Appendix 2-2: Sediment Texture and Grain Size Distribution Metadata

Sediment Texture and Grain Size Distribution Metadata

Note: the following metadata is presented using the Long Island Sound Cable Fund template, for the complete FGDC metadata see:

https://www.sciencebase.gov/catalog/item/5de9be03e4b02caea0eeda45

Dataset Originator: *US Geological Survey*

Publication Date: 2020/11/23

Dataset Title: *Location and grain-size analysis results of sediment samples collected in Long Island Sound, Connecticut and New York, in fall 2017 and spring 2018 by the U.S. Geological Survey, University of Connecticut, and University of New Haven during field activities 2017-056-FA and 2018-018-FA (simplified point shapefile and CSV files.*

Online Linkage:

https://www.sciencebase.gov/catalog/file/get/5de9be03e4b02caea0eeda45

https://doi.org/10.5066/P9GK29NM

Abstract: *Two marine geological surveys were conducted in Long Island Sound, Connecticut and New York, in fall 2017 and spring 2018 by the U.S. Geological Survey (USGS), University of Connecticut, and University of New Haven through the Long Island Sound Mapping and Research Collaborative. Sea-floor images and videos were collected at 210 sampling sites within the survey area, and surficial sediment samples were collected at 179 of the sites. The sediment data and the observations from the images and videos are used to identify sediment texture and sea-floor habitats.*

Dataset purpose: *This dataset provides access to the locations and grain-size analysis results of surficial sediments collected with a modified Van Veen grab sampler on the SEABed Observation and Sampling System (SEABOSS) aboard the Research Vessel (R/V) Connecticut during USGS field activities 2017-056-FA (November 28 to December 3, 2017) and 2018-018-FA (May 8 to 15, 2018). These data were collected to explore the nature of the sea floor and to characterize the seabed by identifying sediment texture. The sediments were analyzed using two different methods: the Beckman Coulter Multisizer 3 and sieving of the 4-phi fraction, and the HORIBA LA-960 laser diffraction analyzer and sieving of the -2-phi fraction. The HORIBA LA-960 laser diffraction analyzer is a new method for analyzing grain-size distribution at the sediment laboratory at the USGS Woods Hole Coastal and Marine Science Center. This dataset was analyzed using both methods so that the results could be compared. Results of the comparison are not included in this data release.*

Time period of content: Data were collected on the following dates: 2017/11/28-2017/12/03 and 2018/05/08-2018/05/15

Dataset Status: *Complete*

Update Frequency: *None planned*

Theme Keywords:

U.S. Geological Survey
USGS
Coastal and Marine Hazards and Resources Program
CMHRP
Woods Hole Coastal and Marine Science Center
WHCMSC
University of Connecticut
UConn
Northeast Underwater Research, Technology and Education Center
NURTEC
University of New Haven
Long Island Sound Habitat Mapping
Long Island Sound Mapping and Research Collaborative
LISMaRC
ground-truth
seafloor samples
sediment samples
sediment data
surficial sediment classification
stations
seafloor
sea floor
marine geology
sediments
SEABOSS
SEABed Observation and Sampling System
Van Veen grab sampler
Beckman Coulter Multisizer 3
HORIBA LA-960 laser diffraction analyzer
gravel
sand
silt
clay
CSV
shapefile
field activity 2017-056-FA
field activity 2018-018-FA
R/V Connecticut
grab sampling
grain-size analysis
marine geology
sea-floor characteristics

North America
United States
Atlantic Ocean
Connecticut
New York

Long Island Sound
Fishers Island
Fishers Island Sound

Access Constraints: *None*

Use Constraints:

Public domain data from the U.S. Government are freely redistributable with proper metadata and source attribution. Please recognize the U.S. Geological Survey as the originator of the dataset.

"Data and metadata are is licensed under a Creative Commons Attribution-Noncommercial-Share Alike 3.0 United States License. Appropriate acknowledgment with a byline/credit/link ***must*** *be given to both the original scientists/data contributors by reference to their relevant publications and to the Marine Geoscience Data System (www.marine-geo.org). Where citation information has been provided to us by scientists it is included with the relevant database entries, and should be acknowledged when data are used. You may browse freely, but you may not circulate or publish materials you obtained from this site if you do not accept the terms of providing adequate citation.*

Data are provided with the express understanding that they will not be sold to third parties or included in commercial databases.

