COLLECTING SEDIMENT SAMPLES BY VIBROCORING
(SUBMERSIBLE or POLE SYSTEM)

Standard Operating Procedure

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1.0 EQUIPMENT AND SUPPLIES

Either of two types of vibrocoring systems:

(1) A mobile boat vibrocoring system consisting of: a 25 ft. aluminum pontoon boat with outboard motor and trailer, Rossfelder Model P-3 vibrocorer, 115/230 VAC, 3-phase generator, 15 ft. draw works with 1,500 lb. winch, 110 VAC, miscellaneous marine equipment and tools, as needed to operate the system. The original system uses aluminum 4-inch (1/8 in. wall) diameter core tubes up to 20 feet long. These may be lined with 3.75-inch (1/16 in. wall) diameter CAB (cellulose acetate butyrate) tubes. A stainless steel nose piece with core catcher is pop-riveted to the lower end of the core tube assembly. Alternatively, 4 in. x 3/32 CAB or 4 x 1/8 in. wall polycarbonate (Lexan) core tubes may be used with a riveted-in CAB core catcher. The vibro-head contains a ball check valve to help retain sediments during tube extraction.

(2) a portable "pole" vibro-coring system per AScI design, consisting of: electric vibrator motor (12 V DC) and mounting plate with socket for attachment of 2" diameter extension poles; two, 12 V DC storage batteries with charger; core tube adapter and clamp with check valve and retrieval lines attached; 2-10 ft. extension poles, 6.5 ft. (2 meter) lengths of 2" diameter core tube (CAB or cellulose acetate butyrate] polymer) with CAB core catchers attached, 2" diameter PE (polyethylene) end caps; duct tape, marker pens, portable drill and ¼" bit; tube cutter tool; glass or polypropylene sample bottles; field crew of at least 2.

2.0 PROCEDURE

The following two sampling procedures apply to the submersible (**S**) and pole (**P**) vibrocoring systems. First:

--Locate the sampling station with an appropriate field positioning system that provides suitable accuracy (± 3 to 5 m).

--Triple anchor the boat (if any) to insure keeping it on station.

--Measure the water depth using appropriate means, such as a sounding line, marked pole or fathometer.

2.1 Collecting the Core

Submersible (S) Vibrocorer System:

S-1) Check for secure attachment of the vibro-head to the winch cable and the aluminum core tube/CAB liner assembly.

S-2) Using the winch and draw works, suspend and lower the vibrocorer slowly until the core tube contacts the bottom. A measuring tape attached to the top shackle of the vibrohead is used to calculate this when water depth and length of the core tube is known.

S-3) Begin vibration and continue penetration until the core tube is fully buried or refusal occurs. Be careful to maintain a taught cable to keep the core tube vertical. Turn off the vibration when penetration is completed.

S-4) Withdraw the core tube slowly by winch, using vibration only if extraction is difficult (as from clay). Raise the core tube until the lower end is accessible from on deck. Thereafter, keep the tube in a near vertical position to preserve core integrity.

S-5) Cap and tape the lower end. If a lined aluminum tube is used, remove the nose piece rivets, slide the liner out (downward) until the sediment/water interface is visible through the liner wall. Drill a small hole just above the interface to drain off all water above the sediment core. Carefully cut off (hacksaw) the liner at this hole, capping and taping it to seal the tube at both ends.

S-6) Label the upper end of the core with date, time and a unique station number. Transfer the core ashore as soon as possible to the processing location, protecting the core from sunlight, heat and physical disturbance as much as possible.

Pole (P) Vibrocorer System:

P-1) Check for secure attachment of the retrieval lines to the core tube mounting clamp.

P-2) Insert a 6.5 ft. length of 2" diameter CAB core tube (core catcher end down) into the mounting clamp and tighten the four wing nuts securely by hand. Make sure clamp is tightened evenly.

P-3) Choose an extension pole of appropriate length (water depth or longer) and insert it into the mounting plate socket; secure it using a 1/4" bolt and locknut.

P-4) Slip the flared lower end of the extension tube over the check-valve end of the core tube adapter, and hold it on by
applying upward tension on the retrieval lines. Lower the system vertically (CAB tubing first)

into the water to the bottom. Press and vibrate tube into the sediment until it is inserted 6 ft., or until refusal occurs. Note insertion length by markings on extension pole.

P-5) Disengage the extension pole and stow on board sampling vessel.

P-6) Retrieve the core tube containing the sample by pulling on the two retrieval lines, either manually or by using a davit-mounted hand winch.

P-7) With tube and barrel held vertically in the boat, drill hole in tube just above the top of the sediment column to drain off water.

P-8) Cut off the tube just above the sediment surface and cap both ends.

P-9) Label the tube lengths with sample station ID codes with a permanent marker; make sure the upper ends are marked as such.

P-10) Stow core within a cooler or enclosed box with bag ice. Transport ashore for processing as soon as possible.

2.2 Processing the Core

The sediment core is usually processed in a nearby field facility in order to describe its structure and create subsamples for chemical analysis. This is important to document the core content and to maintain sample quality.

