A 13,000-YEAR REGIONAL RECORD OF HOLOCENE STORMS IN THE NORTHEASTERN UNITED STATES

A Thesis Presented

by

Anders Joseph Noren

to

The Faculty of the Graduate College

of

The University of Vermont

In Partial Fulfillment of the Requirements
for the Degree of Master of Science
Specializing in Geology

March, 2002

Accepted by the Faculty of the Graduate College, The University of Vermont, in partial fulfillment of the requirements for the degree of Master of Science, specializing in Geology.

Thesis Examination Committee:

____________________________________ Advisor
Paul R. Bierman, Ph.D.

____
Andrea Lini, Ph.D.

____________________________________ Chairperson
Lesley-Ann Dupigny-Giroux, Ph.D.

____________________________________ Interim Dean,
Anne E. Huot, Ph.D. Graduate College

Date: October 22, 2001

ABSTRACT

Using 18 lake sediment cores, this thesis establishes a 13,000-year storm chronology for the northeastern United States. This is the longest storm record yet established for this region, and reveals regional storm patterns not identifiable from single lake records. I retrieved 18 long (3.5 to 6 m) sediment cores from 11 small (0.03 to 4 km^2), deep (13 to 32 m) lakes with inflowing streams and surrounded by steep hillslopes across a ~20,000 km^2 region in Vermont and eastern New York. Twelve of the 18 cores were dated and thoroughly analyzed (the remaining 6 cores were either duplicates or contained deeper sediment from the same location as another core from the same lake). In each core, several coarse-grained, mineral-rich layers with abundant macrofossils of terrestrial plants punctuate the otherwise fine-grained gyttja. Previous, independent paleostorm research and the character of these layers both suggest that such terrigenous material is eroded from the uplands during rainstorms of great intensity or duration.

The recovery of such terrigenous material in lake sediment cores is controlled by lake characteristics and coring location. Lakes most likely to preserve sedimentary storm layers have steep surrounding hillslopes, a large volume of erodible sediment in the uplands, and competent, high-gradient inflowing streams with deltas composed of sand and gravel. Coring locations adjacent to the center of the delta foreslope usually yield cores with the greatest number and thickness of terrigenous layers.

Comparison of the storm chronologies indicates the size (spatial extent) of typical erosion-producing storms. The ages of most storm layers are dissimilar between cores, suggesting that small rainstorms formed by convection may locally cause as much flooding and erosion as hurricanes, nor'easters, or other large-scale storms.

Considering individual lake chronologies together reveals the frequency and possibly the magnitude of storms in this region through the Holocene. Storm magnitude, as estimated by average terrigenous layer thickness, was greatest at 11,800, 10,800, and 1,200 years before present, when New England climate was cool and moist. Storm magnitude varies in cycles of ~510 years, which may reflect the influence of oceanic thermohaline circulation.

Storm frequency varied in regular millennial-scale cycles of ~3,000 years and quasi-regular centennial-scale cycles of ~230 and 390 years. While the centennial-scale variability may reflect changes in solar irradiance, the millennial-scale oscillation is similar to variability documented in other storm and flood records from several locations around the North Atlantic. Evidently, conditions favorable for the generation of severe storms followed similar pacing across this broad region during the Holocene. Storminess reached variable maxima lasting ~1,500 years, centered at approximately 2,600, 5,800, 9,100, and 11,900 years ago, and appears to be presently increasing toward another peak. These periods of increased storminess coincide with cold periods in Europe, and increased sea salt aerosol deposition on the Greenland ice sheet (and hence meridional atmospheric flow). This relationship is consistent with modern, observed climate states during the low phase of the Artic Oscillation (AO); thus, the New England storminess documented here may reflect long-term changes in the preferred phase of the AO. These findings underscore the potential for modulation of this dominant atmospheric mode to account for a significant portion of Holocene North Atlantic climate variability.

Independent storm records in this region exhibit good correlation with the data obtained in this study, suggesting that hillslopes across this region have responded to storms under similar climate forcing since deglaciation. However, storm frequency and magnitude both varied in cycles of much shorter duration than the average Holocene climate of this region. Minor climatic changes that do not significantly affect regional vegetation assemblages may have caused disproportionate increases or decreases in storminess.

ACKNOWLEDGEMENTS

This thesis was supported by National Science Foundation Career Grant EAR9702643 awarded to Paul Bierman. I received a University of Vermont Student Travel Mini-Grant for travel to a meeting where I presented some of these findings. I would like to thank Paul Bierman, my advisor, for developing the idea for this research in the first place, and for his endless enthusiasm, inspiration, and support of all kinds as I worked. I wish to extend a special thanks to Josh Galster, who went above and beyond the call of duty in helping me with both field and lab work. Without his able assistance, this work would not have been possible. I also give special thanks to Karen Jennings for investing countless hours helping me with field reconnaissance and coring, and for support throughout the project. I thank Eric Steig (University of Washington), whose invaluable expertise in analyzing and interpreting the data significantly improved this work. I thank Andrea Lini for spending a lot of time maintaining and fixing the lab equipment that I used. John Southon, Brian Krantz, and others at Lawrence Livermore National Laboratory showed me how to prepare and analyze samples for radiocarbon analysis; I thank them for their help and patience.

Several people spent entire days (and in many cases, evenings) helping me on coring expeditions in cold, wet winter conditions: Josh Galster, Paul Bierman, Karen Jennings, Rachael Howse, Carrie Williams, Sara Gran Mitchell, Drew Lamneck, Gretchen Fowles, Christine Massey, Stephen Turgeon, and Simon Rupard. I sincerely thank all of you for volunteering so much time and effort.

Many people helped in other capacities. I thank Sarah Brown for lab training and both scientific and moral support. Forrest Janukajtis provided able lab and field assistance. Ben Copans, Simon Rupard, and Jen Cunningham also assisted with some of the lab work. I thank Andy Bosley and Angie Conlan for their hard work on grain size analysis of the Lake Morey cores. The 1999 UVM Geohydrology class did much of the footwork for the bathymetric surveys of Amherst and Echo Lakes, and the core from Echo Lake that they retrieved and analyzed guided much of my work during the remainder of the first field season. UVM professor Gagan Mirchandani assisted with the development of the time series filter. Claude Gaboriault and Gordon Chadburn provided swift snowmobile shuttles for our coring crew and equipment to and from Duck and Vail Ponds. Kyle Nichols, Sara Gran, Karen Jennings, and Darrin Santos provided thoughtful comments on drafts of my thesis proposal. I thank comrades Adam Parris, Laura Mallard, and Andi Lord for providing shelter and food during my many trips to Vermont after I'd moved away, and for running errands for me in between trips.

Finally, I thank the many graduate and undergraduate students I've met at UVM for their camaraderie and friendship. Above all, I thank Carrie, and my family and faraway friends Steve and Kate Surbaugh, and Ellen and Nate Hultman, for unending support and perspective throughout my studies.

TABLE OF CONTENTS

LIST OF TABLES

Paper 1

Paper 2

LIST OF FIGURES

Paper 1

Paper 2

CHAPTER 1: INTRODUCTION

Background

Lacustrine sediment is primarily composed of organic material (gyttja) formed by the accumulation of aquatic organisms and their wastes, and terrestrially-derived inorganic and organic material transported to the lakes via inflowing streams and wind. The composition of a particular sedimentary layer depends upon a variety of environmental factors, including climatic variables such as temperature and moisture, and the chemistry of local soils and bedrock. These physical variables influence the aquatic and terrestrial biological assemblages, which affect the composition of the slowly accumulating sediment. Lacustrine sedimentary archives thus preserve a continuous record of environmental conditions both in and around the lake.

The sediment in lakes with steep surrounding hillslopes is often punctuated by discreet, coarse-grained, terrestrially-derived sediment layers (e.g., Thorndycraft et al., 1998; Bierman et al., 1997; Rodbell et al., 1999; Nesje et al., 2001). Such terrigenous material is eroded from the uplands and transported to the lake when severe rainstorms of high intensity or duration pass over the drainage basin (Bierman et al., 1997; Thorndycraft et al., 1998; Rodbell et al., 1999; Brown et al., 2000; Nesje et al., 2001). Stratigraphic and dating analyses performed on sediment cores recovered from such lakes thus allow the determination of paleostorm chronologies.

Previous paleostorm chronologies constructed from sedimentary terrigenous layers have used sediment cores recovered from a single lake to generalize about regional storm variability (Bierman et al., 1997; Thorndycraft et al., 1998; Rodbell et al., 1999; Brown et al., 2000; Nesje et al., 2001). Consequently, these studies do not resolve the size (spatial extent) of typical erosion-producing storms. Because such studies are biased to the particular environmental setting of the lake examined, they also may not reveal variability in the character of terrigenous deposits (important for future paleostorm research), and they may misrepresent true regional storm variability.

Statement of Problem

My research investigates the sedimentary archives of several lakes in the northeastern United States, in order to achieve the following objectives:

1. Describe the character of storm-related terrigenous deposits in lake sediment, detailing how they vary, and in what ways they exhibit uniformity.
2. Determine the size (spatial extent) of storms that caused significant erosion in the northeastern United States. Determine whether terrigenous layers were deposited synchronously in multiple lakes (indicative of hurricanes or other large storms), or at different times (indicative of small storms formed by free convection).
3. Analyze regional storm variability to determine whether periods of increased storm frequency or magnitude (as estimated by storm layer thickness) occurred across the entire region, and to document any cyclic variability in storminess.
4. Compare regional storminess with local and distant records of past climate, to reveal possible teleconnections and forcing mechanisms for temporal variability in extreme precipitation events.

Structure of Thesis

This thesis consists of two papers to be submitted to peer-reviewed journals for publication. The first paper is the shorter of the two, and follows this section as Chapter 2. It discusses millennial-scale cycles in the data, the relationship of these long-term changes to other North Atlantic paleoclimate records, and proposes a climate mechanism consistent with these relationships to explain the observed variability. The second paper (Chapter 3) is considerably longer, and includes the comprehensive literature review for the entire thesis in its first 3 sections. The second paper details the methods I used in the field, laboratory, and for data analysis, and presents suggestions for those who wish to perform similar research. In the second paper I compare individual storm chronologies to examine storm size (spatial extent), discuss a potential representation of average storm intensity, and compare my data to other local records of both storms and average climate. Following the second paper, I summarize the findings of the thesis as a whole in Chapter 4, and list several suggestions for improving this method of reconstructing past storminess in Chapter 5. The appendices contain all survey and laboratory data, and include all bathymetric maps for the study lakes.

CHAPTER 2: PAPER 1

For submission to *Nature*

A Holocene millennial-scale storm cycle in the northeastern United States

Anders J. Noren*, Paul R. Bierman*, Eric J. Steig†, Andrea Lini*, John Southon‡

**Department of Geology, University of Vermont, Burlington, Vermont 05405, USA*

†Quaternary Research Center and Department of Earth and Space Sciences, University of Washington, Seattle, Washington 98195, USA

‡Center for Accelerator Mass Spectrometry, Lawrence Livermore National Laboratory, Livermore, California 94551, USA

Documenting past changes and cycles in climate is crucial for distinguishing between natural climate variability and the effects of human activities. Many paleoclimate records exist that reflect changes in average climate conditions; few reveal variability in the occurrence of extreme climate events such as storms with exceptional rainfall[1]. Here, we show that the frequency of severe rainstorms in the northeastern United States has varied in regular cycles during the past 13,000 years, with a dominant periodicity of about 3,000 years. Storminess peaked at approximately 2,600, 5,800, 9,100, and 11,900 years ago, and appears to be presently increasing toward another peak. These maxima coincide with cold periods in Europe[2-5], with periods of enhanced aerosol deposition on the Greenland ice sheet[6], and with storm and flood events from several locations around the North Atlantic[6-12]. These relationships are consistent with long-term

changes in the preferred phase of the Arctic Oscillation[13], suggesting that modulation of this dominant atmospheric mode may account for a significant fraction of Holocene climate variability in North America and Europe.

Lakes in the hilly terrain of Vermont and eastern New York contain sedimentary archives that consist of organic lake mud (gyttja), punctuated by layers of terrestrially-derived material[14]. The terrigenous layers are commonly coarser, less organic, and contain more macrofossils of terrestrial plants than the surrounding gyttja; they are graded[14] and have distinctive stable isotopic signatures[15]. Previous work has demonstrated that such terrigenous layers are deposited when rainfall of great intensity and/or duration affects lake drainage basins[14-20]. In New England, the heaviest rains occur during localized convective storms, "nor'easters" or other mid-latitude cyclones, and hurricanes/tropical storms or their remnants. During and immediately after these events, material stored in upland streams and on steep basin hillslopes is eroded and transported to lake basins. Thus, stratigraphic analysis and dating of lake sediment cores allows the determination of paleostorm chronologies[14-20].

Other mechanisms (earthquakes, fires, lake-level fluctuations, and removal of vegetation by drought or disease) may also cause or facilitate the deposition of terrigenous material in lakes, but their effects have been shown to be minimal in New England[14,21-23]. The first European settlers in the area deforested most of the landscape, but the significant effects of these and other human activities are limited to the past ~250 years[15]. Snowmelt floods do not transport enough sediment to cause the deposition of terrigenous layers[17,20]. Most germane to the argument that terrigenous layers represent storms are findings in locations with long documentary records, which reveal a strong correlation between heavy rainfall and the occurrence and thickness of terrigenous layers[16-19]. Our field observations during two major storms documented increased transport to New England lakes of woody forest debris, sand, and gravel.

We cored 13 small lakes (Fig. 1) with high drainage basin relief, deep water, steep perimeter bathymetry, and inflowing streams with sandy deltas (a supplemental table of lake characteristics is available). We used a Reasoner coring device[24] fitted with a piston to recover sediment cores from locations in deep water, adjacent to the stream delta foreslopes. The cores vary in length from 3.5 to 6 m, spanning 2,100 to 13,200 years (2.1 to 13.2 ky; Fig. 2a). We documented core stratigraphy with magnetic susceptibility, X-radiography, visual logging, and loss-on-ignition (LOI) analyses[14]. In this manner, we created four distinct records for each core.

We identified significant terrigenous layers in LOI curves by comparing peaks to the background signal. To establish appropriate background estimates, we used singular spectrum analysis (lags = 20) to identify the first principal component in each series, after setting all data points greater than 1σ from the median to equal the median. Any shifts in the original data series that were more than 1σ from the first principal component were considered to be significant. Hence, significance is conservatively measured relative to the local background, rather than the entire data series.

We created a composite record for each core from the results of these four analyses. In the composite record, most terrigenous layers were identified when two or more of the individual analytical techniques detected such layers. In some cases, layers were identified from the results of a single analysis. We believe that this composite record overcomes the limitations of the individual analyses, and most accurately represents the locations and thickness of terrigenous layers. Comparison of our composite record with the results from high-resolution, whole-core grain size analysis[25], a more sensitive analysis for determining the locations of terrigenous deposits, shows good agreement and indicates that the composite record emphasizes the most extreme events. We used the composite record for all subsequent analyses and present those results here.

We dated the cores with 80 accelerator mass spectrometer (AMS) ^{14}C ages of terrestrial plant macrofossils and calibrated these dates using CALIB v4.2 (ref. 26) (a supplemental table of radiocarbon dates is available). We mathematically removed the rapidly-deposited[15] terrigenous layers from each record before creating age models, for which we assumed linear sedimentation rates between successive radiocarbon ages[14]. Combining the age models with the composite sediment records yields a dated event record for each lake (Fig. 2a). Using the 14 event chronologies, we created a single histogram indicating the frequency of depositional events and by inference, the most severe storms during the Holocene (Fig. 2b).

Storminess reached broad and variable maxima lasting ~1,500 years, with the highest peaks centred at approximately 2.6, 5.8, 9.1 and 11.9 ky before present (BP). Prior to European settlement of the area at ~250 BP, when deforestation and livestock grazing accelerated rates of hillslope erosion (which overprints our record[15]), storminess appears to have been increasing toward another peak. This most recent period of increased storminess began at about 600 BP, coincident with the beginning of the Little Ice Age (LIA)[27]; the earliest stormy interval peaked during the Younger-Dryas climate oscillation[3].

Other, independent records of storminess from around the North Atlantic show maxima that correspond with those from our records (Fig. 2c). For example, exceptional storm surge sediment layers were deposited along the northwestern coast of England at ~6 ky BP (ref. 12). Historical records from western Europe and geologic records from both the northern and southern North Atlantic document increases in the frequency and severity of storms during the LIA[8,10]. Somewhat farther afield, the frequency of hurricane landfalls along the northern Gulf of Mexico peaked from ~1 to ~3 ky BP (ref. 11), while the magnitude of floods in the central United States exhibit maxima during at least the last three maxima observed in our records[7,9]. Oscillations in Holocene glaciochemical records from central Greenland ice cores are similar to those in our record of storminess. In particular, the time series of sea-salt sodium (ssNa) in the Greenland Ice Sheet Project Two (GISP2) core, believed to be an indicator of storminess and sea spray in the atmosphere[6], exhibits peaks at times similar to the maxima identified here (Fig. 2d). Thus, the frequency of storms in the northeastern United States appears to be related to widespread North Atlantic climate variability. This result appears to validate the interpretation of the GISP2 glaciochemical record in terms of large-scale atmospheric circulation changes[3].

The pacing of storminess maxima from the various North Atlantic records suggest a quasi-regular cycle of ~3,000 years. Spectral analysis of our New England storminess time series by several methods (Fig. 3) confirms the existence of this oscillation, revealing significant spectral power in a broad, double peak centred at a period of ~3,070 years, and less-significant peaks at ~390 and 229 years. Similar spectral peaks exist in the power spectrum of the GISP2 time series of aerosol deposition[6] (Figs. 2d-e, 3). While the centennial-scale variability may reflect the influence (through unknown mechanisms) of changes in solar irradiance[28,29], the correlation in both the period and phase of the long-term variability in these records suggests the involvement of the Arctic Oscillation (AO)[13]. If, as argued by O'Brien and others[6], enhanced aerosol deposition to the Greenland ice sheet reflects an increase in the relative strength of meridional versus zonal circulation, then increased New England storminess would coincide with a mode of atmospheric circulation most similar to the low phase of the AO, when high-latitude westerlies are weakened. Conversely, times when the frequency of storminess in New England was low would coincide with the enhanced zonal flow of the high phase AO.

Such a relationship between New England storminess and the AO has recently been confirmed for modern climate conditions by Thompson and Wallace[13], who show that nor'easters are four times as likely to occur during low-phase than during high-phase AO.

Thus, the millennial-scale oscillation in New England storminess may reflect long-term modulation of the preferred phase of the AO. This explanation is appealing because it makes a specific prediction that New England storminess should be at its greatest when Europe is cold (characteristic of the low-phase AO). Comparison of our results with the other climate records (Fig. 2), including European glacier fluctuations, suggests that, as predicted, intense storms in New England tend to occur more frequently during periods that are cooler than average in Europe[2-5].

Dominant atmospheric modes, such as the AO and El Niño-Southern Oscillation (ENSO), account for significant fractions of modern climate variability on interannual timescales[1,13,19]. Unlike ENSO, which primarily operates in cycles of 2.5 to 7 years[19], the AO is known to fluctuate on timescales of weeks to decades, without regular cycles[13]. Our results demonstrate that these and other dominant atmospheric modes may be modulated on longer timescales, and could therefore account for much of the variability in the paleoclimate record. In particular, changes in the AO, perhaps modulated by solar forcing, may provide a more robust explanation of Holocene climate variability in the North Atlantic than changes in ocean thermohaline circulation—for which evidence has been difficult to find[30].

Climate models suggest that human activities, specifically the emission of atmospheric greenhouse gases, may lead to increases in the frequency of severe storms in certain regions of the northern hemisphere[1]. However, the existence of natural cycles in storminess confounds reliable detection of human-induced effects. For example, during the past 800 years, New England storminess appears to have been increasing naturally (Figure 2b). If the millennial storm cycle that we documented through the Holocene persists into the future, New England storminess would continue to increase for the next ~700 years. This cyclical and natural increase in storms may explain some of the recently observed increases in extreme precipitation events[1]. Because climate synopses compiled from instrumental records cannot distinguish underlying natural increases in storminess from anthropogenic effects, detected increases in contemporary storminess may not be a reliable indicator of human-induced climate change.

References Cited

1. Easterling, D. R. *et al.* Climate Extremes: Observations, Modeling, and Impacts. *Science* **289**, 2068-2074 (2000).

2. Denton, G. H. & Karlén, W. Holocene climatic variations; their pattern and possible cause. *Quaternary Research* **3**, 155-205 (1973).

3. Mayewski, P. A. *et al.* Changes in atmospheric circulation and ocean ice cover over the North Atlantic during the last 41,000 years. *Science* **263**, 1747-1751 (1994).

4. Alley, R. B. *et al.* Holocene climatic instability: A prominent, widespread event 8200 yr ago. *Geology* **25**, 483-486 (1997).

5. Andrews, J. T. & Ives, J. D. in *Climate Changes in Arctic Areas During the Last Ten-Thousand Years.* (eds. Vasari, Y., Hyvärinen, H. & Hicks, S.) 149-176 (University of Oulu, Oulu, Finland, 1972).

6. O'Brien, S. R. *et al.* Complexity of Holocene climate as reconstructed from a Greenland ice core. *Science* **270**, 1962-1964 (1995).

7. Brown, P., Kennett, J. P. & Ingram, B. L. Marine evidence for episodic Holocene megafloods in North America and the northern Gulf of Mexico. *Paleoceanography* **14**, 498-510 (1999).

8. Hass, H. C. Depositional processes under changing climate: upper Subatlantic granulometric records from the Skagerrak (NE-North Sea). *Marine Geology* **111**, 361-378 (1993).

9. Knox, J. C. Sensitivity of modern and Holocene floods to climate change. *Quaternary Science Reviews* **19**, 439-457 (1999).

10. Lamb, H. H. Variation and changes in the wind and ocean circulation: the Little Ice Age in the northeast Atlantic. *Quaternary Research* **11**, 1-20 (1979).

11. Liu, K. b. & Fearn, M. L. Reconstruction of Prehistoric Landfall Frequencies of Catastrophic Hurricanes in Northwestern Florida from Lake Sediment Records. *Quaternary Research* **54**, 238-245 (2000).

12. Zong, Y. & Tooley, M. J. Evidence of mid-Holocene storm-surge deposits from Morecambe Bay, northwest England: A biostratigraphical approach. *Quaternary International* **55**, 43-50 (1999).

13. Thompson, D. W. J. & Wallace, J. M. Regional Climate Impacts of the Northern Hemisphere Annular Mode. *Science* **293**, 85-89 (2001).

14. Brown, S. L., Bierman, P. R., Lini, A. & Southon, J. R. 10,000 yr record of extreme hydrologic events. *Geology* **28**, 335-338 (2000).

15. Bierman, P. R. *et al.* Postglacial ponds and alluvial fans: Recorders of Holocene landscape history. *GSA Today* **7**, 1-8 (1997).

16. Eden, D. N. & Page, M. J. Palaeoclimatic implications of a storm erosion record from late Holocene lake sediments, North Island, New Zealand. *Palaeogeography, Palaeoclimatology, Palaeoecology* **139**, 37-58 (1998).

17. Lamoureux, S. F. Five centuries of interannual sediment yield and rainfall-induced erosion in the Canadian High Arctic recorded in lacustrine varves. *Water Resources Research* **36**, 309-318 (2000).

18. Nesje, A., Dahl, S. O., Matthews, J. A. & Berrisford, M. S. A ~4500-yr record of river floods obtained from a sediment core in Lake Atnsjøen, eastern Norway. *Journal of Paleolimnology* **25**, 329-342 (2001).

19. Rodbell, D. T. *et al*. An ~15,000-year record of El Niño-driven alluviation in southwestern Ecuador. *Science* **283**, 516-520 (1999).

20. Thorndycraft, V., Hu, Y., Oldfield, F., Crooks, P. R. J. & Appleby, P. G. Individual flood events detected in the recent sediments of the Petit Lac d'Annecy, eastern France. *The Holocene* **8**, 741-746 (1998).

21. Jackson, S. T. & Whitehead, D. R. Holocene vegetation patterns in the Adirondack Mountains. *Ecology* **72**, 641-653 (1991).

22. Ouellet, M. Lake sediments and Holocene seismic hazard assessment within the St. Lawrence Valley, Quebec. *Geological Society of America Bulletin* **109**, 631-642 (1997).

23. Spear, R., Davis, M. B. & Shane, L. C. Late Quaternary history of low- and mid-elevation vegetation in the White Mountains of New Hampshire. *Ecological Monographs* **64**, 85-109 (1994).

24. Reasoner, M. A. Equipment and procedure improvements for a lightweight, inexpensive, percussion core sampling system. *Journal of Paleolimnology* **8**, 273-281 (1993).

25. Bosley, A. C., Bierman, P. R., Noren, A. J. & Galster, J. C. Identification of paleoclimatic cycles during the Holocene using grain size analysis of sediments cored from Lake Morey in Fairlee, VT. *GSA Abstracts with Programs (Regional)* **33**, 15 (2001).

26. Stuiver, M. & Reimer, P. J. Extended ^{14}C Data Base and Revised CALIB 3.0 ^{14}C Age Calibration Program. *Radiocarbon* **35**, 215-230 (1993).

27. Grove, J. M. *The Little Ice Age* (Methuen, London, 1988).

28. Hodell, D. A., Brenner, M., Curtis, J. H. & Guilderson, T. Solar Forcing of Drought Frequency in the Maya Lowlands. *Science* **292**, 1367-1370 (2001).

29. Landscheidt, T. in *Climate: History, Periodicity, and Predictability* (eds. Rampino, M.R., et al.) 428-445 (Van Nostrand Reinhold, New York, 1987).

30. Keigwin, L. D. & Boyle, E. A. Detecting Holocene changes in thermohaline circulation. *Proceedings of the National Academy of Sciences* **97**, 1343-1346 (2000).

31. Gran, S. E., Bierman, P. R. & Nichols, K. K. Teaching winter geohydrology using frozen lakes and snowy mountains. *Journal of Geoscience Education* **47**, 420-447 (1999).

32. Thomson, D. J. Spectrum estimation and harmonic analysis. *Proc. IEEE* **70**, 1055-1096 (1982).

33. Mann, M. E. & Lees, J. M. Robust estimation of background noise and signal detection in climatic time series. *Climatic Change* **33**, 409-445 (1996).

Acknowledgements

We thank J. Galster for extensive field and lab assistance, K. Jennings for field assistance, S. Brown for lab training, P.T. Davis for coring training, assistance, and device design, and J. M. Wallace for insightful comments and discussion. Supported by a US National Science Foundation grant to P.R.B.

Correspondence and requests for materials should be addressed to A.N. (e-mail anders.noren@alumni.carleton.edu).

Figure Captions

Figure 1. Maps showing location of study area in the northeastern United States (inset, shaded) and lakes from which we collected and analysed sediment cores. A = Amherst Lake, Plymouth, VT; B = Echo Lake, Plymouth, VT; C = Lake Elligo, Greensboro, VT; D = Lake Dunmore, Salisbury, VT; E = Emerald Lake, Dorset, VT; F = Beebe Pond, Hubbardton, VT; G = Vail Pond, Sutton, VT; H = Thirteenth Lake, North River, NY; I = Richmond Pond, Richmond, VT[31]; J = Ritterbush Pond, Eden, VT[14]; K = Chapel Pond, Saint Huberts, NY; L = Lake Morey, Fairlee, VT; M = Duck Pond, Sutton, VT.

Figure 2. Storminess in the northeastern United States and relevant climate records. **a**, Individual terrigenous sedimentation event chronologies from study lakes. Two cores were recovered from Echo Lake, each in a distinct depocenter. These depocenters record terrigenous sediment delivery from different stream basins. **b**, Histogram of terrigenous sedimentation events (100 yr bins). Values above the superimposed linear regression are shaded. Histogram values are weighted by the inverse of the number of chronologies that cover each time interval, removing the effect of decreasing numbers of records covering earlier time intervals. However, the resulting plot has more data from more recent times, and is therefore increasingly accurate in depicting regional averages toward the present. The slight linear trend in the data may reflect the slow progradation of the stream deltas into the lakes, toward the coring locations. As these deltas approach, smaller pulses of sediment are more readily transported to the coring locations. **c**, Other relevant climate records. 1: Coolings—1A, worldwide glacial expansions[2]; 1B, the Cockburn Stade and associated cooling[4,5]; 1C, the Younger-Dryas event[3]. 2: GISP2 glaciochemical cold events[6]. 3: Storminess—3A, LIA historical[10] and geologic[8] evidence; 3B, high frequency of hurricane landfalls along the northern Gulf of Mexico coast[11]; 3C, occurrence of storm surge deposits on the northwestern coast of England[12]. 4: Increased magnitude of 1.58-yr recurrence

interval floods in the north-central United States (NCUS)[9]. 5: Increased magnitude of the largest floods in the NCUS[9]. 6: Highest frequency of megafloods on the Mississippi River[7]. **d**, GISP2 ssNa concentration, with values above the superimposed linear regression shaded[6]. **e**, GISP2 nssK concentration, with values above the superimposed linear regression shaded[6]. Other GISP2 aerosol deposition time series[6] exhibit variability similar to ssNa and nssK.

Figure 3. Multitaper spectral analysis (3 tapers) of storminess and GISP2 nssK time series, interpolated with a 100-year interval and with linear trend removed[32]. Spectral analysis of other GISP2 aerosol deposition time series[6] reveal power spectra similar to that of nssK. The harmonic spectrum represents the estimated significant periodic component of the raw spectrum, as measured by the Thomson variance ratio test for periodic signals (F-test). CI = confidence interval. Confidence level is relative to red noise estimated from lag-1 autocorrelation with a median averaging filter[33]. The nssK raw spectrum has been rescaled such that the confidence intervals apply to both power spectra. Median core sampling intervals varied from 2 years in lakes with the highest sedimentation rates, to 27 years in lakes with the lowest sedimentation rates, and the interval varied throughout each core due to the effects of autocompaction and changing sedimentation rates. We used several different interpolation intervals (varying from 10 to 200 years) to obtain evenly-spaced data for spectral analysis, all of which produced similar results. We found the results to be robust to varying resolutions and tapers, and comparable results were obtained with the multitaper, Blackman-Tukey, and maximum entropy methods, as well as periodogram analysis using the Lomb-Scargle method (which avoids the need to interpolate the data).

Supplemental Table 1. Study lake characteristics.

ID*	Lake	Location	Elev. (m)	Area (km^2)	Depth (m)	Basin Area (km^2)	Basin Relief (m)	Relief Ratio (m/km^2)
A	Amherst	Plymouth, VT	326	0.33	27	49.4	675	14
B	Echo	Plymouth, VT	323	0.42	28	68.1	678	10
C	Elligo	Greensboro, VT	269	0.70	30	13.1	259	20
D	Dunmore	Salisbury, VT	173	3.99	32	52.9	812	15
E	Emerald	Dorset, VT	217	0.13	13	14.7	713	48
F	Beebe	Hubbardton, VT	188	0.45	13	7.5	215	29
G	Vail	Sutton, VT	455	0.06	14	2.0	354	177
H	Thirteenth	North River, NY	510	1.33	15	28.5	536	19
I	Richmond†	Richmond, VT	223	0.10	3	2.2	273	125
J	Ritterbush‡	Eden, VT	317	0.05	14	2.2	293	133
K	Chapel	Saint Huberts, NY	485	0.07	24	4.6	925	202
L	Morey	Fairlee, VT	127	2.22	13	20.7	414	20
M	Duck	Sutton, VT	520	0.03	14	0.7	290	414

*ID letters correspond to lakes in Figs. 1 and 2. †From ref. 31. ‡From ref. 14.

Supplemental Table 2. Radiocarbon dates.

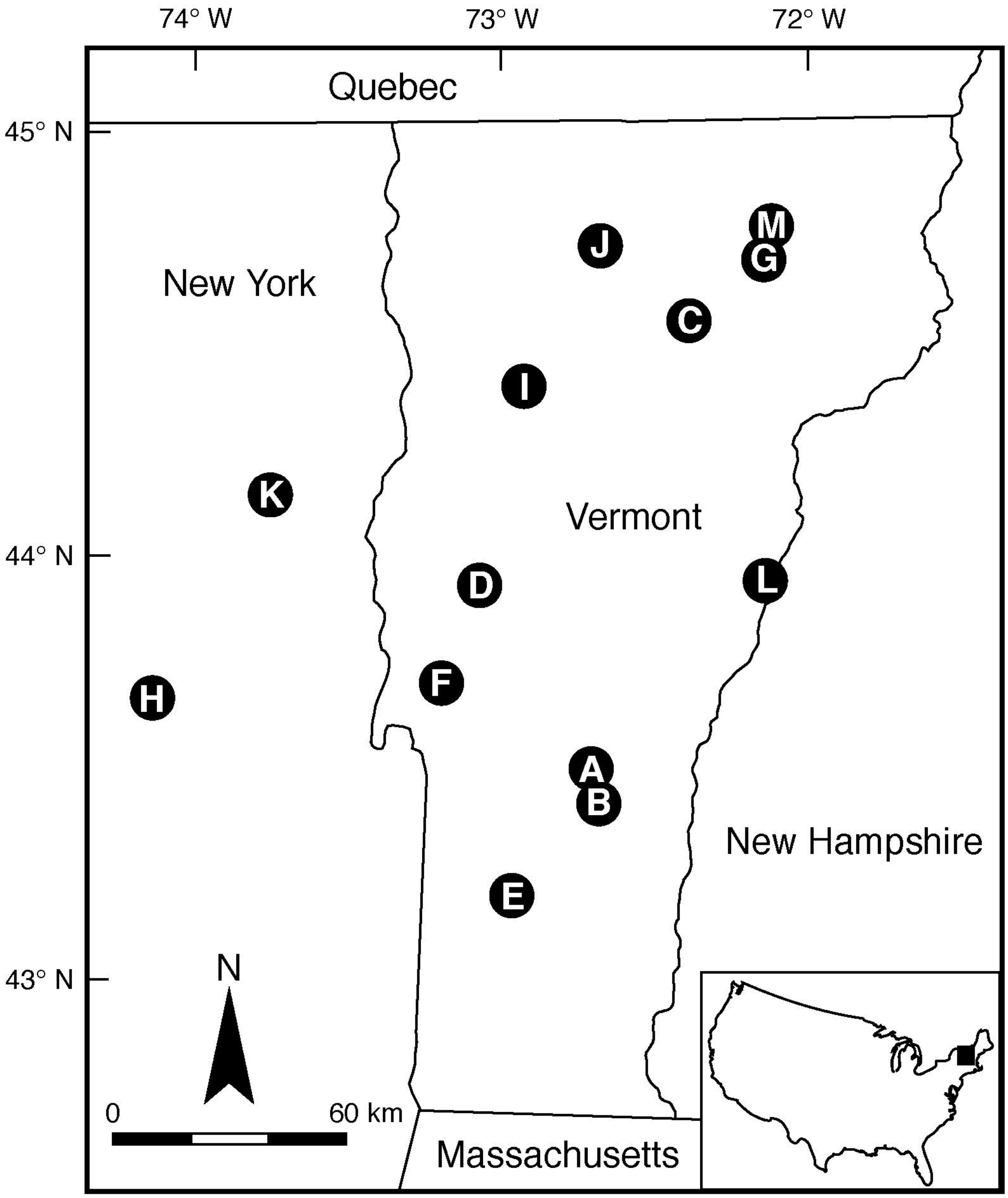
CAMS #	Lake	Core	Depth (cm)	Radiocarbon Age	Calendar Age*	1σ age range
62298	Amherst	1	108	450 ± 40	500	479 - 525
62299†	Amherst	1	141	2150 ± 40	2160	2061 - 2299
67834	Amherst	1	224	920 ± 50	850	789 - 913
62452	Amherst	1	397	1570 ± 50	1470	1412 - 1519
62300†	Amherst	1	426	1330 ± 180	1230	1015 - 1408
67835	Amherst	1	542	2060 ± 60	2030	1949 - 2112
57711	Duck	1	48	220 ± 110	210	1 - 428
57712	Duck	1	192	2510 ± 50	2590	2473 - 2737
57713	Duck	1	311	4040 ± 40	4490	4424 - 4568
57784	Duck	1	480	7530 ± 50	8330	8214 - 8390
57714	Duck	1	522	8790 ± 50	9810	9703 - 10104
57715	Duck	1	529	8790 ± 50	9810	9703 - 10104
57715	Duck	1	558	10900 ± 50	12960	12858 - 13114
57717	Duck	1	567	10980 ± 50	13020	12924 - 13131
62301†	Duck	1	578	10930 ± 40	12980	12882 - 13119
52942	Echo	1	165	360 ± 30	400	324 - 473
52943	Echo	1	307.5	1150 ± 50	1050	974 - 1168
52941	Echo	1	417	2070 ± 140	2050	1876 - 2300
62302†	Echo	2	62	5010 ± 40	5740	5660 - 5859
57718†	Echo	2	68	3850 ± 40	4250	4153 - 4351
57719	Echo	2	215	1270 ± 50	1220	1149 - 1274
57720	Echo	2	345	2480 ± 40	2590	2470 - 2710
62303	Elligo	1	56	200 ± 40	180	3 - 294
57721†	Elligo	1	57	1280 ± 40	1220	1176 - 1262
57722	Elligo	1	217	1260 ± 40	1210	1149 - 1263
57723	Elligo	1	320	1830 ± 50	1760	1706 - 1856
57724	Elligo	1	464	2450 ± 40	2520	2360 - 2707
57725	Elligo	1	591	3250 ± 50	3470	3394 - 3551
67850	Emerald	1	244	2160 ± 40	2190	2067 - 2301
67851	Emerald	1	335	3260 ± 50	3480	3404 - 3552
62304	Emerald	1	583	7740 ± 40	8500	8433 - 8585
57744	Morey	2	16	180 ± 50	170	2 - 293
57745	Morey	2	124	1870 ± 60	1800	1731 - 1870
57746	Morey	2	221	3070 ± 40	3290	3214 - 3344
57747	Morey	2	305	4300 ± 40	4860	4829 - 4954
57748	Morey	2	381	5720 ± 50	6510	6412 - 6617
62305	Morey	2	419	7840 ± 40	8610	8542 - 8695
62306	Morey	2	431	9450 ± 520	10720	9916 - 11551
57749	Morey	2	454	10230 ± 50	11940	11705 - 12285
57750	Morey	2	468	10270 ± 110	12040	11699 - 12333
57751	Morey	2	501	10370 ± 50	12320	11975 - 12606
57752†	Morey	2	519	10180 ± 100	11840	11446 - 12265

*Radiocarbon ages calibrated by using a weighted average of the 1σ calibrated age range midpoints, according to the relative area under the probability distribution[26]; median calibrated ^{14}C age uncertainty is ± 100 years. †Not used in age model.

