidate is proficient with analysis, design and management of GIS databases as well as experience with ESRI GIS software (ArcView). The candidate also has training and experience using Global Positioning System (GPS) technologies.

- *Beach ITS Specialist* - The position requires the incumbent to have previous experience in natural resources database development and management. The incumbent has experience in XML programming, extensive experience with relation database systems, preferably Oracle and Access, extensive knowledge and experience with SQL. The incumbent possesses good

leadership, administrative abilities, strong communication, and organizational skills. The incumbent also has the ability to research, synthesize and assimilate complex database and data management concepts, data transfer and sharing, and network node development. They communicate this information in clear, concise, and technically accurate oral presentations and written documents that may be understood by all levels of understanding in the community. A general knowledge of computer hardware, software, network operating systems is also required. An understanding of scientific systems and social science is preferred.

1.9 DOCUMENTATION AND RECORDS

Records to be generated during the project include:

- Documentation regarding agreements, negotiations, and expectations.

- A report of the proceedings of the BEACH Act Team will be completed, to include all work of the workgroup before, during, and after the monitoring phase of the project. This report also includes information regarding the Team's evaluation of the project, as well as proceedings from any public meetings conducted by the Team

- A final comprehensive annual report will be prepared for submission to the USEPA Administrator

a) Field Records

Beach Evaluation & Classification Checklist – is completed by field staff evaluating available information, pollution threats, sanitary surveys, and exposure considerations. All field information is recorded on individual checklist forms for each beach. Separate geo-locational data files are stored on the GIS Data drive until a central database connecting all information for the beaches is created. Hard copies of each file and other relevant field data, including notebooks, maps, drawings, photographs, and communication records is stored at the office. Field staff enters the information into electronic files.

b) Laboratory Records

Laboratory data form – to be completed initially by the sample collector at the time the sample is collected; followed by the laboratory sample receipt person and analyst when the sample is received, tested, and results are determined. The laboratory data form allows collection of information including, but not limited to, the name of beach, body of water, sampling point, date/time of collection, water and weather conditions, as well as name of laboratory, dates and times of testing, and final results. The laboratory data form serves as a Chain-of-Custody record for each sample

collected and analyzed. The laboratory maintains control of other relevant laboratory records including logs, bench sheets, and raw analytical and QA/QC data.

c) Standard Operating Procedures

Standard operating procedures (SOP's) are written and available for all technical aspects of the beach-monitoring program. SOP's are prepared for sampling and sample submission, sample analysis, data storage, data analysis and data reporting. Final sampling procedures will be incorporated into the *Field Procedures Manual.*

d) Staffing and Training

The beach sampling and monitoring plan also include a staffing plan as well as a plan for training staff that will implement the program. Whether drawn from the ranks of professional staff or volunteers, the personnel responsible for sample collection and environmental measurements at the beaches, as well as those performing the bacterial indicator analyses, are trained for those activities. Training should be ongoing and documented.

Storage, access to, and final disposition of all records are subject to the requirements of the State of Minnesota.

2.1 SAMPLING PROCESS DESIGN

Objective (a) - Identify all public bathing beaches adjacent to Lake Superior

The first step in the beach evaluation and classification process is to identify and locate the beaches along Lakes Superior. Once the beaches are identified and evaluated, the information is used to classify each beach into a priority category of Tier I, II, and III. This classification is then used to direct resources toward monitoring and notification programs at the beach.

a) Geo-locational data - All currently used public beaches along Lakes Superior have been identified, and located via the use of GPS and GIS technologies. All available Digital OrthoPhotos and Digital Raster Graphics are viewed to see if a beach shows up clearly and can be digitized on screen using ArcView 8.2. If the beach can not be delineated on screen then a site visit is made and coordinates are collected using a Trimble GeoExplorer GeoXM GPS unit. The Trimble GeoExplorer GeoXM GPS unit collects locational data in the Universal Transverse Mercator (UTM) format with 2-5 meter accuracy. The data is stored in the AcrPad software and downloaded into the computer. Once a beach polygon layer has been created, it is be used to create a second layer by converting the polygons to polylines. The line layer is then edited so that a single line will represent the length of each beach. Attributes such as beach name and measured length is tied to each line feature. A map of each monitored beach is developed indicating the adjacent coastal recreation waters, points of access by the public, length of beach, as well as any known potential sources of pollution.