Users are strongly encouraged to contact the original investigators responsible for data made available on this site. Where appropriate, researchers are also encouraged to consider collaboration and/or co-authorship with original investigators.

Data should not be used for navigation purposes."

Point of Contact: *Seth Ackerman, U.S. Geological Survey, 384 Woods Hole Road, Woods Hole, MA 02543-1598 USA. Phone: 508-548-8700 x2315, Fax: 508-457-2310, email: sackerman@usgs.gov*

Dataset Credit: *US Geological Survey*

Data Quality Considerations:

Attribute accuracy: *All attributes were evaluated during data processing as standard quality control to ensure attributes contain accurate and relevant information and values. Due to rounding, the sum of the aggregate class percentages (e.g., GRAVEL (wt%), GRAVEL_PCT, etc.) and the sum of the phi fraction percentages (e.g., PHI_11, PHI_10, etc.) may not always add up to exactly 100.000%.*

The sediment samples were all collected with the same modified Van Veen grab sampler mounted on the SEABOSS. The sediment samples were usually collected at the end of the video trackline, but some samples were collected in the middle of the transect (sites NB30, SB50_3, NB65, SB65_2, and 2018-018-112). The samples were analyzed using two methods; separate subsamples were taken for each grain-size analysis. For the spring 2018 survey, the University of Connecticut's Northeast Underwater Research, Technology and Education Center (NURTEC) assigned different names to the sites, which are available in the comments field (COMMENTS). Some USGS site numbers (FIELD_NO) have the same NURTEC site

name (e.g., sites 2018-018-011 and 2018-018-012 are both NURTEC site NB64-T) because the NURTEC site names are based on the target sampling site names.

Physical sediment samples were collected at 179 of the 210 sites occupied during field activities 2017-056-FA and 2018-018-FA; however, locations for all 210 sites are included in the Multisizer analysis results (2017-056-FA_and_2018-018-FA_samples_GS-MS.csv and 2017-056-FA_and_2018-018-FA_samples_GS-MS.shp) with no data values (i.e., -9999) for those sites with no sediment sample analysis. Sediment samples were only attempted in areas where collecting a sample would not damage the SEABOSS; therefore, no samples were collected in areas with a cobble, boulder, or rocky seabed, as identified in real time using the topside live video feed. Samples were also not attempted if the current was too strong, if the deployment was aborted due to the strobe malfunctioning, or if the grab sampler accidentally tripped earlier in the deployment. Each deployment of the SEABOSS is generally considered a unique site; however, five sites (sites SB64_2, 2018-018-024, 2018-018-089, 2018-018-094, and 2018-018-104) had two separate deployments because a sediment grab was not successfully collected during the first deployment. The sediment sample locations for these five sites are from the second deployment when a grab sample was successfully collected. For the spring 2018 data, 14 samples were randomly selected and run as replicates using the laser diffraction analyzer for internal testing purposes. The replicate results are not included in this publication.

Completeness: *Complete*

Positional accuracy:

Horizontal Positional Accuracy: Navigation for field activities 2017-056-FA and 2018-018-FA used Wide Area Augmentation System (WAAS)-enabled GPS. The GPS was set to receive fixes at a 2-second interval in geographic coordinates (World Geodetic System of 1984 [WGS 84]). The recorded position of each sediment sample is the position of the GPS antenna on the survey vessel, located on the aft port side of the R/V Connecticut, not the location of the SEABOSS. The antenna was located approximately 5 meters from the SEABOSS deployment location in fall 2017 and 3 meters in spring 2018. No layback or offset was applied to the recorded position. In addition, the SEABOSS may drift away from the survey vessel when deployed to the sea floor. Based on the various sources of horizontal offsets, a conservative estimate of the horizontal accuracy of the sediment sample locations is 10 meters. The sites with no successful grab included in the Multisizer results are located along the bottom video trackline at the start of the SEABOSS retrieval. Some of these site locations did not originally intersect a bottom video trackline and were moved to the last navigation fix along the site's bottom video trackline.

Vertical Positional Accuracy: The depths recorded for each sample are approximate and were derived from an unpublished composite bathymetry dataset used by the Long Island Sound Mapping and Research Collaborative project.

Process Steps:

Step 1: Collected data.