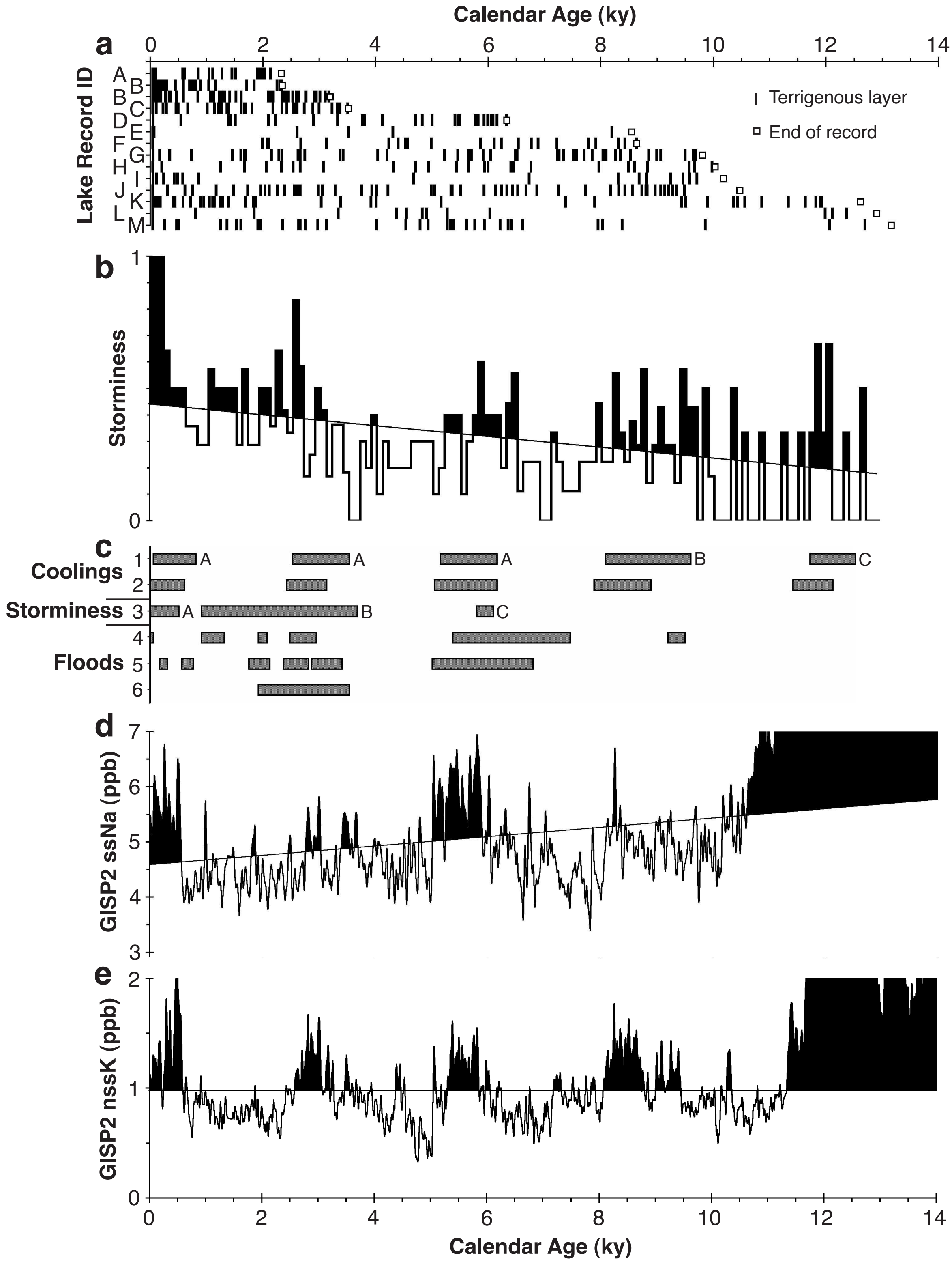
Supplemental Table 2 (continued).

CAMS #	Lake	Core	Depth (cm)	Radiocarbon Age	Calendar Age*	1σ age range
67866	Vail	1	99	320 ± 40	380	312 - 435
57753	Vail	1	202	2230 ± 90	2240	2147 - 2337
57754	Vail	1	252	2590 ± 50	2700	2519 - 2773
57755	Vail	1	313	3150 ± 50	3380	3272 - 3444
57756	Vail	1	410	4500 ± 40	5180	5053 - 5285
57757	Vail	1	475	5800 ± 50	6600	6505 - 6663
57758	Vail	1	549	7520 ± 120	8300	8192 - 8399
57759	Vail	1	583	8350 ± 50	9380	9297 - 9467
67862	Beebe	1	48	1990 ± 50	1940	1889 - 1989
67836	Beebe	1	131	3810 ± 40	4190	4095 - 4253
67837	Beebe	1	205	5090 ± 50	5820	5753 - 5905
67838	Beebe	1	309	6930 ± 50	7740	7686 - 7788
65337	Beebe	1	347	7820 ± 30	8590	8546 - 8630
67839	Chapel	1	32	Modern		
67840†	Chapel	1	100	200 ± 40	180	9 - 294
67841	Chapel	1	159	110 ± 40	130	29 - 261
67842	Chapel	1	273	1890 ± 60	1820	1736 - 1888
67843	Chapel	1	327	3750 ± 50	4090	3989 - 4224
67844	Chapel	1	404	8360 ± 60	9390	9298 - 9469
67845	Chapel	1	459	9380 ± 50	10600	10508 - 10684
67846	Chapel	1	484	9640 ± 60	10980	10793 - 11163
67847	Chapel	1	498	9970 ± 50	11400	11253 - 11550
65338†	Chapel	1	523	220 ± 40	200	8 - 304
67863	Dunmore	1	196	3060 ± 50	3280	3213 - 3344
67848	Dunmore	1	237	3440 ± 40	3700	3638 - 3811
67849	Dunmore	1	354	4690 ± 40	5390	5326 - 5467
65339	Dunmore	1	465	5470 ± 40	6250	6204 - 6296
67852	Thirteenth	1	102	1250 ± 40	1200	1140 - 1259
67853	Thirteenth	1	183	2050 ± 50	2010	1946 - 2096
67854	Thirteenth	1	303	2910 ± 40	3030	2959 - 3137
67855†	Thirteenth	1	403	7440 ± 40	8260	8191 - 8327
67874	Thirteenth	1	498	4680 ± 50	5390	5323 - 5465
67875	Thirteenth	1	580	5990 ± 40	6810	6752 - 6869
65340†	Thirteenth	1	584	2190 ± 30	2230	2146 - 2302
65341	Thirteenth	2	45	5800 ± 40	6610	6553 - 6660
67864	Thirteenth	2	53	5920 ± 50	6730	6670 - 6790
67865	Thirteenth	2	94	7800 ± 60	8550	8459 - 8632
65342	Thirteenth	2	148	8920 ± 260	9930	9564 - 10354

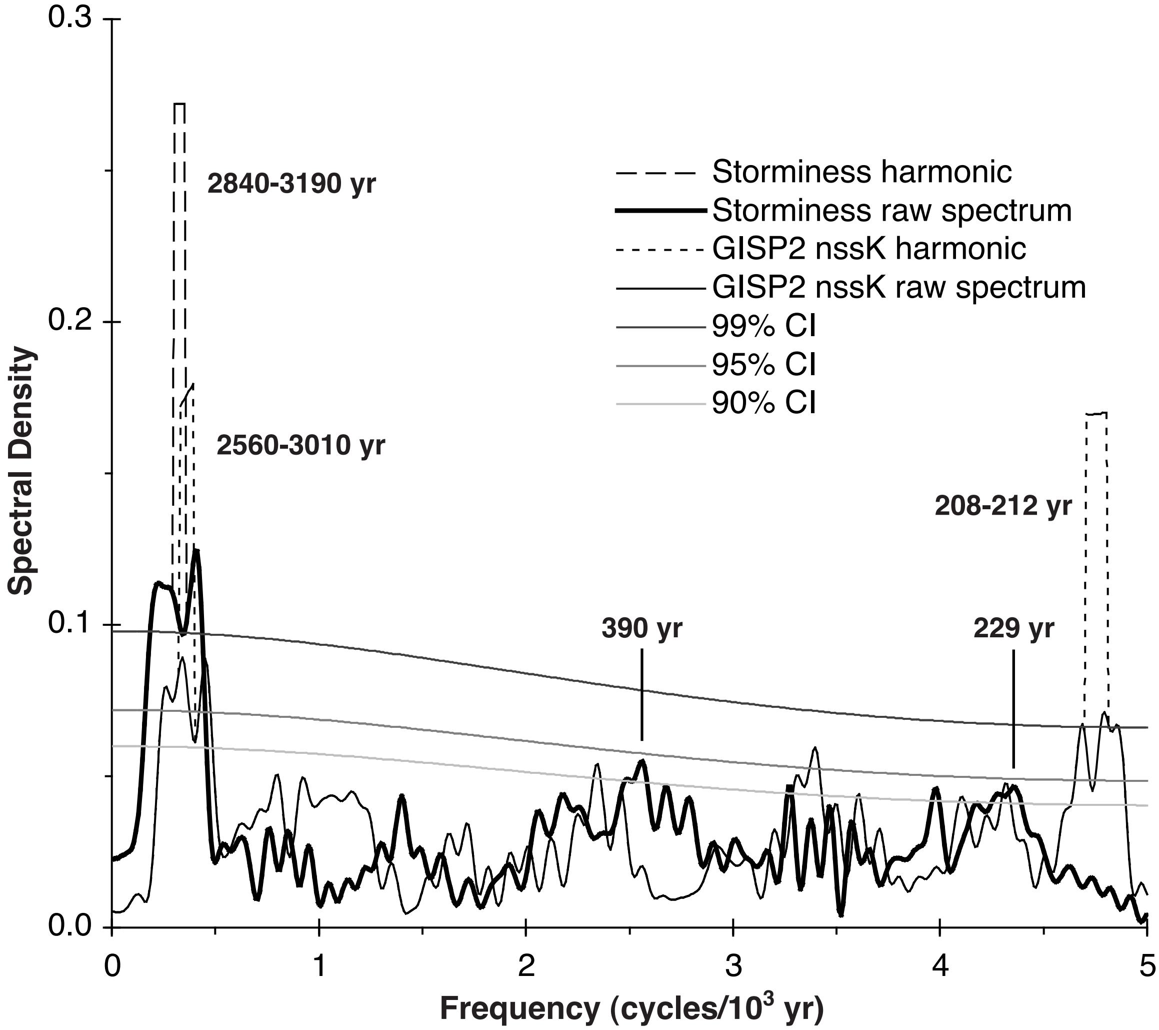
*Radiocarbon ages calibrated by using a weighted average of the 1σ calibrated age range midpoints, according to the relative area under the probability distribution[26]; median calibrated ^{14}C age uncertainty is ± 100 years. †Not used in age model.



Noren et al., Figure 1



Noren et al., Figure 2



Noren et al., Figure 3

CHAPTER 3: PAPER 2

For submission to *Palaeogeography, Palaeoclimatology, Palaeoecology*

Holocene storm-induced erosion in the northeastern United States revealed by multiple lake records

Anders J. Noren, Paul R. Bierman, Josh C. Galster, Andrea Lini, Department of Geology, University of Vermont, Burlington, VT 05405, USA

John Southon, Center for Accelerator Mass Spectrometry, Lawrence Livermore National Laboratory, Livermore, CA 94551, USA

Abstract

Using layers of terrigenous material in sediment cores from 11 lakes in Vermont and New York, we established a ~13,000-year regional record of Holocene storms for the northeastern United States. The composition of these storm-related terrigenous layers varied from nearly pure sand to a mixture of sand and macrofossils of woody forest debris. Lakes most likely to preserve sedimentary storm layers have steep surrounding hillslopes, a large volume of erodible sediment in the uplands, and competent, high-gradient inflowing streams with deltas composed of sand and gravel. Coring locations adjacent to the center of the delta foreslope usually yield cores with the greatest number and thickness of sedimentary terrigenous layers.

Comparison of the storm chronologies, augmented with the results from two previous local studies, reveals disparate ages for most storm layers in individual cores. This result suggests that rainstorms formed by free convection and limited in spatial extent may locally cause as much (or more) flooding and erosion as hurricanes, nor'easters, or other mesoscale to synoptic-scale storms. Storm magnitude, as estimated by average terrigenous layer thickness, was greatest in the early and late Holocene, when New England's climate was cool and moist, and varied in regular cycles of ~510 years. This centennial-scale rhythm in event magnitude may reflect the influence of oceanic thermohaline circulation.

Independent, local paleostorm records are well-correlated with our data. Storm-related depositional events on alluvial fans in Vermont occurred during stormy intervals we identified. In contrast, average New England Holocene climate is not strongly related to storminess. Both the frequency and magnitude of erosion-producing storms vary in cycles of much shorter duration than average regional climate as revealed by studies of pollen, macrofossils, lake levels, and estimates of temperature and precipitation generated in climate models. Thus, minor climatic changes that do not significantly affect regional vegetation assemblages or moisture balance may have caused major increases or decreases in storminess.

Keywords: paleoclimatology; storms; floods; New England; lake cores; Holocene

1. Introduction

Understanding natural climate variability is crucial for interpreting the influence of human activities on future climate change. The climatic effects of increasing average global temperatures, likely due in part to anthropogenic greenhouse gas emissions, will probably not be limited to higher average temperatures and temperature extremes (IPCC, 2001). These human-induced climate changes are also likely to affect storminess and precipitation, including the occurrence of extreme precipitation events, droughts, and wet periods. Past changes in the frequency or severity of these events may reveal underlying patterns from which humans have caused significant, or possibly little, deviation.

Clues to natural climate variability come from archives of past climate preserved in a variety of media, including tree rings, coral growth bands, wetland, lake, and ocean sediment, and annual ice layers in continental and alpine glaciers, among other sources (e.g. Conkey, 1986; Tudhope et al., 2001; Newby et al., 2000; Lamoureux et al., 2001; Bond et al., 1997; Dansgaard et al., 1984; Thompson et al., 2000). These natural media record average temperature or annual precipitation fluctuations, whether directly or indirectly. For example, the varying thickness of annual tree or coral growth rings directly reflects average local temperature fluctuations. In contrast, the changing spectra of sedimentary pollen reflect changing regional vegetation assemblages (which, in turn, reflect longer-term and larger-scale temperature and precipitation variability).

Most Holocene paleoclimate research in the heavily-populated northeastern United States has focused on long-term changes in regional average temperature and/or moisture conditions. Past values of these climate parameters have been revealed by the pollen spectra of lake sediment (Delcourt and Delcourt, 1984; Jackson and Whitehead, 1991; Newby et al., 2000; Spear et al., 1994; Winkler, 1985), which reflect changes in regional vegetation assemblages. Lake level variability, an indicator of the balance between precipitation and evaporation, has been reconstructed from lake sediment compositional changes (Webb et al., 1993). In central New York, Mullins (1998) determined Holocene average summer temperatures from the calcium carbonate content of lake sediments. Cronin et al. (2000) detailed a record of drought from the past millennium by examining microfossils (foraminifera and ostracodes) in sediment cores from Chesapeake Bay. On timescales of the past few centuries, tree ring widths and densities have allowed the reconstruction of average spring and summer temperatures (Conkey, 1986). Only a few reconstructions have been made of extreme climate events such as rainstorms with exceptional precipitation

(Brown et al., 2000; Donnelly et al., 2001a-b; Jennings et al., in review). As historical records of intense storms have shown (Ludlum, 1996), these extreme weather events have profound consequences for society and ecosystems.

In hilly or mountainous terrain, lake sediment is often comprised of organic lake mud (gyttja), largely formed by the decay of aquatic organisms, punctuated by layers of terrestrially-derived material (Brown et al., 2000; Eden and Page, 1998; Nesje et al., 2001; Rodbell et al., 1999; Thorndycraft et al., 1998). Such terrigenous layers are deposited during floods that result from storms producing intense or persistent precipitation. In the northeastern United States, the heaviest rainfall occurs during localized but intense convective storms, "nor'easters" or other mid-latitude cyclones, and hurricanes/tropical storms or their remnants (Keim et al., 1998). As surface runoff from uplands surrounding a lake increases during such events, sediment is transported to the lake in flooded stream channels. Consequently, paleostorm chronologies can be determined by analyzing and dating lake cores (Brown et al., 2000; Eden and Page, 1998; Nesje et al., 2001; Rodbell et al., 1999; Thorndycraft et al., 1998). In this paper, we present the character and ages of terrigenous deposits in sediment cores recovered from 11 lakes in Vermont and eastern New York, and discuss the implications of this record in terms of paleostorm frequency, magnitude, and distribution.

2. Background

Paleoflood research first became well established two decades ago, when Kochel and Baker (1982) analyzed and dated slackwater deposits in river channels to determine the stage and discharge of past river floods. Much subsequent research on prehistoric floods has used these methods (for a summary, see Knox, 1999). More recently, researchers in this field have developed additional methods for reconstructing paleoflood and paleostorm histories. For example, storm surge overwash deposits along coastal areas have been used to establish records of hurricane or cyclone landfalls (Liu and Fearn, 1993; Collins et al., 1999; Liu and Fearn, 2000; Donnelly et al., 2001a-b; Hayne and Chappell, 2001; Nott and Hayne, 2001).

The use of terrigenous deposits in lake sediment as a proxy for floods and storms is also a relatively recent development. Page et al. (1994) demonstrated that a well-dated series of these deposits from Lake Tutira (New Zealand) exhibited good correlation with a nearly century-long written record of daily rainfall; the ages of terrigenous layers corresponded to dates of heavy rainfall. They established the magnitude, frequency, and threshold for erosion-producing storms, and established a positive correlation between the thickness of these sediment layers and storm rainfall. This storm record was later extended beyond the historic period to ~2250 years before present (BP) (Eden and Page, 1998). At Laguna Pallcacocha in Ecuador, Rodbell et al. (1999) recovered a sediment core spanning the past ~15,000 years that contained hundreds of terrigenous clastic layers. They demonstrated that these layers were deposited by storms generated during El Niño events, and showed that the sediment record from the last ~200 years closely matches the historical record of moderate to severe El Niños. On the eastern side of the North Atlantic, Thorndycraft et al. (1997) determined that layers in a short sediment core recovered from Petit Lac d’Annecy (eastern France) were composed of material from the soils in the uplands surrounding the lake, and suggested that the ages of these layers correlated with the dates of historic floods. Farther north, Nesje et al. (2001) recently established a 4500-year flood record from sandy layers in a sediment core retrieved from Atnsjøen in southeastern Norway. They showed that ages of the sandy layers correlated with dates of large historic floods, and documented higher flood frequencies during the Little Ice Age (LIA) (Grove, 1988) and between 1290 and 2690 BP. In the northwestern United States, Ambers (2001) showed that historic flood events were recorded as distinct sedimentary layers in a large reservoir.

In the northeastern United States, Lin (1996) speculated that inorganic deposits in sediment cores from Ritterbush Pond (northern Vermont) reflected the erosive work of storm or flood runoff. Subsequent analysis of these cores (Bierman et al., 1997) demonstrated that $\delta^{13}C$ values of these layers were consistently more positive than the surrounding gyttja. This relationship was interpreted as indicating different source material for the gyttja (aquatic) and inorganic layers (terrestrial). Pairs of radiocarbon dates that bracket the thickest of the inorganic layers revealed that these layers were deposited rapidly. Bierman et al. (1997) also showed that periods of increased deposition of these layers in Ritterbush Pond were coincident with periods of increased aggradation on alluvial fans in central Vermont. They suggested that the correlation between these intervals reflected periods of increased storminess driven by large-scale climate forcing.

Several analyses performed on additional cores retrieved from Ritterbush Pond (Brown et al., 2000; Brown et al., in press) yielded a more detailed chronology and showed that each terrigenous layer was deposited across the entire lake basin. Grain size analysis revealed that the mean particle size of these layers is larger than the surrounding gyttja, and that the layers are often graded. Brown et al. (2000) also speculated about the rainfall intensity/duration threshold required for layer deposition in Ritterbush Pond. They showed that if layer thickness is related to rainfall intensity/duration, then storms much more severe than the historic flood of record (1927) have affected Ritterbush Pond in the past.

Other processes may cause or facilitate the deposition of terrigenous layers, but their effects are probably minimal in New England. Earthquakes may cause mass movements, but the tectonic stability of this region during the Holocene (Ouellet, 1997) suggests that terrigenous layers were not deposited in New England lakes as a result of such events. Vegetative declines caused by drought or disease may decrease evapotranspiration and increase runoff, thus lowering the precipitation intensity/duration threshold for terrigenous layer deposition. However, studies of pollen and terrestrial plant macrofossils indicate continuous vegetative cover on the landscape of this region during the Holocene (Jackson and Whitehead, 1991; Lin, 1996; Spear et al., 1994). Snowmelt floods probably do not transport enough sediment to cause the deposition of terrigenous layers (Thorndycraft et al., 1998; Lamoureux, 2000). Lake-level fluctuations caused by periods of drought or wetness could change the distance between the stream delta and the center of the lake, thereby facilitating or hindering the transport of terrigenous sediment to the coring locations. Choosing lakes with steep perimeter bathymetry surrounded by steep hillslopes minimizes this effect. Early European settlers deforested the New England landscape and used hillslopes for growing food crops and livestock pasture (Meeks, 1986). However, the significant effect of these and other human activities is limited to the past ~250 years (Bierman et al., 1997).

3. Environmental Setting

Lakes and their drainage basins in Vermont and northeastern New York are underlain by a wide variety of metamorphic and sedimentary bedrock lithologies. This suite of rock types is simpler in eastern Vermont and more complex in the western and southern portions of the state. It includes schist, phyllite, quartzite, slate, gneiss, marble, graywacke, greenstone, amphibolite, and granulite; as well as dolostone, limestone, and sandstone with varying degrees of metamorphism (Doll et al., 1961). New York study lakes are underlain by meta-anorthosite, granitic gneiss, marble, and quartzite (Fisher et al., 1970).

Continental glaciers modified the New England landscape during the Pleistocene (Ridge et al., 1999). Deglaciation of southern Vermont (and hence, this field area) began about 15,200 BP (15.2 ky BP), and the ice had receded north into Québec by about 13.4 ky BP (Ridge et al., 1999). Glacial deposits mantle the bedrock over most of the region. At higher elevations, these deposits are commonly limited to glacial till (Doll et al., 1970; Cadwell, 1990). Terraces and/or deltas formed by rivers and glacial lakes locally overly the till at lower elevations. These sandy deposits usually contain larger volumes of easily erodible sediment than till alone. Study lakes are commonly fed by several ephemeral and perennial streams, which vary in order from first to third as determined from United States Geological Survey (USGS) 1:24,000 topographic maps.

4. Field Methods

To identify candidate lakes for coring, we examined all USGS 1:24,000- or 1:25,000-scale topographic maps of Vermont, eastern New York, and Massachusetts. Accessible lakes surrounded by steep hillslopes with inflowing streams were marked for field checking. We procured available bathymetric maps for these lakes, and rejected lakes with shallow water (our coring device requires at least ~8m water depth—see below) or gently sloping perimeter bathymetry. During spring, summer, and autumn field reconnaissance, we examined the deltas of inflowing streams to determine whether coarse-grained sediment had been transported to the lake in the past. We looked for large, fresh deltas, with sand, gravel, and cobbles on the surface. We performed informal surveys of the stream catchments, to determine the availability of loose sediment for erosion and transport to the lake. For lakes without bathymetric maps, we took several preliminary depth soundings to ensure deep water and steep perimeter bathymetry. We chose for coring

11 lakes that most closely met the above criteria (e.g., Fig. 1), and that were broadly distributed across the region (Table 1 and Fig. 2).

During the two winter field seasons, late January to late March of 1999 and 2000, we created bathymetric maps for unmapped lakes (Amherst, Duck, Echo, Emerald, Vail; e.g. Fig. 3). We surveyed depth measurement locations with a Trimble Pathfinder ProXRS differential global positioning system (GPS) or a Pentax PZ-11 total station. Although several streams commonly flow into each lake, we preferentially chose coring locations near the mouths of streams that flow over steep hillslopes, avoiding low-gradient streams. Using a modified Reasoner coring device (Reasoner, 1993) fitted with a piston and not using a core catcher (Brown et al., in press), we retrieved 18 continuous, 1- to 6-m cores from deep water locations, adjacent to the delta foreslopes. Three of these cores (Echo 3 and 4; Vail 2) were replicates, recovered only a few meters away from earlier coring locations to assess local sediment variability. One core (Thirteenth 2) was pushed into lower sediment at the same location as a previous core. We cut the cores into 1.5-m sections, which were stored at 4°C until processing.

5. Lab Methods

Using the most sensitive and robust whole-core analytical techniques of Brown et al. (in press), we documented core stratigraphy with magnetic susceptibility, X-radiography, visual logging, and loss-on-ignition analyses. Magnetic susceptibility (MS) analysis determines the magnetic mineral content of core sediment; therefore, peaks in MS indicate the location of terrigenous layers. MS measurements were made at 1 cm intervals on unopened core sections using a Bartington Magnetic Susceptibility Meter (model MS2) mounted on an automated core track. Because this device integrates measurements over ~5 cm of core, the resulting MS curve provides a low-resolution record of core stratigraphy.

We used MS to assess rapidly the contents of a core and to adjust our field procedures accordingly, and for comparison with other lab analyses. X-radiography (XR) was also performed on unopened cores. As X-rays pass more easily through organic material and are blocked by inorganic material, terrigenous layers are identified visually at ~0.5 cm resolution in the black-and-white images that result from this analysis.

After splitting the cores in half lengthwise and archiving one half, we photographed the core with a high-resolution digital camera. We then made a detailed visual log (VL) of the core at 0.5 cm resolution, noting changes in sediment color and texture, and in the abundance of terrestrial plant macrofossils. We sampled the core at 1 cm intervals and freeze dried these samples for at least 48 hours. Loss-on-ignition (LOI) analysis, at 1 cm resolution, determined the organic content along the length of the core (Brown et al., in press). Samples were weighed, burned for 2 hours at 450°C, cooled for 1 hour, and re-weighed. Expressed as the percent of the original sample mass lost during combustion, both anomalously low and high LOI values typically correspond to terrigenous deposits.

Age control on these cores is provided by accelerator mass spectrometer (AMS) radiocarbon (^{14}C) analyses of 80 terrestrial plant macrofossils. We prepared samples using standard techniques (Brown et al., in press) and calibrated the resulting ages using CALIB v4.2 (Stuiver and Reimer, 1993; Stuiver et al., 1998). Single calibrated ^{14}C ages were determined by averaging the midpoints of 1σ age ranges, weighted according to the relative area under the probability distribution for each age range as determined by the CALIB program. We chose this method over others (for example, simply choosing the single age associated with the greatest probability) to avoid significant errors for age estimates. These errors could arise if the true age and chosen age are at opposite ends of the age range. With the application of age models between successive radiocarbon dates, such a situation would yield large errors in age estimates for a substantial section of the core above and below the stratigraphic location of the macrofossil that provided the date. Using a weighted average reduces the maximum possible error by choosing ages closer to the middle of the age range.

6. Results

6.1. Magnetic Susceptibility

Median single-core MS values range from 0.4 to 50.7 (SI units) (Fig. 4). The wide range of these baseline values underscores the sensitivity of this analysis not only to changes in minerogenic sediment content, but also to local differences in magnetic mineral content of the bedrock eroding and supplying sediment to the lake. MS values are typically high near the top of the cores, and decrease downcore to a baseline from which several peaks deviate in the middle sections of the cores. Some of these peaks are two orders of magnitude higher than baseline values. Some negative peaks (troughs) are present and occasional shifts in baseline values occur. Most MS troughs occur at core depths determined in the VL to contain a mixture of coarse-grained, inorganic material and a high abundance of terrestrial plant macrofossils (see below). Near the bottoms of some cores, baseline MS values gradually rise again. Replicate cores (not plotted in Fig. 4) exhibited nearly identical MS values and were not analyzed by the other lab methods. MS is the least sensitive of the lab techniques, recognizing an average of 14 layers per core (range from 3 to 21 layers) (Table 2).

6.2. X-Radiography

The black-and-white XR images of the cores produced from this analysis commonly exhibit a slightly mottled, dark gray appearance punctuated by several thin (~0.5

to 20 cm), lighter bands that indicate the presence of increased inorganic material (e.g., Fig. 5; Brown et al., 2000). Similar bands that were slightly darker than the average dark gray core tone existed in some of the cores, but were fewer in number than the lighter layers. Other thin layers appeared to be a mixture of both light and dark material. The locations of these dark and/or mixed-color bands correspond to locations in the VL containing a mixture of coarse-grained, inorganic material and a high abundance of terrestrial plant macrofossils (see below). Some cores (and sections of cores) with lower overall organic content appear lighter on average, making the differentiation of slight changes in sediment character more difficult. The bottom sections of certain cores appear mostly white in the XR images. Depending on the core, the number of terrigenous layers identified by XR ranges from 4 to 39, and averages ~18 per core (Table 2).

6.3. Visual Logging

Most core sediment is dark brown in color, but other sediment colors included gray, red, and green hues. The value (lightness/darkness) of the average core sediment also varies slightly. The gyttja near the tops of most cores is usually dark brown, and gradually lightens downcore. Near the bottoms of some cores, grayish tones become more common; in a few cores, the bottom sediment is entirely gray and composed of clay, sand, gravel, or a mixture of these materials, devoid of visible organic material. Terrigenous layers commonly appear anomalously light or dark compared to the surrounding gyttja—often light brown or tan, or less commonly very dark brown, gray, or black (e.g. Fig. 5). The terrigenous layers usually have a speckled appearance due to the presence of both dark and light minerals and an increased abundance of terrestrial plant macrofossils, which appear much darker than most of the core sediment. Terrigenous layers thus vary in composition from nearly pure sand, silt, gravel, or clay to a mixture of these inorganic materials and macrofossils of terrestrial plants. The texture of these layers is universally coarser than the surrounding gyttja; sand grains are usually visible, and thicker (>1 cm) terrigenous layers often appear to be graded. Some of these terrigenous layers contain gravel clasts up to ~3 cm diameter. The number of terrigenous layers identified through visual logging ranges from 3 to 47 per core, with an average of ~19 per core (Table 2).

6.4. Loss-on-Ignition

Median single-core LOI values range from 11.8 to 56.9% (Fig. 6), and are somewhat negatively correlated with median single-core MS values (r^2 = 0.43). LOI values are often low near the tops of the cores. Downcore, LOI values do not commonly tend toward a stable baseline; instead, the baseline typically varies along the length of the core. Many troughs of small to large size and a much smaller number of lesser peaks commonly deviate from this variable baseline. Most of these LOI peaks occur at core depths determined in the VL to contain a mixture of coarse-grained, inorganic material and a high abundance of terrestrial plant macrofossils. We therefore consider both troughs and peaks in LOI to represent significant deposits of terrigenous material. Near the bottoms of some cores, LOI values gradually shift toward lower values and ultimately tend toward values near 0%. LOI was the most sensitive of the lab techniques, identifying an average of ~31 terrigenous layers per core (range from 6 to 55 layers) (Table 2).

6.5. Radiocarbon Analysis

Radiocarbon ages of the 80 terrestrial plant macrofossils vary from modern to 10,980 ^{14}C years (Table 3). Uncertainties range from 30 to 520 ^{14}C years, with a median uncertainty of 50 ^{14}C years. Median calibrated ^{14}C age uncertainty is ± 100 years, and varies from ± 20 to ± 830 years. Of the 80 macrofossils analyzed, 7 ages showed significant (> 2σ) stratigraphic inversion and were therefore discarded; 4 additional ages were inverted, but not significantly (< 2σ). Cores Elligo 2 and Morey 1 were not dated.

7. Data Analysis

7.1. Time Series Filter

To isolate significant troughs and peaks in LOI curves from noise, we compared these shifts to the background LOI signal (Fig. 7). To establish an appropriate background estimate, all data points in the LOI curve greater than 1 whole-core standard deviation from the whole-core median were set to equal the median. The resulting series was filtered with singular spectrum analysis (SSA, Broomhead and King, 1986; Vautard and Ghil, 1989), using a 20-point window to identify the first principal component, which we define as the background. Any shifts in the original data series that were more than one standard deviation from this background were considered to be significant. The nature of the shifting baseline LOI values is therefore considered, as significance is measured relative to the local background rather than the entire data series.

7.2. Composite Sediment Record

We created a composite record of core stratigraphy from the results of the four individual analytical techniques (Fig. 7). In the composite record, we determined the locations of most terrigenous deposits when two or more of the individual techniques identified such layers. In some cases, we identified terrigenous layers from the results of a single analysis. In these cases, the individual analysis was strongly indicative of terrigenous material, and the character of the layer in question masked its location in the other analyses. For example, some terrigenous layers consisted of a mixture of macrofossils and sand in proportion that yielded LOI or MS values similar to background gyttja levels (e.g. core Morey 2 at depths 275 and 357 cm).

This composite record overcomes the limitations of the four individual analyses, and most accurately represents the locations and thickness of terrigenous layers. Comparing the composite record with the results of high-resolution, whole-core grain size analysis (a more sensitive method for determining the locations of terrigenous deposits; see Bosley et al., 2001; Conlan, 2001) shows that the composite record is a conservative representation of the number of terrigenous layers in each core and emphasizes the most extreme events (Fig. 8). Below, we present and discuss the results from data analyses applied to the composite record. Similar results were achieved using the records resulting from each of the four different core analytical techniques. The number of terrigenous layers recognized in the composite records ranges from 6 to 50, averaging ~27 per core (Table 2).

7.3. Age Modeling

To account for the difference in sedimentation rates between the rapidly-deposited terrigenous layers (Bierman et al., 1997) and the slow accumulation of gyttja, we mathematically compressed the composite sediment record by removing the rapidly-deposited terrigenous layers from the stratigraphy. This systematic compression removed from ~5 to 32 percent of the core sediment. Non-inverted ^{14}C ages were used to construct age models for each core, for which we assumed linear sedimentation rates between successive ages. Comparing these age models to the compressed core stratigraphy yields age estimates for each terrigenous layer in the core. These core chronologies may be analyzed individually, or combined into a single histogram that indicates regional storminess (Fig. 9).

7.4. Spectral Analysis

We used spectral analysis to determine whether significant periodicities exist in our data. Using the Analyseries v1.2 (Paillard et al., 1996) and SSA–MTM Toolkit v4.1 (Mann and Lees, 1996) software packages, we detrended and analyzed the data (augmented with the results from previous research in this region (Brown et al., 2000; Gran et al., 1999)) using the multitaper, Blackman–Tukey, and maximum entropy methods. We performed these analyses on our data interpolated to several intervals ranging from 10 to 200 years, all with similar results.

8. Discussion

The analysis and comparison of sedimentary archives from multiple lakes in the northeastern United States provides a unique perspective on past climate. Our regional approach demonstrates the variability in the character and number of sedimentary terrigenous layers in different lakes, and reveals storm patterns not identifiable from single lake records.

8.1. Recovery of terrigenous material

The number and thickness of terrigenous sediment layers present in individual cores varies widely. Based on reconnaissance surveys of the lake catchments and comparing coring locations, we determine that sediment supply, coring location, and inflowing stream competence affect the number and thickness of terrigenous layers recovered in cores.

Field surveys suggest that lakes with large quantities of erodible sediment in their catchments are more likely to have greater numbers and thickness of sedimentary terrigenous layers. Examples of such lakes include Ritterbush, Beebe, and Echo. High-gradient streams feeding Echo and Beebe flow through terrace deposits that are probably either fluvial or lacustrine in origin. In the Ritterbush basin, a large deposit of sandy, unconsolidated material (likely a delta from a higher glacial lake) is perched on a hillslope and cut by a well-incised stream that feeds Ritterbush Pond.

