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Environment, Safety, and Health Directorate

EPC-ES

Technical Procedure

Collection of Benthic Macroinvertebrates in the Rio Grande

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REVISION HISTORY

Document Number and Revision *[Include revision number, beginning with Revision 0]*	**Effective Date** *[Document Control Coordinator inserts effective date]*	**Description of Changes** *[List specific changes made since the previous revision]*
EPC-ES-TP-013, R0	May 10, 2016	Organization Name change from ENV to EPC and Bi-yearly update. Defined the sampling locations more clearly, new permit responsibility, and sampling methodology was changed from ten subsamples to six. Supersedes SOP-5247.
SOP-5247, R1	March 1, 2014	Major Revision.
SOP-5247, R0	July 21, 2009	New Document.

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1.0 PURPOSE AND SCOPE

Local populations of aquatic benthic macroinvertebrates (BMIs) are indicator species of both good- and bad-quality water; they are indicators of overall aquatic conditions, quality of fisheries, chemical conditions, and associated riparian habitat. BMI assemblages, quantified as "metrics," can provide an indicator of water quality within a stream system. Evaluation of the changes in the metrics over time may help in the evaluation of human-induced changes. Unlike fish, BMIs cannot move around much so they are less able to escape the effects of sediment and other pollutants that diminish water quality.

The purpose of this procedure is to describe the process for the establishment, collection, and processing of BMIs from kick net samplers upstream and downstream of Los Alamos National Laboratory (LANL) in the Rio Grande. The reasons for choosing kick net sampling include the quantification of the sample, sample consistency from year to year, and ease of sampling.

This procedure applies to the individual(s) assigned to collect biota samples as part of the Soil, Foodstuffs, and Biota (SFB) Monitoring Project, Environmental Surveillance Program.

2.0 BACKGROUND AND PRECAUTIONS

2.1 Background

This document establishes the basic requirements for establishing, collecting, and processing BMI samples upstream and downstream of LANL in the Rio Grande—the main objective is to determine if there are any impacts to the Rio Grande from LANL operations. The task of identifying BMIs within a sample is given to a well-qualified analytical laboratory, where taxa and individuals per taxa are analyzed to the lowest possible taxonomic level. Work performed under the direction of this procedure by LANL personnel will occur only after required training to applicable documents has been completed and documented.

This monitoring program is part of the Environmental Surveillance Program mandated by DOE Orders 436.1 and 458.1.

Benthic Macroinvertebrates include insects, oligochetes, leeches, molluska, and crustaceans, which are retained by the Standard No. 35 sieve (0.50-mm opening).

Samples are collected in the Rio Grande at three locations with respect to being upstream or downstream of LANL:

- Upstream (five total samples):
  1. Upstream of the Otowi Bridge to Black Mesa (with replicate samples from a minimum of five sites along the length of this reach).
- Downstream (five total samples):
  2. Downstream of the Los Alamos Canyon Confluence ([LAC] with replicate samples from a minimum of two sites downstream of LAC) and,
  3. Downstream of the Sandia Canyon, Mortandad Canyon, and/or Ancho Canyon confluence near the south end of the LANL boundary.

2.2 Precautions

Individuals are required to be trained in the following before performing this procedure:

- First aid;
- Cardiopulmonary Resuscitation (CPR); and
- General Field Safety for All Employees.

All participants near the water must know how to swim.

A minimum of two (2) people are required to go out in the field. Do not perform work under conditions you consider unsafe. Before beginning work described in this procedure, review the hazards and safety controls in Attachment 1, Hazard Review for Macroinvertebrate Sampling.

3.0 EQUIPMENT AND TOOLS

• Turtox bottom kick net (9 W ×18 L in. [0.46 m]) • 5-gallon plastic bucket • Soft scrubbing brushes • 70% ethanol • Paper towels • Chain-of-custody forms • 500-mL wide mouth polyethylene (poly) bottles • Ice chest • Full length arm protection gloves	• Funnels • Ziploc or equivalent bags (1- and 2-gallon size) • Chest waders and belt • Safety glasses, hat • Standard No. 35 sieve (0.50 mm) • First aid kit, Snake bite kit • Water safety rope • Water safety life vests

4.0 STEP-BY-STEP PROCESS DESCRIPTION

4.1 Preparatory Activities

Field Team Leader (FTL):

1. Monitor the Rio Grande for water levels (depth and current). In general, sampling should occur during late September or early October with the currents being no greater than 3 ft/s in the proposed sampling sites.
2. Obtain a trespass permit (written confirmation) with the Pueblo of San Ildefonso (PSI) Environmental Department, and notify the Pueblo at least <u>two weeks in advance of sampling.</u> This notification is required because upstream and some downstream sampling will occur in the Rio Grande within PSI lands.
3. Conduct a hazard review in accordance with Attachment 1, Hazard Review for Macroinvertebrate Sampling.
4. Check the condition of the vehicle and the fuel level before leaving for the field.
5. Identify a point-of-contact to whom you can provide pertinent information of destination, expected time-in, and methods of notifying the field team.
6. Notify the group office to place you on travel status when you are leaving Los Alamos County.
7. Ensure you have a working cell phone.

