CAMP Sediment Quality Sampling Protocol

Sediment quality sampling is conducted every 6 years, beginning in 2011/12, in conjunction with the benthic invertebrate monitoring program. Sediment samples are collected at or near each annual water quality sampling site to the extent feasible (i.e., if/where substrate is suitable for collection). Exceptions include: Lake Winnipegosis, where sediment quality is sampled at the offshore (i.e., deep) benthic invertebrate sampling site; and, the Lake Winnipeg outlet area, where sampling is only conducted at the site near Big Mossy Point.

Sample Collection

Sediment samples are collected using sediment grab samplers (i.e., Ekman or Ponar samplers). Triplicate samples are collected at each sampling site. The upper 5 cm of sediment is collected and submitted for analysis.

In addition, the following is recorded/measured at each site:

- Sampling site name, location ID, and UTMs using a hand-held GPS unit;
- Date and time of sampling;
- Water depth;
- Water temperature, pH, dissolved oxygen, conductivity, and turbidity near the sediment-water interface;
- Method of collection (e.g., wading, from a boat, etc.);
- Sediment collection device (i.e., Ekman or Ponar sampler);
- Penetration depth;
- Number of grabs collected for each sample as well as sample type (i.e., discrete or composite);
- Location of each replicate sample;
- Description of the sediments including texture, consistency, colour, odour, presence of biota, and presence of debris;
- Photographs of sediment grabs; and
- Weather conditions (air temperature, precipitation, wind speed and direction, cloud cover).

Sample Handling and Transport

Samples are kept cool and in the dark until submission to the analytical laboratory.

Laboratory Methods

Samples are submitted to a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory for analysis of the parameters indicated in Table 1. All analyses are performed using standard methods and laboratory quality assurance/quality control (QA/QC) procedures.

Field QA/QC Samples

The sediment quality sampling program incorporates several QA/QC procedures, including: collection of triplicate samples; homogenate duplicates (if/as required); and interlaboratory comparison samples.

- **Triplicate Samples -** Triplicate samples are collected at each site.
- **Homogenate Duplicate Samples** – Homogenate duplicates are prepared and submitted for analysis if collection of multiple grabs are required to obtain the volume of sediments needed for laboratory

analysis. In these instances, sediments from multiple grabs are homogenized to a uniform colour and texture. Homogenate duplicate samples are prepared by splitting the homogenized sample between two sets of containers and submitting both sets for analysis. The purpose of a homogenate duplicate sample is to ascertain the quality of the homogenization (i.e., adequate mixing).

- **Interlaboratory Comparison Samples** – Samples for interlaboratory comparison are collected by filling an additional set of sample containers for submission to a second CALA accredited laboratory for comparison of analytical results. Similar to a homogenate duplicate sample, material from multiple grabs are combined then split between the sample containers for both laboratories.

Table 1. Sediment quality monitoring parameters.

Parameter	Units
Nutrients	
Total Kjeldahl Nitrogen	%
Nitrate/nitrite-N	mg/kg (d.w.)
Phosphorus	mg/kg (d.w.)
Metals/Metalloids	
Aluminum	mg/kg (d.w.)
Antimony	mg/kg (d.w.)
Arsenic	mg/kg (d.w.)
Barium	mg/kg (d.w.)
Beryllium	mg/kg (d.w.)
Bismuth	mg/kg (d.w.)
Boron	mg/kg (d.w.)
Cadmium	mg/kg (d.w.)
Calcium	mg/kg (d.w.)
Chromium	mg/kg (d.w.)
Cobalt	mg/kg (d.w.)
Copper	mg/kg (d.w.)
Iron	mg/kg (d.w.)
Lead	mg/kg (d.w.)
Lithium	mg/kg (d.w.)
Magnesium	mg/kg (d.w.)
Manganese	mg/kg (d.w.)
Mercury	mg/kg (d.w.)
Molybdenum	mg/kg (d.w.)
Nickel	mg/kg (d.w.)
Potassium	mg/kg (d.w.)
Selenium	mg/kg (d.w.)
Silver	mg/kg (d.w.)
Sodium	mg/kg (d.w.)
Strontium	mg/kg (d.w.)
Sulfur	mg/kg (d.w.)
Sulfur	%
Thallium	mg/kg (d.w.)
Tin	mg/kg (d.w.)
Titanium	mg/kg (d.w.)
Tungsten	mg/kg (d.w.)
Uranium	mg/kg (d.w.)
Vanadium	mg/kg (d.w.)
Zinc	mg/kg (d.w.)
Zirconium	mg/kg (d.w.)
Supporting Variables	
Total Organic Carbon	%
Total Carbon	%
Inorganic Carbon	%
Moisture	%
Particle Size (Silt, Clay, and Sand)	%

d.w. = dry weight