Quality Control
The ArcPad software acts as the controlling software. It communicates with the GPS receiver to set specific GPS parameters required for optimal accuracy. Data validity is determined by the number of satellites. If there are too few satellites, a warning tone will sound to identify the data. The same validity checks are also built into the ArcPad software. Any data collected by too few satellites is identified and can be eliminated through this software.

Objective (b) - Develop a Beach Evaluation and Classification Plan

Each beach is evaluated using a Beach Evaluation Checklist (Appendix A). The checklist provides a list of factors that can be used to rank and classify the beaches. The list includes available information, pollution threats, sanitary surveys, exposure considerations and monitoring data. Along with geo-locational data, field staff collects beach characteristic data, environmental condition data and beach informational data.

a) Beach Characteristic Data - Field staff visually observe and record on the Beach Assessment Checklist, the following characteristics of each beach:

- Type of terrain within 5 miles of the beach
- Number of point source discharges (outfalls, drainage pipes etc.) -. Any known point and non-point sources of pollution (CSOs, SSOs, etc.) near sample locations will be indicated on laboratory sample data forms and beach maps
- Land use (farms, animals, houses, marinas, industry, restrooms, parking lots)
- Beach populations (bathers in/out of water, waterfowl, sand sports, water sports)

b) Environmental Conditions - The following WEB sites are used to view real-time and historical weather conditions, wind speed and direction, water temperature and wave height:

- http://climate.umn.edu/
- http://www.coastwatch.msu.edu/twosuperiors.html
- http://www.ndbc.noaa.gov/Maps/WestGL.shtml
- http://www.co-ops.nos.noaa.gov/cgi-bin/

b) Beach Informational Data - Part of the process of evaluating potential health risks related to pathogen exposure during bathing or swimming activities is to compile available information about each beach, including historical knowledge of the beach, designated used, and possible sources of fecal contamination. The following sources are used to help classify and rank our beaches:

Table 4 - Beach Information Sources

Information Source	***Type of Information***	***Purpose***
State Water Quality Report (CWA Section 305(b))	• Known problems with the recreational water • Known or suspected causes • Proposed corrective actions	Review reports on the quality of the recreational waters
Swimmer Reports or Hospital Records	• The number of swimmer complaints • Documented reports of illness • Epidemiological studies conducted • Other agency described health problems	Determine the history of risks to swimmers
Advisory Reports and Closings	• Closings caused by rain events • Frequency of closings during season • Causes of closures • Number of swimmers affected by the closing.	Determine the likelihood of risks to swimmers
Development Planning Reports	• Location of sewer lines • Outfalls • Trash areas • Septic systems • Leaking sewer lines	Identify potential sources of fecal contamination

Information Source	***Type of Information***	***Purpose***
	• runoff	
Point Source Discharge Data	• Combined Sewer Overflows (CSOs) • Concentrated Animal Feeding Operations (CAFOs) • Public Owned Treatment Works (POTWs)	Identify potential sources of fecal contamination
Nonpoint Source Reports (CWA Section 319)	• Reductions in nonpoint source pollution • Improvement in water quality	Determine the extent of nonpoint source pollution
Environmental Group Reports	• *Surfrider* - National beach water quality testing, monitoring and notification program http://www.surfrider.org. • *Heal the Bay* - Local beach closure protocol http://www.healthebay.org • *Natural Resources Defense Council* - Beach closings and monitoring and notification program. http://www.nrdc.org	Review conducted studies and published reports
Chamber of Commerce Reports	• Number of tourist • Tourist spending	Investigate how beaches and recreational waters contribute to the local economy
Sanitary Surveys	• Source controls • Source identification • Persistent problems • Magnitude of pollution • Management actions	Identify potential sources of pollution

Objective (c) - Develop assessment procedures to identify short-term increases in pathogens.