Choosing appropriate coring locations is of paramount importance for maximizing recovery of terrigenous material in cores. In small lakes with only one depocenter located near (~100 to 200 m) inflowing stream deltas, cores from such depocenters contained abundant, obvious layers of terrigenous material. Cores retrieved from locations near the middle of larger lakes (e.g. Emerald and Morey) contained few distinct terrigenous layers, and few macrofossils of terrestrial plants (used for radiocarbon dating). In contrast, cores from locations within 10 to 20 m of the center of the delta foreslope in these larger lakes contained thick, obvious deposits of terrigenous material and abundant terrestrial plant macrofossils. Mid-lake cores from the larger lakes with exceptionally competent, high-gradient inflowing streams and an abundant sediment supply (e.g. Dunmore, Echo) were less affected by their greater distance from the delta, but few lakes with such characteristics exist in this region. High-resolution, whole-core grain size analysis is more sensitive to small changes in sediment character, and reveals terrigenous deposits in cores recovered from distal locations (Bosley et al., 2001; Conlan, 2001; Parris et al., 2001).

The character of inflowing streams also determines the amount of sedimentary terrigenous material in lakes. Stream competence appears to be the determining factor. Terrigenous layers were more common and distinct in cores recovered from lakes with high-gradient inflowing streams, which are capable of transporting larger quantities of coarser-grained sediment than similar-sized but lower-gradient streams flowing in alluvium (e.g. Echo vs. Amherst). The average discharge of these streams also seems to be important, as cores from lakes with larger streams and well-developed channels contained more terrigenous material (e.g. Vail vs. Duck). However, cores from lakes with large but low-gradient streams contained little terrigenous material (e.g. Amherst).

8.2. Chronology comparisons

Storm-related deposition does not appear to have occurred synchronously in multiple lake basins, with the notable caveat that the uncertainties associated with our radiocarbon ages and age models do not allow us to identify conclusively single storm events reflected in multiple cores (Fig. 9). However, if we assume that our modeled ages are reasonably accurate and precise, we can conclude that distinct temporal clustering of events on such short timescales does not predominate in this region. This finding may be interpreted in several different ways: (a) localized, convective rainstorms delivered more sediment to lakes in this region during the Holocene than storms affecting wider areas; (b) hurricanes, nor'easters, and other mesoscale to synoptic-scale storms affected different portions of this region simultaneously but with varying results on the landscape; or (c) inaccurate model ages for terrigenous layers mask any actual correlations between the true ages of these deposits. Differing sensitivities of individual lake basins to a given rainfall intensity or duration may reflect orographic effects on rainfall, the availability of erodible sediment in the catchment, varying antecedent soil moisture levels, or other factors of landscape conditioning (Rodbell et al., 1999). Investigations into varved lake sediment (Gremillion and Rodbell, 1998; Lamoureux, 2000) or other proxies with annual resolution could determine more precisely the ages of past storms and allow better comparisons between individual chronologies. Unfortunately, such lakes with varved sediment are uncommon in New England.

These results suggest that rare, intense hurricanes, nor'easters, or other mesoscale to synoptic-scale storms did not affect multiple lake basins equally and more severely than localized storms formed by free convection. Had such large, catastrophic storms been the primary erosive force in New England during the Holocene, the ages of event layers in Figure 9 would likely exhibit distinct clustering on timescales ≤ ~100 years. Thus, in this region, intense but localized convective rainstorms cause at least as much flooding and erosion, and consequently damage to property or infrastructure, as their larger counterparts that usually receive considerably more public attention.

8.3. Storm magnitude

The accuracy of terrigenous layer thickness as a proxy for rainfall, and hence storm magnitude, has yet to be established in the northeastern United States (Brown et al., 2000). Determining such a relationship has been problematic for several reasons. First, accurate age control near the tops of sediment cores is difficult to attain, both due to the loss of some of the unconsolidated uppermost sediment during coring, and because of large uncertainties associated with radiocarbon dates during the past few hundred years (Stuiver et al., 1998). Thus, the ages of recently deposited terrigenous layers are often uncertain, and comparing them to the dates of major historic storms is difficult. Second, precipitation in this region is highly variable locally (Ludlum, 1996); therefore, long historic records, available for only a few stations, may not adequately reflect actual precipitation values at remote lake locations. The problem of age control may be alleviated by using ^{210}Pb or perhaps ^{137}Cs dating techniques, both of which are more accurate over historic time frames than ^{14}C (Robbins and Edgington, 1975). Using these dating methods on lake cores with associated historic rainfall records may allow for the establishment of terrigenous layer thickness as a proxy for rainfall.

Variable landscape condition and inflowing stream location pose more difficult problems for establishing such a relationship. A relatively saturated landscape from a summer with higher than average rainfall would be more sensitive to fall storms than a landscape following summer drought (Dunne and Leopold, 1978). For example, Hurricane Floyd (September, 1999) brought considerable precipitation to the northeastern United States, but caused little erosion, gullying, or mass movement because it occurred following a summer of below-average rainfall (NOAA/NCDC, 2001). Conversely, the flood of record (November, 1927), which produced extensive erosion, followed a period of higher than normal precipitation (Ludlum, 1996). Landslides or other mass movements that result from intense rainfall might make large quantities of sediment available for rapid transport to the lakes by less-intense storms (Rodbell et al., 1999). Similarly, the position of the inflowing stream on the delta with respect to the coring location might mask the true magnitude of storm floods. If the stream were incised and flowing along the edge of the delta, a very large flood could deposit a thick layer of material to the side of the delta but little material in the front of the delta, where cores are recovered.

If we accept these caveats and interpret terrigenous layer thickness as a proxy for storm magnitude (Fig. 9C), the millennial-scale variability (Fig. 9B; Noren et al., in review) becomes less apparent. Maximum event magnitude prior to the arrival of European settlers to the area (~250 BP) occurred at 11.8, 10.8, and 1.2 ky BP. The highest peak in average terrigenous layer thickness, which occurred during historic times, likely reflects accelerated rates of hillslope erosion caused by deforestation and livestock grazing (Bierman et al., 1997). Lesser peaks in event magnitude occurred at 11.5, 9.8, 6.7, 5.8, 4.3, 2.6, 1.9, and 1.4 ky BP. Spectral analysis of this time series reveals high spectral power, significant at 99% confidence, in a broad peak centered at 509 years (Fig. 10). This peak is close to the 512-year period in atmospheric ^{14}C inventory, thought to reflect instabilities in North Atlantic thermohaline circulation (Stuiver and Braziunas, 1993). Other, longer-scale trends in event magnitude follow average regional climate trends (see below).

8.4. Comparison with regional storm and climate records

Combined into a single histogram, the ages of terrigenous layers and by inference, the most severe rainstorms in New England exhibit temporal clustering on millennial and centennial timescales (Fig. 9B; Noren et al., in review). Storminess reached broad and variable maxima lasting ~1.5 ky, with the highest peaks centered at approximately 2.6, 5.8, 9.1 and 11.9 ky BP, and appears to be presently increasing toward another peak (Noren et al., in review).

Independent storm records from this region are well-correlated with our data. Jennings et al. (in review) investigated the stratigraphies of five postglacial alluvial fans in Vermont to determine their sedimentation histories, which span up to 13.3 ky. Their findings augment the existing Holocene sedimentation chronologies for five other postglacial fans determined by Bierman et al. (1997). Nearly all of the distinct, prehistoric depositional events on alluvial fans in Vermont occurred at times we identify as particularly stormy (Fig. 9D; Noren et al., in review). The correlation between these different paleostorm proxies suggests that hillslopes across this region have responded similarly to storms under the same millennial-scale climate forcing since deglaciation (Noren et al., in review).

The average Holocene climate of the northeastern United States since deglaciation includes a gradual transition from cold, moist postglacial conditions to a warm, dry mid-Holocene, followed by gradual cooling and moistening until present (e.g. Webb et al., 1993; Delcourt and Delcourt, 1984; Jackson and Whitehead, 1991; Spear et al., 1994; Kutzbach et al., 1987; Mullins, 1998; Winkler, 1985). In particular, this region was cold from deglaciation to ~11.6 ky BP, and became gradually warmer, and perhaps moister, with prevalent meridional air flow until ~8.6 ky BP. Climate was warm and dry with predominantly zonal air flow (with the possible exception of a brief, ~200-400-year, cool, dry, and dusty interval centered at ~8.2 ky BP) until ~4.5 ky BP. A gradual climatic transition followed, to conditions that were cool and wet with mostly meridional flow (similar to present conditions), which became fully established at ~3.2 ky BP.

The average thickness of lacustrine terrigenous deposits (Fig. 9C), and by inference, storm magnitude, exhibits long-term variability similar to regional climate. Average storm layers were thickest in the early and late Holocene, when climate was cool and moist; they were thinnest in the mid-Holocene, when warm and dry conditions were predominant. This correlation between layer thickness and climate may indicate that extreme precipitation events were more intense during periods of increased wetness, a result consistent with relationships observed in modern, instrumental records of climate (Easterling et al., 2000).

Alternatively, the deposition of thicker storm layers in the early and late Holocene could reflect higher antecedent soil moisture that resulted from wet climate conditions during those intervals. As discussed above, larger volumes of terrigenous sediment may be more easily eroded when the landscape is wetter than average. If antecedent soil moisture is the primary control on the thickness of terrigenous layers, such deposits should be both thicker and more numerous during moist climate conditions—as frequent, low-intensity storms would more easily erode sediment during these intervals. However, the number of terrigenous layers deposited during the early and late Holocene was not significantly different than during the mid-Holocene. Thus, storm intensity rather than antecedent soil moisture is probably the primary control on the thickness of terrigenous layers.

On shorter (centennial to millennial) timescales, the average regional climate of the northeastern United States exhibits little variability, unlike both storm frequency and magnitude. The centennial- and millennial-scale variability of these storm time series are not apparent in average climate trends as revealed by studies of pollen, macrofossils, lake levels, and estimates of temperature and precipitation generated in climate models (e.g. Webb et al., 1993; Delcourt and Delcourt, 1984; Jackson and Whitehead, 1991; Spear et al., 1994; Kutzbach et al., 1987; Mullins, 1998; Winkler, 1985). These documented fluctuations in storminess may have been caused by minor climatic changes that did not significantly affect regional vegetation or moisture balance. This result underscores the potential for other climatic changes, notably anthropogenic temperature increases caused by greenhouse gas emissions, to produce conditions more (or less) favorable for the generation of severe storms (IPCC, 2001).

9. Conclusion

Since deglaciation more than 13,000 years ago, severe rainstorms in the northeastern United States have caused the erosion of silt, sand, gravel, and woody forest debris from steep hillslopes. This material was transported in flooded stream channels to lakes beneath these hillslopes, and deposited as distinctive layers in the lake sediment. Such terrigenous layers in sediment cores recovered from several lakes in this region reveal much about significant, erosion-producing storms and their effects. This is the longest storm record yet established for the northeastern United States, and the first regional paleostorm record established from the sediment of multiple lakes. Such an approach reveals variability in the character and numbers of sedimentary terrigenous layers in different lakes, and regional storm patterns not identifiable from single lake records.

The composition of terrigenous layers varies from nearly pure sand to a mixture of sand and macrofossils of woody forest debris. The quantity of terrigenous material in sediment cores is controlled by lake characteristics and coring location. Lakes most likely to preserve sedimentary storm layers have steep surrounding hillslopes, a large volume of erodible sediment in the uplands, and competent, high-gradient inflowing streams with deltas composed of sand and gravel. Coring locations adjacent to the center of the delta foreslope usually yield cores with the greatest number and thickness of sedimentary terrigenous layers.

The most severe Holocene rainstorms in this region have been both localized but intense storms formed by free convection, as well as hurricanes, nor'easters, or other synoptic-scale storms. Such storms were probably most severe in the early and late Holocene, when New England's climate was cool and moist, and the magnitude of these storms most likely varied in regular cycles of ~510 years. This rhythm in storm severity may reflect the influence of oceanic thermohaline circulation. Storm-related depositional events on alluvial fans in Vermont occurred during intervals we identified as having frequent severe storms. The frequency and magnitude of such storms varied in cycles of much shorter duration than the average regional climate of the northeastern United States. Thus, minor climatic changes that did not significantly affect regional vegetation assemblages or moisture balance may have caused disproportionate increases or decreases in storminess.

Acknowledgements

We thank K. Jennings for field assistance, S. Brown for lab training, and P.T. Davis for coring training, assistance, and device design. Thanks to A. Bosley and A. Conlan for grain size analysis of the Morey cores. We thank R. Howse, C. Williams, S.

Gran Mitchell, D. Lamneck, G. Fowles, C. Massey, S. Turgeon, and S. Rupard for assistance with core collection. We thank F. Janukajtis, B. Copans, and J. Cunningham for assistance in the lab. Supported by National Science Foundation Career Grant EAR9702643 to Bierman and Instrumentation Grant EAR9724190 to Bierman and Lini.

References

Ambers, R.K., 2001. Using the sediment record in a western Oregon flood-control reservoir to assess the influence of storm history and logging on sediment yield. Journal of Hydrology 244 (3-4), 181-200.

Bierman, P.R., Lini, A., Zehfuss, P., Church, A., Davis, P.T., Southon, J.R., Baldwin, L., 1997. Postglacial ponds and alluvial fans: Recorders of Holocene landscape history. GSA Today 7 (10), 1–8.

Bond, G.C., Showers, W., Cheseby, M., Lotti, R., Almasi, P., deMenocal, P., Priore, P., Cullen, H., Hajdas, I., Bonani, G., 1997. A Pervasive Millennial-Scale Cycle in North Atlantic Holocene and Glacial Climates. Science 278 (5341), 1257-1266.

Bosley, A.C., Bierman, P.R., Noren, A.J., Galster, J.C., 2001. Identification of paleoclimatic cycles during the Holocene using grain size analysis of sediments cored from Lake Morey in Fairlee, VT. GSA Abstracts with Programs (Regional) 33 (1), 15.

Broomhead, D.S., King, G.P., 1986. Extracting qualitative dynamics from experimental data. Physica D 20, 217–236.

Brown, S.L., Bierman, P.R., Lini, A., Davis, P.T., Southon, J.R., in press. Lake cores as archives of Holocene watershed erosion events. Journal of Paleolimnology.

Brown, S.L., Bierman, P.R., Lini, A., Southon, J.R., 2000. 10,000 yr record of extreme hydrologic events. Geology 28 (4), 335–338.

Cadwell, D.H., 1990. Surficial Geologic Map of New York State. New York State Geological Survey, Albany.

Collins, E.S., Scott, D.B., Gayes, P.T., 1999. Hurricane records on the South Carolina coast: Can they be detected in the sediment record? Quaternary International 56, 15–26.

Conkey, L.E., 1986. Red spruce tree-ring widths and densities in eastern North America as indicators of past climate. Quaternary Research 26, 232–243.

Conlan, A.M., 2001. Spatial extent of sediment pulses in Lake Morey, Fairlee, VT. Vermont Geological Society Spring Meeting, Norwich University, Norwich, VT.

Cronin, T., Willard, D., Karlsen, A., Ishman, S., Verardo, S., McGeehin, J., Kerhin, R., Holmes, C., Colman, S., Zimmerman, A., 2000. Climatic variability in the eastern United States over the past millennium from Chesapeake Bay sediments. Geology 28 (1), 3–6.

Dansgaard, W., Johnsen, S.J., Clausen, H.B., Dahl-Jensen, D., Gundestrup, N., Hammer, C.U., Oeschger, H., 1984. North Atlantic climatic oscillations revealed by deep Greenland ice cores. In: Hansen, J.E., Takahashi, T. (Eds.). Climate processes and climate sensitivity. American Geophysical Union, Washington, DC, pp. 288–306.

Delcourt, P.A., Delcourt, H.R., 1984. Late Quaternary paleoclimates and biotic responses in eastern North America and the western North Atlantic Ocean. Palaeogeography, Palaeoclimatology, Palaeoecology 48, 263–284.

Doll, C.G., Cady, W.M., Thompson Jr., J.B., Billings, M.P., 1961. Centennial Geologic Map of Vermont.

Doll, C.G., Stewart, D.P., MacClintock, P., 1970. Surficial Geologic Map of Vermont. Williams and Heintz Map Corporation, Washington, DC.

Donnelly, J.P., Bryant, S.S., Butler, J., Dowling, J., Fan, L., Hausmann, N., Newby, P.E., Shuman, B.N., Stern, J., Westover, K., Webb III, T., 2001a. 700 yr sedimentary record of intense hurricane landfalls in southern New England. Geological Society of America Bulletin 113 (6), 714–727.

Donnelly, J.P., Roll, S., Wengren, M., Butler, J., Lederer, R., Webb III, T., 2001b. Sedimentary evidence of intense hurricane strikes from New Jersey. Geology 29 (7), 615–618.

Dunne, T.B., and Leopold, L.B., 1978. Water in Environmental Planning. W.H. Freeman, San Francisco, 818 p.

Easterling, D.R., Meehl, G.A., Parmesan, C., Changnon, S.A., Karl, T.R., Mearns, L.O., 2000. Climate Extremes: Observations, Modeling, and Impacts. Science 289 (5487), 2068–2074.

Eden, D.N., Page, M.J., 1998. Palaeoclimatic implications of a storm erosion record from late Holocene lake sediments, North Island, New Zealand. Palaeogeography, Palaeoclimatology, Palaeoecology 139, 37–58.

Fisher, D.W., Isachsen, Y.W., Rickard, L.V., 1970. Geologic Map of New York State. New York State Geological Survey, Albany.

Gran, S.E., Bierman, P.R., Nichols, K.K., 1999. Teaching winter geohydrology using frozen lakes and snowy mountains. Journal of Geoscience Education 47 (5), 420–447.

Gremillion, P.T., Rodbell, D.T., 1998. Overturn history of an iron-rich meromictic lake as an indicator of extreme meteorological events. GSA Abstracts with Programs 30 (7), 114.

Grove, J.M., 1988. The Little Ice Age. Methuen, London, 498 pp.

Hayne, M., Chappell, J., 2001. Cyclone frequency during the last 5000 years at Curacoa Island, north Queensland, Australia. Palaeogeography, Palaeoclimatology, Palaeoecology 168 (3-4), 207-219.

IPCC Working Group I, 2001. Climate Change 2001: The Scientific Basis, Intergovernmental Panel on Climate Change, Geneva, Switzerland.

Jackson, S.T., Whitehead, D.R., 1991. Holocene vegetation patterns in the Adirondack Mountains. Ecology 72 (2), 641–653.

Jennings, K.L., Bierman, P.R., Southon, J.R., in review. Timing and style of deposition on humid-temperate fans, Vermont, USA. Geological Society of America Bulletin.

Keim, B., Mayewski, P.A., Zielinski, G.A., Wake, C., Carpenter, K., Cox, J., Souney, J., Sanborn, P., Rodgers, M., 1998. New England's Changing Climate, Weather and Air Quality. University of New Hampshire, Durham, 48 pp.

Knox, J.C., 1999. Sensitivity of modern and Holocene floods to climate change. Quaternary Science Reviews 19, 439–457.

Kochel, R.C., Baker, V.R., 1982. Paleoflood Hydrology. Science 215 (4531), 353–361.

Kutzbach, J.E., 1987. Model simulations of the climatic patterns during the deglaciation of North America. In: Ruddiman, W.F., Wright, H.E. (Eds.). North America and adjacent oceans during the last deglaciation. Geographical Society of America, Boulder, Colorado, pp. 425–446.

Lamoureux, S.F., 2000. Five centuries of interannual sediment yield and rainfall-induced erosion in the Canadian High Arctic recorded in lacustrine varves. Water Resources Research 36, 309–318.

Lamoureux, S.F., England, J.H., Sharp, M.J., Bush, A.B.G., 2001. A varve record of increased 'Little Ice Age' rainfall associated with volcanic activity, Arctic Archipelago, Canada. The Holocene 11 (2), 243-249.

Lin, L., 1996. Environmental changes inferred from pollen analysis and ^{14}C ages of pond sediments, Green Mountains, Vermont. Master's Thesis, University of Vermont, Burlington, 125 pp.

Liu, K., Fearn, M.L., 1993. Lake-sediment record of late Holocene hurricane activities from coastal Alabama. Geology 21, 793–796.

Liu, K., Fearn, M.L., 2000. Reconstruction of Prehistoric Landfall Frequencies of Catastrophic Hurricanes in Northwestern Florida from Lake Sediment Records. Quaternary Research 54, 238–245.

Ludlum, D., 1996. The Vermont Weather Book. Vermont Historical Society, Montpelier, 302 pp.

Mann, M.E., Lees, J.M., 1996. Robust estimation of background noise and signal detection in climatic time series. Climatic Change 33, 409–445.

Meeks, H.A., 1986. Vermont's land and resources. New England Press, Shelburne, Vermont, 332 pp.

Mullins, H.T., 1998. Environmental change controls of lacustrine carbonate, Cayuga Lake, New York. Geology 26 (5), 443–446.

NOAA/NCDC (National Oceanic and Atmospheric Administration/National Climatic Data Center), 2001. Climate of 1999: Annual, U.S. Regional and Statewide Analyses. Retrieved October 13, 2001, from http://lwf.ncdc.noaa.gov/oa/climate/research/1999/ann/us_regional.html

Nesje, A., Dahl, S.O., Matthews, J.A., Berrisford, M.S., 2001. A ~4500-yr record of river floods obtained from a sediment core in Lake Atnsjøen, eastern Norway. Journal of Paleolimnology 25 (3), 329–342.

Newby, P.E., Killoran, P., Waldorf, M.R., Shuman, B.N., Webb, R.S., Webb III, T., 2000. 14,000 years of sediment, vegetation, and water-level changes at the Makepeace Cedar Swamp, southeastern Massachusetts. Quaternary Research 53, 352–368.

Noren, A.J., Bierman, P.R., Steig, E.J., Lini, A., Southon, J.R., in review. A Holocene millennial-scale storm cycle in the northeastern United States. Nature.

Nott, J., Hayne, M., 2001. High frequency of 'super-cyclones' along the Great Barrier Reef over the past 5,000 years. Nature 413, 508-512.

Ouellet, M., 1997. Lake sediments and Holocene seismic hazard assessment within the St. Lawrence Valley, Quebec. Geological Society of America Bulletin 109, 631–642.

Page, M.J., Trustrum, N.A., DeRose, R.C., 1994. A high-resolution record of storm-induced erosion from lake sediments, New Zealand. Journal of Paleolimnology 11, 333–348.

Paillard, D., Labeyrie, L., Yiou, P., 1996. Macintosh program performs time-series analysis. Eos, Transactions, American Geophysical Union 77, 379.

Parris, A.S., Bosley, A.C., Bierman, P.R., Lini, A., Noren, A.J., Lord, A.M., Conlan, A.M., Morgan, L., 2001. Grain by grain: Holocene storms and hillslope erosion in New England. GSA Abstracts with Programs, 314.

Reasoner, M.A., 1993. Equipment and procedure improvements for a lightweight, inexpensive, percussion core sampling system. Journal of Paleolimnology 8, 273–281.

Ridge, J.C., Besonen, M.R., Brochu, M., Brown, S.L., Callahan, J.W., Cook, G.J., Nicholson, R.S., Toll, N.J., 1999. Varve, paleomagnetic, and ^{14}C chronologies for late Pleistocene events in New Hampshire and Vermont (U.S.A.). Géographie physique et Quaternaire 53 (1), 79-106.

Robbins, J.A., Edgington, D.N., 1975. Determination of recent sedimentation rates in Lake Michigan using Pb-210 and Cs-137. Geochimica et Cosmochimica Acta 39, 289-304.

Rodbell, D.T., Seltzer, G.O., Anderson, D.M., Abbott, M.B., Enfield, D.B., Newman, J.H., 1999. An ~15,000-year record of El Niño-Driven alluviation in southwestern Ecuador. Science 283 (5401), 516–520.

Spear, R., Davis, M.B., Shane, L.C., 1994. Late Quaternary history of low- and mid-elevation vegetation in the White Mountains of New Hampshire. Ecological Monographs 64, 85–109.

Stuiver, M., Braziunas, T.F., 1993. Sun, ocean, climate and atmospheric $^{14}CO_2$: an evaluation of causal and spectral relationships. The Holocene 3 (4), 289–305.

Stuiver, M., Reimer, P.J., 1993. Extended ^{14}C Data Base and Revised CALIB 3.0 ^{14}C Age Calibration Program. Radiocarbon 35, 215–230.

Stuiver, M., Reimer, P.J., Bard, E., Beck, J.W., Burr, G.S., Hughen, K.A., Kromer, B., McCormac, G., van der Plicht, J., Spurk, M., 1998. INTCAL98 radiocarbon age calibration, 24,000-0 cal BP. Radiocarbon 40 (3), 1041–1083.

Thompson, L.G., Yao, T., Mosley-Thompson, E., Davis, M.E., Henderson, K.A., Lin, P.N., 2000. A High-Resolution Millennial Record of the South Asian Monsoon from Himalayan Ice Cores. Science 289 (5486), 1916-1919.

Thomson, D.J., 1982. Spectrum estimation and harmonic analysis. Proc. IEEE 70, 1055-1096.

Thorndycraft, V., Hu, Y., Oldfield, F., Crooks, P.R.J., Appleby, P.G., 1998. Individual flood events detected in the recent sediments of the Petit Lac d'Annecy, eastern France. The Holocene 8 (6), 741–746.

Tudhope, A.W., Chilcott, C.P., McCulloch, M.T., Cook, E.R., Chappell, J., Ellam, R.M., Lea, D.W., Lough, J.M., Shimmield, G.B., 2001. Variability in the El Nino-Southern Oscillation Through a Glacial-Interglacial Cycle. Science 291 (5508), 1511-1517.

Vautard, R., Ghil, M., 1989. Singular spectrum analysis in non-linear dynamics, with applications to paleoclimatic time series. Physica D 35, 395–424.

Webb III, T., Bartlein, P.J., Harrison, S.P., Anderson, K.J., 1993. Vegetation, lake levels, and climate in eastern North America for the past 18,000 years. In: Wright, H.E., Kutzbach, J.E., Street-Perrot, F.A., Bartlein, P.J., Ruddiman, W.F., Webb, T. (Eds.). Global climates since the last glacial maximum. University of Minnesota Press, Minneapolis, pp. 415–467.

Winkler, M.G., 1985. A 12,000-year history of vegetation and climate for Cape Cod, Massachusetts. Quaternary Research 23, 301–312.

Figure Captions

Figure 1. Topographic map of area surrounding Chapel Pond, showing steep catchment and major inflowing stream channels (highlighted). Contour interval: 6 m. Universal Transverse Mercator (UTM) Zone 18 coordinates shown. Modified from United States Geological Survey Keene Valley and Elizabethtown 1:25,000 topographic maps.

Figure 2. Maps showing location of study area in the northeastern United States (inset, shaded) and lakes from which we collected and analyzed sediment cores. A = Amherst Lake, Plymouth, VT; B = Echo Lake, Plymouth, VT; C = Lake Elligo, Greensboro, VT; D = Lake Dunmore, Salisbury, VT; E = Emerald Lake, Dorset, VT; F = Beebe Pond, Hubbardton, VT; G = Vail Pond, Sutton, VT; H = Thirteenth Lake, North River, NY; I = Richmond Pond, Richmond, VT (from Gran et al., 1999); J = Ritterbush Pond, Eden, VT (from Brown et al., 2000 and in press); K = Chapel Pond, Saint Huberts, NY; L = Lake Morey, Fairlee, VT; M = Duck Pond, Sutton, VT.

Figure 3. Bathymetric map of Vail Pond, showing depth measurements and coring location. Positions of inflowing and outflowing streams indicated by arrows.

Figure 4. Whole-core magnetic susceptibility values (SI units); method integrates values over ~5 cm of core. Values have been natural log-transformed. Core ID letters correspond to lakes in Table 1 and Fig. 2.

Figure 5. Sample photograph of 20-cm core section (from Chapel Pond), showing distinct 8-cm terrigenous layer (157 to 164 cm) composed of sand and terrestrial plant

macrofossils. X-radiograph and values of LOI and MS of same core section shown for comparison, with location of terrigenous layer shaded.

Figure 6. Whole-core percent mass loss-on-ignition values (1 cm sample interval). Core ID letters correspond to lakes in Table 1 and Fig. 2. Core L1 data from Conlan (2001).

Figure 7. Comparison of whole-core datasets from one core (Lake Dunmore). Light bands (and dark bands on LOI column) indicate the location of terrigenous layers identified by each analytical technique. Light and dark bands differentiate significant LOI troughs and peaks, respectively. Raw data for LOI and MS shown for comparison with inferred location of terrigenous deposits. Time series filter shown superimposed on LOI curve: heavy black line = raw LOI data; thin black line = background LOI level determined by SSA filtering; light gray lines = 1σ filter for significance. COMP = Composite sediment record, determined by comparing the results of the individual lab analyses.

Figure 8. Comparison of results of high-resolution, whole-core grain size (GS) analysis for cores Morey 1 (Conlan, 2001) and Morey 2 (Bosley et al., 2001) with composite sediment record for each core. Significant variability in GS and thus the location of terrigenous layers (light bands) was determined with the time series filter described in the text; 1σ filter for significance (light line) shown superimposed on raw data (only peaks in GS—not troughs—are considered significant).

Figure 9. Individual storm chronologies, time series of regional storminess variability, and local storm records for the northeastern United States. (**A**) Individual event chronologies from study lakes, with median 1σ calibrated ^{14}C age uncertainty of ± 100 years shown for each event. (**B**) Histogram of events (100 yr bins), weighted by the

inverse of the number of core records covering each interval. Values above the superimposed linear regression are shaded. (**C**) Histogram showing average thickness of terrigenous layers recovered in cores, with 100 yr bins (thick line). This plot may reflect event magnitude over time. 11-point running average superimposed (thin line). (**D**) Depositional events on alluvial fans in Vermont (Bierman et al., 1997; Jennings et al., in review), separated vertically to show age uncertainties greater than 200 years (no vertical scale implied).

Figure 10. Multitaper spectral analysis (3 tapers) of time series of average terrigenous layer thickness, interpolated with a 100-year interval and with linear trend removed (Thomson, 1982). The harmonic spectrum represents the estimated significant periodic component of the storminess raw spectrum, as measured by the Thomson variance ratio test for periodic signals (F-test). CI = confidence interval. Confidence level is relative to red noise estimated from lag-1 autocorrelation with a median averaging filter, following Mann and Lees (1996).

Table 1. Study lake characteristics and coring location coordinates.

ID*	Lake	Location	Elev. (m)	Area (km^2)	Max. Depth (m)	Basin Area (km^2)	Basin Relief (m)	Relief Ratio (m/km^2)	Coring Location UTM Zone 18 Easting (m)	UTM Zone 18 Northing (m)
A	Amherst	Plymouth, VT	326	0.33	27.4	49.4	675	14	685666	4817426
B	Echo	Plymouth, VT	323	0.42	27.7	68.1	678	10	686006	4815627
									685941 §	4816217 §
C	Elligo	Greensboro, VT	269	0.70	30.5	13.1	259	20	709864	4941066
									709788 §	4942359 §
D	Dunmore	Salisbury, VT	173	3.99	32.0	52.9	812	15	654830	4863362
E	Emerald	Dorset, VT	217	0.13	13.0	14.7	713	48	111180 **	86202 **
F	Beebe	Hubbardton, VT	188	0.45	13.1	7.5	215	29	646418	4843932
G	Vail	Sutton, VT	455	0.06	14.0	2.0	354	177	731912	4954135
H	Thirteenth	North River, NY	510	1.33	14.9	28.5	536	19	570352	4839573
I	Richmond†	Richmond, VT	223	0.10	2.8	2.2	273	125	464332 **	213050 **
J	Ritterbush‡	Eden, VT	317	0.05	14.0	2.2	293	133	N/A	N/A
K	Chapel	Saint Huberts, NY	485	0.07	23.8	4.6	925	202	600237	4887879
L	Morey	Fairlee, VT	127	2.22	13.1	20.7	414	20	728301	4866700
									728186 §	4866599 §
M	Duck	Sutton, VT	520	0.03	13.1	0.7	290	414	732336	4954558

*ID letters correspond to lakes in other Figs. †From Gran et al. (1999). ‡From Brown et al. (2000). §Second core recovered from same lake. **Vermont State Plane coordinates. Datum for all UTM coordinates is NAD 1927 Eastern US.

Table 2. Number of terrigenous layers identified.

Core	Magnetic Susceptibility	X-Radiography	Visual Log	Loss-On-Ignition	Composite
Amherst	9	4	4	24	16
Echo 1	18	21	26	29	28
Echo 2	19	33	23	35	37
Elligo 1	14	18	12	52	31
Elligo 2	12	15	*	*	*
Dunmore	17	20	26	24	27
Emerald	3	4	3	8	6
Beebe	14	20	23	35	23
Vail	19	39	21	55	46
Thirteenth	19	25	20	52	26
Chapel	21	22	47	31	50
Morey 1	8	7	5	6	11
Morey 2	9	11	11	9	13
Duck	14	7	15	37	37

*Not analyzed.

Table 3. Radiocarbon dates of terrestrial plant macrofossils.

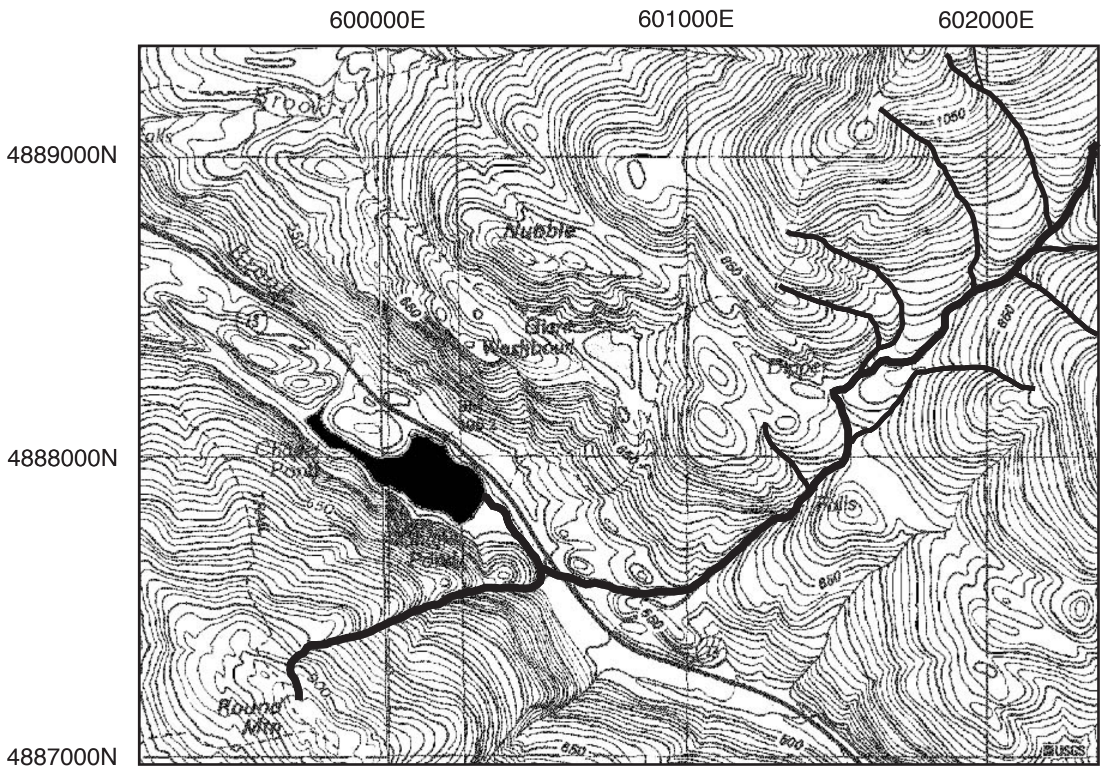
CAMS #	Lake	Core	Depth (cm)	Radiocarbon Age	Calibrated Age*	1σ age range
62298	Amherst	1	108	450 ± 40	500	479 - 525
62299†	Amherst	1	141	2150 ± 40	2160	2061 - 2299
67834	Amherst	1	224	920 ± 50	850	789 - 913
62452	Amherst	1	397	1570 ± 50	1470	1412 - 1519
62300†	Amherst	1	426	1330 ± 180	1230	1015 - 1408
67835	Amherst	1	542	2060 ± 60	2030	1949 - 2112
57711	Duck	1	48	220 ± 110	210	1 - 428
57712	Duck	1	192	2510 ± 50	2590	2473 - 2737
57713	Duck	1	311	4040 ± 40	4490	4424 - 4568
57784	Duck	1	480	7530 ± 50	8330	8214 - 8390
57714	Duck	1	522	8790 ± 50	9810	9703 - 10104
57715	Duck	1	529	8790 ± 50	9810	9703 - 10104
57715	Duck	1	558	10900 ± 50	12960	12858 - 13114
57717	Duck	1	567	10980 ± 50	13020	12924 - 13131
62301†	Duck	1	578	10930 ± 40	12980	12882 - 13119
52942	Echo	1	165	360 ± 30	400	324 - 473
52943	Echo	1	307.5	1150 ± 50	1050	974 - 1168
52941	Echo	1	417	2070 ± 140	2050	1876 - 2300
62302†	Echo	2	62	5010 ± 40	5740	5660 - 5859
57718†	Echo	2	68	3850 ± 40	4250	4153 - 4351
57719	Echo	2	215	1270 ± 50	1220	1149 - 1274
57720	Echo	2	345	2480 ± 40	2590	2470 - 2710
62303	Elligo	1	56	200 ± 40	180	3 - 294
57721†	Elligo	1	57	1280 ± 40	1220	1176 - 1262
57722	Elligo	1	217	1260 ± 40	1210	1149 - 1263
57723	Elligo	1	320	1830 ± 50	1760	1706 - 1856
57724	Elligo	1	464	2450 ± 40	2520	2360 - 2707
57725	Elligo	1	591	3250 ± 50	3470	3394 - 3551
67850	Emerald	1	244	2160 ± 40	2190	2067 - 2301
67851	Emerald	1	335	3260 ± 50	3480	3404 - 3552
62304	Emerald	1	583	7740 ± 40	8500	8433 - 8585
57744	Morey	2	16	180 ± 50	170	2 - 293
57745	Morey	2	124	1870 ± 60	1800	1731 - 1870
57746	Morey	2	221	3070 ± 40	3290	3214 - 3344
57747	Morey	2	305	4300 ± 40	4860	4829 - 4954
57748	Morey	2	381	5720 ± 50	6510	6412 - 6617
62305	Morey	2	419	7840 ± 40	8610	8542 - 8695
62306	Morey	2	431	9450 ± 520	10720	9916 - 11551
57749	Morey	2	454	10230 ± 50	11940	11705 - 12285
57750	Morey	2	468	10270 ± 110	12040	11699 - 12333
57751	Morey	2	501	10370 ± 50	12320	11975 - 12606
57752†	Morey	2	519	10180 ± 100	11840	11446 - 12265
67866	Vail	1	99	320 ± 40	380	312 - 435
57753	Vail	1	202	2230 ± 90	2240	2147 - 2337
57754	Vail	1	252	2590 ± 50	2700	2519 - 2773
57755	Vail	1	313	3150 ± 50	3380	3272 - 3444
57756	Vail	1	410	4500 ± 40	5180	5053 - 5285
57757	Vail	1	475	5800 ± 50	6600	6505 - 6663
57758	Vail	1	549	7520 ± 120	8300	8192 - 8399
57759	Vail	1	583	8350 ± 50	9380	9297 - 9467
67862	Beebe	1	48	1990 ± 50	1940	1889 - 1989
67836	Beebe	1	131	3810 ± 40	4190	4095 - 4253
67837	Beebe	1	205	5090 ± 50	5820	5753 - 5905
67838	Beebe	1	309	6930 ± 50	7740	7686 - 7788
65337	Beebe	1	347	7820 ± 30	8590	8546 - 8630

*Radiocarbon ages calibrated according to Stuiver et al. (1993), Stuiver et al. (1998), and weighting procedure described in text. †Not used in age model.

