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Environmental Protection-Environmental Stewardship

for **COLLECTION OF BENTHIC MACROINVERTEBRATES IN THE RIO GRANDE**

APPROVAL SIGNATURES:

Subject Matter Expert:	**Organization**	**Signature**	**Date**
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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 than 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 identification of BMIs within a sample is given to a well qualified analytical laboratory where taxa and individuals per taxa are analyzed. Work performed under 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.**

Reference documents: "Macroinvertebrate Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters," EPA/600/4-90/030, "Methods for Sampling Benthic Macroinvertebrates in Large Rivers," National Biological Assessment and Criteria Workshop, EPA/LR101, and "Bioassessment of the Rio Grande Upstream and Downstream of the Los Alamos National Laboratory, New Mexico, USA," Journal of Environmental Protection, 2012, 3, 1596-1605.

Benthic Macroinvertebrates—includes insects, oligochetes, leeches, molluska, crustaceans, and that 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 Los Alamos National Laboratory:

- Upstream:
    1. Upstream of the Otowi Bridge to Black Mesa.
- Downstream:
    2. Downstream of the Los Alamos Canyon Confluence and, if time and resources permit,
    3. Downstream of the Chaquehui confluence near the south end of the LANL boundary.

2.2 Precautions

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

- First aid;
- Cardiopulmonary Resuscitation (CPR);
- General Field Safety for All Employees.
- All participants near the water must know how to swim.

A minimum of two (2) people is 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 X18 L in. [0.46 m])	• Ziplock™ bags (one and two gallon size)
• 5 gallon plastic bucket	• Chest waders and belt
• Soft scrubbing brushes	• Safety glasses, hat
• 70% ethanol	• Standard No. 35 sieve (0.50 mm)
• Paper towels	• First Aid Kit, Snake bite kit
• Chain-of-custody forms	• Water safety rope
• 500-mL wide mouth poly bottles	• Water safety life vests
• Ice chest	
• Full length arm protection gloves	
• Funnels	

4.0 STEP-BY-STEP PROCESS DESCRIPTION

4.1 Preparatory Activities

Field Team Leader	1.	Monitor the Rio Grande for water levels (depth and current). In general, sampling should occur prior to the main monsoon floods that occur in July/August and the currents are no greater than 3 ft/s in the proposed sampling sites.
	2.	Since sampling will occur in the Rio Grande within the Pueblo of San Ildefonso lands, it is required that the FTL check in with the PSI Environmental Department at least <u>two weeks in advance</u> and let them know in writing about the sampling.
	3.	Conduct a hazard review in accordance with Attachment 1, Hazard Review for Macroinvertebrate Sampling.
	4.	Before leaving the field, check the condition of the vehicle and the fuel level.
	5.	Identify a Point-of-Contact to provide pertinent information of destination, expected time-in, and methods of notifying the field team.
	6.	When leaving Los Alamos County, notify the group office to place you on travel status.

	7.	Ensure you have a working cell phone.

4.2 Collecting and Processing Samples from the Rio Grande

Sampler	1.	All safety and health procedures should be in place and employed as per Attachment 1, Hazard Review for Macroinvertebrate Sampling.
	2.	At each of the three major sampling locations, locate five potential sites within each reach that contain similar habitats.
	3.	At each sample site, collect six subsamples in a downstream direction along a 6 m long transect at the 6- to 12-in (15- to 30-cm) depth for a total area of approximately $3m^2$ (0.46 m wide x 6 m long= 2.8 m^2). Each subsample will be collected by holding the net (0.46 m wide) approximately 1 m downstream and then waddling/shuffling towards the net; this will loft the BMIs into the net. Repeat six times and being careful not to invert the net and lose the sample. After collection of the six subsamples, immerse and invert the net contents into a 5 gallon plastic bucket one-half filled with water; gently rinse clean the BMIs and debris from the net with a soft bristle brush and water.
	4.	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: a large funnel may be used to help pour the contents of the sieve into the bottle).
	5.	At the laboratory discard the water and fix with 70% ethanol. The water can be discarded by placing a five inch diameter filter made of the same mesh as the net; the filter is placed over the mouth of the bottle and held together with a cap with holes; invert and discard water; and any organisms on the filter can be rinsed back into the bottle with ethanol.
	6.	After a 24 hour period, decant the old ethanol and replace with a fresh mixture.
	7.	Secure sample bottles with COC tape.