An important objective is to minimize beachgoers' health risk associated with infectious diseases caused by exposure to microorganisms. Notification of elevated levels of indicator bacteria is usually based on monitoring of beach waters. Under this system, however, users of recreational waters can be exposed to waterborne pathogens because of delayed notification. The laboratory methods commonly used take 24 to 48 hours. To reduce exposure to pathogens, we need tools that can provide a quick, reliable indication of the water quality conditions. As a part of this objective, we will develop a process for

assessing short-term increases in pathogens and pathogen indicators and will evaluate the use of predictive models in beach monitoring programs.

a) Assessment Procedures for Identifying Short-term Increases

Frequent, regular sampling is required to identify short-term increases in pathogens and increases due to weather events. Several beach monitoring efforts are already underway. We will evaluate existing monitoring data along with new data, as it becomes available. Data from the following sources will be evaluated for this project:

- MPCA Beach Pilot Project

  The MPCA along with the Beach Team has developed a beach water testing pilot project for the 2003 swimming season. The project involves weekly sampling at 32 sites and twice a week sampling at 5 sites. This pilot study is used to help determine if the beach locations are in the appropriate tier and if there are any unknown existing bacteriological problems. Sampling begins the week of Memorial Day and ends a week after Labor Day. Other information is collected such as air and water temperature, wave height, wind direction, estimate of wind speed, estimate of bird counts, and estimate of bather counts.

- Identifying the Sources of Coliform Bacteria in Coastal Ecosystems and Their Relations to Land Use

  Researchers plan to determine the source and distribution of fecal bacteria in the Lake Superior Basin by refining molecular and metabolic fingerprinting techniques. They will analyze strains of bacteria living in the intestines of animals including terns, gulls, deer, beaver, and humans, and compare them to bacteria in water samples from watersheds and the Duluth-Superior Harbor. Their goal is to help wastewater treatment plants and governing agencies quantify how land use relates to sources of fecal pollution.

- The Impacts of E. coli From Soil on the Lake Superior Watershed

  This project seeks to determine whether E. coli bacteria (Escherichia coli), an indicator of fecal pollution, comes from humans or from sediments that erode into the Duluth-Superior harbor and Lake Superior. Although sewage or treated effluents are often blamed as sources of E. coli, many of these bacteria filter into aquatic environments from livestock in agricultural areas, warm-blooded animals in natural ecosystems, as well as from soils and sediments. As a result, the extent of human influences on coastal ecosystems and health risks may be over-estimated. Researchers will look at whether E. coli released into natural environments from soils and sediments survive and persist, and will identify what factors might influence their survival and reproduction. Using DNA fingerprinting, they hope to build on a previous Sea Grant project by identifying

the original sources of E. coli found in the sediment, soil and nearshore environments of Lake Superior and to estimate the impact this has on fecal coliform measurements in the lake and harbor. Results will be useful to regional wastewater plant operators and government agencies both locally and in other coastal regions.

c) Use of Predictive Models

Many models are being developed and tested for Great Lakes beaches. Their applicability will be assessed for use on the recreational waters of the North Shore of Lake Superior in an as-needed basis after reviewing the first two years of data. Until there is an increase in use of the beaches and a demonstrated health risk to the public the use of predictive models is unnecessary.

Objective (d) - Public Notification and Risk Communication

One of the tasks of this objective is to assess problems with public notification and risk communication whenever the water quality criteria for bacteria have been exceeded, and to identify the audience. A survey is being designed to assess the effectiveness of current notification procedures (see Appendix B).

- Age of the user
- How often they visit the beach
- Type of contact with the water
- Illness related to beach activities
- What source is used to obtain beach water quality information
- Desired methods of communication
- Awareness of potential health risks with swimming

MPCA staff will be mailing the survey to residents of Park Point. The information will be compiled and summarized in a report to the Beach Team for final recommendations.