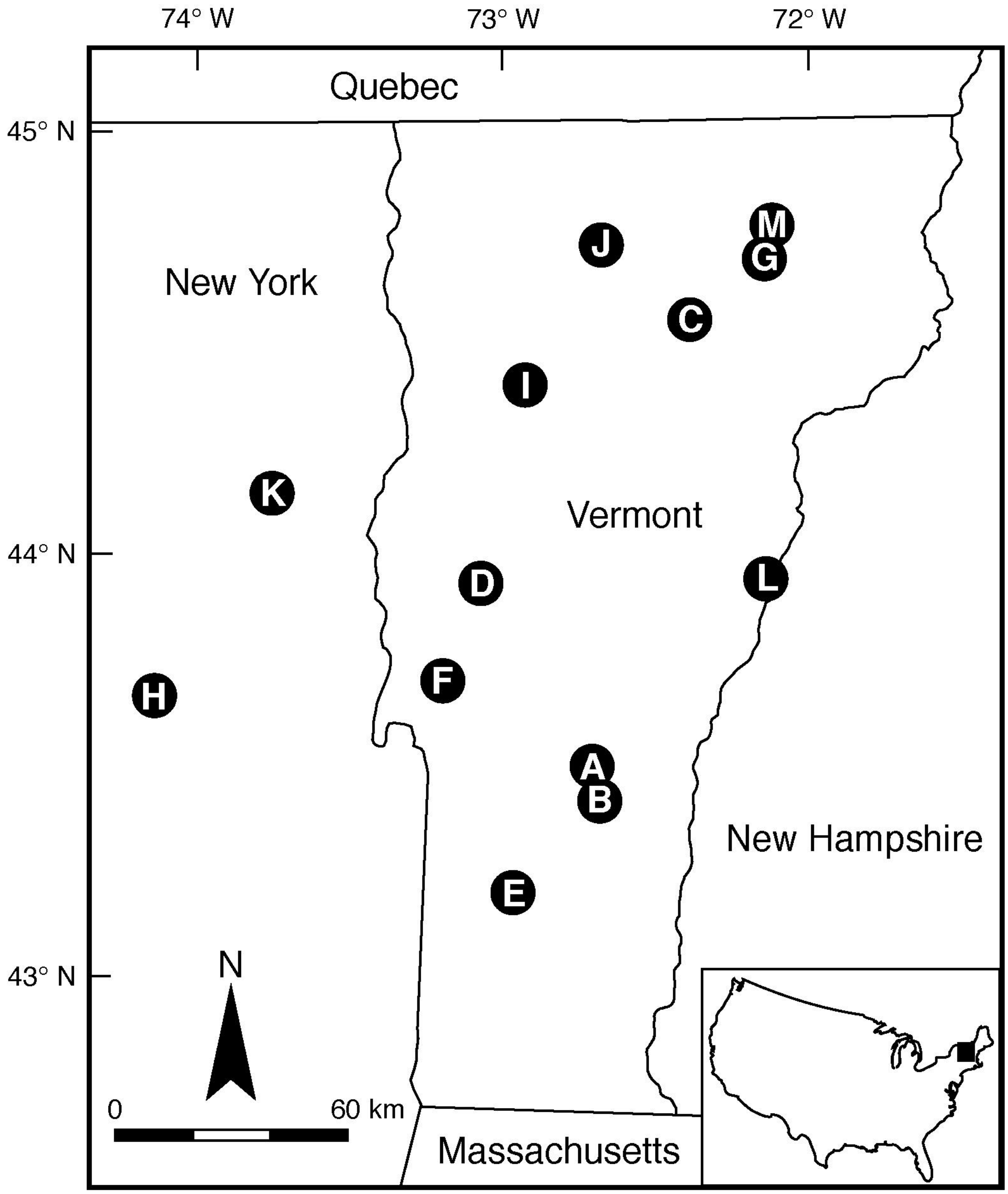
Table 3 (continued).

CAMS #	Lake	Core	Depth (cm)	Radiocarbon Age	Calibrated Age*	1σ age range
67839	Chapel	1	32	Modern		
67840†	Chapel	1	100	200 ± 40	180	9 - 294
67841	Chapel	1	159	110 ± 40	130	29 - 261
67842	Chapel	1	273	1890 ± 60	1820	1736 - 1888
67843	Chapel	1	327	3750 ± 50	4090	3989 - 4224
67844	Chapel	1	404	8360 ± 60	9390	9298 - 9469
67845	Chapel	1	459	9380 ± 50	10600	10508 - 10684
67846	Chapel	1	484	9640 ± 60	10980	10793 - 11163
67847	Chapel	1	498	9970 ± 50	11400	11253 - 11550
65338†	Chapel	1	523	220 ± 40	200	8 - 304
67863	Dunmore	1	196	3060 ± 50	3280	3213 - 3344
67848	Dunmore	1	237	3440 ± 40	3700	3638 - 3811
67849	Dunmore	1	354	4690 ± 40	5390	5326 - 5467
65339	Dunmore	1	465	5470 ± 40	6250	6204 - 6296
67852	Thirteenth	1	102	1250 ± 40	1200	1140 - 1259
67853	Thirteenth	1	183	2050 ± 50	2010	1946 - 2096
67854	Thirteenth	1	303	2910 ± 40	3030	2959 - 3137
67855†	Thirteenth	1	403	7440 ± 40	8260	8191 - 8327
67874	Thirteenth	1	498	4680 ± 50	5390	5323 - 5465
67875	Thirteenth	1	580	5990 ± 40	6810	6752 - 6869
65340†	Thirteenth	1	584	2190 ± 30	2230	2146 - 2302
65341	Thirteenth	2	45	5800 ± 40	6610	6553 - 6660
67864	Thirteenth	2	53	5920 ± 50	6730	6670 - 6790
67865	Thirteenth	2	94	7800 ± 60	8550	8459 - 8632
65342	Thirteenth	2	148	8920 ± 260	9930	9564 - 10354

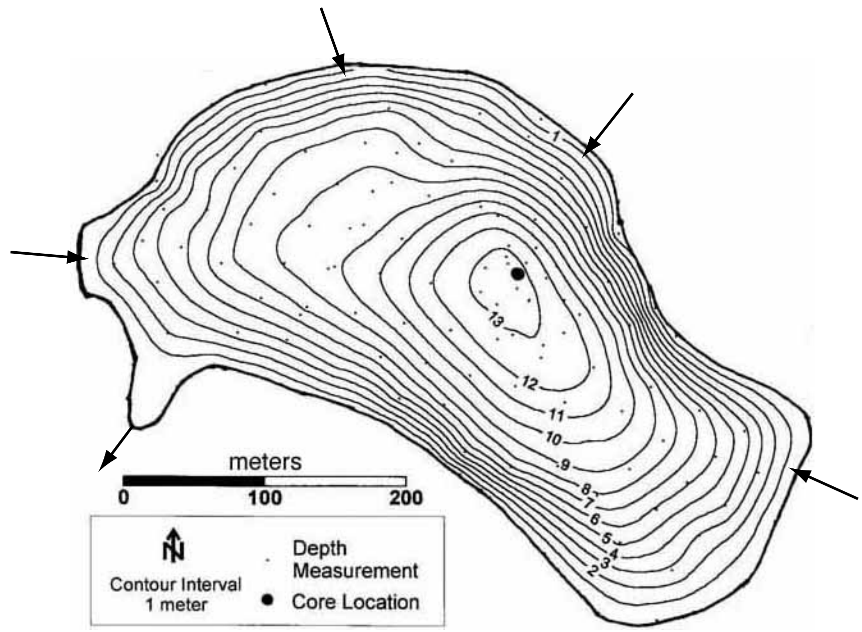
*Radiocarbon ages calibrated according to Stuiver et al. (1993), Stuiver et al. (1998), and weighting procedure described in text. †Not used in age model.



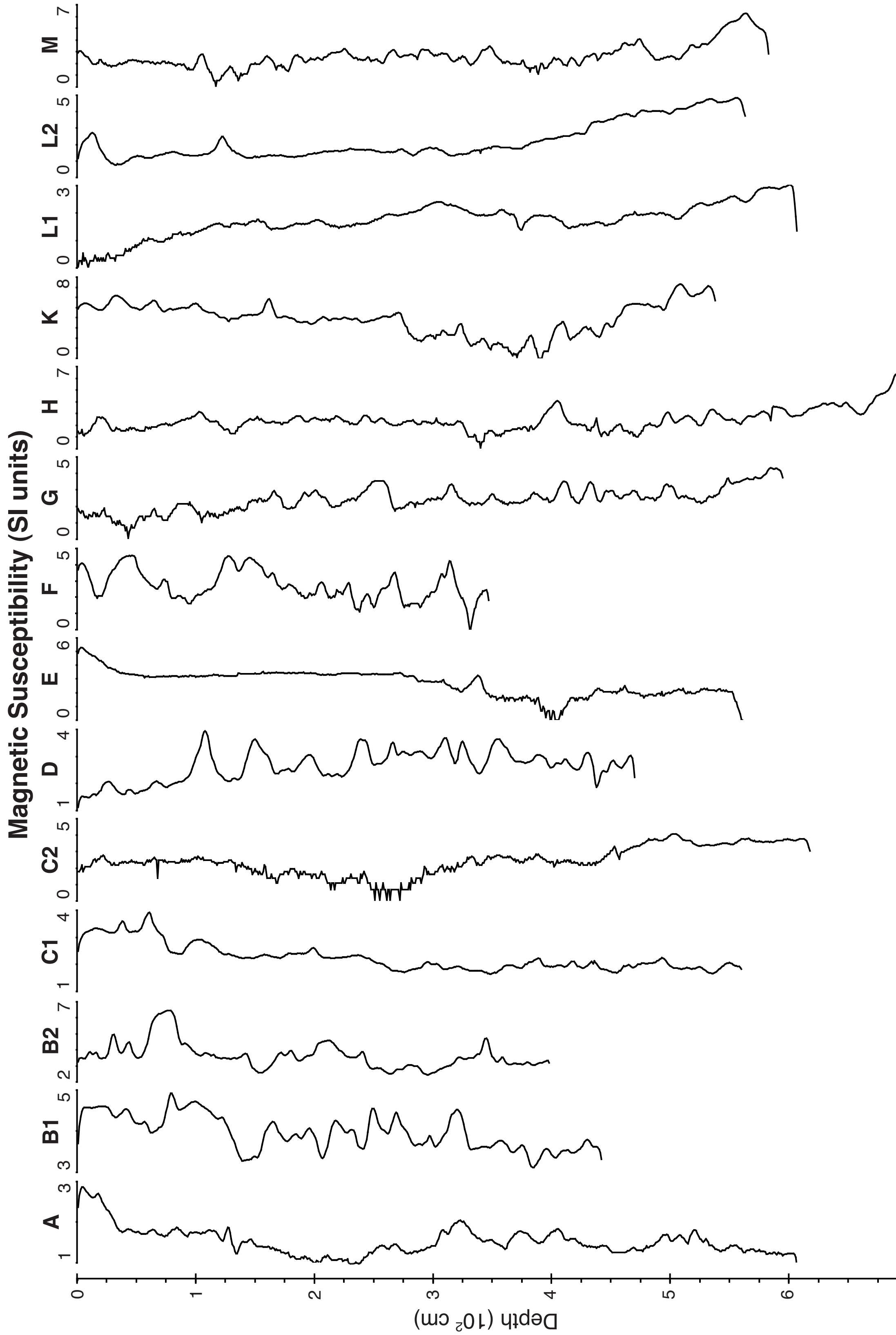
Noren et al., Figure 1



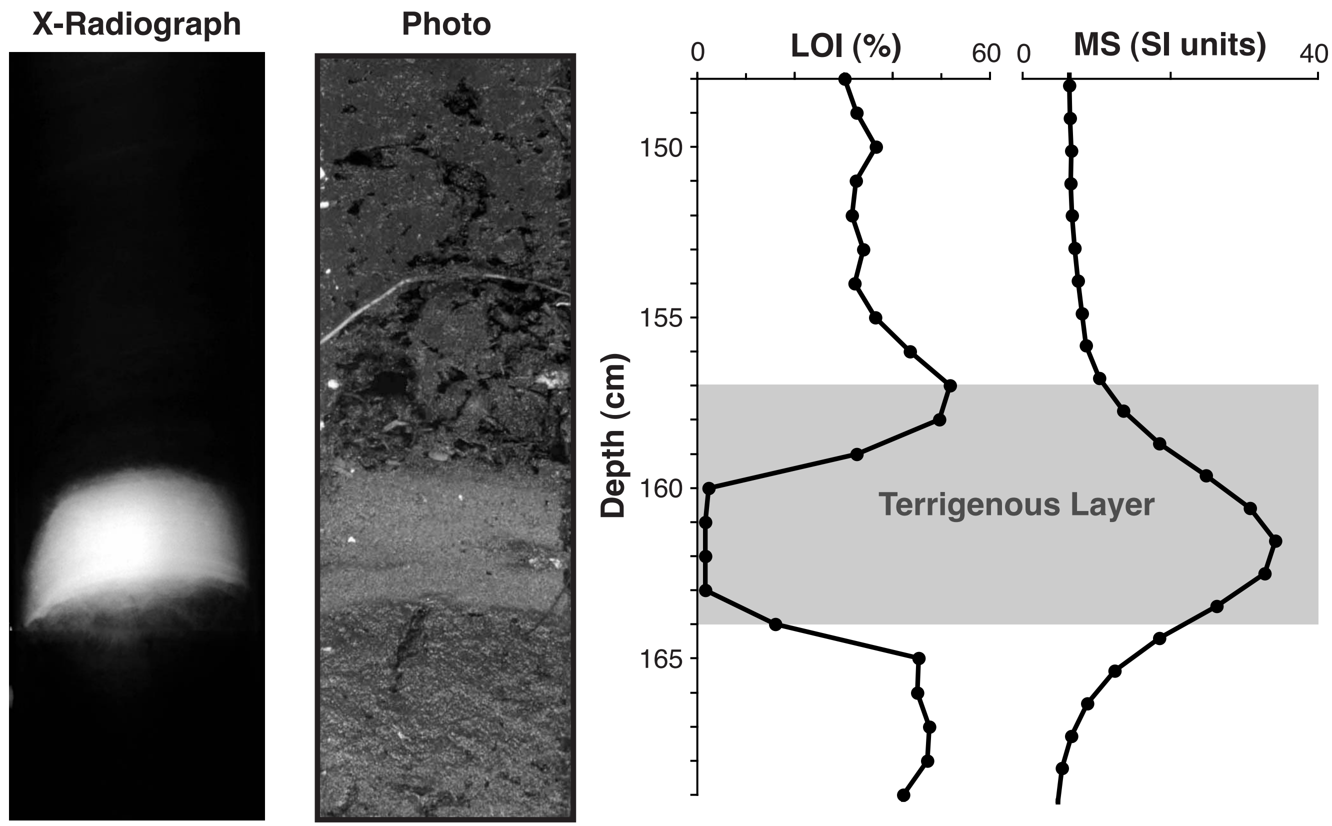
Noren et al., Figure 2



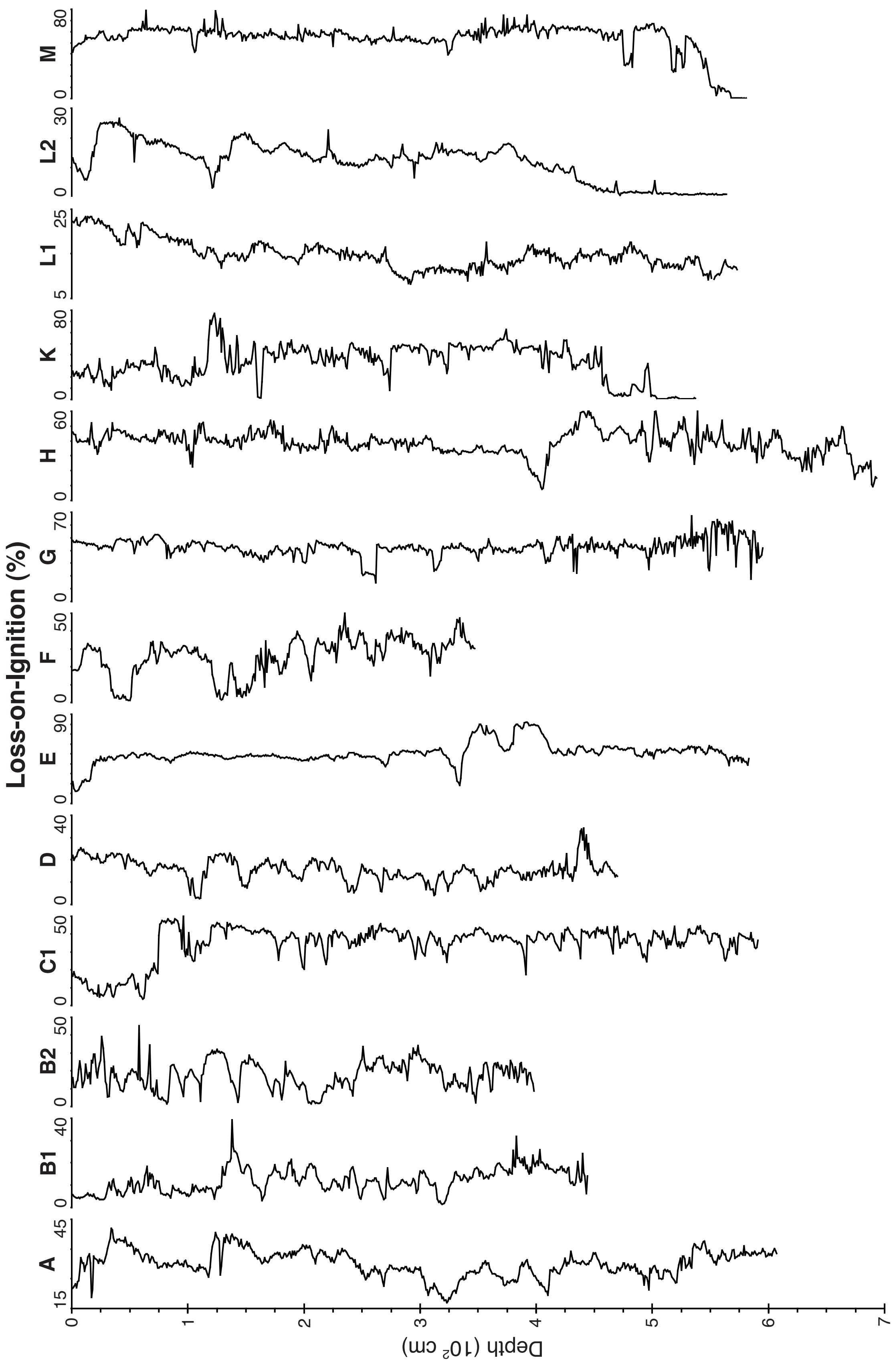
Noren et al., Figure 3



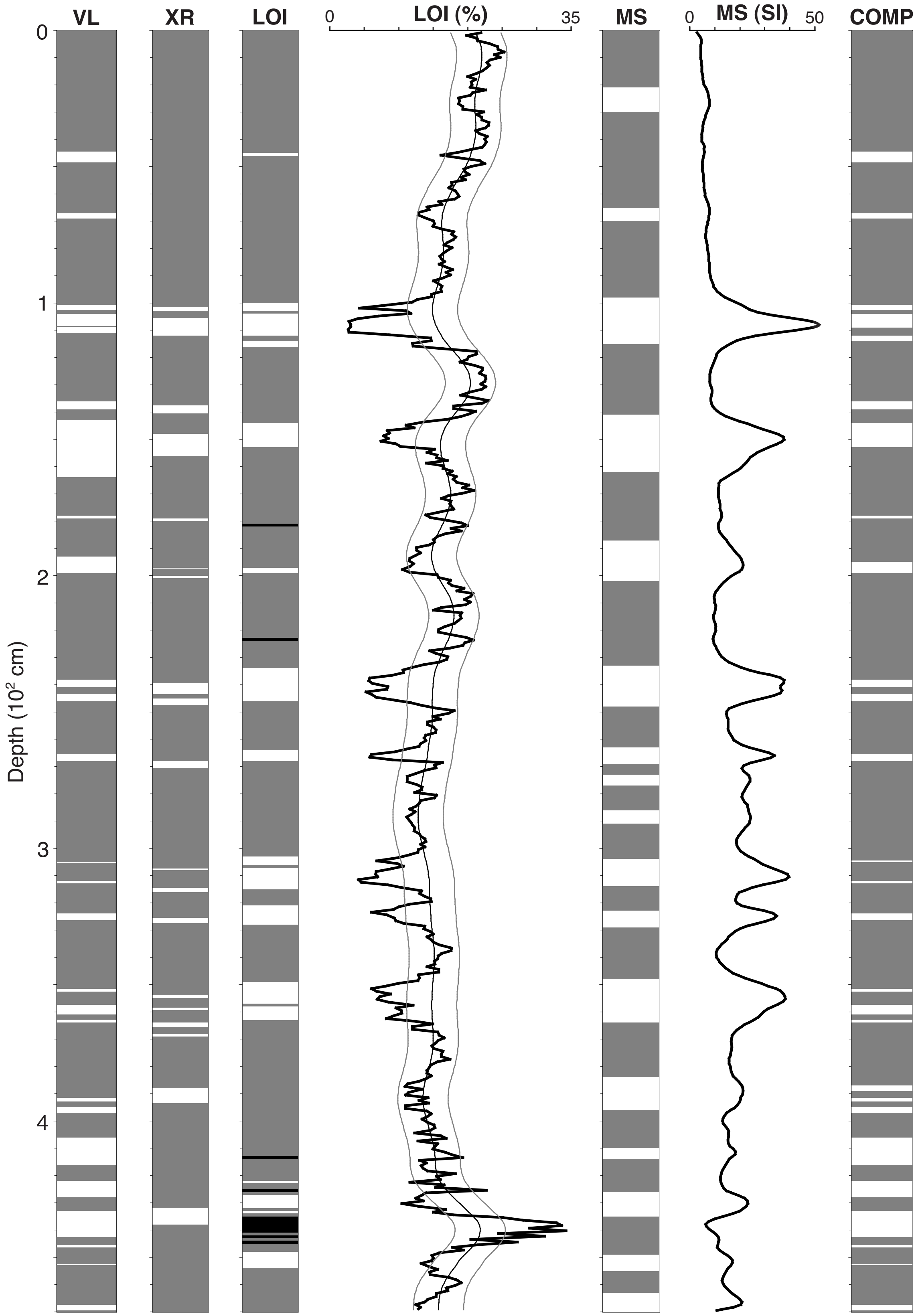
Noren et al., Figure 4



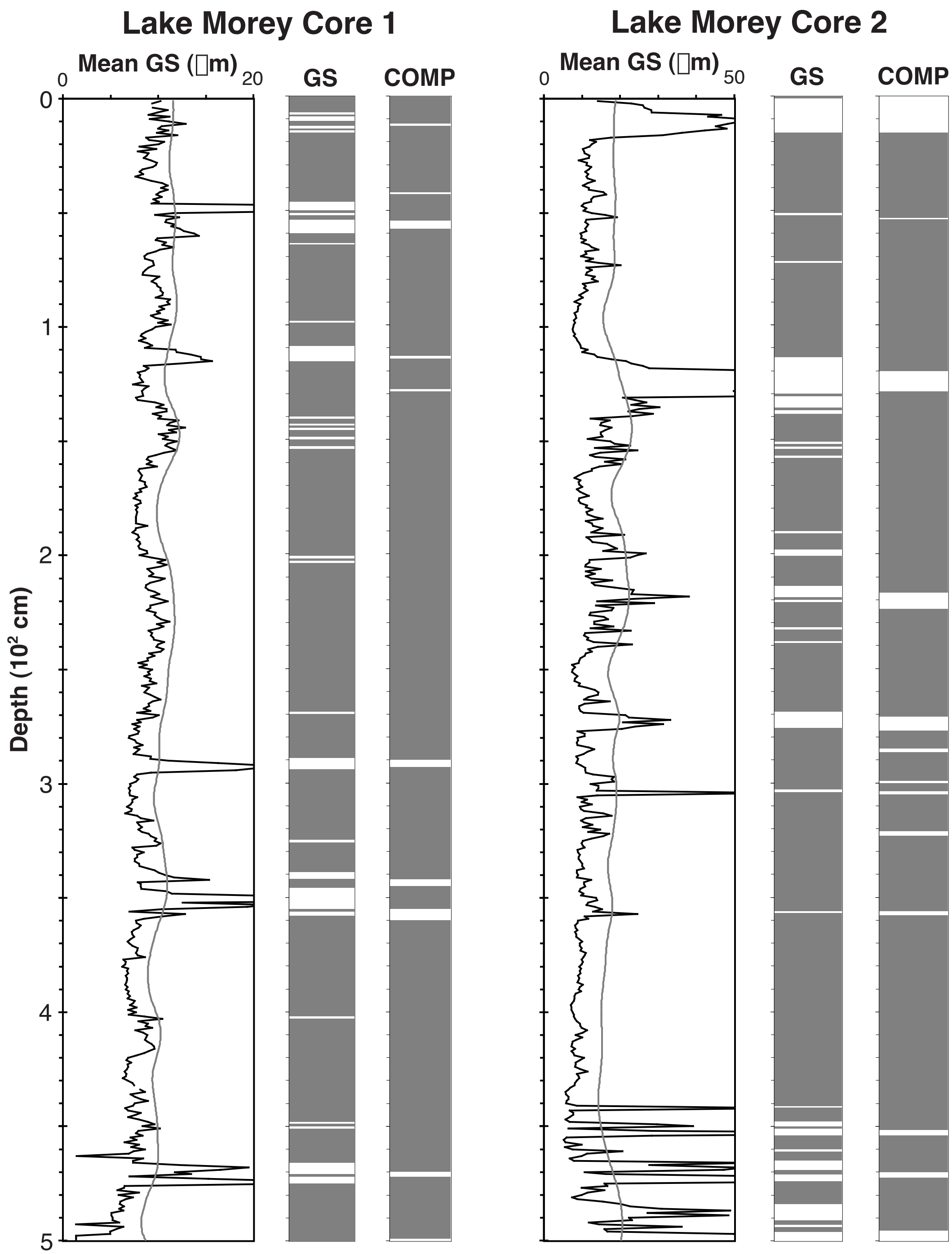
Noren et al., Figure 5



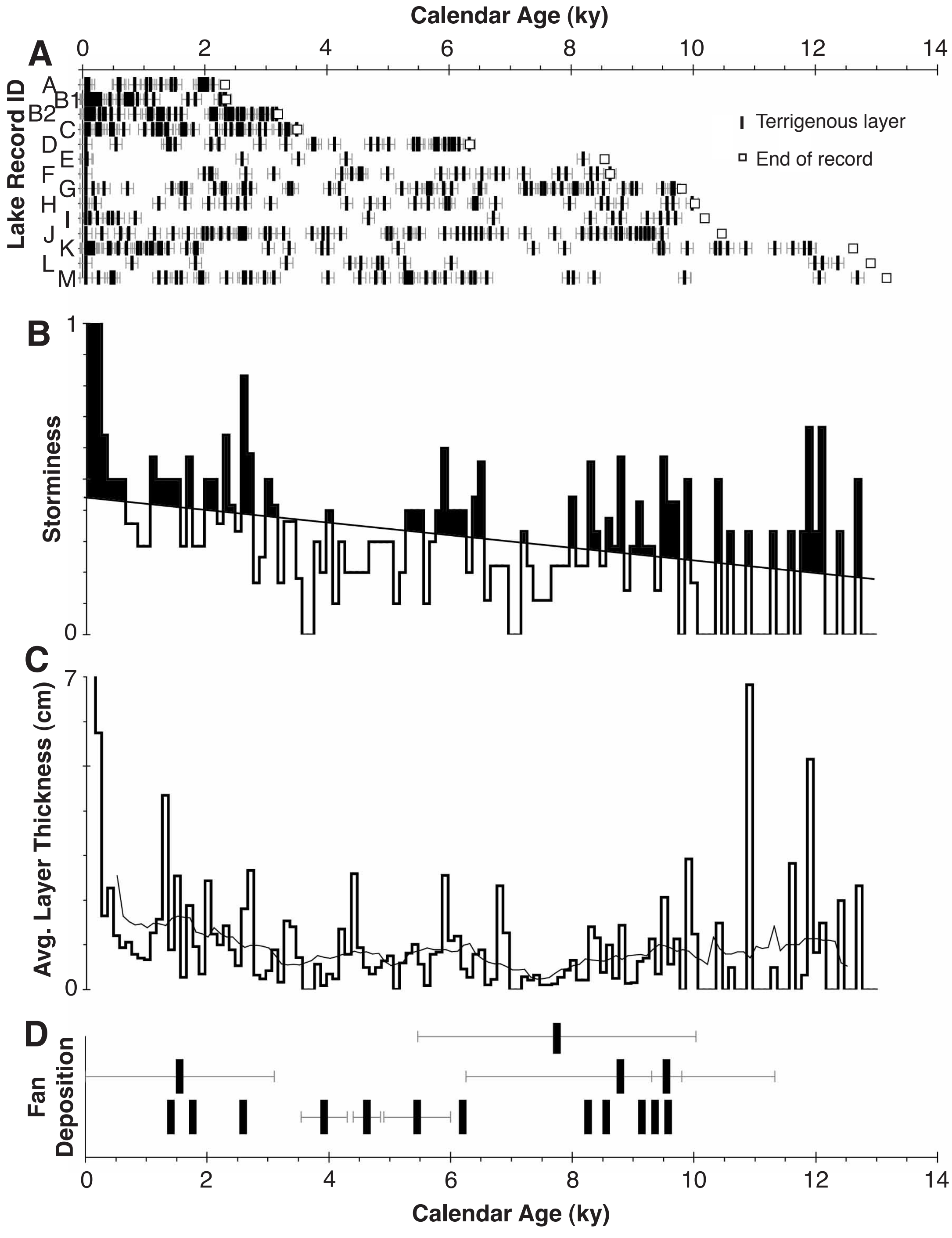
Noren et al., Figure 6



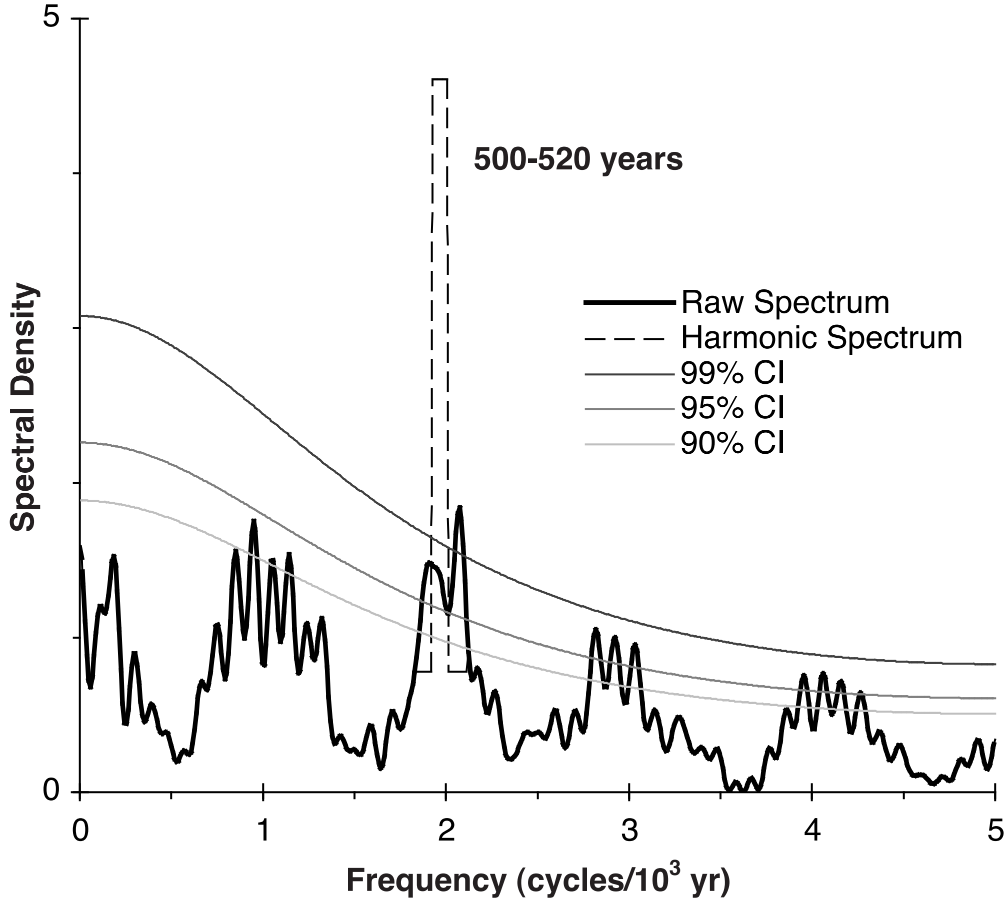
Noren et al., Figure 7



Noren et al., Figure 8



Noren et al., Figure 9



Noren et al., Figure 10

CHAPTER 4: SUMMARY OF FINDINGS

The analysis and comparison of sedimentary archives from multiple lakes in the northeastern United States reveals an unprecedented and unique perspective on the past. This approach to paleotempestology shows the variability in the character and number of sedimentary terrigenous layers in different lakes, and reveals regional storm patterns not identifiable from single lake records. In particular, I conclude the following regarding storm-related terrigenous sedimentary layers in lakes of the northeastern United States:

1. Terrigenous layers commonly appear anomalously light or dark compared to the surrounding gyttja in sediment cores—often light brown or tan, or less commonly very dark brown, gray, or black. Such layers usually have a speckled appearance due to the presence of both dark and light minerals and an increased abundance of terrestrial plant macrofossils, which appear much darker than most of the core sediment. Terrigenous layers thus vary in composition from nearly pure sand, silt, gravel, or clay to a mixture of these inorganic materials and macrofossils of terrestrial plants. The texture of these layers is universally coarser than the surrounding gyttja; sand grains are usually visible, and thicker (>1 cm) terrigenous layers often appear to be graded. Some of these terrigenous layers contain gravel clasts up to ~3 cm diameter.
2. The recovery of terrigenous material in sediment cores is controlled by lake characteristics and coring location. Lakes most likely to preserve sedimentary storm layers have steep surrounding hillslopes, a large volume of erodible sediment in the uplands, and competent, high-gradient inflowing streams with deltas composed of sand and gravel. Coring locations adjacent to the center of the delta foreslope usually yield cores with the greatest numbers and thickness of sedimentary terrigenous layers.