4.2 Collecting and Processing Samples from the Rio Grande

Sampler:

1. Ensure that all safety and health procedures are in place and employed per Attachment 1, Hazard Review for Macroinvertebrate Sampling.
2. Collect six subsamples at each sample site, in a downstream direction along a 6-m-long transect at the 0.5- to 0.75-ft depth, for a total area of approximately 3 m^2 (0.46 m wide x 6 m long = 2.8 m^2).

   Collect each subsample by holding the net (0.46 m wide) approximately 1 m downstream and then waddling/shuffling towards the net; this process will loft the BMIs into the net. Repeat six times, being careful not to invert the net and lose the sample.

   After collecting the six subsamples, immerse and invert the net contents into a 5-gallon plastic bucket half filled with water; gently rinse clean the BMIs and debris from the net with a soft bristle brush and water.
3. Pour the contents of the bucket through a Standard No. 35 (0.50-mm) sieve. Rinse bucket until clean. Remove all clean vegetation and small rocks from the sieve. Wash the contents of the sieve into a labeled wide-mouth 500-mL poly bottle with water, and place bottle into a cooled ice chest. **Note**: You may use a large funnel to help pour the contents of the sieve into the bottle.
4. Invert the bottle, discard the water, and fix with 70% ethanol, once back at LANL.

   Note: You can use a 5-in.-diameter filter made of the same mesh as the net to discard the water as follows: Place the filter over the mouth of the bottle, holding the filter on the bottle by means of a cap with holes. You can rinse any organisms on the filter back into the bottle with ethanol.
5. Decant the old ethanol and replace with a fresh mixture after 24 h.
6. Secure sample bottles with chain-of-custody (COC) tape.

4.3 Maintaining Custody of Samples

Sampler:

1. Document COC for all samples used to demonstrate compliance. Fill in all information on COC sheet; this should include location (upstream or downstream), site location (1 [most upstream], 2, 3, 4, and 5 [most downstream]), date, samplers, and X and Y coordinates.
2. Verify the possession and handling of samples is traceable at all times.

   Note: A sample is considered in custody if it is

   - in one's physical possession;
   - in one's view after being in one's physical possession;
   - in one's physical possession and then locked up so that no one can tamper with it; or
   - kept in a secure area where access is restricted to authorized and accountable personnel only. (A secured area is an area that is locked [e.g., a room, cooler, vehicle, or refrigerator]).
3. Use a custody seal to secure the area if the area cannot be secured.

4.4 Transferring Custody of Samples

Sampler:

1. Complete the "relinquished by/received by" and "date" sections of the form whenever samples are transferred into the custody of another person or organization.
   Note: These sections of the form must provide a complete history of custody of the samples from collection to transfer to the Sample Management Office and/or to the analytical laboratory directly.

Analytical Laboratory:

2. Transfer samples with COC to the analytical laboratory for analysis. Include on the analytical request the identification of taxa (order, family, genus, and species) and number of individuals per taxa plus the following metrics: species richness, Shannon diversity, evenness, E richness, P richness, T richness, %EPT, % Tolerant species, Hilsenhoff's Biotic Index (HBI) (tolerance to organic pollution).

4.5 Broken Chain-of-Custody

FTL: Whenever there is a break in the COC of a sample,

1. Document the failure by initiating a deficiency report in accordance with ISD 322-4, Issues and Corrective Action Management Process.
2. Document the occurrence, evaluate the potential impact (if any) on the samples, and propose a fix to prevent recurrence.
3. Use a custody seal to secure the area or the sample container if the area cannot be secured.

4.6 Emergency Actions to Take in the Event of Hazard Control Failure

FTL: For all injuries:

1. Perform first aid as appropriate. An injury could necessitate calling 911.
2. See that the injured person is taken to Occupational Medicine (only if immediate medical attention is not required) or to the nearest hospital.
3. Notify the individual's supervisor and group office as soon as possible.

4.7 Records

FTL:

1. Submit the following record generated by this procedure to the principal investigator:
   - Completed Chain of Custody form.