Two marine geological surveys were conducted in Long Island Sound, Connecticut and New York, in fall 2017 and spring 2018. The R/V Connecticut occupied one of the target sites and

the SEABOSS was deployed off the vessel's A-frame on the stern of the ship. The SEABOSS was equipped with a modified Van Veen grab sampler, a Nikon D300 digital still camera with a Photosea strobe, two video cameras (one forward-looking so that a shipboard operator could monitor for proper tow depth and obstacles, and one downward-looking, a Kongsberg Simrad OE1365 in this setup, that overlapped with the field of view of the still camera) with a topside feed, a GoPro HERO4 Black camera recording backup video, and lights to illuminate the sea floor for video and photograph collection. The elements of this particular SEABOSS were held within a stainless-steel frame that measured 1.15 x 1.15 meters. The frame had a stabilizer fin that oriented the system as it drifted over the seabed. The winch operator lowered the SEABOSS until the sea floor was observed in the topside live video feed. For those sites that were primarily targeted for a sediment grab, the vessel and SEABOSS then drifted with wind and current for up to a few minutes to ensure a decent image with a clear view of the sea floor was acquired; for those sites that were targeted for both a video transect of the sea floor and a sediment grab, the vessel was navigated along a planned transect for up to an hour. A scientist monitored the real-time bottom video and acquired bottom photographs at points of interest by remotely triggering the Nikon camera shutter. Bottom video was also recorded during the drift from the downward-looking video camera. Then, at most sites the winch operator lowered the Van Veen grab sampler until it rested on the sea floor. When the system was raised, the Van Veen grab sampler closed and collected a sample as it was lifted off the sea floor. Times for the sampler retrieval, which would later be used to derive the sample locations, were manually recorded in the survey log when the sampler was lifted off the seabed. The sampler was recovered to the deck of the survey vessel where a subsample was taken for grain-size analysis at the sediment laboratory at the USGS Woods Hole Coastal and Marine Science Center. Sediment samples were only attempted in areas where collecting a sample would not damage the SEABOSS; therefore, no samples were collected in areas with a cobble, boulder, or rocky seabed, as identified in real time using the topside live video feed. Samples were also not attempted if the current was too strong, if the deployment was aborted due to the strobe malfunctioning, or if the grab sampler accidentally tripped earlier in the deployment. A total of 210 sites were occupied aboard the R/V Connecticut with the SEABOSS: 93 sites were occupied in fall 2017 during field activity 2017-056-FA, and 117 sites were occupied in spring 2018 during field activity 2018-018-FA. Sediment samples were collected at 179 of the 210 sites.

Step 2: Acquired and processed navigation.

During the surveys, WAAS-enabled GPS navigation from a Garmin GPSMAP 76C receiver was logged through a DataBridge data logger and ArcMap GPS. The GPS was set to receive fixes at a 2-second interval in geographic coordinates (WGS 84). Dates and times were recorded in Coordinated Universal Time (UTC). Log files were saved for each Julian day in text format. An AWK script (parse_gprmc17056.awk for the fall 2017 log files and parse_gprmc18018.awk for the spring 2018 log files) was used to parse the GPRMC navigation string from the log files for each survey and create ASCII Comma Separated Values (CSV) text files. The output files were merged for each survey and then reformatted using an AWK script (nav_time_reformat.awk), creating a processed navigation CSV text file for each sampling survey

Step 3: Assembled sample information for sediment laboratory.

The sediment sample times (as recorded in the survey logs) were used to parse GPS positions for each sediment sample from the logged GPS data. Approximate depths for each sample were derived from an unpublished composite bathymetry dataset used by the Long Island Sound Mapping and Research Collaborative project. This information was then provided to the sediment laboratory at the USGS Woods Hole Coastal and Marine Science Center with the sample analysis request form for each survey.

Step 4: Analyzed sediment samples using the HORIBA LA-960 laser diffraction analyzer and sieving of the -2-phi fraction.