3. Comparison of the storm chronologies, augmented with the results from two previous local studies (Brown et al., 2000; Gran et al. 1999), reveals disparate ages for most storm layers in individual cores. This result suggests that localized but intense summer rainstorms formed by free convection may locally cause as much flooding and erosion as hurricanes, nor'easters, or other large-scale storms.
4. Combining the chronologies reveals the frequency and possibly the magnitude of storms through the Holocene. Event magnitude, as estimated by average terrigenous layer thickness, was greatest at 11,800, 10,800, and 1,200 years before present, when New England climate was cool and moist. Storm magnitude varies in cycles of ~510 years, which may reflect the influence of oceanic thermohaline circulation.
5. Storm frequency varied in regular millennial-scale cycles of ~3,000 years and quasi-regular centennial-scale cycles of ~230 and 390 years. While the centennial-scale variability may reflect changes in solar irradiance, the millennial-scale oscillation is similar to variability in other storm and flood records from several locations around the North Atlantic. Evidently, conditions favorable for the generation of severe storms followed similar pacing across this broad region during the Holocene. Storminess reached variable maxima lasting ~1,500 years, centered at approximately 2,600, 5,800, 9,100, and 11,900 years ago, and appears to be presently increasing toward another peak.
6. The relationship of the millennial-scale storm cycle to other paleoclimate records from around the North Atlantic is consistent with long-term modulation of Arctic Oscillation, which causes similar climatic relationships in modern records of climate. This finding underscores the potential for modulation of this dominant atmospheric mode to account for a significant portion of Holocene North Atlantic climate variability.

7. Independent storm records in this region exhibit good correlation with my data, suggesting that hillslopes across this region have responded to storms under similar climate forcing since deglaciation. However, storm frequency and magnitude both varied in cycles of much shorter duration than the average Holocene climate of this region. Thus, minor climatic changes that do not significantly affect regional vegetation assemblages may have caused disproportionate increases or decreases in storminess.

CHAPTER 5: SUGGESTIONS FOR FUTURE RESEARCH

Several possibilities exist for improving this work, and for furthering the goal of understanding when and where intense storms affected landscapes in the past. Some of these ideas are more easily implemented than others, but most of them have the potential to reveal new information about the geomorphic processes I describe and/or the patterns of past storms. In particular, I recommend:

1. High-resolution grain size analysis as the primary lab method. The composition of terrigenous layers (the specific proportion of inorganic material and terrestrial plant macrofossils) may make them difficult to recognize in visual logs and x-radiographs, and may cause storm layers to exhibit a range of LOI and MS values. The sole unifying feature of all terrigenous layers I documented was a coarser texture than the surrounding gyttja. The high-resolution, whole-core grain size analysis performed by Bosley et al. (2001) and Conlan (2001) confirmed the existence of terrigenous sedimentary layers that remained questionable after analysis by the four techniques I used. Their analyses also revealed many additional layers that were not detected by any of the less-sensitive techniques.

I strongly recommend the use of grain size analysis—which is more sensitive, objective, and robust than the other techniques—as the primary lab method for future core investigations. The time invested in sample preparation and the analysis itself should be balanced by not needing to invest time performing or (much more significantly) interpreting X-radiographic and LOI analyses, or creating composite records from the individual analyses. Interpretation of grain size curves, by contrast, is straightforward; and the relationship between sediment grain size and the energy of depositional environment may allow further inferences regarding event magnitude. The sensitivity of grain size analysis may also allow the determination of storm records from sediment cores from many additional lakes that do not possess all of the usual desirable characteristics.

I further recommend the re-examination with grain size analysis of most or all cores collected to date. Evidence of many additional storms may be revealed, which would provide more data for spectral analyses and comparison between cores.

2. High-resolution, whole-core charcoal analysis. Although pollen studies have demonstrated that hillslopes were never completely devoid of vegetation across this entire region during the Holocene, we cannot be certain that localized wildfires did not remove vegetation from individual hillslopes. Such fires would make the hillslopes more sensitive to the erosive effects of rainfall. Centimeter-by-centimeter charcoal analysis using the Winkler method (Winkler, 1985b) of one or more cores would reveal whether fires had affected any portion of the specific drainage basin in question (Laird and Campbell, 2000), and by inference, if fires are likely to have influenced other catchments—at any specific times determined by the preliminary analyses, and in general. Toward that end, I would recommend choosing a core with a long timespan for the first such analysis.

3. Lead-210 and/or cesium-137 dating. Using these techniques to date core tops (or—if the sedimentation rate of the lake in question is low—to date surface cores recovered with a gravity corer) may allow comparison of the dates of terrigenous sediment delivery to local written or instrumental records of historic rainfall. This comparison could further validate this proxy for storms, and may allow the determination of specific intensity/duration thresholds for erosion-producing storms. Similarly, a relationship between terrigenous layer thickness and rainfall intensity/duration—like the relationship established by Page et al. (1994)—may be established for this region. In conjunction with this analysis, written records of historic rainfall from locations close to the cored lakes must also be investigated.

4. Determine the spatial extent of sediment pulses. While Brown et al. (2000) determined that terrigenous sediment layers were deposited basin-wide in Ritterbush Pond, my results from larger lakes suggests that these most sediment pulses do not travel farther than a few hundred meters across flat-bottomed lakes. Retrieving and analyzing multiple cores from several locations around stream deltas that have prograded into such lakes (e.g. Morey, Beebe, Dunmore, Elligo [2nd coring location], etc.) would reveal the distance that these sediment pulses travel, both away from the delta, and around the delta. The effect, if any, of stream channel avulsion on the fan/delta surface could be evaluated, and optimal coring locations could be determined.

5. Evolutionary spectral analysis. This variety of spectral analysis would determine whether significant cycles in storminess have changed with time: whether, for example, the observed millennial- or centennial-scale cycles were more pronounced at certain times during the Holocene (or if they are progressively strengthening or weakening). Changes in the periods of these cycles would also be revealed by this analysis.

6. Spatial analysis/correlation. Investigating the geographical distribution of terrigenous layer deposition during the Holocene has the potential to reveal meaningful spatial patterns. These patterns may, for example, reflect individual or average storm tracks; they could demonstrate the influence of regional topography on storm variability; and they may reveal the signatures of exceptionally intense individual hurricanes or other large storms.

7. Investigate archives with better age control. Spectral analysis, comparisons between storm records from individual lakes, and comparisons with historical records are critically dependent on the accuracy of the ages determined for the storm events. While undoubtedly rare, any lakes with varved sediment should be a high priority for additional coring. Paleostorm studies from meromictic lakes (Gremillion and Rodbell,

1998) and other lakes with varved sediment (Lamoureux, 1999) demonstrate the great potential for these records to be compared with other climate records.

8. Split, sample, and analyze core Elligo 2. Given its likely short timespan and lack of significant variability in MS and XR analyses, core Elligo 2 was never further analyzed. If grain size analysis is employed, this core may yet reveal a reasonable record of storms. This record could also be compared to the results of core Elligo 1 to further assess local variability of terrigenous sediment delivery to a single lake.

9. Get radiocarbon dates for cores Morey 1 and Ritterbush 5. Dating Morey 1 would allow comparison to the results of core Morey 2, which would reveal information about both the spatial extent of individual terrigenous sediment pulses. Dating Ritterbush 5 would complete the Ritterbush record from deglaciation to present, adding 2,000 to 3,000 years and many storm layers to the chronology.

REFERENCES CITED

Alley, R.B., Mayewski, P.A., Sowers, T., Stuiver, M., Taylor, K.C., Clark, P.U., 1997. Holocene climatic instability: A prominent, widespread event 8200 yr ago. Geology 25 (6), 483-486.

Ambers, R.K., 2001. Using the sediment record in a western Oregon flood-control reservoir to assess the influence of storm history and logging on sediment yield. Journal of Hydrology 244 (3-4), 181-200.

Andrews, J.T., Ives, J.D., 1972. Late and post-glacial events (<10,000 BP) in eastern Canadian Arctic with particular reference to the Cockburn moraines and the breakup of the Laurentide Ice Sheet. In: Vasari, Y., Hyvärinen, H., Hicks, S. (Eds.). Climate Changes in Arctic Areas During the Last Ten-Thousand Years. University of Oulu, Oulu, Finland, pp. 149-176.

Bierman, P.R., Lini, A., Zehfuss, P., Church, A., Davis, P.T., Southon, J.R., Baldwin, L., 1997. Postglacial ponds and alluvial fans: Recorders of Holocene landscape history. GSA Today 7 (10), 1-8.

Bond, G.C., Showers, W., Cheseby, M., Lotti, R., Almasi, P., deMenocal, P., Priore, P., Cullen, H., Hajdas, I., Bonani, G., 1997. A Pervasive Millennial-Scale Cycle in North Atlantic Holocene and Glacial Climates. Science 278 (5341), 1257-1266.

Bosley, A.C., Bierman, P.R., Noren, A.J., Galster, J.C., 2001. Identification of paleoclimatic cycles during the Holocene using grain size analysis of sediments cored from Lake Morey in Fairlee, VT. GSA Abstracts with Programs (Regional) 33 (1), 15.

Broomhead, D.S., King, G.P., 1986. Extracting qualitative dynamics from experimental data. Physica D 20, 217-236.

Brown, P., Kennett, J.P., Ingram, B.L., 1999. Marine evidence for episodic Holocene megafloods in North America and the northern Gulf of Mexico. Paleoceanography 14 (4), 498-510.

Brown, S.L., Bierman, P.R., Lini, A., Davis, P.T., Southon, J.R., 2001. Lake cores as archives of Holocene watershed erosion events. Journal of Paleolimnology, in press.

Brown, S.L., Bierman, P.R., Lini, A., Southon, J.R., 2000. 10,000 yr record of extreme hydrologic events. Geology 28 (4), 335-338.

Cadwell, D.H., 1990. Surficial Geologic Map of New York State. New York State Geological Survey, Albany.

Collins, E.S., Scott, D.B., Gayes, P.T., 1999. Hurricane records on the South Carolina coast: Can they be detected in the sediment record? Quaternary International 56, 15-26.

Conkey, L.E., 1986. Red spruce tree-ring widths and densities in eastern North America as indicators of past climate. Quaternary Research 26, 232-243.

Conlan, A.M., 2001. Spatial extent of sediment pulses in Lake Morey, Fairlee, VT. Vermont Geological Society Spring Meeting, Norwich University, Norwich, VT.

Cronin, T., Willard, D., Karlsen, A., Ishman, S., Verardo, S., McGeehin, J., Kerhin, R., Holmes, C., Colman, S., Zimmerman, A., 2000. Climatic variability in the eastern United States over the past millennium from Chesapeake Bay sediments. Geology 28 (1), 3-6.

Dansgaard, W., Johnsen, S.J., Clausen, H.B., Dahl-Jensen, D., Gundestrup, N., Hammer, C.U., Oeschger, H., 1984. North Atlantic climatic oscillations revealed by deep Greenland ice cores. In: Hansen, J.E., Takahashi, T. (Eds.). Climate processes and climate sensitivity. American Geophysical Union, Washington, DC, pp. 288-306.

Delcourt, P.A., Delcourt, H.R., 1984. Late Quaternary paleoclimates and biotic responses in eastern North America and the western North Atlantic Ocean. Palaeogeography, Palaeoclimatology, Palaeoecology 48, 263-284.

Denton, G.H., Karlén, W., 1973. Holocene climatic variations; their pattern and possible cause. Quaternary Research 3 (2), 155-205.

Doll, C.G., Cady, W.M., Thompson Jr., J.B., Billings, M.P., 1961. Centennial Geologic Map of Vermont.

Doll, C.G., Stewart, D.P., MacClintock, P., 1970. Surficial Geologic Map of Vermont. Williams and Heintz Map Corporation, Washington, DC.

Donnelly, J.P., Bryant, S.S., Butler, J., Dowling, J., Fan, L., Hausmann, N., Newby, P.E., Shuman, B.N., Stern, J., Westover, K., Webb III, T., 2001a. 700 yr sedimentary record of intense hurricane landfalls in southern New England. Geological Society of America Bulletin 113 (6), 714-727.

Donnelly, J.P., Roll, S., Wengren, M., Butler, J., Lederer, R., Webb III, T., 2001b. Sedimentary evidence of intense hurricane strikes from New Jersey. Geology 29 (7), 615-618.

Dunne, T.B., and Leopold, L.B., 1978. Water in Environmental Planning. W.H. Freeman, San Francisco, 818 p.

Easterling, D.R., Meehl, G.A., Parmesan, C., Changnon, S.A., Karl, T.R., Mearns, L.O., 2000. Climate Extremes: Observations, Modeling, and Impacts. Science 289 (5487), 2068-2074.

Eden, D.N., Page, M.J., 1998. Palaeoclimatic implications of a storm erosion record from late Holocene lake sediments, North Island, New Zealand. Palaeogeography, Palaeoclimatology, Palaeoecology 139, 37-58.

Fisher, D.W., Isachsen, Y.W., Rickard, L.V., 1970. Geologic Map of New York State. New York State Geological Survey, Albany.

Gran, S.E., Bierman, P.R., Nichols, K.K., 1999. Teaching winter geohydrology using frozen lakes and snowy mountains. Journal of Geoscience Education 47 (5), 420-447.

Gremillion, P.T., Rodbell, D.T., 1998. Overturn history of an iron-rich meromictic lake as an indicator of extreme meteorological events. GSA Abstracts with Programs 30 (7), 114.

Grove, J.M., 1988. The Little Ice Age. Methuen, London, 498 pp.

Hass, H.C., 1993. Depositional processes under changing climate: upper Subatlantic granulometric records from the Skagerrak (NE-North Sea). Marine Geology 111, 361-378.

Hayne, M., Chappell, J., 2001. Cyclone frequency during the last 5000 years at Curacoa Island, north Queensland, Australia. Palaeogeography, Palaeoclimatology, Palaeoecology 168 (3-4), 207-219.

Hodell, D.A., Brenner, M., Curtis, J.H., Guilderson, T., 2001. Solar Forcing of Drought Frequency in the Maya Lowlands. Science 292 (5520), 1367-1370.

IPCC Working Group I, 2001. Climate Change 2001: The Scientific Basis, Intergovernmental Panel on Climate Change, Geneva, Switzerland.

Jackson, S.T., Whitehead, D.R., 1991. Holocene vegetation patterns in the Adirondack Mountains. Ecology 72 (2), 641-653.

Jennings, K.L., Bierman, P.R., Southon, J.R., 2001. Timing and style of deposition on humid-temperate fans, Vermont, USA. Geological Society of America Bulletin, in review.

Keigwin, L.D., Boyle, E.A., 2000. Detecting Holocene changes in thermohaline circulation. Proceedings of the National Academy of Sciences 97, 1343-1346.

Keim, B., Mayewski, P.A., Zielinski, G.A., Wake, C., Carpenter, K., Cox, J., Souney, J., Sanborn, P., Rodgers, M., 1998. New England's Changing Climate, Weather and Air Quality. University of New Hampshire, Durham, 48 pp.

Knox, J.C., 1999. Sensitivity of modern and Holocene floods to climate change. Quaternary Science Reviews 19, 439-457.

Kochel, R.C., Baker, V.R., 1982. Paleoflood Hydrology. Science 215 (4531), 353-361.

Kutzbach, J.E., 1987. Model simulations of the climatic patterns during the deglaciation of North America. In: Ruddiman, W.F., Wright, H.E. (Eds.). North America and adjacent oceans during the last deglaciation. Geographical Society of America, Boulder, Colorado, pp. 425-446.

Laird, L.D., Campbell, I.D., 2000. High resolution palaeofire signals from Christina Lake, Alberta: a comparison of the charcoal signals extracted by two different methods. Palaeogeography, Palaeoclimatology, Palaeoecology 164, 111-123.

Lamb, H.H., 1979. Variation and changes in the wind and ocean circulation: the Little Ice Age in the northeast Atlantic. Quaternary Research 11, 1-20.

Lamoureux, S.F., 2000. Five centuries of interannual sediment yield and rainfall-induced erosion in the Canadian High Arctic recorded in lacustrine varves. Water Resources Research 36, 309-318.

Lamoureux, S.F., England, J.H., Sharp, M.J., Bush, A.B.G., 2001. A varve record of increased 'Little Ice Age' rainfall associated with volcanic activity, Arctic Archipelago, Canada. The Holocene 11 (2), 243-249.

Landscheidt, T., 1987. Long-Range Forecasts of Solar Cycles and Climate Change. In: Rampino, M.R., et al. (Eds.). Climate: History, Periodicity, and Predictability. Van Nostrand Reinhold, New York, pp. 428-445.

Lin, L., 1996. Environmental changes inferred from pollen analysis and ^{14}C ages of pond sediments, Green Mountains, Vermont. Master's Thesis, University of Vermont, Burlington, 125 pp.

Liu, K., Fearn, M.L., 1993. Lake-sediment record of late Holocene hurricane activities from coastal Alabama. Geology 21, 793-796.

Liu, K., Fearn, M.L., 2000. Reconstruction of Prehistoric Landfall Frequencies of Catastrophic Hurricanes in Northwestern Florida from Lake Sediment Records. Quaternary Research 54, 238-245.

Ludlum, D., 1996. The Vermont Weather Book. Vermont Historical Society, Montpelier, 302 pp.

Mann, M.E., Lees, J.M., 1996. Robust estimation of background noise and signal detection in climatic time series. Climatic Change 33, 409-445.

Mayewski, P.A., Meeker, L.D., Twickler, M.S., Whitlow, S.I., Yang, Q., Lyons, W.B., Prentice, M., 1997. Major features and forcing of high-latitude northern hemisphere atmospheric circulation using a 110,000-year-long glaciochemical series. Journal of Geophysical Research 102 (C12), 26345-26366.

Mayewski, P.A., Meeker, L.D., Whitlow, S.I., Twickler, M.S., Morrison, M.C., Bloomfield, P., Bond, G.C., Alley, R.B., Gow, A.J., Grootes, P.M., Meese, D.A., Ram, M., Taylor, K.C., Wumkes, W., 1994. Changes in atmospheric circulation and ocean ice cover over the North Atlantic during the last 41,000 years. Science 263 (5154), 1747-1751.

Meeks, H.A., 1986. Vermont's land and resources. New England Press, Shelburne, Vermont, 332 pp.

Mullins, H.T., 1998. Environmental change controls of lacustrine carbonate, Cayuga Lake, New York. Geology 26 (5), 443-446.

Nesje, A., Dahl, S.O., Matthews, J.A., Berrisford, M.S., 2001. A ~4500-yr record of river floods obtained from a sediment core in Lake Atnsjøen, eastern Norway. Journal of Paleolimnology 25 (3), 329-342.

Newby, P.E., Killoran, P., Waldorf, M.R., Shuman, B.N., Webb, R.S., Webb III, T., 2000. 14,000 years of sediment, vegetation, and water-level changes at the Makepeace Cedar Swamp, southeastern Massachusetts. Quaternary Research 53, 352-368.

NOAA/NCDC (National Oceanic and Atmospheric Administration/National Climatic Data Center), 2001. Climate of 1999: Annual, U.S. Regional and Statewide Analyses. Retrieved October 13, 2001, from http://lwf.ncdc.noaa.gov/oa/climate/research/1999/ann/us_regional.html

Noren, A.J., Bierman, P.R., Steig, E.J., Lini, A., Southon, J.R., 2001. A Holocene millennial-scale storm cycle in the northeastern United States. Nature, in review.

Nott, J., Hayne, M., 2001. High frequency of 'super-cyclones' along the Great Barrier Reef over the past 5,000 years. Nature 413, 508-512.

O'Brien, S.R., Mayewski, P.A., Meeker, L.D., Meese, D.A., Twickler, M.S., Whitlow, S.I., 1995. Complexity of Holocene climate as reconstructed from a Greenland ice core. Science 270, 1962-1964.

Ouellet, M., 1997. Lake sediments and Holocene seismic hazard assessment within the St. Lawrence Valley, Quebec. Geological Society of America Bulletin 109, 631-642.

Page, M.J., Trustrum, N.A., DeRose, R.C., 1994. A high-resolution record of storm-induced erosion from lake sediments, New Zealand. Journal of Paleolimnology 11, 333-348.

Paillard, D., Labeyrie, L., Yiou, P., 1996. Macintosh program performs time-series analysis. Eos, Transactions, American Geophysical Union 77, 379.

Parris, A.S., Bosley, A.C., Bierman, P.R., Lini, A., Noren, A.J., Lord, A.M., Conlan, A.M., Morgan, L., 2001. Grain by grain: Holocene storms and hillslope erosion in New England. GSA Abstracts with Programs, 314.

Raisbeck, G.M., Yiou, F., Jouzel, J., Petit, J.R., 1990. ^{10}Be and δ^2H in polar ice cores as a probe of the solar variability's influence on climate. Philosophical Transactions of the Royal Society of London 330 (1615), 463-469.

Reasoner, M.A., 1993. Equipment and procedure improvements for a lightweight, inexpensive, percussion core sampling system. Journal of Paleolimnology 8, 273-281.

Ridge, J.C., Besonen, M.R., Brochu, M., Brown, S.L., Callahan, J.W., Cook, G.J., Nicholson, R.S., Toll, N.J., 1999. Varve, paleomagnetic, and ^{14}C chronologies for late Pleistocene events in New Hampshire and Vermont (U.S.A.). Géographie physique et Quaternaire 53 (1), 79-106.

Robbins, J.A., Edgington, D.N., 1975. Determination of recent sedimentation rates in Lake Michigan using Pb-210 and Cs-137. Geochimica et Cosmochimica Acta 39, 289-304.

Rodbell, D.T., Seltzer, G.O., Anderson, D.M., Abbott, M.B., Enfield, D.B., Newman, J.H., 1999. An ~15,000-year record of El Niño-Driven alluviation in southwestern Ecuador. Science 283 (5401), 516-520.

Spear, R., Davis, M.B., Shane, L.C., 1994. Late Quaternary history of low- and mid-elevation vegetation in the White Mountains of New Hampshire. Ecological Monographs 64, 85-109.

Stuiver, M., Braziunas, T.F., 1993. Sun, ocean, climate and atmospheric $^{14}CO_2$: an evaluation of causal and spectral relationships. The Holocene 3 (4), 289-305.

Stuiver, M., Reimer, P.J., 1993. Extended ^{14}C Data Base and Revised CALIB 3.0 ^{14}C Age Calibration Program. Radiocarbon 35, 215-230.

Stuiver, M., Reimer, P.J., Bard, E., Beck, J.W., Burr, G.S., Hughen, K.A., Kromer, B., McCormac, G., van der Plicht, J., Spurk, M., 1998. INTCAL98 radiocarbon age calibration, 24,000-0 cal BP. Radiocarbon 40 (3), 1041-1083.

Thompson, D.W.J., Wallace, J.M., 2001. Regional Climate Impacts of the Northern Hemisphere Annular Mode. Science 293 (5527), 85-89.

Thompson, L.G., Yao, T., Mosley-Thompson, E., Davis, M.E., Henderson, K.A., Lin, P.N., 2000. A High-Resolution Millennial Record of the South Asian Monsoon from Himalayan Ice Cores. Science 289 (5486), 1916-1919.

Thomson, D.J., 1982. Spectrum estimation and harmonic analysis. Proc. IEEE 70, 1055-1096.

Thorndycraft, V., Hu, Y., Oldfield, F., Crooks, P.R.J., Appleby, P.G., 1998. Individual flood events detected in the recent sediments of the Petit Lac d'Annecy, eastern France. The Holocene 8 (6), 741-746.

Tudhope, A.W., Chilcott, C.P., McCulloch, M.T., Cook, E.R., Chappell, J., Ellam, R.M., Lea, D.W., Lough, J.M., Shimmield, G.B., 2001. Variability in the El Nino-Southern Oscillation Through a Glacial-Interglacial Cycle. Science 291 (5508), 1511-1517.

Vautard, R., Ghil, M., 1989. Singular spectrum analysis in non-linear dynamics, with applications to paleoclimatic time series. Physica D 35, 395-424.

Webb, T., Bartlein, P.J., Harrison, S.P., Anderson, K.J., 1993. Vegetation, lake levels, and climate in eastern North America for the past 18,000 years. In: Wright, H.E., Kutzbach, J.E., Street-Perrot, F.A., Bartlein, P.J., Ruddiman, W.F., Webb, T. (Eds.). Global climates since the last glacial maximum. University of Minnesota Press, Minneapolis, pp. 415-467.

Winkler, M.G., 1985a. A 12,000-year history of vegetation and climate for Cape Cod, Massachusetts. Quaternary Research 23, 301-312.

Winkler, M.G., 1985b. Charcoal analysis for paleoenvironmental interpretation: a chemical assay. Quaternary Research 23, 313-326.

Zong, Y., Tooley, M.J., 1999. Evidence of mid-Holocene storm-surge deposits from Morecambe Bay, northwest England: A biostratigraphical approach. Quaternary International 55, 43-50.

APPENDIX A: BATHYMETRIC SURVEY DATA

Amherst Lake, Duck Pond, Echo Lake, Vail Pond:

Universal Transverse Mercator Zone 18N
Datum: NAD 1927 Eastern US
Equipment: Trimble Pathfinder ProXRS Differential GPS

Emerald Lake

Vermont State Plane
Datum: ?
Equipment: Trimble Pathfinder ProXRS Differential GPS; Pentax Total Station

Depth Precision: ~ ± 0.1 m

C = coring location; P = lake perimeter as determined by digitizing USGS 1:24,000 topographic maps or aerial photographs

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Amherst	1	685724.092	4816686.456	0.3	10	0.031671	0.413
Amherst	2	685730.768	4816689.665	0.2	10	0.028705	0.413
Amherst	3	685742.953	4816706.839	0.2	10	0.028674	0.413
Amherst	4	685712.206	4816715.703	1.5	10	0.073982	0.413
Amherst	5	685733.911	4816728.395	5.9	10	0.037683	0.413
Amherst	6	685760.988	4816740.870	6.5	10	0.028843	0.413
Amherst	7	685788.980	4816752.823	6.0	10	0.033577	0.371
Amherst	8	685812.622	4816761.221	10.5	10	0.025673	0.371
Amherst	9	685837.490	4816776.331	11.9	11	0.053677	0.370
Amherst	10	685866.376	4816787.119	8.7	10	0.060677	0.370
Amherst	11	685867.960	4816811.973	11.1	11	0.050540	0.369
Amherst	12	685831.685	4816811.411	16.0	10	0.033112	0.369
Amherst	13	685804.592	4816804.565	17.1	10	0.091008	0.369
Amherst	14	685779.868	4816800.116	14.9	10	0.112676	0.369
Amherst	15	685752.169	4816794.473	9.0	10	0.043626	0.369
Amherst	16	685708.440	4816785.215	4.5	10	0.129373	0.418
Amherst	17	685695.953	4816819.037	5.1	10	0.108581	0.418
Amherst	18	685724.262	4816833.261	12.5	10	0.136239	0.369
Amherst	19	685773.847	4816849.880	19.5	10	0.059122	0.369
Amherst	20	685823.674	4816865.717	19.0	10	0.036814	0.369
Amherst	21	685857.859	4816880.886	14.6	10	0.085777	0.369
Amherst	22	685811.626	4816917.540	15.9	10	0.052606	0.369
Amherst	23	685777.049	4816909.412	18.1	10	0.018369	0.369
Amherst	24	685739.273	4816895.564	18.2	10	0.093886	0.369
Amherst	25	685686.798	4816879.595	8.0	10	0.091212	0.439
Amherst	26	685667.551	4816928.955	6.6	11	0.050423	0.438
Amherst	27	685701.706	4816938.955	13.0	10	0.057808	0.372
Amherst	28	685740.088	4816956.593	13.7	10	0.054635	0.659
Amherst	29	685739.653	4816983.791	9.8	10	0.067401	0.659
Amherst	30	685713.513	4816977.588	12.5	10	0.052594	0.373
Amherst	31	685746.553	4817040.263	7.8	10	0.209267	0.659
Amherst	32	685689.800	4817069.943	14.5	10	0.056252	0.377
Amherst	33	685647.347	4817080.888	10.7	17	0.042065	0.372
Amherst	34	685604.225	4817091.559	7.5	11	0.146811	0.486
Amherst	35	685629.487	4817159.161	14.4	10	0.066358	0.384
Amherst	36	685674.389	4817189.861	18.0	13	0.087448	0.382
Amherst	37	685725.734	4817223.044	8.3	10	0.115860	0.664
Amherst	38	685754.112	4817343.624	10.5	10	0.113507	0.667
Amherst	39	685644.966	4817326.382	27.3	10	0.064122	0.396
Amherst	40	685594.326	4817322.559	22.4	10	0.062628	0.396
Amherst	41	685495.219	4817391.540	5.4	10	0.084169	0.410
Amherst	42	685546.330	4817407.904	12.7	10	0.119244	0.410
Amherst	43	685598.050	4817424.223	21.8	10	0.058100	0.410
Amherst	44	685654.025	4817440.676	26.4	10	0.108234	0.410
Amherst	45	685742.725	4817455.477	18.7	10	0.092990	0.680
Amherst	46	685793.583	4817553.912	1.0	10	0.132805	0.684
Amherst	47	685754.756	4817541.082	15.5	10	0.187079	0.684
Amherst	48	685718.233	4817528.423	22.1	10	0.106662	0.684
Amherst	49	685685.385	4817517.331	24.3	10	0.165917	0.684
Amherst	50	685632.903	4817496.801	22.1	10	0.160518	0.608
Amherst	51	685581.918	4817480.651	16.5	10	0.120953	0.615
Amherst	52	685531.815	4817464.165	8.3	10	0.099280	0.688
Amherst	53	685482.920	4817450.629	4.5	10	0.154824	0.688
Amherst	54	685527.932	4817508.066	11.9	10	0.057945	0.690
Amherst	55	685480.734	4817534.155	8.7	20	0.213055	0.653
Amherst	56	685550.388	4817554.814	14.0	10	0.127846	0.664
Amherst	57	685626.617	4817538.872	21.2	10	0.078628	0.664
Amherst	58	685657.258	4817597.447	20.2	10	0.062128	0.664

