Standard Operating Procedure

Malvern Grain Size Analyzer

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| **Department:** | Earth and Environmental Sciences |
| **Date SOP was written:** | 9/19/2013 |
| **Date SOP was approved by PI/lab supervisor:** | 9/19/2013 |
| **Principal Investigator:** | Steven Goodbred |
| **Internal Lab Safety Coordinator/Lab Manager:** | Richard Bradshaw |
| **Lab Phone:** | Click here to enter text. |
| **Office Phone:** | S. Goodbred (615) 322-4511 (campus phone: 2-4511) Bradshaw (615) 343-0839 (campus phone: 3-0839) |
| **Emergency Contact:** | S. Goodbred (615) 916-9259R. Bradshaw (208) 260-2792 |
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| **Location(s) covered by this SOP:** | *SC1110B* |
| *(Building/Room Number)* |

**Type of SOP:** ☒ Process ☐Hazardous Chemical ☐ Hazardous Class

**Purpose**

**Personal Protective Equipment (PPE)**

**Respirator Protection**

**Eye Protection**

ANSI approved, tight-fitting safety glasses/goggles and/or face shield.

**Body Protection**

Remove any loose jewelry around your neck or any jewelry on your hands and wrists. Tightly secure long hair in ponytail.

**Ear Protection**

Ear protection in the form of ear muffs or ear plugs must be worn during operation.

**Engineering Controls**

**Medical Emergency**

To contact the [Vanderbilt University Police Department](http://police.vanderbilt.edu/) in an emergency:

* Call **911** from any campus phone.
* Call **(615) 421-1911** from any other phone.

**Protocol/Procedure**

**Report any problems or abnormalities with the equipment immediately to the PI or LM.**

**\*\*\*NEVER leave the machine unattended while operating\*\*\***

SAMPLE PREP

If your sample is mostly mud:

1. Scoop out the tiniest bit of mud (about a pinkie nail’s length) onto spatula. Rinse through a 1 mm-mesh size (1000 microns) sieve with de-ionized water (DI), using rubber policeman to pass through mesh. Make a note of any particles that do not pass through the sieve.
2. Use rubber policeman to homogenize the sample in the pan.
3. Rinse contents of pan into a 50 or 100-mL beaker using DI.

 If your sample is mostly sand:

1. Scoop ~1.5-2 cm length of sand onto spatula and rinse through 1 mm (1000 microns) sieve, using rubber policeman to pass through mesh if necessary. Make a note of any particles that do not pass through the sieve.
2. Use rubber policeman to homogenize the sample in the pan.
3. Rinse contents of pan into 50 or 100-mL beaker using DI.
4. Use rubber policeman to homogenize the sample in the beaker. Let the beaker sit for ~10 seconds after mixing, then immediately decant any muddy liquid from the beaker into the sink, being careful not to lose any sand settled at the bottom (decant samples into the “sed trap” in the sink—i.e., the bucket).

GRAIN SIZE ANALYSIS

1. Turn on machine, both the power for the laser and power for the pump.
2. Lift the pump apparatus and place a 500 or 1000-mL beaker full of fresh DI below.
3. Make sure the green button on the front of the pump apparatus is lit (meaning it is not draining). Turn on the pump. Set speed to 2800-3000 rpm. If there are a lot of bubbles running through the machine, you can turn off the pump for ~5 seconds and turn back on.
4. Make sure the water running through the tubes and beaker is clear and free of sediment. If the water is not clear, turn off the pump, drain the tubes (green button), lift up the pump apparatus and rinse any sediment off the paddles, sonicator, and intake valves with DI. Remove the beaker and empty it in the “sed trap” in the sink (i.e., the bucket), rinse with DI until clean, and re-fill with clean DI. Replace the full beaker below the pump and circulate the clean water through. Repeat as necessary.
5. Open Mastersizer 2000 program.
6. When prompted, indicate if you will be using an existing SOP or creating a new one. We are using **"BanglaPIRE for database"**for BanglaPIRE core samples.
7. Once SOP is loaded/created, fill in Sample ID and any comments/notes you want for your sample.
8. Next follow instructions in Yellow Box. Under the Transect B and C SOP, it will first tell you to hit Start when beaker is full of clear DI. Then the apparatus will run a background calibration (~1 minute). When it finishes calibration, it will prompt you to add your sample.
9. Homogenize your sample before pouring into large beaker. If mud, pour all the contents of the small beaker into the large beaker. If sand, add enough until the laser obscuration is between 10-20%. For both, if you go over 20%, that’s ok, it won’t break the machine. If it is less than 10%, you must add more sample to get a good reading. Sonicate (ultrasound) your sample at the indicated rate and time. Hit Start to initiate the grain size analysis. Measurement will take ~ 1 minute.
10. When the measurement is done (usually a beep sounds), take a look at the graph in the background showing the grain size histogram for your sample. Make sure the data makes sense before moving on. Run a repeat sample if the data looks suspect.
11. Unit will also display message, “Post-measurement instructions entered in SOP”. Click ok.
12. If you have more samples to run and want to run the same SOP, indicate so.
13. Turn off the pump and drain the water from the tubes (green button). Go through the steps listed in #4 above for cleaning the water through the Malvern.
14. You’re now ready for your next sample. Make sure you’ve rinsed all glassware, utensils, and sieve with DI between samples.
15. If done completely, close the SOP program, and make sure you remove your last sample from the beaker and rinse the machine with clean water. Leave the machine with clean water in the tubes (i.e., not drained!). Power down the machine by turning off the pump power and laser power.
16. Clean up your lab area (wash all glassware, utensils, and sieves, and wipe down the table).
17. Export your data (as a .csv which can be read into excel) using an established Template (the file “Export Templates.xls” lists a summary of data exported with select established templates) or create a new Template, whatever works best for you.

**NOTE**

Any deviation from this SOP requires approval from PI.

**Documentation of Training** (signature of all users is required)

* Prior to conducting any work with the Malvern Grain Size Analyzer, LM or designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, and emergency procedures.
* The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP.
* The Principal Investigator must ensure that their laboratory personnel have attended appropriate laboratory safety training and are current with any refresher training required.

I have read and understand the content of this SOP:

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| **Name** | **Signature** | **Identification** | **Date** |
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