The samples from each survey were analyzed in the sediment laboratory at the USGS Woods Hole Coastal and Marine Science Center using two different methods: the Beckman Coulter Multisizer 3 and sieving of the 4-phi fraction, and the HORIBA LA-960 laser diffraction analyzer and sieving of the -2-phi fraction. Separate subsamples were taken from each sample submitted to the sediment analysis laboratory for each method. For the sediments analyzed using the HORIBA LA-960 laser diffraction analyzer and sieving of the -2-phi fraction, the subsamples for grain-size analysis were assigned unique analysis identifiers (ANALYSIS_ID) and divided into batches of no more than 30 samples. Each batch was entered into a Microsoft Excel data entry spreadsheet (LD Worksheet Template_xxxx.xlsx, where xxxx is the identifier assigned to the sample submission) to record the initial and dried sample weights, as well as the sieved coarse fraction weights. Each batch was also entered into macro-enabled Microsoft Excel data entry spreadsheets (GrainSizeWorksheet_LD1-30_xxxx(batch_yy).xlsm or GrainSizeWorksheet_LD31-60_xxxx(batch_yy).xlsm, where xxxx is the identifier assigned to the sample submission, "LD1-30" and "LD31-60" refer to the pre-labeled and weighed glass laser diffraction vials in which the samples will be run, and "batch_yy" refers to the sample batch) to record the measurement data coming from the laser diffraction unit and incorporate the initial, dried, and sieved weights. About 10-15 grams of wet sediment were placed in a pre-weighed beaker and the gross weight was recorded. The sample was wet sieved through a 4 mm (No. 5) sieve. If there was any coarse fraction remaining in the sieve, the coarse material was oven dried at 100 degrees Celsius in a pre-weighed beaker, and weighed again when dry. This coarse fraction was dry sieved to determine the individual weights of the -2- to -5-phi fractions, and the weights were recorded in the data entry spreadsheet LD Worksheet Template_xxxx.xlsx. The fine fraction in water was collected in a pre-labeled and weighed glass laser diffraction vial. If there was any coarse fraction remaining in the sieve from wet sieving, this vial was also oven dried at 100 degrees Celsius and weighed when dry. If there was no coarse fraction remaining from wet sieving, the sample can proceed directly to processing for analyses by the HORIBA LA-960 laser diffraction unit. Fine fractions ready for analysis by the HORIBA laser diffraction unit were rehydrated with distilled water if they had been dry. Fifteen (15) ml of pre-mixed 40 g/l sodium hexametaphosphate [(NaPO3)6] were added to each sample. If the height of the fluid in the laser diffraction vial was less than 5 cm, more distilled water was added to raise the level to no more than 8 cm in the vial. The samples were gently stirred, covered, and allowed to soak for at least 1 hour (for samples that were not dried) or up to 24 hours (for samples that were dried). Soaked vials were placed into an ultrasonic bath and run for 10 minutes at a frequency of 37 Hz with a power level of 100. If the samples appeared to be fully disaggregated, they were placed into pre-determined autosampler locations and were run using the HORIBA LA-960 for Windows software to get the fine fraction grain-size

distributions. The fine fraction distribution data were added to the appropriate data entry spreadsheets (GrainSizeWorksheet_LD1-30_xxxx(batch_yy).xlsm or GrainSizeWorksheet_LD31-60_xxxx(batch_yy).xlsm) for each survey. The spreadsheet for each survey was used to calculate a continuous phi class distribution from the original fractions.

Step 5: Analyzed sediment samples using the Beckman Coulter Multisizer 3 and sieving of the 4-phi fraction.

The subsamples for grain-size analysis using the Beckman Coulter Multisizer 3 and sieving of the 4-phi fraction were assigned unique analysis identifiers (ANALYSIS_ID), and a macro-enabled Microsoft Excel data entry spreadsheet (GrainSizeWorksheet_xxxx.xlsm, where xxxx is the batch number assigned to the sample submission) was created for each survey to record the measurement data. About 50 grams of wet sediment were placed in a pre-weighed beaker, weighed, oven dried at 100 degrees Celsius, and reweighed to correct for salt. The dried sample was wet sieved through a 0.062 mm (No. 230) sieve. The coarse fraction remaining in the sieve was oven dried at 100 degrees Celsius (until completely dried) and weighed. The fine fraction in water was collected in a plastic Nalgene bottle and sealed with a screw lid (stored for no longer than one week). The coarse fraction was dry sieved to determine the individual weights of the 4- to -5-phi fractions, and the weights were recorded in the data entry spreadsheet. The fine fraction was run and combined using the 200-micron and 30-micron Coulter analyses using the Multisizer 3 software to get the fine fraction grain-size distribution for each survey. The fine fraction distribution data were added to the data entry spreadsheet for each survey. The spreadsheet for each survey was used to calculate a continuous phi class distribution from the original fractions.