2.2 SAMPLING METHODS REQUIREMENTS

All sampling follows these general rules:

a. Samples are collected in containers approved by the Minnesota Department of Health (MDH) laboratory certification program.

b. Extreme care is taken to avoid contaminating the sample and sample container.
   - Do not remove bottle covering and closure until just prior to obtaining each sample.

- Do not touch the inside of the sample container.
- Do not rinse the sample container.
- Do not put caps on the ground while sampling.
- Do not transport the samples with other environmental samples.

c. Adhering to sample preservation and holding time limits is critical to the production of valid data.
   - Samples should be labeled, iced or refrigerated at 1 - 4 degrees C immediately after collection and during transit to the lab. Samples will be immediately placed on wet ice and placed in a cooler for transport to the laboratory.
   - Care should be taken to ensure that sample bottles are not totally immersed in water from melted ice during transit or storage.
   - Samples should arrive in the laboratory no later than 6 hours after collection. Whenever possible samples should arrive at the lab on the day of collection, preferably before 3 p.m.

d. The sampler will complete the laboratory data form noting time, date, and location of sample collection.

e. Samples will be analyzed on the day of collection whenever possible and holding times may not exceed 24 hours.

2.3 SAMPLE HANDLING AND CUSTODY REQUIREMENTS

The laboratory data form (Appendix D) serves as a Chain-of-Custody record for each sample collected and analyzed. In keeping with laboratory requirements (Standard Methods), all samples must be sealed, chilled, and transported from the sample point to the laboratory for analysis within six hours after sampling. Sample collectors have exclusive custody of any sample from the time of collection until the sample is deposited with the laboratory. The laboratory assumes custody of each sample it receives and is responsible for forwarding all sample analysis results to the Project Manager within twenty-four hours to forty-eight hours of receiving the sample.

2.4 ANALYTICAL METHODS REQUIREMENT

All analyses shall be performed in laboratories certified by the Minnesota Department of Health for microbiological analysis of *E. coli* in water. Table 5 lists all the current EPA approved analytical methods or microbiological analysis of E. coli and fecal coliform.

Table 5 - EPA Approved Analytical Methods

Indicator	Type of Analyses Performed	Method Number
Fecal coliform	❑ Membrane Filter Fecal Coliform Test (MFFCC)	Standard Methods 9222(D)
E. coli	❑ Membrane Filter Fecal Coliform Test (MFFCC) with Nutrient Agar ❑ MPN - Enzyme Substrate Test - Colilert™ ❑ Membrane Filter E. coli Test – m-ColiBlue 24 broth	Standard Methods 9222(D) and Standard Methods 9222(G) Standard Methods 9223(B)

2.5 QUALITY CONTROL REQUIREMENT

A number of quality control checks are required to ensure the quality of the generated data. All laboratory staff adheres to current and generally accepted practices for safe handling, testing of samples, and chain of custody measures.

(a) Precision

Precision is a measure of the degree to which two or more measurements are in agreement. Field precision is estimated through the collection and measurement of two samples at the same sampling site at approximately 10 percent of the samples. The precision of laboratory analyses is estimated by analyzing two or more aliquots of the same water sample. This data quality indicator is obtained from two duplicate samples by calculating the relative percent difference (RPD) as follows:

$$RPD = \frac{|C_1 - C_2|}{(C_1 - C_2)/2} \times 100$$

Where C_1 is the first of the two values and C_2 is the second value. Because of the heterogeneity of populations of bacteria in surface waters, an RPD of less than or equal to 50 percent between field duplicates for microbiological analyses might be considered acceptable. When multiple replicates are analyzed, precision of the test is expressed in terms of standard deviation and the ability to detect the target organism. This is the coefficient of variation: CV=[Standard Deviation/Mean]x100. Analysts should also be able to duplicate bacterial colony counts on the same membrane within 5 percent and the counts of other analysts within 10 percent; otherwise, procedures should be reviewed and corrective action implemented.