5.0 REFERENCES

- "Macroinvertebrate Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters," U.S. Environmental Protection Agency document EPA/600/4-90/030 (November 1990)
- "Methods for Sampling Benthic Macroinvertebrates in Large Rivers," EPA/LR101, presentation at U.S. Environmental Protection Agency National Biological Assessment and Criteria Workshop
- "Bioassessment of the Rio Grande Upstream and Downstream of the Los Alamos National Laboratory, New Mexico, USA," *Journal of Environmental Protection*, **3**, 1596−1605 (November 2012)

6.0 ATTACHMENTS OR APPENDIXES

Attachment 1: *Hazard Review for Macroinvertebrate Sampling*

ATTACHMENT 1 – HAZARD REVIEW FOR MACROINVERTEBRATE SAMPLING

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Work Tasks/Steps	Hazards, Concerns, and Potential Accidents; Likelihood/Severity	Controls, Preventive Measures (e.g., safety equipment, administrative controls, etc.)	Hazard Level (from IMP 300-00-00, Hazard Grading Matrix)
Preparatory Activities • Travel to sampling sites in the field	Vehicular traffic Various field and outdoor hazards such as seasonal heat and cold extremes, wind, sun exposure, lighting, insects, reptiles, slips, falls, brush	At least two persons should be involved in all field trips. Train to "General Field Safety for all Employees." Wear seat belts and obey all traffic signs. Communication equipment required. Wear PPE: eye protection, toe protection, long pants, long-sleeve shirt, sun and insect protection. A snake bite kit should be carried on all field trips.	Low
• Monitoring river flows and collecting river data	Falling into river from bank	Two man rule. Know how to swim. Use safety pole. Wear PPE. If contact is made with river water, immediately wash with soap and water or wipe with ethyl alcohol wipes.	
Collecting Samples from the Rio Grande	Falling into river	Two man rule. All field personnel should know how to swim and should wear water life vests. Chest waders should always be worn with a belt to prevent them from filling with water in case of a fall. Don't venture deeper than two feet and attach safety rope to waist. Person on shore should hold the rope.	Low

ATTACHMENT 1 – HAZARD REVIEW FOR MACROINVERTEBRATE SAMPLING

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Work Tasks/Steps	Hazards, Concerns, and Potential Accidents; Likelihood/Severity	Controls, Preventive Measures (e.g., safety equipment, administrative controls, etc.)	Hazard Level (from IMP 300-00-00, Hazard Grading Matrix)
	River water exposure (human sewage wastes, pathogens, toxic pollutants)	Wear full length arm gloves. Avoid splashing. Immediately wash with soap and clean water or with ethyl alcohol wipes if exposed to river water. Tetanus, hepatitis, typhoid fever, and polio immunizations must be up to date.	
	Broken glass or barbed wire in river bottom	Do not venture into the water without foot protection and thick waders. Use net as a safety pole. Carry first aid kit into field.	
Processing Samples from the Rio Grande	River water exposure (human sewage wastes, pathogens, toxic pollutants)	Wear full length arm gloves when processing samplers. Avoid splashing. Immediately wash with soap and clean water or with ethyl alcohol wipes if exposed to river water. Tetanus, hepatitis, typhoid fever, and polio shots must be up to date.	Processing Samples from the Rio Grande
	Chemical exposure to ethanol	Wear chemical resistant gloves when processing samples.	

Wastes or Residual Materials

Pour old ethanol into labeled waste bottle. Store in approved chemical storage unit until full and can be safely discarded. Do not pour down sink.

Emergency Actions to Take in Event of Control Failure

For all injuries, provide first aid and see that injured person is taken to Occupational Medicine (only if immediate medical attention is not required) or the nearest hospital. Notify supervisor and group office as soon as possible.

From: Hollis, Diana J
Sent: Tuesday, August 23, 2016 11:08 AM
To: Maestas, Pamela Therese
Subject: RE: DC review of ADESH procedures

Hi Pamela,

All of the procedures are covered by at least one DUSA, so they're approved for posting.

Diana

From: Maestas, Pamela Therese
Sent: Tuesday, August 23, 2016 11:01 AM
To: Hollis, Diana J <dhollis@lanl.gov>
Subject: DC review of ADESH procedures

Hi Diana,
At your leisure, can you please DC review the attached ADESH procedures (EPC-CP-TPP-MetM, EPC-ES-TP-013, OIO-TP-5166, OIO-TP-5171, and OIO-TP-5191). These need to be posted to the EPRR because they are referenced in ADEM/ADESH deliverables.
Thank you.

Pamela T. Maestas
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