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Amherst	59	685680.762	4817682.556	10.7	10	0.099750	0.664
Amherst	60	685612.321	4817651.480	13.8	10	0.235006	0.662
Amherst	61	685540.148	4817621.106	11.1	10	0.138946	0.662
Amherst	62	685475.530	4817594.925	9.7	10	0.114480	0.662
Amherst	63	685377.268	4817699.394	1.1	11	0.049451	0.661
Amherst	64	685443.591	4817710.000	4.6	10	0.086651	0.662
Amherst	65	685520.218	4817725.281	7.9	12	0.068113	0.660
Amherst	66	685589.657	4817730.998	1.7	10	0.053785	0.662
Amherst	67	685652.065	4817736.814	4.0	10	0.047199	0.662
Amherst	68	685711.084	4817612.324	18.3	12	0.070661	0.660
Amherst	69	685723.657	4817572.217	20.2	11	0.053808	0.661
Amherst	70	685750.849	4817581.455	14.6	10	0.091985	0.595
Amherst	71	685740.186	4817622.157	13.0	11	0.312058	0.569
Amherst	72	685485.769	4817833.510	0.3	13	0.046688	0.541
Amherst	73	685443.225	4817819.060	0.7	10	0.099256	0.543
Amherst	74	685371.802	4817792.852	0.7	11	0.033077	0.532
Amherst	75	685383.919	4817855.911	0.4	10	0.073641	0.520
Amherst	76	685399.094	4817882.042	0.3	10	0.089845	0.478
Amherst	77	685442.339	4817867.069	0.7	10	0.110668	0.468
Amherst	78	685661.011	4817411.549	27.7	11	0.076487	0.336
Amherst	79	685676.315	4817417.499	27.4	10	0.045987	0.335
Amherst	80	685649.735	4817424.396	27.2	11	0.096655	0.334
Amherst	81	685654.354	4817440.791	26.5	10	0.092331	0.335
Amherst	82	685672.743	4817441.362	26.7	10	0.057376	0.334
Amherst	83	685675.200	4817466.089	25.8	10	0.088710	0.334
Amherst	84	685663.511	4817467.174	25.5	10	0.046434	0.334
Amherst	85	685662.774	4817452.970	26.1	10	0.096018	0.334
Amherst	C	685665.878	4817426.411	27.3	17	0.216831	0.333
Amherst	P	685896.907	4816619.690	0.0			
Amherst	P	685895.657	4816621.190	0.0			
Amherst	P	685894.097	4816632.190	0.0			
Amherst	P	685892.847	4816633.190	0.0			
Amherst	P	685891.467	4816639.190	0.0			
Amherst	P	685892.597	4816641.690	0.0			
Amherst	P	685892.407	4816649.190	0.0			
Amherst	P	685892.287	4816654.190	0.0			
Amherst	P	685893.287	4816662.690	0.0			
Amherst	P	685892.787	4816679.690	0.0			
Amherst	P	685893.527	4816698.190	0.0			
Amherst	P	685894.717	4816700.690	0.0			
Amherst	P	685894.657	4816702.190	0.0			
Amherst	P	685893.287	4816706.690	0.0			
Amherst	P	685892.027	4816708.190	0.0			
Amherst	P	685890.467	4816720.190	0.0			
Amherst	P	685889.157	4816723.690	0.0			
Amherst	P	685888.787	4816737.190	0.0			
Amherst	P	685888.657	4816742.190	0.0			
Amherst	P	685888.467	4816748.690	0.0			
Amherst	P	685888.287	4816757.190	0.0			
Amherst	P	685889.347	4816763.190	0.0			
Amherst	P	685890.347	4816771.690	0.0			
Amherst	P	685890.157	4816776.690	0.0			
Amherst	P	685892.217	4816791.690	0.0			
Amherst	P	685893.467	4816792.690	0.0			
Amherst	P	685894.467	4816800.190	0.0			
Amherst	P	685895.467	4816808.690	0.0			
Amherst	P	685895.287	4816814.690	0.0			
Amherst	P	685896.467	4816816.190	0.0			
Amherst	P	685897.467	4816826.190	0.0			
Amherst	P	685899.467	4816842.190	0.0			
Amherst	P	685899.347	4816847.190	0.0			
Amherst	P	685899.097	4816856.690	0.0			
Amherst	P	685898.907	4816862.690	0.0			
Amherst	P	685897.527	4816869.190	0.0			
Amherst	P	685897.467	4816871.190	0.0			
Amherst	P	685897.347	4816876.190	0.0			
Amherst	P	685896.967	4816889.690	0.0			
Amherst	P	685895.597	4816894.690	0.0			
Amherst	P	685895.597	4816895.690	0.0			
Amherst	P	685889.287	4816901.690	0.0			
Amherst	P	685884.287	4816904.190	0.0			
Amherst	P	685883.027	4816905.190	0.0			
Amherst	P	685875.467	4816911.190	0.0			
Amherst	P	685862.787	4816926.690	0.0			
Amherst	P	685857.717	4816931.690	0.0			
Amherst	P	685847.787	4816934.690	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Amherst	P	685847.717	4816936.190	0.0			
Amherst	P	685840.217	4816940.690	0.0			
Amherst	P	685840.217	4816942.190	0.0			
Amherst	P	685833.967	4816944.190	0.0			
Amherst	P	685831.527	4816944.190	0.0			
Amherst	P	685829.097	4816944.190	0.0			
Amherst	P	685824.157	4816945.190	0.0			
Amherst	P	685813.027	4816946.190	0.0			
Amherst	P	685811.787	4816947.190	0.0			
Amherst	P	685810.527	4816947.190	0.0			
Amherst	P	685800.717	4816946.690	0.0			
Amherst	P	685799.527	4816945.690	0.0			
Amherst	P	685798.287	4816945.690	0.0			
Amherst	P	685795.847	4816945.690	0.0			
Amherst	P	685794.597	4816945.690	0.0			
Amherst	P	685783.407	4816950.190	0.0			
Amherst	P	685779.657	4816952.190	0.0			
Amherst	P	685778.407	4816953.690	0.0			
Amherst	P	685774.527	4816959.690	0.0			
Amherst	P	685769.467	4816964.190	0.0			
Amherst	P	685768.217	4816965.690	0.0			
Amherst	P	685765.717	4816967.690	0.0			
Amherst	P	685764.467	4816969.190	0.0			
Amherst	P	685763.097	4816972.690	0.0			
Amherst	P	685761.657	4816981.190	0.0			
Amherst	P	685759.027	4816987.190	0.0			
Amherst	P	685758.717	4816998.190	0.0			
Amherst	P	685759.787	4817005.690	0.0			
Amherst	P	685759.467	4817015.690	0.0			
Amherst	P	685758.967	4817033.690	0.0			
Amherst	P	685758.787	4817041.190	0.0			
Amherst	P	685759.407	4817064.690	0.0			
Amherst	P	685759.347	4817065.690	0.0			
Amherst	P	685759.097	4817075.690	0.0			
Amherst	P	685758.467	4817097.690	0.0			
Amherst	P	685759.467	4817106.190	0.0			
Amherst	P	685759.407	4817110.190	0.0			
Amherst	P	685756.847	4817113.690	0.0			
Amherst	P	685755.347	4817123.190	0.0			
Amherst	P	685753.787	4817135.690	0.0			
Amherst	P	685754.717	4817145.190	0.0			
Amherst	P	685755.597	4817158.690	0.0			
Amherst	P	685756.157	4817184.690	0.0			
Amherst	P	685758.287	4817197.190	0.0			
Amherst	P	685764.847	4817226.690	0.0			
Amherst	P	685767.097	4817234.190	0.0			
Amherst	P	685767.787	4817255.190	0.0			
Amherst	P	685773.027	4817287.190	0.0			
Amherst	P	685775.217	4817297.190	0.0			
Amherst	P	685779.657	4817315.690	0.0			
Amherst	P	685780.847	4817316.690	0.0			
Amherst	P	685781.967	4817321.690	0.0			
Amherst	P	685784.027	4817335.190	0.0			
Amherst	P	685784.967	4817346.190	0.0			
Amherst	P	685788.217	4817363.690	0.0			
Amherst	P	685790.467	4817369.690	0.0			
Amherst	P	685791.097	4817393.190	0.0			
Amherst	P	685792.217	4817398.190	0.0			
Amherst	P	685790.657	4817409.190	0.0			
Amherst	P	685787.847	4817421.190	0.0			
Amherst	P	685784.847	4817442.190	0.0			
Amherst	P	685785.967	4817445.690	0.0			
Amherst	P	685787.157	4817447.190	0.0			
Amherst	P	685795.407	4817462.190	0.0			
Amherst	P	685795.157	4817470.690	0.0			
Amherst	P	685798.407	4817486.690	0.0			
Amherst	P	685802.967	4817499.190	0.0			
Amherst	P	685805.287	4817504.190	0.0			
Amherst	P	685807.217	4817525.190	0.0			
Amherst	P	685808.407	4817526.190	0.0			
Amherst	P	685808.347	4817527.690	0.0			
Amherst	P	685803.287	4817533.690	0.0			
Amherst	P	685800.657	4817540.690	0.0			
Amherst	P	685799.347	4817541.690	0.0			
Amherst	P	685791.287	4817568.690	0.0			
Amherst	P	685790.967	4817578.690	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Amherst	P	685790.907	4817580.690	0.0			
Amherst	P	685787.967	4817599.190	0.0			
Amherst	P	685785.407	4817604.190	0.0			
Amherst	P	685778.527	4817630.690	0.0			
Amherst	P	685777.157	4817634.690	0.0			
Amherst	P	685769.467	4817646.690	0.0			
Amherst	P	685766.907	4817650.190	0.0			
Amherst	P	685756.717	4817664.690	0.0			
Amherst	P	685753.967	4817674.190	0.0			
Amherst	P	685745.027	4817686.190	0.0			
Amherst	P	685735.907	4817704.190	0.0			
Amherst	P	685726.847	4817722.190	0.0			
Amherst	P	685715.217	4817741.690	0.0			
Amherst	P	685713.967	4817742.690	0.0			
Amherst	P	685712.657	4817745.190	0.0			
Amherst	P	685712.657	4817746.690	0.0			
Amherst	P	685710.157	4817748.690	0.0			
Amherst	P	685701.157	4817762.190	0.0			
Amherst	P	685698.657	4817764.690	0.0			
Amherst	P	685685.847	4817783.690	0.0			
Amherst	P	685684.597	4817783.690	0.0			
Amherst	P	685683.347	4817784.690	0.0			
Amherst	P	685678.287	4817789.690	0.0			
Amherst	P	685669.527	4817795.690	0.0			
Amherst	P	685658.157	4817806.190	0.0			
Amherst	P	685651.787	4817813.190	0.0			
Amherst	P	685650.287	4817823.190	0.0			
Amherst	P	685648.967	4817827.690	0.0			
Amherst	P	685648.597	4817841.190	0.0			
Amherst	P	685648.407	4817847.690	0.0			
Amherst	P	685647.157	4817848.690	0.0			
Amherst	P	685635.347	4817876.690	0.0			
Amherst	P	685630.157	4817886.190	0.0			
Amherst	P	685626.097	4817900.690	0.0			
Amherst	P	685622.097	4817910.690	0.0			
Amherst	P	685620.847	4817912.690	0.0			
Amherst	P	685620.847	4817911.690	0.0			
Amherst	P	685612.467	4817902.690	0.0			
Amherst	P	685607.657	4817900.190	0.0			
Amherst	P	685598.097	4817890.190	0.0			
Amherst	P	685587.287	4817880.190	0.0			
Amherst	P	685578.787	4817874.690	0.0			
Amherst	P	685569.027	4817872.190	0.0			
Amherst	P	685561.717	4817869.190	0.0			
Amherst	P	685560.467	4817869.190	0.0			
Amherst	P	685556.787	4817869.190	0.0			
Amherst	P	685554.347	4817869.190	0.0			
Amherst	P	685551.847	4817870.190	0.0			
Amherst	P	685545.657	4817871.190	0.0			
Amherst	P	685543.157	4817873.690	0.0			
Amherst	P	685541.717	4817881.190	0.0			
Amherst	P	685541.657	4817883.190	0.0			
Amherst	P	685541.657	4817884.690	0.0			
Amherst	P	685541.597	4817885.690	0.0			
Amherst	P	685535.407	4817888.190	0.0			
Amherst	P	685534.097	4817889.190	0.0			
Amherst	P	685529.157	4817890.190	0.0			
Amherst	P	685527.907	4817891.690	0.0			
Amherst	P	685529.157	4817891.690	0.0			
Amherst	P	685526.847	4817885.190	0.0			
Amherst	P	685526.967	4817881.690	0.0			
Amherst	P	685524.597	4817876.690	0.0			
Amherst	P	685523.467	4817873.190	0.0			
Amherst	P	685524.847	4817869.190	0.0			
Amherst	P	685528.787	4817859.690	0.0			
Amherst	P	685528.907	4817856.190	0.0			
Amherst	P	685529.097	4817848.690	0.0			
Amherst	P	685529.097	4817847.190	0.0			
Amherst	P	685527.907	4817847.190	0.0			
Amherst	P	685519.287	4817847.190	0.0			
Amherst	P	685516.787	4817849.690	0.0			
Amherst	P	685514.027	4817859.190	0.0			
Amherst	P	685513.907	4817862.690	0.0			
Amherst	P	685511.347	4817867.690	0.0			
Amherst	P	685508.847	4817870.190	0.0			
Amherst	P	685508.717	4817872.690	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Amherst	P	685507.347	4817878.690	0.0			
Amherst	P	685507.287	4817882.190	0.0			
Amherst	P	685507.157	4817884.690	0.0			
Amherst	P	685506.967	4817893.190	0.0			
Amherst	P	685487.347	4817890.190	0.0			
Amherst	P	685476.287	4817889.690	0.0			
Amherst	P	685473.717	4817893.690	0.0			
Amherst	P	685472.347	4817899.690	0.0			
Amherst	P	685452.027	4817923.690	0.0			
Amherst	P	685448.157	4817929.690	0.0			
Amherst	P	685443.097	4817934.190	0.0			
Amherst	P	685434.157	4817946.190	0.0			
Amherst	P	685430.407	4817949.690	0.0			
Amherst	P	685429.157	4817949.690	0.0			
Amherst	P	685425.467	4817950.690	0.0			
Amherst	P	685421.717	4817952.190	0.0			
Amherst	P	685416.907	4817949.190	0.0			
Amherst	P	685407.287	4817940.690	0.0			
Amherst	P	685398.847	4817934.190	0.0			
Amherst	P	685389.287	4817922.690	0.0			
Amherst	P	685386.907	4817920.190	0.0			
Amherst	P	685375.097	4817902.690	0.0			
Amherst	P	685370.527	4817890.190	0.0			
Amherst	P	685361.027	4817877.690	0.0			
Amherst	P	685358.847	4817867.690	0.0			
Amherst	P	685355.467	4817854.190	0.0			
Amherst	P	685352.027	4817846.690	0.0			
Amherst	P	685349.847	4817835.690	0.0			
Amherst	P	685345.407	4817818.190	0.0			
Amherst	P	685343.097	4817812.190	0.0			
Amherst	P	685338.287	4817808.190	0.0			
Amherst	P	685329.967	4817796.690	0.0			
Amherst	P	685328.787	4817796.690	0.0			
Amherst	P	685325.347	4817786.690	0.0			
Amherst	P	685323.157	4817777.190	0.0			
Amherst	P	685323.527	4817762.190	0.0			
Amherst	P	685323.907	4817748.690	0.0			
Amherst	P	685326.907	4817728.190	0.0			
Amherst	P	685329.787	4817713.690	0.0			
Amherst	P	685332.527	4817702.690	0.0			
Amherst	P	685335.347	4817689.190	0.0			
Amherst	P	685340.657	4817675.690	0.0			
Amherst	P	685351.407	4817641.690	0.0			
Amherst	P	685355.407	4817630.690	0.0			
Amherst	P	685359.347	4817619.690	0.0			
Amherst	P	685370.097	4817588.190	0.0			
Amherst	P	685372.787	4817579.690	0.0			
Amherst	P	685381.787	4817565.190	0.0			
Amherst	P	685392.157	4817544.690	0.0			
Amherst	P	685402.407	4817529.190	0.0			
Amherst	P	685415.347	4817506.190	0.0			
Amherst	P	685421.657	4817500.190	0.0			
Amherst	P	685430.467	4817492.190	0.0			
Amherst	P	685445.657	4817477.690	0.0			
Amherst	P	685451.907	4817473.190	0.0			
Amherst	P	685461.027	4817453.690	0.0			
Amherst	P	685465.527	4817424.690	0.0			
Amherst	P	685466.847	4817420.690	0.0			
Amherst	P	685469.717	4817405.190	0.0			
Amherst	P	685475.027	4817391.690	0.0			
Amherst	P	685475.657	4817367.190	0.0			
Amherst	P	685475.967	4817356.190	0.0			
Amherst	P	685484.027	4817331.690	0.0			
Amherst	P	685485.717	4817314.690	0.0			
Amherst	P	685488.347	4817307.690	0.0			
Amherst	P	685491.097	4817297.690	0.0			
Amherst	P	685495.347	4817277.190	0.0			
Amherst	P	685496.717	4817272.190	0.0			
Amherst	P	685497.967	4817269.690	0.0			
Amherst	P	685499.407	4817263.690	0.0			
Amherst	P	685503.287	4817256.190	0.0			
Amherst	P	685509.717	4817245.690	0.0			
Amherst	P	685517.347	4817237.190	0.0			
Amherst	P	685530.097	4817219.190	0.0			
Amherst	P	685532.717	4817213.190	0.0			
Amherst	P	685536.657	4817205.690	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Amherst	P	685544.347	4817192.690	0.0			
Amherst	P	685554.657	4817175.690	0.0			
Amherst	P	685564.907	4817161.190	0.0			
Amherst	P	685567.467	4817157.690	0.0			
Amherst	P	685580.157	4817142.190	0.0			
Amherst	P	685585.347	4817133.690	0.0			
Amherst	P	685589.287	4817123.190	0.0			
Amherst	P	685595.787	4817110.690	0.0			
Amherst	P	685597.287	4817099.690	0.0			
Amherst	P	685604.157	4817074.190	0.0			
Amherst	P	685605.787	4817058.690	0.0			
Amherst	P	685608.657	4817043.690	0.0			
Amherst	P	685612.907	4817023.190	0.0			
Amherst	P	685617.027	4817007.190	0.0			
Amherst	P	685623.597	4816992.690	0.0			
Amherst	P	685630.217	4816974.690	0.0			
Amherst	P	685635.407	4816964.690	0.0			
Amherst	P	685642.097	4816945.690	0.0			
Amherst	P	685645.967	4816937.190	0.0			
Amherst	P	685658.967	4816911.690	0.0			
Amherst	P	685661.717	4816902.190	0.0			
Amherst	P	685672.217	4816876.690	0.0			
Amherst	P	685676.157	4816866.690	0.0			
Amherst	P	685678.967	4816855.690	0.0			
Amherst	P	685684.467	4816832.690	0.0			
Amherst	P	685688.597	4816818.190	0.0			
Amherst	P	685692.347	4816814.690	0.0			
Amherst	P	685693.967	4816801.190	0.0			
Amherst	P	685694.157	4816793.690	0.0			
Amherst	P	685697.217	4816770.690	0.0			
Amherst	P	685704.157	4816741.190	0.0			
Amherst	P	685709.407	4816729.190	0.0			
Amherst	P	685709.847	4816714.690	0.0			
Amherst	P	685710.027	4816707.190	0.0			
Amherst	P	685710.217	4816699.690	0.0			
Amherst	P	685711.657	4816691.190	0.0			
Amherst	P	685715.657	4816681.690	0.0			
Amherst	P	685718.157	4816679.190	0.0			
Amherst	P	685719.467	4816675.690	0.0			
Amherst	P	685720.787	4816673.190	0.0			
Amherst	P	685729.467	4816671.190	0.0			
Amherst	P	685741.787	4816670.190	0.0			
Amherst	P	685751.527	4816672.690	0.0			
Amherst	P	685762.467	4816678.190	0.0			
Amherst	P	685772.157	4816684.690	0.0			
Amherst	P	685773.157	4816693.190	0.0			
Amherst	P	685776.527	4816703.190	0.0			
Amherst	P	685779.967	4816713.190	0.0			
Amherst	P	685785.907	4816721.690	0.0			
Amherst	P	685800.347	4816732.190	0.0			
Amherst	P	685817.527	4816733.690	0.0			
Amherst	P	685832.287	4816734.190	0.0			
Amherst	P	685839.657	4816735.690	0.0			
Amherst	P	685844.527	4816736.190	0.0			
Amherst	P	685848.347	4816732.690	0.0			
Amherst	P	685854.717	4816724.190	0.0			
Amherst	P	685857.217	4816722.690	0.0			
Amherst	P	685858.527	4816718.190	0.0			
Amherst	P	685862.467	4816710.690	0.0			
Amherst	P	685863.787	4816707.190	0.0			
Amherst	P	685866.467	4816698.690	0.0			
Amherst	P	685870.347	4816691.190	0.0			
Amherst	P	685873.027	4816682.690	0.0			
Amherst	P	685874.597	4816671.690	0.0			
Amherst	P	685874.717	4816665.690	0.0			
Amherst	P	685877.597	4816651.190	0.0			
Amherst	P	685879.027	4816643.690	0.0			
Amherst	P	685879.287	4816635.190	0.0			
Amherst	P	685878.287	4816626.690	0.0			
Amherst	P	685877.217	4816619.190	0.0			
Amherst	P	685874.967	4816610.690	0.0			
Duck	1	732404.362	4954433.899	2.2	12	0.098579	0.467
Duck	2	732418.407	4954443.405	2.8	12	0.058611	0.465
Duck	3	732430.092	4954452.167	2.9	14	0.083760	0.463
Duck	4	732432.557	4954475.142	4.5	11	0.147336	0.383

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Duck	5	732420.279	4954468.975	5.1	12	0.107792	0.464
Duck	6	732406.497	4954459.271	4.7	11	0.062043	0.383
Duck	7	732395.515	4954451.158	3.7	11	0.102479	0.383
Duck	8	732388.019	4954439.858	2.5	12	0.075254	0.382
Duck	9	732368.683	4954446.644	2.8	12	0.192437	0.431
Duck	10	732380.946	4954457.170	3.5	11	0.046266	0.382
Duck	11	732392.947	4954469.119	5.2	10	0.059028	0.383
Duck	12	732406.602	4954478.995	6.2	49	0.141460	0.360
Duck	13	732421.277	4954487.723	6.0	15	0.114006	0.337
Duck	14	732435.849	4954496.064	5.0	12	0.055550	0.384
Duck	15	732434.722	4954514.890	5.2	14	0.101252	0.336
Duck	16	732420.341	4954505.162	6.5	13	0.106401	0.337
Duck	17	732407.401	4954497.203	7.0	19	0.570492	0.355
Duck	18	732389.782	4954485.436	6.5	18	0.085891	0.376
Duck	19	732381.143	4954480.463	6.0	20	0.073781	0.375
Duck	20	732373.392	4954469.774	5.1	16	0.058598	0.378
Duck	21	732357.667	4954459.757	3.7	11	0.074226	0.381
Duck	22	732357.168	4954474.332	5.6	13	0.072370	0.426
Duck	23	732364.161	4954482.335	6.5	10	0.086673	0.427
Duck	24	732377.644	4954493.738	7.1	14	0.075033	0.378
Duck	25	732391.498	4954505.169	7.6	18	0.054112	0.327
Duck	26	732404.886	4954516.245	7.5	17	0.079442	0.327
Duck	27	732419.581	4954526.424	6.5	15	0.080719	0.327
Duck	28	732405.407	4954534.378	7.5	18	0.044848	0.325
Duck	29	732388.539	4954523.065	8.3	19	0.048801	0.325
Duck	30	732375.012	4954512.171	7.8	15	0.045469	0.327
Duck	31	732359.756	4954500.009	8.1	21	0.056251	0.419
Duck	32	732342.351	4954487.019	6.6	12	0.064077	0.425
Duck	33	732325.230	4954492.773	6.1	17	0.069997	0.421
Duck	34	732342.528	4954506.918	8.7	16	0.054109	0.422
Duck	35	732355.818	4954519.537	10.5	26	1.261297	0.350
Duck	36	732370.862	4954531.620	10.7	27	1.793481	0.350
Duck	37	732388.420	4954543.220	8.8	20	0.366479	0.352
Duck	38	732404.824	4954556.330	7.1	14	0.579345	0.323
Duck	39	732396.728	4954572.334	5.8	11	0.088871	0.355
Duck	40	732381.812	4954560.239	8.4	16	0.109981	0.352
Duck	41	732368.034	4954549.415	11.4	23	0.124492	0.348
Duck	42	732353.666	4954539.779	12.2	25	0.069540	0.347
Duck	43	732336.380	4954526.363	11.5	25	0.046862	0.347
Duck	44	732320.975	4954515.419	8.5	15	0.077336	0.431
Duck	45	732302.878	4954524.099	7.5	17	0.082373	0.430
Duck	46	732317.994	4954533.988	11.0	19	0.108126	0.396
Duck	47	732335.143	4954545.536	12.8	22	0.069345	0.344
Duck	48	732353.490	4954557.751	12.7	24	0.100658	0.343
Duck	49	732369.962	4954568.017	10.5	27	0.097737	0.341
Duck	50	732385.434	4954578.746	7.1	14	0.070363	0.348
Duck	51	732384.011	4954597.486	5.9	14	0.035727	0.348
Duck	52	732368.527	4954586.237	9.1	16	0.041836	0.347
Duck	53	732353.682	4954575.284	12.1	24	0.076469	0.342
Duck	54	732337.077	4954563.664	13.1	29	0.140224	0.340
Duck	55	732320.600	4954553.207	12.4	23	0.031627	0.343
Duck	56	732303.091	4954543.210	9.4	21	0.102395	0.345
Duck	57	732286.972	4954553.488	6.8	18	0.109332	0.453
Duck	58	732304.278	4954563.450	10.4	21	0.117461	0.346
Duck	59	732320.631	4954574.469	12.2	18	0.045476	0.348
Duck	60	732338.382	4954586.552	11.7	21	0.061094	0.346
Duck	61	732353.115	4954595.506	9.8	20	0.085255	0.347
Duck	62	732365.279	4954604.304	7.5	18	0.065889	0.348
Duck	63	732364.069	4954618.362	5.4	13	0.136147	0.356
Duck	64	732346.294	4954615.698	5.9	14	0.107460	0.356
Duck	65	732330.899	4954605.909	8.1	17	0.109581	0.354
Duck	66	732314.735	4954594.934	8.7	16	0.065694	0.355
Duck	67	732300.225	4954584.485	8.2	17	0.053441	0.357
Duck	68	732284.424	4954573.113	6.4	16	0.083358	0.359
Duck	69	732282.103	4954591.625	5.3	14	0.084925	0.360
Duck	70	732298.263	4954601.866	6.3	16	0.081685	0.378
Duck	71	732315.509	4954612.098	5.9	14	0.110749	0.362
Duck	72	732332.858	4954622.237	3.0	12	0.059641	0.364
Duck	73	732341.346	4954556.546	13.1	16	0.063239	0.437
Duck	74	732329.530	4954559.241	13.0	19	0.105635	0.434
Duck	75	732331.517	4954571.029	12.9	17	0.091066	0.436
Duck	76	732343.898	4954568.352	12.9	24	0.182175	0.431
Duck	77	732347.260	4954554.274	12.9	23	2.115207	0.446
Duck	78	732339.450	4954555.156	13.0	19	0.220685	0.448
Duck	79	732345.318	4954545.651	12.6	22	0.177699	0.446
Duck	80	732333.863	4954549.296	12.8	21	0.168073	0.447

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Duck	81	732332.270	4954554.926	13.0	29	0.177012	0.442
Duck	82	732343.987	4954561.273	13.0	22	0.097592	0.446
Duck	83	732343.251	4954568.565	12.9	22	0.068256	0.446
Duck	84	732337.945	4954564.279	13.0	26	0.084098	0.444
Duck	85	732329.456	4954560.270	13.0	21	0.059877	0.447
Duck	86	732332.309	4954568.711	12.9	47	0.149672	0.430
Duck	87	732338.530	4954575.052	12.6	27	0.185644	0.443
Duck	C	732336.234	4954558.209	13.1	23	0.156682	0.446
Duck	P	732312.895	4954625.991	0.0	12	0.091091	0.439
Duck	P	732432.784	4954558.928	0.0	11	0.083647	0.429
Duck	P	732305.092	4954479.589	0.0	14	0.123220	0.421
Duck	P	732350.760	4954429.395	0.0	10	0.039990	0.424
Duck	P	732432.438	4954428.176	0.0	11	0.033615	0.423
Duck	P	732432.514	4954428.059	0.0	10	0.026165	0.390
Duck	P	732303.690	4954480.000	0.0			
Duck	P	732303.620	4954481.000	0.0			
Duck	P	732301.440	4954484.000	0.0			
Duck	P	732300.310	4954485.500	0.0			
Duck	P	732299.250	4954486.500	0.0			
Duck	P	732298.120	4954488.500	0.0			
Duck	P	732295.880	4954492.500	0.0			
Duck	P	732294.810	4954493.500	0.0			
Duck	P	732293.690	4954495.500	0.0			
Duck	P	732291.380	4954500.500	0.0			
Duck	P	732290.310	4954501.500	0.0			
Duck	P	732289.000	4954506.500	0.0			
Duck	P	732288.880	4954509.500	0.0			
Duck	P	732286.690	4954512.000	0.0			
Duck	P	732285.500	4954515.000	0.0			
Duck	P	732282.190	4954520.000	0.0			
Duck	P	732281.120	4954520.000	0.0			
Duck	P	732278.940	4954524.000	0.0			
Duck	P	732277.810	4954526.000	0.0			
Duck	P	732275.500	4954531.000	0.0			
Duck	P	732274.440	4954532.000	0.0			
Duck	P	732273.060	4954538.000	0.0			
Duck	P	732271.810	4954542.500	0.0			
Duck	P	732270.750	4954543.500	0.0			
Duck	P	732270.620	4954545.500	0.0			
Duck	P	732269.500	4954547.500	0.0			
Duck	P	732268.380	4954549.500	0.0			
Duck	P	732266.190	4954552.500	0.0			
Duck	P	732266.060	4954555.500	0.0			
Duck	P	732262.810	4954558.500	0.0			
Duck	P	732259.620	4954561.500	0.0			
Duck	P	732258.310	4954566.000	0.0			
Duck	P	732257.120	4954569.000	0.0			
Duck	P	732257.000	4954572.000	0.0			
Duck	P	732256.810	4954576.000	0.0			
Duck	P	732256.750	4954577.000	0.0			
Duck	P	732256.690	4954578.000	0.0			
Duck	P	732256.620	4954579.500	0.0			
Duck	P	732256.440	4954583.500	0.0			
Duck	P	732257.380	4954584.500	0.0			
Duck	P	732259.190	4954589.500	0.0			
Duck	P	732260.120	4954591.500	0.0			
Duck	P	732261.940	4954595.500	0.0			
Duck	P	732262.880	4954596.500	0.0			
Duck	P	732264.880	4954598.000	0.0			
Duck	P	732265.880	4954599.000	0.0			
Duck	P	732269.810	4954602.000	0.0			
Duck	P	732270.750	4954603.000	0.0			
Duck	P	732272.750	4954604.500	0.0			
Duck	P	732274.690	4954606.500	0.0			
Duck	P	732275.690	4954607.500	0.0			
Duck	P	732282.620	4954611.000	0.0			
Duck	P	732283.620	4954612.000	0.0			
Duck	P	732287.620	4954613.000	0.0			
Duck	P	732289.620	4954614.000	0.0			
Duck	P	732293.750	4954614.500	0.0			
Duck	P	732298.810	4954614.500	0.0			
Duck	P	732302.690	4954619.000	0.0			
Duck	P	732303.690	4954620.000	0.0			
Duck	P	732309.620	4954624.500	0.0			
Duck	P	732310.500	4954626.500	0.0			
Duck	P	732312.440	4954628.500	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Duck	P	732316.380	4954631.500	0.0			
Duck	P	732323.310	4954636.000	0.0			
Duck	P	732324.310	4954637.000	0.0			
Duck	P	732329.380	4954637.500	0.0			
Duck	P	732331.440	4954637.500	0.0			
Duck	P	732335.500	4954637.500	0.0			
Duck	P	732341.750	4954636.000	0.0			
Duck	P	732343.810	4954635.000	0.0			
Duck	P	732349.940	4954635.500	0.0			
Duck	P	732353.000	4954635.500	0.0			
Duck	P	732355.120	4954634.500	0.0			
Duck	P	732358.250	4954634.000	0.0			
Duck	P	732366.560	4954631.500	0.0			
Duck	P	732367.620	4954630.500	0.0			
Duck	P	732370.750	4954629.500	0.0			
Duck	P	732373.940	4954626.500	0.0			
Duck	P	732376.120	4954624.500	0.0			
Duck	P	732378.310	4954622.000	0.0			
Duck	P	732381.440	4954620.000	0.0			
Duck	P	732384.750	4954616.000	0.0			
Duck	P	732386.880	4954614.000	0.0			
Duck	P	732389.060	4954611.500	0.0			
Duck	P	732391.250	4954608.500	0.0			
Duck	P	732393.690	4954601.500	0.0			
Duck	P	732395.750	4954600.500	0.0			
Duck	P	732397.940	4954597.500	0.0			
Duck	P	732402.380	4954592.000	0.0			
Duck	P	732406.620	4954588.000	0.0			
Duck	P	732406.690	4954587.000	0.0			
Duck	P	732408.810	4954585.000	0.0			
Duck	P	732413.120	4954581.000	0.0			
Duck	P	732418.500	4954576.500	0.0			
Duck	P	732419.500	4954576.500	0.0			
Duck	P	732422.810	4954571.500	0.0			
Duck	P	732422.940	4954569.500	0.0			
Duck	P	732425.060	4954568.000	0.0			
Duck	P	732427.250	4954566.000	0.0			
Duck	P	732429.380	4954564.000	0.0			
Duck	P	732429.500	4954562.000	0.0			
Duck	P	732432.750	4954558.000	0.0			
Duck	P	732434.940	4954555.000	0.0			
Duck	P	732437.310	4954548.000	0.0			
Duck	P	732439.440	4954547.500	0.0			
Duck	P	732439.620	4954543.500	0.0			
Duck	P	732440.880	4954539.500	0.0			
Duck	P	732442.120	4954534.500	0.0			
Duck	P	732443.310	4954531.500	0.0			
Duck	P	732443.500	4954527.500	0.0			
Duck	P	732445.750	4954523.500	0.0			
Duck	P	732447.060	4954518.500	0.0			
Duck	P	732447.120	4954516.500	0.0			
Duck	P	732447.440	4954511.500	0.0			
Duck	P	732447.620	4954507.500	0.0			
Duck	P	732448.810	4954503.500	0.0			
Duck	P	732449.120	4954498.500	0.0			
Duck	P	732449.310	4954494.500	0.0			
Duck	P	732449.500	4954490.500	0.0			
Duck	P	732449.620	4954488.500	0.0			
Duck	P	732449.690	4954486.500	0.0			
Duck	P	732449.880	4954483.500	0.0			
Duck	P	732451.120	4954479.500	0.0			
Duck	P	732451.120	4954478.500	0.0			
Duck	P	732451.250	4954476.500	0.0			
Duck	P	732451.380	4954473.500	0.0			
Duck	P	732451.690	4954468.500	0.0			
Duck	P	732451.750	4954466.500	0.0			
Duck	P	732452.000	4954462.500	0.0			
Duck	P	732451.380	4954454.000	0.0			
Duck	P	732450.440	4954452.000	0.0			
Duck	P	732450.620	4954449.000	0.0			
Duck	P	732450.690	4954447.000	0.0			
Duck	P	732449.880	4954443.000	0.0			
Duck	P	732448.940	4954441.000	0.0			
Duck	P	732449.000	4954440.000	0.0			
Duck	P	732448.190	4954436.000	0.0			
Duck	P	732446.250	4954434.000	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Duck	P	732445.310	4954432.500	0.0			
Duck	P	732444.310	4954431.500	0.0			
Duck	P	732441.310	4954430.500	0.0			
Duck	P	732437.250	4954430.500	0.0			
Duck	P	732435.190	4954430.000	0.0			
Duck	P	732430.250	4954427.000	0.0			
Duck	P	732429.250	4954426.000	0.0			
Duck	P	732427.310	4954423.500	0.0			
Duck	P	732425.310	4954422.500	0.0			
Duck	P	732419.380	4954419.500	0.0			
Duck	P	732415.310	4954418.000	0.0			
Duck	P	732410.120	4954420.000	0.0			
Duck	P	732401.940	4954420.500	0.0			
Duck	P	732399.880	4954420.500	0.0			
Duck	P	732394.810	4954419.000	0.0			
Duck	P	732390.750	4954419.000	0.0			
Duck	P	732384.690	4954416.500	0.0			
Duck	P	732380.560	4954417.500	0.0			
Duck	P	732373.250	4954420.000	0.0			
Duck	P	732368.000	4954422.500	0.0			
Duck	P	732361.810	4954424.500	0.0			
Duck	P	732359.690	4954425.500	0.0			
Duck	P	732354.560	4954426.000	0.0			
Duck	P	732353.500	4954427.000	0.0			
Duck	P	732352.310	4954430.000	0.0			
Duck	P	732352.250	4954431.000	0.0			
Duck	P	732352.060	4954434.000	0.0			
Duck	P	732351.940	4954437.000	0.0			
Duck	P	732351.810	4954439.000	0.0			
Duck	P	732350.560	4954444.000	0.0			
Duck	P	732348.250	4954449.000	0.0			
Duck	P	732347.060	4954452.000	0.0			
Duck	P	732344.880	4954455.000	0.0			
Duck	P	732344.690	4954459.000	0.0			
Duck	P	732341.500	4954460.500	0.0			
Duck	P	732339.310	4954463.500	0.0			
Duck	P	732336.120	4954465.500	0.0			
Duck	P	732334.060	4954466.500	0.0			
Duck	P	732329.940	4954467.000	0.0			
Duck	P	732327.810	4954468.000	0.0			
Duck	P	732322.620	4954469.500	0.0			
Duck	P	732319.500	4954470.500	0.0			
Duck	P	732318.500	4954470.500	0.0			
Duck	P	732314.380	4954471.500	0.0			
Duck	P	732312.250	4954472.000	0.0			
Duck	P	732307.060	4954474.000	0.0			
Duck	P	732303.880	4954476.000	0.0			
Duck	P	732302.880	4954476.000	0.0			
Duck	P	732300.810	4954475.500	0.0			
Duck	P	732303.690	4954480.000	0.0			
Echo	1	685873.560	4815581.000	0.0	26	0.117430	0.390
Echo	2	685814.098	4815633.733	0.5	21	0.055911	0.399
Echo	3	685834.669	4815631.730	1.0	13	0.074800	0.388
Echo	4	685847.974	4815632.018	0.8	12	0.127764	0.388
Echo	5	685889.483	4815626.655	2.3	11	0.100355	0.407
Echo	6	685909.067	4815623.872	7.2	11	0.095654	0.405
Echo	7	685928.582	4815622.431	9.4	14	0.045478	0.329
Echo	8	685948.404	4815620.849	11.1	11	0.032710	0.331
Echo	9	685974.004	4815619.544	13.4	14	0.066118	0.329
Echo	10	686003.891	4815616.838	14.5	14	0.162906	0.329
Echo	11	686033.307	4815611.495	14.1	14	0.060881	0.329
Echo	12	686062.032	4815607.820	11.5	15	0.115164	0.333
Echo	13	686087.784	4815604.824	6.9	11	0.053858	0.540
Echo	14	686109.528	4815602.053	2.5	11	0.038814	0.521
Echo	15	685957.343	4814898.844	2.0	18	0.056848	0.426
Echo	16	685972.970	4814917.202	4.1	13	0.069595	0.429
Echo	17	685953.478	4814928.077	4.3	15	0.130521	0.428
Echo	18	685951.029	4814951.230	4.9	11	0.083667	0.431
Echo	19	685986.197	4814958.077	5.4	14	0.128575	0.429
Echo	20	686011.513	4814975.598	4.9	10	0.203546	0.422
Echo	21	685994.347	4814987.236	7.6	12	0.084935	0.421
Echo	22	685971.164	4814982.909	7.5	10	0.220628	0.422
Echo	23	685948.408	4814994.517	6.4	10	0.142014	0.422
Echo	24	685917.759	4815007.695	4.9	14	0.160493	0.420
Echo	25	685894.193	4814996.987	3.3	11	0.115952	0.422

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Echo	26	685913.817	4815030.215	6.5	10	0.069753	0.422
Echo	27	685946.382	4815026.427	10.0	11	0.103874	0.422
Echo	28	685976.493	4815025.699	12.6	12	0.084779	0.421
Echo	29	686011.298	4815020.798	11.0	10	0.089309	0.422
Echo	30	686025.692	4815047.810	11.0	10	0.112181	0.422
Echo	31	685975.080	4815056.526	15.4	11	0.042625	0.422
Echo	32	685947.050	4815055.803	14.9	10	0.070710	0.422
Echo	33	685922.695	4815053.611	7.3	10	0.052387	0.422
Echo	34	685899.918	4815051.003	5.7	10	0.062986	0.422
Echo	35	686033.832	4815079.984	8.9	10	0.043527	0.454
Echo	36	685983.510	4815088.648	16.5	13	0.120112	0.455
Echo	37	685952.617	4815095.943	18.2	11	0.266876	0.456
Echo	38	685917.679	4815091.927	12.9	14	0.068354	0.461
Echo	39	685900.519	4815137.638	9.8	12	0.163361	0.468
Echo	40	685939.534	4815141.588	17.5	10	0.118534	0.470
Echo	41	685973.292	4815148.654	16.7	10	0.108603	0.470
Echo	42	686033.003	4815183.851	2.6	16	0.097499	0.466
Echo	43	685991.378	4815188.585	11.0	10	0.077386	0.470
Echo	44	685951.797	4815193.500	15.6	10	0.099982	0.470
Echo	45	685922.975	4815195.958	14.5	10	0.138634	0.470
Echo	46	685888.021	4815197.866	9.1	12	0.045212	0.468
Echo	47	685883.367	4815225.680	8.9	11	0.050624	0.469
Echo	48	685940.156	4815237.338	13.0	13	0.072164	0.497
Echo	49	685972.168	4815237.776	9.1	17	0.127793	0.494
Echo	50	686009.696	4815238.603	3.4	16	0.067407	0.495
Echo	51	685992.817	4815269.031	3.6	18	0.090178	0.494
Echo	52	685960.588	4815275.156	6.9	12	0.114421	0.498
Echo	53	685920.584	4815280.264	10.9	11	0.138701	0.499
Echo	54	685893.579	4815287.252	10.0	11	0.193936	0.499
Echo	55	685865.535	4815301.168	5.0	12	0.163450	0.498
Echo	56	685894.036	4815317.217	6.4	13	0.141094	0.498
Echo	57	685926.731	4815331.369	6.5	16	0.126221	0.495
Echo	58	685964.316	4815338.805	5.6	18	0.165766	0.441
Echo	59	685988.317	4815484.564	8.2	28	0.132184	0.425
Echo	60	685994.991	4815509.667	11.6	25	0.120937	0.407
Echo	61	686002.142	4815537.065	13.0	12	0.088443	0.408
Echo	62	685970.060	4815537.632	13.2	11	0.082809	0.406
Echo	63	685936.252	4815540.707	11.2	11	0.044214	0.403
Echo	64	685890.304	4815547.718	5.8	12	0.104880	0.400
Echo	65	685853.988	4815547.799	1.0	15	0.146583	0.396
Echo	66	685875.258	4815563.335	0.4	17	0.105148	0.392
Echo	67	685902.644	4815576.968	7.0	10	0.049237	0.396
Echo	68	685922.372	4815583.583	9.4	11	0.063131	0.392
Echo	69	685956.622	4815585.063	12.1	13	0.075643	0.389
Echo	70	685987.202	4815580.196	13.7	11	0.142474	0.389
Echo	71	686017.831	4815577.926	13.7	11	0.059722	0.386
Echo	72	686045.897	4815576.490	11.8	10	0.101056	0.385
Echo	73	686076.295	4815575.596	7.2	10	0.103603	0.559
Echo	74	686099.227	4815576.564	3.0	11	0.113873	0.558
Echo	75	685984.218	4815368.172	2.9	15	0.097841	0.369
Echo	76	685945.780	4815373.810	5.4	10	0.137319	0.371
Echo	77	685903.518	4815379.541	1.4	14	0.105499	0.367
Echo	78	685865.331	4815387.842	0.9	14	0.120684	0.366
Echo	79	685825.657	4815396.061	0.7	13	0.048097	0.364
Echo	80	685828.018	4815425.822	0.6	10	0.053523	0.365
Echo	81	685865.830	4815431.395	1.0	10	0.062460	0.364
Echo	82	685903.363	4815440.644	4.7	19	0.076610	0.357
Echo	83	685940.020	4815446.138	8.1	10	0.064143	0.355
Echo	84	685975.875	4815449.747	6.2	11	0.057104	0.451
Echo	85	685965.522	4815486.521	10.5	23	0.105338	0.443
Echo	86	685939.904	4815490.942	10.9	12	0.100911	0.451
Echo	87	685911.347	4815493.484	8.9	10	0.191048	0.452
Echo	88	685882.822	4815497.958	5.1	10	0.092788	0.452
Echo	89	685854.725	4815497.890	1.2	12	0.052646	0.451
Echo	90	685915.772	4815669.814	8.3	10	0.044265	0.308
Echo	91	685936.902	4815664.976	10.5	11	0.059434	0.307
Echo	92	685962.570	4815660.774	12.8	14	0.073041	0.305
Echo	93	685993.593	4815653.453	14.8	10	0.056557	0.306
Echo	94	686021.768	4815651.645	15.1	10	0.051010	0.305
Echo	95	686053.070	4815647.414	14.0	10	0.028711	0.304
Echo	96	686086.312	4815639.827	8.7	10	0.028958	0.304
Echo	97	686086.992	4815674.960	7.4	10	0.366906	0.312
Echo	98	686060.326	4815678.207	12.5	10	0.046416	0.302
Echo	99	686110.130	4815655.530	1.7	11	0.060546	0.300
Echo	100	685834.161	4815738.794	2.9	12	0.071588	0.346
Echo	101	685858.800	4815747.287	5.3	10	0.053156	0.333