Step 6: Calculated grain-size classification and statistical analyses.

A continuous phi class distribution from the original fractions was transposed to the "results" tab in the macro-enabled Microsoft Excel data entry workbook (GrainSizeWorksheet_LD1-30_xxxx(batch_yy).xlsm or GrainSizeWorksheet_LD31-60_xxxx(batch_yy).xlsm for the laser diffraction results, where xxxx is the identifier assigned to the sample submission, "LD1-30" and "LD31-60" refer to the pre-labeled and weighed glass laser diffraction vials in which the samples were run, and "batch_yy" refers to the sample batch; or GrainSizeWorksheet_xxxx.xlsm for the Multisizer results, where xxxx is the identifier assigned to the sample submission) for each survey. Macros in the workbook ("GS_MoM_Arithmatic," "GS_statistics," and "sedimentname" for the laser diffraction results, and "GS_statistics" and "sedimentname" for the Multisizer results) were run to calculate grain-size classification and statistical analyses and finish processing the data. Sample, navigation, and field identifiers along with continuous phi class distribution data, grain-size classification, and statistical analysis results were copied and pasted into a final Microsoft Excel spreadsheet (xxxx_GS-LD_results.xlsx for the laser diffraction results and xxxx_GS-MS_results.xlsx for the Multisizer results, where xxxx is the batch number assigned to the sample submission) for each survey. The processed data were quality control checked and assigned a quality grade based on the examination of the analytical data. Processed data were released to the submitter and incorporated into the laboratory's database. All raw analytical data generated by the samples were archived in the sediment analysis laboratory.

Step 7: Created final sediment grain-size analysis results CSV files.

For the laser diffraction results, the sediment grain-size analysis results spreadsheets for each survey were merged in Microsoft Excel 2016 for Mac and then edited to remove the quality grade and metric distribution fields and to format fields. The Microsoft Excel spreadsheet was then saved as a CSV file (2017-056-FA_and_2018-018-FA_samples_GS-LD.csv). For the Multisizer results, the sediment grain-size analysis results spreadsheets for each survey were merged in Microsoft Excel 2016 for Mac and then edited to remove some fields, format fields, add site locations for those sites where no sample was successfully collected, and add a no data value (-9999) to empty attributes as needed. The sites with no successful grab were located using the start time of the sampler retrieval from the survey logs; the sampler retrieval position was chosen as the sample location because the video clip is considered the sample in the absence of a physical sample. Some of these site locations from the survey logs did not intersect a bottom video trackline, so they were moved to the last navigation fix along the site's bottom video trackline. Finally, the Microsoft Excel spreadsheet was saved as a CSV file (2017-056-FA_and_2018-018-FA_samples_GS-MS.csv). This process step and the subsequent process step were performed by the same person, Emily Huntley.

Step 8: Created a simplified sediment grain-size analysis results shapefile from the Multisizer analysis.

The CSV file of the sediment grain-size analysis results from the Multisizer analysis was copied and edited to create a simplified version of the CSV file with fewer attribute fields (specifically, STDEV, SKEWNESS, KURTOSIS, and the individual phi measurements [e.g., PHI_11] were removed). A shapefile was created using the simplified version of the CSV file in Esri ArcGIS (version 10.3.1), and XTools Pro (version 12.0) for Esri ArcGIS was used to modify some field parameters in the point shapefile (Table Operations - Table Restructure). Please note that this metadata file represents the CSV file; users should access the CSV file for the full sediment grain-size analysis results.

Attributes:

ANALYSIS_ID

An identifier for the sample that is unique to the database. This identifier begins with the assigned multi-letter code GS-, which corresponds to the type of analysis performed on the sample (grain-size analysis), followed by a six-digit number assigned sequentially as samples are registered for analysis.

SAMPLE_ID

The identification value assigned to the sample at the time of collection. This varies from field activity to field activity, and the ID can contain any combination of letters and numbers.

FAN

The serial number assigned to the dataset field activity during which the sample was collected. This value is in the format YYYY-XXX-FA where YYYY is the year, XXX is the number assigned to the activity within the year, and FA indicates Field Activity.

LATITUDE

Latitude coordinate, in decimal degrees (WGS 84), of sample location. South latitude is recorded as negative values.

LONGITUDE

Longitude coordinate, in decimal degrees (WGS 84), of sample location. West longitude is recorded as negative values.