(b) Accuracy

Accuracy is determined through the adherence to all sampling handling and holding times.

(c) Representativeness

In the sample design, care is taken to determine if the area of sample collection is typical and representative of each area of concern.

1) For lengthy beaches, if bathers are relatively evenly distributed along the beach area, samples are spaced a maximum of 500 meters apart.
2) For beaches where bathers are concentrated in one area, 1 sample is taken where most of the swimmers congregate and then a sample shall be taken 15 meters on either side.

2.6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS

The thermometer is inspected by field staff prior to each sampling event and maintenance logs are kept on each meter. The Project Leader maintains a maintenance log book to track scheduled maintenance on all equipment.

2.7 INSTRUMENT CALIBRATION AND FREQUENCY

The thermometers will be calibrated, annually, prior to each sampling season, according to the manufacturer's instructions. Calibration results are recorded in a log book and maintained by the Project Leader. Calibration procedures and standards are contained in the SOP manual, available upon request.

2.8 INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES

The Lake Superior Beach Monitoring project uses digital thermometers and lab supplied sample bottles for bacteriological water assessment. Broken thermometers are shipped back to the manufacturer for repair or replacement.

2.9 DATA ACQUISTION REQUIREMENTS

For the Lake Superior Beach Monitoring project historical bacteriological data is taken from literature and documentation provided by the MPCA, Minnesota Department of Health, county health departments, and area research programs. A GIS database and field investigation is used to identify monitoring locations.

2.10 DATA MANAGEMENT

This Project is developing a system to collect, store, and display all pertinent information about each participating beach. The data is stored in an accessible form usable to the local decision-

makers. A system of quality control checks are performed to assure that all data is accurate and authorized before being stored in the data storage system. All data is analyzed statistically immediately upon receipt, so that beach advisory decisions can be made quickly. Additionally, all beach data is reported electronically to the MPCA in an acceptable form, and data is made compatible for reporting to US EPA. Appropriate user instructions and system documentation is developed and made available to all staff using the database system.

3.1 ASSESSMENT AND RESPONSE ACTIONS

The effectiveness of the monitoring program is assessed at regular intervals through the use of technical systems audits, performance evaluations, and audits of data quality to verify that sampling and analysis are performed in accordance with the established QC procedures and that all operational aspects of the program are acceptable. This Project identifies specific assessment methods and procedures for project documentation as well as collection, preservation, and storage of water samples. The laboratory is responsible for the compliance regarding the analytical aspects of the Project.

The QA program includes procedures for identifying and defining a problem, assigning responsibility for investigating the problem, determining the cause of the problem, assigning responsibility for implementing corrective action, and assigning responsibility for determining the effectiveness of the corrective action and verifying that the corrective action has eliminated the problems.

3.2 REPORTS

Lake Superior Beach Monitoring and Notification program reports are produced in October of each year monitoring occurs. The project manager is responsible for all report production and distribution. Reports are forwarded to the cities, counties, state and EPA Region V office, and other members of the Beach Team. This report consists of data result, modeling results, the actions taken to notify the public when water quality standards are exceeded, and project status.

4.1 DATA REVIEW, VALIDATION, AND VERIFICATION REQUIREMENTS

All Lake Superior Beach Monitoring field and laboratory data is reviewed by the Project Manager and through data processing to determine if the data meet QAPP objectives. Decisions to reject or qualify data are made by the Project Manager.

4.2 VALIDATION AND VERIFICATION METHODS

As part of the Lake Superior Beach Monitoring protocol, any sample readings out of the expected range are reported to the Project Leader and the appropriate county staff. A second sample is taken by the field staff as soon as possible to verify the condition.

Once the data has been entered into the Beach database, errors in data entry are corrected. Outliers and inconsistencies are flagged for further review, or discarded. Problems with data quality are discussed in the reports to data users.