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Echo	102	685890.659	4815755.828	7.1	10	0.036717	0.332
Echo	103	685926.933	4815766.276	11.0	10	0.040887	0.332
Echo	104	685960.659	4815773.703	12.5	10	0.037835	0.332
Echo	105	685989.343	4815777.810	11.2	10	0.049874	0.332
Echo	106	686024.005	4815785.305	6.6	10	0.034054	0.332
Echo	107	686016.873	4815834.425	0.6	10	0.036059	0.331
Echo	108	685987.815	4815827.638	9.7	10	0.034417	0.331
Echo	109	685949.962	4815819.099	12.5	10	0.051299	0.331
Echo	110	685933.527	4815816.273	12.1	10	0.050356	0.331
Echo	111	685906.515	4815811.817	10.5	10	0.084682	0.331
Echo	112	685881.157	4815808.066	8.3	11	0.039156	0.331
Echo	113	685858.760	4815804.399	5.8	10	0.056502	0.359
Echo	114	685833.434	4815801.760	1.6	11	0.072701	0.360
Echo	115	686011.044	4815901.522	2.2	10	0.085064	0.333
Echo	116	685800.386	4816016.247	2.9	10	0.026640	0.384
Echo	117	685812.246	4816017.405	6.5	10	0.059392	0.385
Echo	118	685844.915	4816016.020	14.2	10	0.049935	0.337
Echo	119	685883.322	4816022.473	17.9	10	0.056863	0.337
Echo	120	685914.612	4816023.411	18.4	10	0.079454	0.337
Echo	121	685952.456	4816023.980	15.7	10	0.104799	0.337
Echo	122	685969.936	4816023.248	12.5	10	0.104728	0.338
Echo	123	686001.031	4816024.867	4.2	10	0.118769	0.338
Echo	124	686018.859	4816026.015	0.5	10	0.102523	0.421
Echo	125	686067.322	4816175.588	0.3	10	0.068039	0.338
Echo	126	686100.520	4816209.720	0.3	10	0.066911	0.339
Echo	127	686231.224	4816280.513	0.5	10	0.064540	0.408
Echo	128	686218.434	4816308.554	5.0	10	0.059968	0.407
Echo	129	686209.048	4816329.990	5.7	10	0.098422	0.407
Echo	130	686198.540	4816353.157	4.1	10	0.085865	0.407
Echo	131	686185.052	4816374.349	2.0	10	0.079728	0.407
Echo	132	686177.663	4816399.038	0.5	10	0.029485	0.399
Echo	133	686266.802	4816381.275	0.5	10	0.065737	0.399
Echo	134	686269.997	4816359.232	1.3	10	0.019376	0.399
Echo	135	686273.631	4816334.422	2.5	10	0.061102	0.399
Echo	136	686276.731	4816314.102	0.3	11	0.036469	0.396
Echo	137	686042.303	4816371.487	0.7	10	0.024396	0.388
Echo	138	686052.805	4816340.835	4.5	10	0.037194	0.388
Echo	139	686059.586	4816318.244	6.1	10	0.120250	0.388
Echo	140	686068.416	4816293.626	7.5	10	0.075546	0.388
Echo	141	686080.279	4816263.707	6.3	10	0.061281	0.388
Echo	142	686089.177	4816233.606	2.0	10	0.111794	0.388
Echo	143	686024.386	4816184.503	13.3	10	0.031426	0.388
Echo	144	685988.792	4816192.091	23.7	10	0.038882	0.381
Echo	145	685947.948	4816201.193	25.7	10	0.072272	0.381
Echo	146	685900.678	4816212.166	25.8	10	0.030459	0.429
Echo	147	685858.630	4816219.724	26.0	10	0.038315	0.429
Echo	148	685825.406	4816227.236	25.3	10	0.048239	0.429
Echo	149	685795.391	4816234.533	22.4	10	0.043895	0.429
Echo	150	685765.774	4816242.675	17.2	10	0.076961	0.429
Echo	151	685726.619	4816250.981	5.1	10	0.170762	0.429
Echo	152	685769.888	4816071.552	3.4	10	0.065243	0.449
Echo	153	685767.151	4816099.118	5.1	11	0.046879	0.435
Echo	154	685765.045	4816130.694	6.4	16	0.088580	0.376
Echo	155	685764.667	4816156.674	8.5	12	0.100228	0.352
Echo	156	685762.553	4816193.752	12.6	12	0.110653	0.352
Echo	157	685763.650	4816230.836	15.9	13	0.046196	0.284
Echo	158	685763.557	4816257.965	17.9	10	0.063379	0.286
Echo	159	685765.023	4816294.955	13.6	10	0.107510	0.341
Echo	160	685786.271	4816324.621	12.3	10	0.165235	0.438
Echo	161	685786.736	4816295.302	18.3	10	0.060391	0.303
Echo	162	685788.147	4816260.923	20.6	10	0.057358	0.303
Echo	163	685789.650	4816229.172	21.5	10	0.052624	0.303
Echo	164	685789.186	4816197.768	20.1	10	0.037256	0.262
Echo	165	685790.174	4816169.168	18.1	10	1.048106	0.263
Echo	166	685789.115	4816134.276	13.4	10	0.054845	0.262
Echo	167	685790.195	4816102.813	10.8	14	0.135945	0.261
Echo	168	685793.143	4816077.697	7.6	10	0.096802	0.262
Echo	169	685796.423	4816053.383	6.7	11	0.100952	0.262
Echo	170	685812.145	4816054.430	9.4	10	0.054644	0.262
Echo	171	685811.597	4816092.048	14.2	10	0.051158	0.263
Echo	172	685814.196	4816126.191	18.3	10	0.101251	0.263
Echo	173	685819.018	4816159.188	22.5	10	0.061251	0.263
Echo	174	685823.171	4816196.886	25.3	10	0.140256	0.265
Echo	175	685825.276	4816236.883	24.9	10	0.061984	0.265
Echo	176	685826.793	4816270.599	24.3	10	0.105853	0.265
Echo	177	685827.428	4816303.000	22.4	10	0.045513	0.265

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Echo	178	685813.772	4816343.687	13.8	10	0.091373	0.266
Echo	179	685837.005	4816366.802	11.9	10	0.026977	0.328
Echo	180	685844.344	4816335.483	19.7	10	0.052887	0.266
Echo	181	685849.265	4816305.177	23.8	12	0.052648	0.266
Echo	182	685850.654	4816272.532	25.3	10	0.071019	0.305
Echo	183	685851.298	4816239.626	25.9	10	0.055181	0.267
Echo	184	685854.202	4816201.616	25.9	10	0.077833	0.267
Echo	185	685858.066	4816167.444	24.8	12	0.049195	0.267
Echo	186	685862.646	4816123.275	22.9	10	0.068051	0.268
Echo	187	685868.224	4816080.044	20.6	10	0.096731	0.268
Echo	188	685873.078	4816043.876	18.7	10	0.033003	0.268
Echo	189	685910.360	4816058.133	19.6	10	0.058991	0.269
Echo	190	685909.085	4816095.473	21.7	10	0.046394	0.274
Echo	191	685908.331	4816140.054	24.3	11	0.053797	0.307
Echo	192	685907.586	4816178.476	25.5	10	0.127062	0.322
Echo	193	685903.186	4816218.017	26.2	10	0.083336	0.279
Echo	194	685899.998	4816252.294	26.6	10	0.051800	0.324
Echo	195	685893.670	4816282.876	26.5	10	0.120760	0.324
Echo	196	685922.172	4816288.842	26.6	10	0.099064	0.327
Echo	197	685933.137	4816258.699	24.8	10	0.077943	0.327
Echo	198	685939.688	4816217.293	26.2	10	0.063566	0.327
Echo	199	685944.077	4816178.464	25.2	10	0.052404	0.331
Echo	200	685947.442	4816145.282	24.6	10	0.124173	0.331
Echo	201	685947.793	4816107.279	22.2	10	0.036504	0.332
Echo	202	685947.490	4816055.786	18.3	10	0.034615	0.332
Echo	203	685984.510	4816069.237	15.4	10	0.061696	0.332
Echo	204	685981.712	4816107.380	20.4	10	0.051792	0.332
Echo	205	685978.350	4816141.771	23.3	11	0.072549	0.331
Echo	206	685973.224	4816178.617	24.8	10	0.099664	0.332
Echo	207	685970.923	4816214.335	25.3	10	0.038366	0.332
Echo	208	685966.064	4816262.267	25.7	10	0.043552	0.405
Echo	209	685960.072	4816297.564	24.2	10	0.128337	0.331
Echo	210	685958.040	4816334.442	17.8	10	0.073092	0.331
Echo	211	685921.071	4816328.211	22.9	10	0.034408	0.331
Echo	212	685917.654	4816368.848	14.0	10	0.067070	0.409
Echo	213	685955.136	4816372.809	9.0	10	0.114579	0.409
Echo	214	685993.693	4816357.312	10.8	10	0.110878	0.417
Echo	215	686001.608	4816309.979	15.6	10	0.052849	0.417
Echo	216	686008.462	4816266.959	18.4	10	0.067718	0.417
Echo	217	686010.779	4816219.800	19.4	10	0.097623	0.329
Echo	218	686014.671	4816181.415	17.2	10	0.077342	0.449
Echo	219	686015.624	4816136.568	14.1	10	0.072016	0.329
Echo	220	686041.189	4816170.501	4.4	10	0.106167	0.484
Echo	221	686044.147	4816212.248	5.8	10	0.370747	0.622
Echo	222	686041.376	4816260.048	12.0	11	0.137984	0.512
Echo	223	685972.135	4815965.295	6.0	10	0.060275	0.464
Echo	224	685923.181	4815964.013	14.4	10	0.071330	0.470
Echo	225	685883.187	4815964.301	14.7	11	0.176410	0.469
Echo	226	685840.924	4815964.608	13.4	10	0.071461	0.505
Echo	227	685840.937	4815932.730	12.4	10	0.057130	0.505
Echo	228	685880.779	4815929.431	14.8	10	0.142570	0.505
Echo	229	685917.561	4815925.698	13.8	10	0.110591	0.474
Echo	230	685963.336	4815930.175	12.2	10	0.170873	0.474
Echo	231	685965.111	4815875.149	9.7	10	0.148921	0.473
Echo	232	685924.750	4815870.775	13.7	10	0.182763	0.473
Echo	233	685886.815	4815867.320	8.4	10	0.046734	0.524
Echo	234	685848.522	4815865.640	7.8	10	0.105802	0.524
Echo	235	685818.490	4815879.093	7.3	10	0.092248	0.524
Echo	236	685890.421	4815690.114	3.3	10	0.099561	0.524
Echo	237	685902.136	4815689.090	5.8	10	0.148608	0.524
Echo	238	685912.377	4815688.346	7.0	11	0.141545	0.469
Echo	239	685924.324	4815689.833	8.3	10	0.063059	0.530
Echo	240	685930.216	4815708.865	7.7	11	0.065010	0.529
Echo	241	685955.873	4815719.428	10.2	10	0.171525	0.529
Echo	242	685976.735	4815735.422	10.7	14	0.065766	0.525
Echo	243	685998.123	4815749.976	8.9	10	0.101493	0.528
Echo	244	685942.154	4816199.510	25.4	10	0.064115	0.270
Echo	245	685955.707	4816220.500	25.7	10	0.029966	0.293
Echo	246	685947.925	4816233.989	25.7	10	0.035346	0.294
Echo	247	685924.073	4816231.527	25.7	10	0.044913	0.294
Echo	248	685923.606	4816209.045	26.2	11	0.064810	0.270
Echo	C1	685995.115	4815631.592	14.6	15	0.036720	0.311
Echo	C2	685941.465	4816217.268	26.2	18	0.064841	0.282
Echo	C3	685940.933	4816219.766	26.3	13	0.082100	0.284
Echo	C4	686005.800	4815626.795	14.8	13	0.112002	0.384
Echo	P	685852.060	4814920.500	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Echo	P	685853.310	4814920.500	0.0			
Echo	P	685859.560	4814918.000	0.0			
Echo	P	685860.750	4814918.500	0.0			
Echo	P	685861.940	4814919.500	0.0			
Echo	P	685865.440	4814927.000	0.0			
Echo	P	685870.250	4814931.000	0.0			
Echo	P	685872.500	4814938.500	0.0			
Echo	P	685874.940	4814939.500	0.0			
Echo	P	685878.440	4814946.000	0.0			
Echo	P	685884.500	4814949.500	0.0			
Echo	P	685888.060	4814954.500	0.0			
Echo	P	685890.500	4814956.000	0.0			
Echo	P	685896.440	4814962.500	0.0			
Echo	P	685902.620	4814962.500	0.0			
Echo	P	685905.060	4814964.000	0.0			
Echo	P	685911.190	4814964.000	0.0			
Echo	P	685917.380	4814962.000	0.0			
Echo	P	685922.310	4814962.000	0.0			
Echo	P	685922.310	4814960.500	0.0			
Echo	P	685929.880	4814956.000	0.0			
Echo	P	685932.310	4814955.000	0.0			
Echo	P	685934.880	4814952.500	0.0			
Echo	P	685938.750	4814945.500	0.0			
Echo	P	685941.250	4814943.000	0.0			
Echo	P	685942.750	4814933.000	0.0			
Echo	P	685944.060	4814930.500	0.0			
Echo	P	685945.560	4814921.000	0.0			
Echo	P	685945.690	4814917.500	0.0			
Echo	P	685947.000	4814913.500	0.0			
Echo	P	685947.120	4814908.500	0.0			
Echo	P	685948.620	4814899.000	0.0			
Echo	P	685948.690	4814895.500	0.0			
Echo	P	685951.380	4814887.000	0.0			
Echo	P	685952.690	4814885.500	0.0			
Echo	P	685954.000	4814882.000	0.0			
Echo	P	685954.000	4814880.500	0.0			
Echo	P	685955.310	4814879.500	0.0			
Echo	P	685957.880	4814876.000	0.0			
Echo	P	685959.120	4814875.000	0.0			
Echo	P	685965.310	4814873.500	0.0			
Echo	P	685966.500	4814874.000	0.0			
Echo	P	685973.750	4814879.000	0.0			
Echo	P	685974.940	4814881.500	0.0			
Echo	P	685984.560	4814889.000	0.0			
Echo	P	685988.120	4814893.000	0.0			
Echo	P	685990.440	4814899.000	0.0			
Echo	P	685998.750	4814909.000	0.0			
Echo	P	685999.940	4814910.500	0.0			
Echo	P	686001.120	4814913.000	0.0			
Echo	P	686003.440	4814919.000	0.0			
Echo	P	686009.380	4814925.500	0.0			
Echo	P	686012.940	4814930.500	0.0			
Echo	P	686016.380	4814939.000	0.0			
Echo	P	686021.060	4814949.000	0.0			
Echo	P	686023.380	4814954.000	0.0			
Echo	P	686026.810	4814964.000	0.0			
Echo	P	686027.880	4814969.000	0.0			
Echo	P	686031.310	4814979.000	0.0			
Echo	P	686031.310	4814980.000	0.0			
Echo	P	686040.750	4814995.000	0.0			
Echo	P	686040.690	4814996.500	0.0			
Echo	P	686045.250	4815009.000	0.0			
Echo	P	686047.690	4815011.500	0.0			
Echo	P	686048.690	4815020.000	0.0			
Echo	P	686052.190	4815025.000	0.0			
Echo	P	686058.120	4815034.000	0.0			
Echo	P	686059.380	4815034.000	0.0			
Echo	P	686062.750	4815043.500	0.0			
Echo	P	686065.190	4815046.500	0.0			
Echo	P	686066.310	4815048.500	0.0			
Echo	P	686068.620	4815055.000	0.0			
Echo	P	686070.940	4815060.000	0.0			
Echo	P	686072.060	4815065.000	0.0			
Echo	P	686074.380	4815070.000	0.0			
Echo	P	686074.310	4815072.500	0.0			
Echo	P	686074.000	4815084.500	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Echo	P	686071.440	4815087.000	0.0			
Echo	P	686071.250	4815094.500	0.0			
Echo	P	686071.060	4815101.500	0.0			
Echo	P	686069.380	4815117.500	0.0			
Echo	P	686068.190	4815117.500	0.0			
Echo	P	686065.310	4815131.000	0.0			
Echo	P	686064.060	4815132.000	0.0			
Echo	P	686062.560	4815142.000	0.0			
Echo	P	686060.000	4815146.500	0.0			
Echo	P	686058.750	4815148.000	0.0			
Echo	P	686058.690	4815149.000	0.0			
Echo	P	686053.560	4815156.500	0.0			
Echo	P	686053.560	4815157.500	0.0			
Echo	P	686053.500	4815159.000	0.0			
Echo	P	686050.940	4815163.500	0.0			
Echo	P	686050.880	4815166.000	0.0			
Echo	P	686050.690	4815172.000	0.0			
Echo	P	686050.500	4815178.500	0.0			
Echo	P	686050.440	4815181.000	0.0			
Echo	P	686052.880	4815182.000	0.0			
Echo	P	686055.310	4815183.500	0.0			
Echo	P	686057.810	4815182.000	0.0			
Echo	P	686062.560	4815187.500	0.0			
Echo	P	686063.560	4815196.000	0.0			
Echo	P	686064.620	4815202.000	0.0			
Echo	P	686067.060	4815203.500	0.0			
Echo	P	686070.690	4815206.000	0.0			
Echo	P	686075.500	4815210.000	0.0			
Echo	P	686077.810	4815216.000	0.0			
Echo	P	686078.940	4815219.500	0.0			
Echo	P	686078.880	4815222.000	0.0			
Echo	P	686076.310	4815225.500	0.0			
Echo	P	686075.060	4815227.000	0.0			
Echo	P	686068.690	4815235.500	0.0			
Echo	P	686053.440	4815252.000	0.0			
Echo	P	686052.190	4815253.000	0.0			
Echo	P	686050.940	4815254.500	0.0			
Echo	P	686048.310	4815259.000	0.0			
Echo	P	686039.560	4815266.500	0.0			
Echo	P	686039.500	4815267.500	0.0			
Echo	P	686038.250	4815268.500	0.0			
Echo	P	686037.000	4815270.000	0.0			
Echo	P	686033.120	4815276.000	0.0			
Echo	P	686033.060	4815277.000	0.0			
Echo	P	686031.750	4815282.000	0.0			
Echo	P	686031.690	4815284.500	0.0			
Echo	P	686025.380	4815290.500	0.0			
Echo	P	686022.880	4815291.500	0.0			
Echo	P	686021.620	4815292.500	0.0			
Echo	P	686019.060	4815296.500	0.0			
Echo	P	686017.750	4815298.500	0.0			
Echo	P	686016.250	4815309.500	0.0			
Echo	P	686014.940	4815312.000	0.0			
Echo	P	686015.940	4815319.500	0.0			
Echo	P	686017.120	4815321.000	0.0			
Echo	P	686018.440	4815319.500	0.0			
Echo	P	686018.560	4815313.500	0.0			
Echo	P	686019.810	4815312.500	0.0			
Echo	P	686019.810	4815313.500	0.0			
Echo	P	686019.620	4815319.500	0.0			
Echo	P	686020.750	4815323.500	0.0			
Echo	P	686020.560	4815330.500	0.0			
Echo	P	686024.120	4815335.500	0.0			
Echo	P	686026.500	4815338.500	0.0			
Echo	P	686026.120	4815352.000	0.0			
Echo	P	686026.120	4815353.000	0.0			
Echo	P	686026.060	4815354.000	0.0			
Echo	P	686026.060	4815355.500	0.0			
Echo	P	686023.310	4815365.000	0.0			
Echo	P	686022.060	4815366.500	0.0			
Echo	P	686015.560	4815378.500	0.0			
Echo	P	686014.310	4815379.500	0.0			
Echo	P	686014.120	4815387.000	0.0			
Echo	P	686014.120	4815388.000	0.0			
Echo	P	686015.310	4815389.500	0.0			
Echo	P	686015.190	4815394.500	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Echo	P	686014.750	4815409.000	0.0			
Echo	P	686014.690	4815411.500	0.0			
Echo	P	686014.690	4815412.500	0.0			
Echo	P	686014.620	4815414.000	0.0			
Echo	P	686012.000	4815420.000	0.0			
Echo	P	686010.750	4815421.000	0.0			
Echo	P	686009.380	4815426.000	0.0			
Echo	P	686009.380	4815427.500	0.0			
Echo	P	686008.060	4815428.500	0.0			
Echo	P	686007.940	4815433.500	0.0			
Echo	P	686007.940	4815434.500	0.0			
Echo	P	686009.060	4815437.000	0.0			
Echo	P	686013.940	4815439.500	0.0			
Echo	P	686016.310	4815443.500	0.0			
Echo	P	686021.120	4815446.000	0.0			
Echo	P	686028.380	4815451.000	0.0			
Echo	P	686040.500	4815457.500	0.0			
Echo	P	686047.750	4815463.000	0.0			
Echo	P	686054.940	4815469.000	0.0			
Echo	P	686058.560	4815473.000	0.0			
Echo	P	686063.380	4815477.000	0.0			
Echo	P	686065.750	4815479.500	0.0			
Echo	P	686068.120	4815482.000	0.0			
Echo	P	686070.500	4815484.500	0.0			
Echo	P	686071.620	4815490.500	0.0			
Echo	P	686072.690	4815495.500	0.0			
Echo	P	686073.880	4815498.000	0.0			
Echo	P	686077.560	4815498.000	0.0			
Echo	P	686080.000	4815497.000	0.0			
Echo	P	686088.620	4815497.500	0.0			
Echo	P	686094.620	4815502.500	0.0			
Echo	P	686096.810	4815512.500	0.0			
Echo	P	686103.940	4815523.500	0.0			
Echo	P	686112.380	4815530.000	0.0			
Echo	P	686113.500	4815533.500	0.0			
Echo	P	686125.500	4815544.000	0.0			
Echo	P	686127.880	4815547.500	0.0			
Echo	P	686128.940	4815552.500	0.0			
Echo	P	686129.810	4815567.500	0.0			
Echo	P	686129.560	4815574.500	0.0			
Echo	P	686129.310	4815585.500	0.0			
Echo	P	686127.440	4815609.000	0.0			
Echo	P	686128.000	4815633.500	0.0			
Echo	P	686129.250	4815633.500	0.0			
Echo	P	686130.250	4815642.000	0.0			
Echo	P	686129.880	4815655.500	0.0			
Echo	P	686128.440	4815663.000	0.0			
Echo	P	686127.880	4815684.000	0.0			
Echo	P	686126.620	4815685.000	0.0			
Echo	P	686124.000	4815691.000	0.0			
Echo	P	686123.940	4815692.500	0.0			
Echo	P	686115.000	4815705.500	0.0			
Echo	P	686113.690	4815708.000	0.0			
Echo	P	686107.310	4815716.500	0.0			
Echo	P	686103.500	4815721.000	0.0			
Echo	P	686101.000	4815722.000	0.0			
Echo	P	686091.060	4815725.500	0.0			
Echo	P	686089.810	4815727.000	0.0			
Echo	P	686081.190	4815727.500	0.0			
Echo	P	686071.190	4815732.500	0.0			
Echo	P	686058.690	4815739.500	0.0			
Echo	P	686058.620	4815741.500	0.0			
Echo	P	686054.750	4815749.000	0.0			
Echo	P	686053.310	4815757.500	0.0			
Echo	P	686052.060	4815758.500	0.0			
Echo	P	686053.000	4815768.500	0.0			
Echo	P	686054.190	4815770.000	0.0			
Echo	P	686052.620	4815782.000	0.0			
Echo	P	686051.250	4815787.000	0.0			
Echo	P	686051.190	4815790.500	0.0			
Echo	P	686049.810	4815795.500	0.0			
Echo	P	686047.000	4815807.500	0.0			
Echo	P	686044.380	4815815.000	0.0			
Echo	P	686043.120	4815816.000	0.0			
Echo	P	686039.250	4815823.500	0.0			
Echo	P	686037.940	4815824.500	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Echo	P	686034.120	4815829.500	0.0			
Echo	P	686032.750	4815834.000	0.0			
Echo	P	686030.000	4815846.500	0.0			
Echo	P	686028.750	4815847.500	0.0			
Echo	P	686028.690	4815850.000	0.0			
Echo	P	686028.310	4815862.500	0.0			
Echo	P	686028.250	4815866.000	0.0			
Echo	P	686029.310	4815871.000	0.0			
Echo	P	686030.380	4815878.500	0.0			
Echo	P	686031.250	4815890.500	0.0			
Echo	P	686032.440	4815893.000	0.0			
Echo	P	686032.190	4815901.500	0.0			
Echo	P	686032.060	4815905.500	0.0			
Echo	P	686025.380	4815926.000	0.0			
Echo	P	686024.000	4815932.000	0.0			
Echo	P	686025.060	4815938.000	0.0			
Echo	P	686025.000	4815939.500	0.0			
Echo	P	686026.060	4815945.500	0.0			
Echo	P	686025.880	4815953.000	0.0			
Echo	P	686026.940	4815959.000	0.0			
Echo	P	686029.000	4815972.500	0.0			
Echo	P	686030.250	4815974.000	0.0			
Echo	P	686032.500	4815981.500	0.0			
Echo	P	686032.120	4815993.500	0.0			
Echo	P	686033.060	4816004.500	0.0			
Echo	P	686034.000	4816016.000	0.0			
Echo	P	686035.120	4816021.000	0.0			
Echo	P	686036.250	4816024.500	0.0			
Echo	P	686038.120	4816045.500	0.0			
Echo	P	686039.060	4816056.500	0.0			
Echo	P	686043.500	4816074.000	0.0			
Echo	P	686044.560	4816080.000	0.0			
Echo	P	686050.440	4816090.000	0.0			
Echo	P	686052.880	4816092.500	0.0			
Echo	P	686059.810	4816107.500	0.0			
Echo	P	686068.000	4816122.500	0.0			
Echo	P	686072.500	4816138.500	0.0			
Echo	P	686079.560	4816151.000	0.0			
Echo	P	686087.690	4816168.500	0.0			
Echo	P	686092.250	4816181.000	0.0			
Echo	P	686093.500	4816182.000	0.0			
Echo	P	686098.250	4816187.000	0.0			
Echo	P	686101.940	4816187.500	0.0			
Echo	P	686112.880	4816192.500	0.0			
Echo	P	686117.750	4816195.000	0.0			
Echo	P	686125.000	4816198.000	0.0			
Echo	P	686127.500	4816198.000	0.0			
Echo	P	686138.560	4816198.500	0.0			
Echo	P	686139.750	4816198.500	0.0			
Echo	P	686149.440	4816205.000	0.0			
Echo	P	686150.620	4816206.000	0.0			
Echo	P	686161.620	4816210.000	0.0			
Echo	P	686172.500	4816215.500	0.0			
Echo	P	686183.440	4816222.000	0.0			
Echo	P	686194.310	4816228.500	0.0			
Echo	P	686200.440	4816229.500	0.0			
Echo	P	686207.690	4816233.500	0.0			
Echo	P	686213.690	4816240.000	0.0			
Echo	P	686220.880	4816246.500	0.0			
Echo	P	686224.500	4816250.000	0.0			
Echo	P	686234.060	4816260.000	0.0			
Echo	P	686235.190	4816262.500	0.0			
Echo	P	686242.500	4816266.500	0.0			
Echo	P	686243.690	4816268.000	0.0			
Echo	P	686251.060	4816268.000	0.0			
Echo	P	686258.440	4816268.500	0.0			
Echo	P	686259.560	4816272.000	0.0			
Echo	P	686269.120	4816281.000	0.0			
Echo	P	686273.940	4816285.000	0.0			
Echo	P	686277.560	4816288.500	0.0			
Echo	P	686282.440	4816290.000	0.0			
Echo	P	686283.620	4816292.500	0.0			
Echo	P	686290.810	4816299.000	0.0			
Echo	P	686294.440	4816300.000	0.0			
Echo	P	686300.560	4816301.500	0.0			
Echo	P	686311.620	4816303.000	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Echo	P	686315.310	4816303.500	0.0			
Echo	P	686318.940	4816304.500	0.0			
Echo	P	686325.000	4816307.500	0.0			
Echo	P	686327.500	4816307.500	0.0			
Echo	P	686329.940	4816307.500	0.0			
Echo	P	686332.380	4816309.000	0.0			
Echo	P	686339.560	4816315.000	0.0			
Echo	P	686340.750	4816317.500	0.0			
Echo	P	686340.690	4816320.000	0.0			
Echo	P	686336.750	4816327.500	0.0			
Echo	P	686331.620	4816335.500	0.0			
Echo	P	686330.380	4816337.000	0.0			
Echo	P	686321.440	4816349.000	0.0			
Echo	P	686315.120	4816355.000	0.0			
Echo	P	686310.060	4816359.500	0.0			
Echo	P	686297.440	4816372.500	0.0			
Echo	P	686292.380	4816376.000	0.0			
Echo	P	686281.120	4816384.500	0.0			
Echo	P	686274.880	4816386.500	0.0			
Echo	P	686268.620	4816390.000	0.0			
Echo	P	686267.380	4816391.500	0.0			
Echo	P	686258.750	4816393.500	0.0			
Echo	P	686251.310	4816395.500	0.0			
Echo	P	686245.060	4816398.000	0.0			
Echo	P	686237.690	4816399.000	0.0			
Echo	P	686228.940	4816402.500	0.0			
Echo	P	686220.310	4816403.500	0.0			
Echo	P	686215.440	4816403.000	0.0			
Echo	P	686196.940	4816404.000	0.0			
Echo	P	686189.560	4816403.500	0.0			
Echo	P	686177.380	4816400.500	0.0			
Echo	P	686170.060	4816398.000	0.0			
Echo	P	686160.250	4816396.500	0.0			
Echo	P	686152.880	4816396.500	0.0			
Echo	P	686151.620	4816396.000	0.0			
Echo	P	686144.310	4816395.000	0.0			
Echo	P	686140.620	4816394.500	0.0			
Echo	P	686139.380	4816394.500	0.0			
Echo	P	686138.190	4816393.500	0.0			
Echo	P	686133.380	4816389.500	0.0			
Echo	P	686131.000	4816387.000	0.0			
Echo	P	686125.000	4816380.500	0.0			
Echo	P	686116.620	4816372.000	0.0			
Echo	P	686110.560	4816369.000	0.0			
Echo	P	686102.000	4816366.500	0.0			
Echo	P	686081.190	4816363.500	0.0			
Echo	P	686073.880	4816362.000	0.0			
Echo	P	686068.940	4816361.500	0.0			
Echo	P	686060.250	4816365.000	0.0			
Echo	P	686050.380	4816366.000	0.0			
Echo	P	686040.440	4816368.000	0.0			
Echo	P	686027.880	4816379.000	0.0			
Echo	P	686021.620	4816383.500	0.0			
Echo	P	686012.810	4816389.500	0.0			
Echo	P	686007.880	4816391.500	0.0			
Echo	P	685994.190	4816397.500	0.0			
Echo	P	685986.750	4816399.500	0.0			
Echo	P	685974.310	4816403.000	0.0			
Echo	P	685970.620	4816404.000	0.0			
Echo	P	685954.560	4816407.000	0.0			
Echo	P	685947.120	4816409.500	0.0			
Echo	P	685944.620	4816410.500	0.0			
Echo	P	685931.000	4816412.500	0.0			
Echo	P	685926.060	4816415.000	0.0			
Echo	P	685921.120	4816414.500	0.0			
Echo	P	685913.810	4816413.000	0.0			
Echo	P	685912.560	4816413.000	0.0			
Echo	P	685897.880	4816411.500	0.0			
Echo	P	685896.620	4816411.500	0.0			
Echo	P	685894.190	4816411.500	0.0			
Echo	P	685891.690	4816411.500	0.0			
Echo	P	685889.250	4816411.000	0.0			
Echo	P	685881.810	4816412.000	0.0			
Echo	P	685880.620	4816412.000	0.0			
Echo	P	685878.060	4816414.500	0.0			
Echo	P	685856.250	4816404.000	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Echo	P	685853.810	4816401.500	0.0			
Echo	P	685843.000	4816392.500	0.0			
Echo	P	685838.250	4816387.500	0.0			
Echo	P	685833.440	4816382.500	0.0			
Echo	P	685826.190	4816378.500	0.0			
Echo	P	685822.620	4816372.500	0.0			
Echo	P	685815.310	4816369.500	0.0			
Echo	P	685806.810	4816365.500	0.0			
Echo	P	685799.500	4816363.000	0.0			
Echo	P	685793.380	4816362.500	0.0			
Echo	P	685783.560	4816362.500	0.0			
Echo	P	685771.190	4816364.500	0.0			
Echo	P	685765.060	4816364.500	0.0			
Echo	P	685753.940	4816366.500	0.0			
Echo	P	685752.690	4816366.500	0.0			
Echo	P	685751.440	4816366.500	0.0			
Echo	P	685746.560	4816365.000	0.0			
Echo	P	685745.440	4816362.500	0.0			
Echo	P	685743.120	4816357.500	0.0			
Echo	P	685740.940	4816345.000	0.0			
Echo	P	685740.120	4816331.500	0.0			
Echo	P	685739.120	4816321.500	0.0			
Echo	P	685735.750	4816312.000	0.0			
Echo	P	685733.500	4816303.000	0.0			
Echo	P	685725.380	4816285.500	0.0			
Echo	P	685721.810	4816279.500	0.0			
Echo	P	685719.500	4816274.500	0.0			
Echo	P	685723.620	4816260.000	0.0			
Echo	P	685727.750	4816241.500	0.0			
Echo	P	685730.500	4816233.000	0.0			
Echo	P	685732.750	4816194.000	0.0			
Echo	P	685734.250	4816185.500	0.0			
Echo	P	685734.750	4816166.000	0.0			
Echo	P	685737.690	4816148.500	0.0			
Echo	P	685740.440	4816136.500	0.0			
Echo	P	685742.500	4816107.000	0.0			
Echo	P	685745.120	4816101.000	0.0			
Echo	P	685745.690	4816079.000	0.0			
Echo	P	685743.440	4816071.500	0.0			
Echo	P	685743.620	4816065.500	0.0			
Echo	P	685752.560	4816052.000	0.0			
Echo	P	685754.060	4816042.500	0.0			
Echo	P	685755.310	4816041.500	0.0			
Echo	P	685756.620	4816039.000	0.0			
Echo	P	685766.690	4816032.000	0.0			
Echo	P	685769.190	4816029.500	0.0			
Echo	P	685774.310	4816022.000	0.0			
Echo	P	685775.560	4816021.000	0.0			
Echo	P	685776.810	4816020.000	0.0			
Echo	P	685789.380	4816011.500	0.0			
Echo	P	685794.440	4816005.500	0.0			
Echo	P	685800.750	4815998.500	0.0			
Echo	P	685800.880	4815995.000	0.0			
Echo	P	685802.500	4815981.500	0.0			
Echo	P	685803.750	4815980.000	0.0			
Echo	P	685799.060	4815971.500	0.0			
Echo	P	685799.060	4815970.500	0.0			
Echo	P	685796.000	4815948.000	0.0			
Echo	P	685795.060	4815937.000	0.0			
Echo	P	685796.620	4815923.500	0.0			
Echo	P	685798.000	4815918.500	0.0			
Echo	P	685798.190	4815912.500	0.0			
Echo	P	685796.060	4815899.000	0.0			
Echo	P	685796.940	4815867.000	0.0			
Echo	P	685799.690	4815856.000	0.0			
Echo	P	685802.620	4815839.000	0.0			
Echo	P	685803.880	4815838.000	0.0			
Echo	P	685806.620	4815827.000	0.0			
Echo	P	685807.880	4815827.000	0.0			
Echo	P	685810.560	4815818.500	0.0			
Echo	P	685810.620	4815817.500	0.0			
Echo	P	685814.380	4815813.500	0.0			
Echo	P	685824.500	4815804.000	0.0			
Echo	P	685827.060	4815800.500	0.0			
Echo	P	685830.940	4815792.000	0.0			
Echo	P	685832.250	4815791.000	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Echo	P	685833.690	4815782.500	0.0			
Echo	P	685833.880	4815776.500	0.0			
Echo	P	685831.690	4815766.500	0.0			
Echo	P	685830.500	4815764.000	0.0			
Echo	P	685829.500	4815755.500	0.0			
Echo	P	685824.940	4815741.500	0.0			
Echo	P	685825.190	4815733.000	0.0			
Echo	P	685824.000	4815730.500	0.0			
Echo	P	685822.120	4815709.500	0.0			
Echo	P	685822.310	4815702.500	0.0			
Echo	P	685821.120	4815701.000	0.0			
Echo	P	685816.620	4815686.000	0.0			
Echo	P	685815.690	4815674.000	0.0			
Echo	P	685814.560	4815671.500	0.0			
Echo	P	685812.380	4815661.500	0.0			
Echo	P	685803.380	4815629.500	0.0			
Echo	P	685801.000	4815627.000	0.0			
Echo	P	685801.000	4815625.500	0.0			
Echo	P	685799.120	4815604.500	0.0			
Echo	P	685798.000	4815602.000	0.0			
Echo	P	685798.060	4815599.500	0.0			
Echo	P	685798.560	4815580.000	0.0			
Echo	P	685800.000	4815573.000	0.0			
Echo	P	685800.250	4815563.000	0.0			
Echo	P	685800.310	4815561.500	0.0			
Echo	P	685807.810	4815557.000	0.0			
Echo	P	685809.060	4815556.000	0.0			
Echo	P	685820.690	4815535.500	0.0			
Echo	P	685823.190	4815533.000	0.0			
Echo	P	685824.750	4815521.000	0.0			
Echo	P	685824.940	4815516.000	0.0			
Echo	P	685825.440	4815496.500	0.0			
Echo	P	685824.620	4815481.500	0.0			
Echo	P	685823.500	4815476.500	0.0			
Echo	P	685822.310	4815476.500	0.0			
Echo	P	685818.750	4815470.500	0.0			
Echo	P	685817.560	4815469.000	0.0			
Echo	P	685812.690	4815467.500	0.0			
Echo	P	685806.560	4815467.500	0.0			
Echo	P	685801.620	4815466.000	0.0			
Echo	P	685792.880	4815472.000	0.0			
Echo	P	685787.880	4815475.500	0.0			
Echo	P	685778.060	4815475.000	0.0			
Echo	P	685776.810	4815475.000	0.0			
Echo	P	685770.810	4815469.000	0.0			
Echo	P	685768.440	4815466.000	0.0			
Echo	P	685768.620	4815459.000	0.0			
Echo	P	685769.250	4815437.000	0.0			
Echo	P	685773.500	4815416.000	0.0			
Echo	P	685777.750	4815394.000	0.0			
Echo	P	685779.190	4815387.000	0.0			
Echo	P	685780.560	4815382.000	0.0			
Echo	P	685780.690	4815378.500	0.0			
Echo	P	685785.810	4815368.500	0.0			
Echo	P	685787.120	4815366.000	0.0			
Echo	P	685789.880	4815355.500	0.0			
Echo	P	685791.190	4815353.000	0.0			
Echo	P	685791.250	4815350.500	0.0			
Echo	P	685799.000	4815337.000	0.0			
Echo	P	685800.250	4815336.000	0.0			
Echo	P	685803.940	4815336.000	0.0			
Echo	P	685808.880	4815336.000	0.0			
Echo	P	685823.690	4815334.500	0.0			
Echo	P	685836.000	4815333.500	0.0			
Echo	P	685842.250	4815330.000	0.0			
Echo	P	685849.810	4815323.000	0.0			
Echo	P	685857.500	4815312.000	0.0			
Echo	P	685858.880	4815307.000	0.0			
Echo	P	685856.750	4815295.000	0.0			
Echo	P	685858.500	4815274.000	0.0			
Echo	P	685859.940	4815266.500	0.0			
Echo	P	685862.620	4815258.000	0.0			
Echo	P	685864.250	4815244.500	0.0			
Echo	P	685867.000	4815234.000	0.0			
Echo	P	685867.440	4815218.000	0.0			
Echo	P	685870.060	4815212.000	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Echo	P	685870.190	4815205.500	0.0			
Echo	P	685870.380	4815198.500	0.0			
Echo	P	685876.940	4815184.000	0.0			
Echo	P	685885.000	4815159.500	0.0			
Echo	P	685889.060	4815146.000	0.0			
Echo	P	685889.380	4815134.000	0.0			
Echo	P	685888.440	4815123.000	0.0			
Echo	P	685891.500	4815101.000	0.0			
Echo	P	685892.940	4815092.500	0.0			
Echo	P	685893.120	4815085.000	0.0			
Echo	P	685893.560	4815070.000	0.0			
Echo	P	685893.750	4815063.000	0.0			
Echo	P	685894.000	4815053.000	0.0			
Echo	P	685892.940	4815047.000	0.0			
Echo	P	685893.440	4815029.500	0.0			
Echo	P	685892.310	4815026.000	0.0			
Echo	P	685890.000	4815018.500	0.0			
Echo	P	685886.620	4815008.500	0.0			
Echo	P	685883.120	4815000.000	0.0			
Echo	P	685882.000	4814997.500	0.0			
Echo	P	685877.380	4814985.000	0.0			
Echo	P	685876.310	4814980.000	0.0			
Echo	P	685873.940	4814976.500	0.0			
Echo	P	685867.000	4814961.500	0.0			
Echo	P	685861.060	4814951.500	0.0			
Echo	P	685858.750	4814946.500	0.0			
Echo	P	685856.380	4814944.000	0.0			
Echo	P	685854.060	4814939.000	0.0			
Echo	P	685852.880	4814937.500	0.0			
Echo	P	685851.690	4814936.500	0.0			
Echo	P	685848.120	4814930.000	0.0			
Echo	P	685845.750	4814926.500	0.0			
Echo	P	685878.440	4815584.000	0.0			
Echo	P	685878.380	4815585.000	0.0			
Echo	P	685879.560	4815586.500	0.0			
Echo	P	685880.690	4815591.500	0.0			
Echo	P	685880.620	4815592.500	0.0			
Echo	P	685880.560	4815596.000	0.0			
Echo	P	685880.500	4815598.500	0.0			
Echo	P	685881.500	4815606.000	0.0			
Echo	P	685882.690	4815607.500	0.0			
Echo	P	685882.500	4815616.000	0.0			
Echo	P	685881.250	4815616.000	0.0			
Echo	P	685882.310	4815621.000	0.0			
Echo	P	685883.440	4815625.500	0.0			
Echo	P	685884.560	4815630.500	0.0			
Echo	P	685884.500	4815632.000	0.0			
Echo	P	685888.120	4815634.500	0.0			
Echo	P	685888.060	4815637.000	0.0			
Echo	P	685886.690	4815643.000	0.0			
Echo	P	685886.440	4815650.500	0.0			
Echo	P	685886.380	4815654.000	0.0			
Echo	P	685886.310	4815655.500	0.0			
Echo	P	685886.310	4815656.500	0.0			
Echo	P	685882.120	4815673.500	0.0			
Echo	P	685880.810	4815677.000	0.0			
Echo	P	685879.560	4815678.500	0.0			
Echo	P	685878.310	4815678.500	0.0			
Echo	P	685877.120	4815678.500	0.0			
Echo	P	685875.880	4815678.000	0.0			
Echo	P	685874.620	4815678.000	0.0			
Echo	P	685872.250	4815675.500	0.0			
Echo	P	685871.190	4815669.500	0.0			
Echo	P	685870.000	4815667.000	0.0			
Echo	P	685870.120	4815663.500	0.0			
Echo	P	685870.190	4815661.000	0.0			
Echo	P	685870.310	4815656.000	0.0			
Echo	P	685870.500	4815650.000	0.0			
Echo	P	685869.440	4815643.500	0.0			
Echo	P	685868.250	4815641.000	0.0			
Echo	P	685868.440	4815635.000	0.0			
Echo	P	685868.500	4815631.500	0.0			
Echo	P	685868.560	4815629.000	0.0			
Echo	P	685868.690	4815625.500	0.0			
Echo	P	685868.750	4815623.000	0.0			
Echo	P	685868.880	4815619.000	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Echo	P	685869.000	4815614.000	0.0			
Echo	P	685867.880	4815609.500	0.0			
Echo	P	685868.000	4815604.500	0.0			
Echo	P	685868.190	4815598.000	0.0			
Echo	P	685867.000	4815596.000	0.0			
Echo	P	685867.060	4815593.500	0.0			
Echo	P	685867.250	4815588.500	0.0			
Echo	P	685868.500	4815587.000	0.0			
Echo	P	685869.750	4815586.000	0.0			
Echo	P	685871.000	4815585.000	0.0			
Echo	P	685872.250	4815583.500	0.0			
Echo	P	685872.310	4815582.500	0.0			
Echo	P	685873.560	4815581.000	0.0			
Echo	P	685878.440	4815584.000	0.0			
Emerald	1	111184.197	86205.397	9.8	21	0.242978	0.510
Emerald	2	111167.372	86242.317	10.0	24	0.053475	0.510
Emerald	3	111183.203	86265.432	10.6	13	0.066037	0.519
Emerald	4	111162.576	86187.123	9.5	11	0.121040	0.521
Emerald	5	111171.543	86176.858	9.4	21	0.154964	0.480
Emerald	6	111181.587	86164.190	9.4	13	0.092620	0.484
Emerald	7	111227.858	86141.134	8.7	11	0.213751	0.478
Emerald	8	111217.901	86157.956	8.9	12	0.060393	0.471
Emerald	9	111200.038	86170.733	9.3	10	0.112920	0.469
Emerald	10	111187.731	86222.624	10.0	21	0.118667	0.447
Emerald	11	111187.933	86239.757	10.2	21	0.107211	0.443
Emerald	12	111196.229	86258.943	10.7	36	0.169017	0.429
Emerald	13	111211.162	86262.594	10.6	38	0.141289	0.424
Emerald	14	111200.329	86278.675	10.8	37	0.144977	0.425
Emerald	15	111198.180	86293.675	10.8	24	0.122337	0.426
Emerald	16	111219.092	86296.036	10.8	17	0.058604	0.431
Emerald	17	111237.066	86314.134	10.7	19	0.241994	0.429
Emerald	18	111212.207	86330.714	10.2	23	0.119505	0.568
Emerald	19	111216.306	86314.460	10.8	36	0.078104	0.556
Emerald	20	111198.536	86309.344	10.6	23	0.083777	0.416
Emerald	21	111176.970	86306.346	10.2	17	0.508673	0.582
Emerald	22	111159.696	86285.649	10.0	22	0.097578	0.597
Emerald	23	111159.908	86263.982	10.2	27	0.144015	0.421
Emerald	24	111224.922	86191.703	8.5	17	0.139176	0.401
Emerald	25	111224.660	86173.012	8.6	15	0.108938	0.402
Emerald	26	111256.608	86183.380	5.5	20	0.541958	0.589
Emerald	27	111275.910	86192.720	4.4	11	0.117226	0.675
Emerald	28	111276.973	86175.432	8.7	15	0.099991	0.674
Emerald	29	111280.939	86162.720	10.4	19	0.173055	0.669
Emerald	30	111293.516	86144.139	12.5	32	0.245521	0.656
Emerald	31	111304.843	86143.165	13.3	22	0.068886	0.666
Emerald	32	111303.688	86186.331	11.5	22	0.704360	0.646
Emerald	33	111302.187	86209.068	8.8	11	0.165741	0.656
Emerald	34	111323.725	86230.104	8.2	12	0.350614	0.653
Emerald	35	111308.156	86228.570	5.2	11	0.282198	0.654
Emerald	36	111301.978	86219.245	6.9	16	0.277638	0.648
Emerald	37	111293.113	86211.137	5.7	15	0.357634	0.649
Emerald	38	111327.654	86147.132	13.7	11	0.122363	0.642
Emerald	39	111353.364	86171.573	13.3	34	0.180012	0.604
Emerald	40	111345.871	86191.336	12.9	38	0.116647	0.601
Emerald	41	111341.601	86205.450	11.7	35	0.322654	0.603
Emerald	42	111357.118	86225.789	10.6	19	0.213555	0.619
Emerald	43	111355.854	86243.979	4.5	18	0.256007	0.620
Emerald	44	111363.900	86248.900	4.6	20	0.360636	0.551
Emerald	45	111371.302	86253.425	3.6	21	0.187782	0.540
Emerald	46	111378.365	86258.905	2.6	13	0.553352	0.589
Emerald	47	111386.676	86259.293	2.3	12	0.434474	0.653
Emerald	48	111390.728	86239.848	6.6	22	0.174358	0.642
Emerald	49	111385.382	86215.448	9.4	21	0.315370	0.525
Emerald	50	111377.480	86182.470	11.8	30	0.255765	0.628
Emerald	51	111372.835	86157.338	12.1	58	0.118269	0.482
Emerald	52	111364.835	86133.238	11.9	30	0.108305	0.492
Emerald	53	111232.011	86370.760	9.0	29	0.067050	0.422
Emerald	54	111244.136	86384.013	9.1	28	0.097802	0.430
Emerald	55	111251.607	86393.063	9.0	16	0.097466	0.420
Emerald	56	111254.730	86398.600	8.9	20	0.150798	0.425
Emerald	57	111260.269	86406.629	8.7	22	0.074130	0.450
Emerald	58	111264.679	86411.892	8.6	22	0.346713	0.409
Emerald	59	111285.462	86424.971	8.5	26	0.099680	0.400
Emerald	60	111304.508	86422.589	7.7	19	0.136574	0.398
Emerald	61	111323.031	86411.873	8.2	21	24.254517	0.394