Both the 2" pole vibrocores and the 4" submersible vibrocores, contained and transported ashore in CAB plastic tubes after sampling, are processed in the same way. First, cut off cap and tape the cores in sections of 40" (about 1 meter) in length. This length fits onto a stainless steel tray on the core processing table, and can be photographed conveniently in only three frames of film. Alternatively, the entire core length may be photographed in 18" steps using a moveable camera box with a built-in light source. Make any cross cuts with either a hacksaw or the vibrating cutter tool described below. When sub-sampling the core later on, take care not to include any sediment from this cut surface, or any plastic chips from the saw cut.

Next, cut the CAB core liner (filled with sediment) lengthwise along opposite sides of the 40" or longer section. Usually this is done with a vibrating saw, router, or with a hooked cutting blade. Note: cut through the liner wall without cutting significantly into the sediment core itself. Disturbed sediment adjacent to the liner wall should not be sampled anyway, but it is important not to contaminate the undisturbed interior of the core with plastic chips or other debris from the cutting process. If, before coring, the outer wall of the Lexan liner (1/8" thick) is scored or pre-cut halfway through with with a circular saw or other tool, then the final cut during processing can be made with a hooked blade. However, Lexan plastic is very tough, and cutting with a razor knife can be dangerous and difficult to control without cutting into the core. The best hand tool available for cutting hard plastic liners is an electrical vibrating or "reciprocating" saw of the type used in industry to cut sheet metal, or in medical practice to cut off plaster casts. (one such saw is

made by Fein.) When used with a blade guide, the cut depth can be controlled so as to barely cut through the liner wall. The cuttings tend to form ribbons rather than chips, which helps in avoiding contamination of the sediment inside. Also, the vibrating blade is much safer to use than a conventional saw blade, since it does not readily cut soft material such as skin.

Once the liner wall is cut through along opposite sides (top and bottom of the horizontal core), use a series of flat, thin blades of rectangular shape (and pre-cleaned) to cut the sediment core lengthwise into two half-cylinders, using a series of vertical cuts along the core's radial axis. Use a clean blade for each cut. Vertical cutting in discrete steps, rather than "dragging" the blade through the core) insures that the layered structure of the core is not obscured, and that contaminants are not spread across layers. Between each vertical cut, wash and scrub all adhering sediment off of the blade in a bucket of clean tap water. Note: it is usually not practical to decontaminate the blade fully after each cut, but any chance of contaminant carryover between zones can be minimized by cutting through the less oily parts of the core first. Alternatively, several clean blades can be used -- one for each increment of length. It helps if the blade is wet when cutting through oily silt or stiff clay sediments, which tend to adhere. A cleanly cut surface is best for documenting core structure.

Arrange the two half-cylinders of the core section side-by-side, with the cut surfaces facing up. Extend a tape measure along beside them, starting at the original top end of the core. Photograph the core in color with a track-mounted 35 mm camera. With 160 watts (4, 4' bulbs) of fluorescent light, 200 speed film is suitable for good results. Insure that the wet surface of the core does not reflect light directly into the camera lens. A polarizing filter helps to reduce reflectance off the wet core surface. Photograph the core section in overlapping frames; place a small label with core field ID number so that it appears in each frame. Advance the tape measure appropriately for any additional sections of the same core.

If a moveable light box is used, the tape measure is first positioned along the full length of the core. Overlap the fields of view at least one inch.

While the core section is still intact, record a general description of the core structure, noting zones of different color, texture, sediment type (silt, sand, clay, gravel, etc.), and apparent oiliness.

Collect each core interval, as pre-determined in the study plan, from the undisturbed core interior with a clean, stainless steel spoon or spatula. Place the sediment from an individual core interval into a clean stainless steel mixing bowl of appropriate size (bowls and spoons are pre-cleaned according to OEPA protocols). Mix the sediment with a clean stainless steel spoon thoroughly or until visually homogeneous. During this operation, remove any obviously "non-sediment" objects from the sample; bottle caps, broken glass, sticks, large rocks, etc.

Place approximately 150 mL of sediment collected from each core interval into a labeled 250 mL wide-mouth glass jar (pre-cleaned according to EPA protocols), leaving space at the top of the bottle for later mixing (unless the samples are for volatile organics analysis, in which case the jar should be completely filled). Label each jar with a unique station identification number,

with a suffix indicating the layer (X cm - Y cm) of the sample. Record a description of the layers in each core on Core Observation Log Sheets. Store the sample bottles on ice or in a refrigerator until transfer shipment to the analytical laboratories.

2.3 Sample Storage

Freeze all sample jars at -5 to -10 °C until analysis.

3.0 Health and Safety and Environmental Compliance

1) Field crew personnel should always wear appropriate personal protection clothing and equipment, which at a minimum includes:

- Safety glasses or face shields
- Poly-coated Tyvek or Saranex jump suits
- Double gloves (Latex inner gloves and Nitrile outer gloves)
- Steel-toed rubber boots
- Life jacket, under jump suit (to avoid contaminating it)

The intention of this clothing is to minimize personal exposure to the possibly hazardous sediments.

2) Field crew personnel should make a point of consuming liquids (cool water recommended) on a regular basis, to minimize heat stress, and take periodic rest breaks to minimize fatigue.

3) Excess sample will usually be disposed of by the client firm or agency.

4) The sediment processing crew at the field facility should wear protective clothing to include safety glasses or goggles, a Tyvek (or Saranex) jump suit, latex gloves and rubber boots. Personnel involved in the decontamination work should also wear nitrile outer gloves.