4.3 RECONCILIATION WITH DATA QUALITY OBJECTIVES

Sample records, chain of custody records, and sample tracking records are reviewed to verify that all the samples collected were analyzed so the data set will be complete. Data entries and analyses are also verified. The input of large quantities of historical data is spot checked to detect potential data entry errors. Calculations are reviewed by rechecking the computations, reviewing the assumptions used and checking the input data against the original sources to be sure transcription errors have not occurred.

Once the data have been confirmed to meet standards, a report that provides an assessment of the usability of the data, a summary of sample results, and a summary of QC and QA results is prepared. The report discusses any discrepancies between the Data Quality Objectives (DQOs) and the data collected and any effects such discrepancies might have on the ability to meet the DQOs.

APPENDIX A

BEACH EVALUATION CHECKLIST

General Information

Beach Name: _____

Location/County: _____

Jurisdictional Authority: _____State _____County _____City

Is it a designated beach? _____Yes _____No

Lifeguards present? _____Yes _____No

Beach Design

Degree of slope: _____

Geology: _____Rocky _____Pebbles (gravel) _____Sandy _____Mud (silt and clay)

Physical Features: _____Trees _____Bushes & Shrubs _____Grassy areas _____Other

_____Bluffs/cliffs _____Evidence of runoff _____Runoff controls

Vegetation: _____Algae _____Weeds _____Miscellaneous/debris

Contamination Sources

Number of outfalls:

Type of outfall	Distance from beach

Other pollution sources:
Land use Patterns Surrounding the Beach:

_____Farms _____Animals _____Houses _____Marina _____Industry

_____Restrooms _____Parking lots

Beach Population:

_____# People at the beach _____# People in water _____# Waterfowl present

Recreational Use:

_____Sand sports _____Non-motorized water sports _____Motorized water sports

_____Swimming

Weather conditions

Water temperature: _____

Air temperature: _____

Any significant events taking place on the beach:

Other comments:

#Pictures taken:

APPENDIX B

The Minnesota Pollution Control Agency (MPCA) would like your help. The MPCA is currently working with the Environmental Protection Agency to monitor the water quality along the coast of Lake Superior.

Please take a few minutes to answer this survey and mail it back to us in the envelope enclosed. Circle the answer or answers that best describe your belief.

1. Please circle your age group

18-30 30-40 40-50 50-65 65 older

2. How often to you visit the beach during the months of

June _____Times per week

July _____Times per week

August _____Times per week

September _____Times per week

3. Are you aware of current water quality monitoring Lake Superior or the Duluth Harbor?

Yes No

If yes please describe.

4. Where do you gather information about environmental issues?

Newspaper Television Internet

Personal conversations Community meetings

Other _____

5. Do you participate in activities that put you in contact with the water in Lake Superior?

Yes No

If yes please circle

Swimming Power Boating Sailing

Paddling Beach walking Other _____

6. Do you participate in activities that put you in contact with the water in the Duluth Harbor?

Yes No

If yes please circle

Swimming Power Boating Sailing

Paddling Beach walking Other _____

7. To what extent do you agree or disagree with this statement: "Swimming in Lake Superior poses no risk to health."

Strongly agree Somewhat agree Neither agree nor disagree

Somewhat disagree Strongly disagree No opinion

8. To what extent do you agree or disagree with this statement: "Swimming in the Duluth Harbor poses no risk to health."

Strongly agree Somewhat agree Neither agree nor disagree

Somewhat disagree Strongly disagree No opinion

Thank you for your participation.

Appendix C

BEACH POSTING, RESTRICTION OF ACCESS

1) If the standard for *E. coli* content is exceeded, a recommendation will be made for posting the beach with signs that advise against swimming due to high bacteria levels.