4.3 Maintaining Custody of Samples

Sampler	1.	Document chain-of-custody 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, 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 one of the following: • 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.	If the area cannot be secured, use a custody seal to secure the area.
4.4 Transferring Custody of Samples		
Sampler	1.	Whenever samples are transferred into the custody of another person or organization, complete the "relinquished by/received by" and "date" sections of the form. [NOTE: These sections of the form must provide a complete history of custody of the samples from collection to transfer to the analytical laboratory.}
Analytical Laboratory	2.	Transfer samples with COC to the analytical laboratory for analysis. Requested analysis should include 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	1.	Whenever there is a break in the chain-of-custody of a sample, 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.	If the area cannot be secured, use a custody seal to secure the area or the sample container.
4.6 Emergency Actions to Take in the Event of Control Failure		
FTL	1.	Perform First Aid as appropriate. An injury could necessitate calling 911.
	2.	For all injuries, 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 records generated by this procedure to the Principal Investigator:
   - Completed Chain of Custody form.

2. The records need to be submitted to the RPF in accordance with EP-DIR-SOP-4004, *Record Transmittal and Retrieval Process.*

5.0 ATTACHMENTS

Attachment 1 Hazard Review for Macroinvertebrate Sampling

6.0 REVISION HISTORY

Revision No. *[Enter current revision number, beginning with Rev.0]*	**Effective Date** *[DCC inserts effective date for revision]*	**Description of Changes** *[List specific changes made since the previous revision]*	**Type of Change** *[Technical (T) or Editorial (E)]*
0	July 21, 2009	New Document	T/E
1	March 1, 2014	Changed group name. Also, because of a comparative study conducted in 2009 (rock baskets) and 2011 (kick net), the protocol for kick nets was judged to be more effective, simpler, safer, and less costly and time consuming than artificial substrate samplers. Moreover, artificial samplers are more prone to loss because of flash flooding.	

If you have read and understand the preceding document, click here to receive EDS credit.

ATTACHMENT 1	
SOP-5247, R0 **HAZARD REVIEW FOR MACROINVERTEBRATE SAMPLING (PAGE 1)**	Records Use only Los Alamos NATIONAL LABORATORY EST. 1943

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
	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.	

ATTACHMENT 1	
SOP-5247, R0 (Cont'd) **HAZARD REVIEW FOR MACROINVERTEBRATE SAMPLING**	Records Use only Los Alamos NATIONAL LABORATORY EST. 1943

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.	Low
	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.

Los Alamos
NATIONAL LABORATORY
EST. 1943

Environment, Safety and Health

Electronic Public Reading Room - Posting of Controlled Procedures

Operations Integration Office Management Approval:

Print Name	Signature	Date
Ellena Martinez	Ellena Martinez	3/4/16

Derivative Classifier:

☐ OUO ☐ UCNI ☒ Unclassified ☐ Classified

Print Name	Signature	Date
Larry W. Maassen	Larry Maassen	3/4/16

List of Controlled Documents:

Procedure No.	Title/Description
Air Monitoring (ENV)	
ENV-ES-TPP-003	Technical Project Plan for the Neighborhood Environmental Watch Network (NEWNET)
ENV-ES-TPP-007	Technical Project Plan for the Direct Penetrating Radiation Monitoring Network (DPRNET)
Data Validation (ADESH)	
OIO-TP-5161	Routine Validation of Volatile Organic Compound Analytical Data
OIO-TP-5162	Routine Validation of Semivolatile Organic Compound Analytical Data
OIO-TP-5163	Routine Validation of Organochlorine Pesticide and Polychlorinated Biphenyl Analytical Data
OIO-TP-5165	Routine Validation of Metals Analytical Data
General Field Work	
OIO-TP-222	Shipping/Receiving of Environmental Samples by the Sample Management Office (SMO)
OIO-QP-219	Sample Control and Field Documentation
Soil, Foodstuffs, and Biota Sampling (ENV)	
ENV-ES-TPP-002	Technical Project Plan for Biota Dose Assessment
ENV-ES-TP-003	Collection of Soil and Vegetation Samples for the Environmental Surveillance Program
ENV-ES-TP-004	Produce Sampling
ENV-ES-TP-007	Game Animal Sampling
ENV-ES-TP-006	Sampling Soil and Vegetation at Facility Sites
SOP-5247	Collection of Benthic Macroinvertebrates in the Rio Grande
ENV-ES-TP-008	Collection of Crawfish in the Rio Grande
Well Drilling, Construction, Development, Maintenance, and Abandonment	
ENV-RCRA-QP-010	Land Application of Groundwater