DEPTH_M

Approximate depth of water in meters at the sample location derived from an unpublished composite bathymetry dataset used by the Long Island Sound Mapping and Research Collaborative.

T_DEPTH

Top depth of the sample below the sediment-water interface in centimeters.aborative project.

B_DEPTH

Bottom depth of the sample below the sediment-water interface in centimeters.

DEVICE

Sampling device used to collect the sample.

DATE COLLECTED

Calendar date based on UTC time indicating when the sample was collected in the format MM/DD/YYYY where MM is the numeric month, DD is the day of the month, and YYYY is the year.

ANALYSIS COMPLETION DATE

Calendar date indicating when analyses on the sample were completed in the format MM/DD/YYYY where MM is the numeric month, DD is the day of the month, and YYYY is the year.

ANALYSIS METHOD

Method used to analyze the sample for grain-size distribution. Grain-size analysis using the HORIBA laser diffraction unit and sieving of the >= -2 phi fraction.

WEIGHT WET SAMPLE (g)

Weight of initial sample in grams

GRAVEL (wt%)

Gravel content in percent dry weight of the sample. Gravel consists of particles with nominal diameters greater than 2 mm (-1 phi and larger).

SAND (wt%)

Sand content in percent dry weight of the sample. Sand consists of particles with nominal diameters less than 2 mm, but greater than or equal to 0.0625 mm (0 phi through 4 phi, inclusive).

SILT (wt%)

Silt content in percent dry weight of the sample. Silt consists of particles with nominal diameters less than 0.0625 mm, but greater than or equal to 0.004 mm (5 phi through 8 phi, inclusive).

CLAY (wt%)

Clay content in percent dry weight of the sample. Clay consists of particles with nominal diameters less than 0.004 mm (9 phi and smaller).

CLASSIFICATION (Shepard)

Sediment classification based on a rigorous definition (Shepard [1954] as modified by Schlee and Webster [1967], Schlee [1973], and Poppe and others [2005]). In the definitions below, gravel is defined as particles with nominal diameters greater than 2 mm; sand consists of particles with nominal diameters less than 2 mm, but greater than or equal to 0.0625 mm; silt consists of particles with nominal diameters less than 0.0625 mm, but greater than or equal to 0.004 mm; and clay consists of particles with nominal diameters less than 0.004 mm.

The shapefile is a simplified version of the CSV file of the Multisizer analysis results (2017-056-FA_and_2018-018-FA_samples_GS-MS.csv) with fewer attribute fields. Specifically, STDEV, SKEWNESS, KURTOSIS, and the individual phi measurements (e.g., PHI_11) were removed. The shapefile also has two additional attributes, FID and Shape, which have the following descriptions:

Attribute:
Attribute Label: FID
Attribute Definition: Internal feature number.
Attribute Definition Source: Esri
Attribute Domain Values:
Unrepresentable Domain: Sequential unique whole numbers that are automatically generated.

Attribute:
Attribute Label: Shape
Attribute Definition: Feature geometry.
Attribute Definition Source: Esri
Attribute Domain Values:
Unrepresentable Domain: Coordinates defining the features.

All the other attributes in the shapefile have the same definitions as the CSV file attributes (see the detailed description section for the 2017-056-FA_and_2018-018-FA_samples_GS-

MS entity for definitions of the CSV file attributes). Please note that some of the field names were truncated since a shapefile field name can only contain up to 10 characters. The following fields are included in the shapefile: FID, Shape, ANALYSIS_I (truncated field name for ANALYSIS_ID), FIELD_NO, PROJECT, FA_ID, CONTACT, AREA, LATITUDE, LONGITUDE, DEPTH_M, T_DEPTH, B_DEPTH, DEVICE, DATE_COLLE (truncated field name for DATE_COLLECTED), ANALYSIS_C (truncated field name for ANALYSIS_COMPLETION_DATE), WEIGHT, GRAVEL_PCT, SAND_PCT, SILT_PCT, CLAY_PCT, CLASSIFICA (truncated field name for CLASSIFICATION), MEDIAN, MEAN, ANALYST, and COMMENTS.

Metadata reference: *Seth Ackerman, U.S. Geological Survey, 384 Woods Hole Road, Woods Hole, MA 02543-1598 USA. Phone: 508-548-8700 x2315, Fax: 508-457-2310, email: sackerman@usgs.gov*