2) The following example is the suggested language for posting a beach advisory:

The message board at some facilities will provide information to the public about the beach water sampling as follows:

When Water Samples Contain Elevated Levels of Bacteria

The water in this lake serves many uses. It is here for your recreational use, as well as other uses like irrigation and domestic water supply. Like any natural water body, the water in this lake contains many naturally occurring microorganisms, some of which may cause illness if swallowed. County or State staff regularly tests the water quality at the swimming beach. If the results of water quality sampling reflect elevated bacteria levels, bathing beaches shall be posted with a prominent sign alerting you of that fact. Elevated levels of these bacteria may increase the risk of infection from the waterborne pathogens. Staff will continue to monitor the water and will promptly remove all signs when bacterial counts return to acceptable levels.

Appendix D

North Shore Analytical, Inc.
5612 Miller Trunk Highway, Suite 1
Duluth, MN 55811
Phone (218) 729-4658
Fax (218) 729-4659

Record # :

Chain of Custody

Client Name: Beach Program, MPCA						Report to: Heidi Bauman			Sampled by:
Address: Suite 400, 525 S. Lake Ave.						Phone:723-4953			Project: Lake Superior Beach Program
City: Duluth			State: MN	Zip: 55802		Fax:723-4727			

NSA Lab #	Bottle #	Client Sample Identification	Date Collected	Time Collected	Matrix	Sample Type		Container/ Preservation	Analysis Requested
						Grab	Composite		
					SW	X		P/NA	E. coli
					SW	X		P/NA	fecal coliform
					SW	X		P/NA	E. coli
					SW	X		P/NA	fecal coliform
					SW	X		P/NA	E. coli
					SW	X		P/NA	fecal coliform

Transfer #	Relinquished By	Date	Time	Accepted By	Date	Time	Condition
1							
2							
3							

ADDITIONAL COMMENTS:

KEY:	Matrix:		Containers:	Preservation:
Lab use only	SW = Surface Water	GW = Ground Water	P = Plastic	NA = None Added
	WW = Wastewater	DW = Drinking Water	G = Glass	H = Hydrochloric Acid
			B = Plastic Bag	B = Bromine Monochloride

Appendix E

SAMPLING PROTOCOL

To assure consistency in collecting samples for analysis, the following procedures will be used:

1) Specific sites will be designated for collecting samples during the bathing season. Samples will be collected exclusively at these sites for the duration of the sampling period.
2) Sample bottles will be prepared and provided by the laboratories charged with conducting bacteria analyses.

General Rules of Sampling

a. Take extreme care to avoid contamination the sample and sample container.
- Do not remove bottle covering and closure until just prior to obtaining each sample.
- Do not touch the inside of the sample container.
- Do not rinse the sample container.
- Do not put caps on the ground while sampling.
- Do not transport the samples with other environmental samples.

b. Adhering to sample preservation and holding time limits is critical to the production of valid data.
- Samples should be labeled, iced or refrigerated at 1 - 4 degrees C immediately after collection and during transit to the lab.
- Care should be taken to ensure that sample bottles are not totally immersed in water during transit or storage.
- Samples should arrive in the lab no later than 6 hours after collection. Whenever possible samples should arrive at the lab on the day of collection, preferably before 3 p.m.

c. The sampler will complete the laboratory data form noting time, date, and location of sample collection, current weather conditions (including wind direction and velocity), water temperature, clarity, wave height and any abnormal water conditions.

Sampling Method

- Label the bottle.
- Carefully move to the first sampling location. Water should be approximately knee deep. While wading slowly in the water, try to avoid kicking up bottom sediment at the sampling site.
- Open a sampling bottle and grasp it at the base with one hand and plunge the bottle mouth downward into the water to avoid introducing surface scum.
- The sampling depth should approximately 6 to 12 inches below the surface of the water.
- Position the mouth of the bottle into the current away from your hand. If the water body is static, an artificial current can be created by moving the bottle horizontally with the direction of the bottle pointed away from you.
- Tip the bottle slightly upward to allow air to exit and the bottle to fill.
- Make sure the bottle is completely filled before removing it from the water.
- Remove the bottle from the water body and pour out a small portion to allow an air space of 2 cm for proper mixing of the sample before analyses.
- Tightly close the cap.
- Store sample in a cooler immediately.