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Emerald	62	111316.916	86406.885	8.7	15	0.088122	0.398
Emerald	63	111327.213	86399.508	8.4	14	0.249597	0.451
Emerald	64	111321.984	86376.942	8.8	12	0.065619	0.459
Emerald	65	111314.981	86360.154	9.0	11	0.109888	0.405
Emerald	66	111299.875	86335.884	8.9	15	0.114615	0.441
Emerald	67	111338.567	86405.065	7.6	12	0.044723	0.458
Emerald	68	111341.611	86429.373	4.4	11	0.066332	0.400
Emerald	69	111346.005	86448.725	1.6	15	0.096833	0.397
Emerald	70	111362.218	86458.891	1.2	15	0.054952	0.396
Emerald	71	111341.961	86463.555	1.2	15	0.046130	0.395
Emerald	72	111316.342	86467.662	4.3	12	0.212171	0.438
Emerald	73	111312.102	86479.559	1.6	18	0.853845	0.471
Emerald	74	111302.320	86471.015	5.6	12	0.050814	0.396
Emerald	75	111317.566	86454.414	6.7	14	0.055721	0.395
Emerald	76	111317.187	86468.046	3.3	14	0.065522	0.395
Emerald	77	111330.302	86456.582	2.9	13	0.051276	0.395
Emerald	78	111355.287	86447.926	1.3	12	0.078626	0.396
Emerald	79	111381.103	86458.920	1.5	11	0.081089	0.397
Emerald	80	111396.950	86454.432	1.6	11	0.058278	0.397
Emerald	81	111414.958	86450.363	2.1	18	0.078430	0.393
Emerald	82	111426.011	86447.602	2.2	11	0.069679	0.399
Emerald	83	111434.117	86441.740	1.9	12	0.374095	0.407
Emerald	84	111418.151	86411.742	1.2	11	0.075593	0.309
Emerald	85	111405.844	86351.878	1.6	11	0.056695	0.311
Emerald	86	111145.143	86242.678	8.5	1		
Emerald	87	111131.668	86241.312	3.3	1		
Emerald	88	111125.157	86225.852	6.3	1		
Emerald	89	111098.984	86214.125	5.6	1		
Emerald	90	111090.700	86205.757	4.7	1		
Emerald	91	111113.320	86198.120	7.7	1		
Emerald	92	111143.173	86217.440	9.3	1		
Emerald	93	111158.205	86205.225	9.6	1		
Emerald	94	111168.868	86199.470	9.6	1		
Emerald	95	111152.151	86186.230	9.3	1		
Emerald	96	111145.997	86175.256	9.1	1		
Emerald	97	111123.128	86177.483	8.3	1		
Emerald	98	111108.796	86172.182	7.0	1		
Emerald	99	111109.858	86162.117	5.5	1		
Emerald	100	111132.985	86165.129	8.6	1		
Emerald	101	111137.217	86151.137	8.6	1		
Emerald	102	111146.414	86156.334	8.9	1		
Emerald	103	111152.251	86151.439	9.0	1		
Emerald	104	111154.026	86145.098	8.9	1		
Emerald	105	111164.589	86146.759	9.0	1		
Emerald	106	111165.118	86140.486	8.9	1		
Emerald	107	111153.872	86136.435	8.7	1		
Emerald	108	111160.126	86109.968	7.9	1		
Emerald	109	111165.953	86102.648	8.1	1		
Emerald	110	111175.646	86097.094	8.5	1		
Emerald	111	111179.327	86113.402	8.8	1		
Emerald	112	111183.291	86131.413	9.1	1		
Emerald	113	111202.048	86123.488	9.2	1		
Emerald	114	111194.464	86106.124	9.1	1		
Emerald	115	111186.185	86102.089	8.9	1		
Emerald	116	111194.724	86093.965	9.0	1		
Emerald	117	111175.190	86054.705	7.9	1		
Emerald	118	111181.493	86062.663	8.2	1		
Emerald	119	111190.178	86070.976	8.7	1		
Emerald	120	111195.924	86075.055	8.8	1		
Emerald	121	111211.287	86078.715	8.9	1		
Emerald	122	111203.923	86070.137	8.8	1		
Emerald	123	111193.472	86060.809	8.5	1		
Emerald	124	111183.590	86050.200	8.1	1		
Emerald	125	111195.108	86050.555	8.3	1		
Emerald	126	111204.486	86059.590	8.6	1		
Emerald	127	111213.161	86055.484	8.4	1		
Emerald	128	111206.390	86046.830	8.2	1		
Emerald	129	111218.192	86034.861	7.6	1		
Emerald	130	111230.329	86049.297	7.7	1		
Emerald	131	111235.702	86044.270	7.3	1		
Emerald	132	111231.565	86028.422	6.5	1		
Emerald	133	111239.405	86055.593	7.7	1		
Emerald	134	111233.473	86064.469	8.2	1		
Emerald	135	111230.047	86071.226	8.2	1		
Emerald	136	111236.211	86076.066	8.4	1		
Emerald	137	111254.752	86010.111	0.8	1		

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Emerald	138	111263.327	86004.567	0.6	1		
Emerald	139	111272.026	86010.854	0.6	1		
Emerald	140	111264.456	86015.763	0.8	1		
Emerald	141	111255.506	86023.383	1.8	1		
Emerald	142	111274.552	86023.519	0.9	1		
Emerald	143	111274.716	86034.031	1.5	1		
Emerald	144	111256.693	86039.190	4.0	1		
Emerald	145	111264.942	86051.698	4.6	1		
Emerald	146	111271.087	86047.003	2.4	1		
Emerald	147	111278.329	86050.484	3.4	1		
Emerald	148	111288.582	86042.069	3.6	1		
Emerald	149	111274.419	86060.972	4.2	1		
Emerald	150	111258.043	86053.467	6.4	1		
Emerald	151	111259.101	86064.590	7.2	1		
Emerald	152	111267.773	86070.899	5.0	1		
Emerald	153	111280.366	86064.425	6.2	1		
Emerald	154	111292.087	86062.501	7.6	1		
Emerald	155	111286.454	86076.055	8.5	1		
Emerald	156	111258.904	86076.966	7.7	1		
Emerald	157	111256.231	86085.179	7.9	1		
Emerald	158	111220.232	86114.436	9.0	1		
Emerald	159	111238.342	86105.784	8.6	1		
Emerald	160	111256.604	86096.754	7.0	1		
Emerald	161	111274.489	86087.540	8.3	1		
Emerald	162	111299.772	86075.781	9.5	1		
Emerald	163	111310.958	86069.769	9.7	1		
Emerald	164	111348.593	86070.126	9.5	1		
Emerald	165	111347.343	86050.268	7.9	1		
Emerald	166	111350.839	86041.699	6.5	1		
Emerald	167	111329.048	86060.227	9.5	1		
Emerald	168	111367.914	86078.633	7.6	1		
Emerald	169	111369.188	86092.590	8.9	1		
Emerald	170	111357.688	86090.835	10.2	1		
Emerald	171	111363.285	86113.130	11.6	1		
Emerald	172	111291.448	86092.316	10.3	1		
Emerald	173	111263.242	86106.846	4.8	1		
Emerald	174	111257.616	86117.961	4.6	1		
Emerald	175	111249.480	86151.503	7.1	1		
Emerald	176	111237.464	86157.708	8.2	1		
Emerald	177	111252.183	86163.924	6.2	1		
Emerald	178	111261.093	86161.632	5.3	1		
Emerald	179	111263.011	86171.454	4.7	1		
Emerald	180	111237.055	86179.811	7.9	1		
Emerald	181	111236.417	86202.098	7.4	1		
Emerald	182	111251.707	86206.393	3.6	1		
Emerald	183	111192.589	86185.336	9.5	1		
Emerald	184	111208.202	86202.486	9.3	1		
Emerald	185	111201.548	86224.668	9.8	1		
Emerald	186	111222.193	86216.424	8.5	1		
Emerald	187	111225.595	86251.743	10.0	1		
Emerald	188	111224.953	86265.625	10.4	1		
Emerald	189	111228.576	86279.329	10.6	1		
Emerald	190	111254.653	86283.900	9.8	1		
Emerald	191	111245.959	86264.929	9.6	1		
Emerald	192	111239.634	86257.140	9.7	1		
Emerald	C	111179.967	86201.591	9.8	1		
Emerald	P	111304.826	85969.942	0.0			
Emerald	P	111303.606	85969.912	0.0			
Emerald	P	111301.176	85969.842	0.0			
Emerald	P	111297.536	85969.732	0.0			
Emerald	P	111289.006	85970.742	0.0			
Emerald	P	111285.286	85973.142	0.0			
Emerald	P	111281.606	85974.292	0.0			
Emerald	P	111276.676	85976.662	0.0			
Emerald	P	111273.036	85976.552	0.0			
Emerald	P	111268.146	85977.672	0.0			
Emerald	P	111266.896	85978.892	0.0			
Emerald	P	111257.186	85978.612	0.0			
Emerald	P	111253.536	85978.502	0.0			
Emerald	P	111251.116	85978.432	0.0			
Emerald	P	111237.716	85979.302	0.0			
Emerald	P	111230.436	85979.092	0.0			
Emerald	P	111225.616	85977.702	0.0			
Emerald	P	111215.866	85978.672	0.0			
Emerald	P	111214.616	85979.892	0.0			
Emerald	P	111208.546	85979.712	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Emerald	P	111201.226	85980.762	0.0			
Emerald	P	111190.266	85981.692	0.0			
Emerald	P	111181.726	85982.702	0.0			
Emerald	P	111179.266	85983.892	0.0			
Emerald	P	111174.366	85985.002	0.0			
Emerald	P	111173.116	85986.222	0.0			
Emerald	P	111169.366	85989.872	0.0			
Emerald	P	111163.046	85998.472	0.0			
Emerald	P	111160.466	86003.422	0.0			
Emerald	P	111157.896	86008.362	0.0			
Emerald	P	111156.536	86013.342	0.0			
Emerald	P	111151.386	86023.232	0.0			
Emerald	P	111151.316	86025.742	0.0			
Emerald	P	111149.766	86036.992	0.0			
Emerald	P	111148.406	86041.972	0.0			
Emerald	P	111147.006	86048.202	0.0			
Emerald	P	111146.866	86053.212	0.0			
Emerald	P	111145.396	86061.952	0.0			
Emerald	P	111145.246	86066.972	0.0			
Emerald	P	111143.926	86070.702	0.0			
Emerald	P	111143.636	86080.722	0.0			
Emerald	P	111142.086	86091.972	0.0			
Emerald	P	111140.806	86094.442	0.0			
Emerald	P	111140.656	86099.462	0.0			
Emerald	P	111139.256	86105.692	0.0			
Emerald	P	111138.006	86106.912	0.0			
Emerald	P	111133.966	86120.602	0.0			
Emerald	P	111131.536	86120.532	0.0			
Emerald	P	111127.606	86130.452	0.0			
Emerald	P	111126.236	86135.432	0.0			
Emerald	P	111121.126	86144.062	0.0			
Emerald	P	111118.556	86149.012	0.0			
Emerald	P	111116.056	86151.452	0.0			
Emerald	P	111112.336	86153.852	0.0			
Emerald	P	111108.626	86156.252	0.0			
Emerald	P	111107.376	86157.472	0.0			
Emerald	P	111106.156	86157.432	0.0			
Emerald	P	111104.906	86158.652	0.0			
Emerald	P	111099.866	86164.782	0.0			
Emerald	P	111099.836	86166.042	0.0			
Emerald	P	111094.826	86170.912	0.0			
Emerald	P	111091.006	86177.072	0.0			
Emerald	P	111087.286	86179.472	0.0			
Emerald	P	111084.786	86181.912	0.0			
Emerald	P	111079.676	86190.552	0.0			
Emerald	P	111078.426	86191.772	0.0			
Emerald	P	111075.856	86196.712	0.0			
Emerald	P	111074.596	86197.932	0.0			
Emerald	P	111074.346	86206.712	0.0			
Emerald	P	111074.196	86211.722	0.0			
Emerald	P	111076.586	86213.042	0.0			
Emerald	P	111077.766	86214.332	0.0			
Emerald	P	111082.366	86223.252	0.0			
Emerald	P	111083.506	86225.792	0.0			
Emerald	P	111085.866	86228.372	0.0			
Emerald	P	111090.606	86232.272	0.0			
Emerald	P	111095.466	86232.412	0.0			
Emerald	P	111101.426	86236.352	0.0			
Emerald	P	111108.566	86241.572	0.0			
Emerald	P	111109.746	86242.862	0.0			
Emerald	P	111112.096	86245.442	0.0			
Emerald	P	111115.666	86248.052	0.0			
Emerald	P	111118.026	86250.632	0.0			
Emerald	P	111123.946	86255.812	0.0			
Emerald	P	111126.336	86257.142	0.0			
Emerald	P	111127.406	86262.192	0.0			
Emerald	P	111129.616	86269.782	0.0			
Emerald	P	111129.356	86278.562	0.0			
Emerald	P	111129.106	86287.332	0.0			
Emerald	P	111130.166	86292.382	0.0			
Emerald	P	111130.026	86297.402	0.0			
Emerald	P	111129.766	86306.172	0.0			
Emerald	P	111130.946	86307.462	0.0			
Emerald	P	111133.186	86313.802	0.0			
Emerald	P	111135.506	86317.632	0.0			
Emerald	P	111137.866	86320.212	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Emerald	P	111140.186	86324.042	0.0			
Emerald	P	111142.466	86329.122	0.0			
Emerald	P	111147.176	86334.282	0.0			
Emerald	P	111150.706	86338.142	0.0			
Emerald	P	111156.666	86342.082	0.0			
Emerald	P	111162.626	86346.022	0.0			
Emerald	P	111166.126	86351.142	0.0			
Emerald	P	111172.006	86357.582	0.0			
Emerald	P	111176.796	86360.232	0.0			
Emerald	P	111181.466	86366.632	0.0			
Emerald	P	111184.966	86371.752	0.0			
Emerald	P	111191.996	86380.742	0.0			
Emerald	P	111199.236	86382.202	0.0			
Emerald	P	111205.166	86387.392	0.0			
Emerald	P	111208.656	86392.512	0.0			
Emerald	P	111213.296	86400.182	0.0			
Emerald	P	111214.506	86400.212	0.0			
Emerald	P	111221.576	86407.942	0.0			
Emerald	P	111224.996	86415.572	0.0			
Emerald	P	111229.706	86420.722	0.0			
Emerald	P	111231.986	86425.812	0.0			
Emerald	P	111235.556	86428.422	0.0			
Emerald	P	111242.546	86438.662	0.0			
Emerald	P	111247.226	86445.072	0.0			
Emerald	P	111249.506	86450.152	0.0			
Emerald	P	111254.176	86456.562	0.0			
Emerald	P	111258.886	86461.722	0.0			
Emerald	P	111269.596	86469.552	0.0			
Emerald	P	111271.946	86472.132	0.0			
Emerald	P	111275.446	86477.252	0.0			
Emerald	P	111282.546	86483.732	0.0			
Emerald	P	111287.226	86490.142	0.0			
Emerald	P	111290.686	86496.512	0.0			
Emerald	P	111294.176	86501.632	0.0			
Emerald	P	111299.956	86511.842	0.0			
Emerald	P	111303.596	86511.942	0.0			
Emerald	P	111305.956	86514.522	0.0			
Emerald	P	111309.446	86519.642	0.0			
Emerald	P	111310.626	86520.932	0.0			
Emerald	P	111318.946	86527.442	0.0			
Emerald	P	111318.976	86526.192	0.0			
Emerald	P	111321.446	86525.002	0.0			
Emerald	P	111323.906	86523.822	0.0			
Emerald	P	111326.336	86523.892	0.0			
Emerald	P	111328.766	86523.962	0.0			
Emerald	P	111331.196	86524.032	0.0			
Emerald	P	111340.906	86524.312	0.0			
Emerald	P	111342.116	86524.352	0.0			
Emerald	P	111346.976	86524.482	0.0			
Emerald	P	111353.006	86525.912	0.0			
Emerald	P	111354.226	86525.952	0.0			
Emerald	P	111356.616	86527.272	0.0			
Emerald	P	111362.686	86527.452	0.0			
Emerald	P	111371.106	86530.202	0.0			
Emerald	P	111377.036	86535.392	0.0			
Emerald	P	111378.176	86537.932	0.0			
Emerald	P	111382.886	86543.092	0.0			
Emerald	P	111386.416	86546.952	0.0			
Emerald	P	111391.086	86553.362	0.0			
Emerald	P	111393.336	86559.702	0.0			
Emerald	P	111394.366	86566.002	0.0			
Emerald	P	111395.356	86573.562	0.0			
Emerald	P	111396.466	86577.362	0.0			
Emerald	P	111397.426	86586.172	0.0			
Emerald	P	111399.706	86591.252	0.0			
Emerald	P	111402.056	86593.832	0.0			
Emerald	P	111401.986	86596.342	0.0			
Emerald	P	111401.726	86605.112	0.0			
Emerald	P	111402.796	86610.162	0.0			
Emerald	P	111403.936	86612.702	0.0			
Emerald	P	111405.116	86613.992	0.0			
Emerald	P	111406.296	86615.282	0.0			
Emerald	P	111409.786	86620.402	0.0			
Emerald	P	111410.856	86625.452	0.0			
Emerald	P	111415.676	86626.842	0.0			
Emerald	P	111419.286	86628.202	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Emerald	P	111424.026	86632.102	0.0			
Emerald	P	111425.206	86633.392	0.0			
Emerald	P	111426.386	86634.682	0.0			
Emerald	P	111427.596	86634.722	0.0			
Emerald	P	111428.776	86636.012	0.0			
Emerald	P	111437.096	86642.522	0.0			
Emerald	P	111438.126	86648.822	0.0			
Emerald	P	111439.296	86650.112	0.0			
Emerald	P	111441.586	86655.192	0.0			
Emerald	P	111442.686	86658.992	0.0			
Emerald	P	111443.866	86660.282	0.0			
Emerald	P	111446.076	86667.872	0.0			
Emerald	P	111447.176	86671.672	0.0			
Emerald	P	111447.136	86672.922	0.0			
Emerald	P	111448.316	86674.212	0.0			
Emerald	P	111448.206	86677.972	0.0			
Emerald	P	111448.246	86676.722	0.0			
Emerald	P	111449.756	86666.722	0.0			
Emerald	P	111451.186	86659.242	0.0			
Emerald	P	111451.366	86652.972	0.0			
Emerald	P	111451.546	86646.702	0.0			
Emerald	P	111451.916	86634.162	0.0			
Emerald	P	111452.136	86626.642	0.0			
Emerald	P	111451.396	86610.312	0.0			
Emerald	P	111451.576	86604.042	0.0			
Emerald	P	111451.766	86597.772	0.0			
Emerald	P	111451.986	86590.252	0.0			
Emerald	P	111452.306	86578.972	0.0			
Emerald	P	111452.566	86570.192	0.0			
Emerald	P	111452.676	86566.432	0.0			
Emerald	P	111451.866	86552.612	0.0			
Emerald	P	111450.756	86548.812	0.0			
Emerald	P	111450.906	86543.802	0.0			
Emerald	P	111451.236	86532.512	0.0			
Emerald	P	111451.596	86519.982	0.0			
Emerald	P	111451.896	86509.952	0.0			
Emerald	P	111453.366	86501.212	0.0			
Emerald	P	111453.806	86486.162	0.0			
Emerald	P	111452.736	86481.112	0.0			
Emerald	P	111452.876	86476.102	0.0			
Emerald	P	111451.996	86464.782	0.0			
Emerald	P	111450.886	86460.982	0.0			
Emerald	P	111451.256	86448.452	0.0			
Emerald	P	111450.156	86444.652	0.0			
Emerald	P	111449.156	86437.102	0.0			
Emerald	P	111446.836	86433.262	0.0			
Emerald	P	111447.056	86425.742	0.0			
Emerald	P	111444.846	86418.152	0.0			
Emerald	P	111443.816	86411.852	0.0			
Emerald	P	111442.716	86408.052	0.0			
Emerald	P	111442.786	86405.542	0.0			
Emerald	P	111442.936	86400.532	0.0			
Emerald	P	111441.906	86394.232	0.0			
Emerald	P	111440.836	86389.182	0.0			
Emerald	P	111440.946	86385.412	0.0			
Emerald	P	111441.166	86377.892	0.0			
Emerald	P	111441.276	86374.132	0.0			
Emerald	P	111441.346	86371.622	0.0			
Emerald	P	111440.246	86367.832	0.0			
Emerald	P	111435.676	86357.662	0.0			
Emerald	P	111434.466	86357.622	0.0			
Emerald	P	111433.326	86355.082	0.0			
Emerald	P	111432.216	86351.292	0.0			
Emerald	P	111429.936	86346.202	0.0			
Emerald	P	111426.656	86333.562	0.0			
Emerald	P	111424.346	86329.732	0.0			
Emerald	P	111422.026	86325.902	0.0			
Emerald	P	111418.636	86317.022	0.0			
Emerald	P	111417.716	86306.952	0.0			
Emerald	P	111416.686	86300.652	0.0			
Emerald	P	111415.766	86290.592	0.0			
Emerald	P	111414.766	86283.032	0.0			
Emerald	P	111414.806	86281.772	0.0			
Emerald	P	111414.916	86278.012	0.0			
Emerald	P	111415.166	86269.242	0.0			
Emerald	P	111416.606	86261.752	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Emerald	P	111419.146	86258.062	0.0			
Emerald	P	111421.646	86255.622	0.0			
Emerald	P	111423.076	86248.142	0.0			
Emerald	P	111425.576	86245.702	0.0			
Emerald	P	111425.616	86244.452	0.0			
Emerald	P	111426.866	86243.232	0.0			
Emerald	P	111429.366	86240.792	0.0			
Emerald	P	111429.476	86237.032	0.0			
Emerald	P	111433.296	86230.872	0.0			
Emerald	P	111433.626	86219.582	0.0			
Emerald	P	111431.496	86209.482	0.0			
Emerald	P	111428.176	86198.102	0.0			
Emerald	P	111427.146	86191.792	0.0			
Emerald	P	111426.196	86182.982	0.0			
Emerald	P	111426.406	86175.462	0.0			
Emerald	P	111425.346	86170.412	0.0			
Emerald	P	111424.276	86165.362	0.0			
Emerald	P	111423.316	86156.552	0.0			
Emerald	P	111422.246	86151.502	0.0			
Emerald	P	111417.796	86137.572	0.0			
Emerald	P	111412.056	86126.112	0.0			
Emerald	P	111408.666	86117.232	0.0			
Emerald	P	111405.316	86107.102	0.0			
Emerald	P	111402.036	86094.462	0.0			
Emerald	P	111399.906	86084.362	0.0			
Emerald	P	111398.766	86081.812	0.0			
Emerald	P	111394.166	86072.902	0.0			
Emerald	P	111390.706	86066.522	0.0			
Emerald	P	111384.816	86060.082	0.0			
Emerald	P	111381.396	86052.452	0.0			
Emerald	P	111380.216	86051.172	0.0			
Emerald	P	111373.186	86042.182	0.0			
Emerald	P	111367.406	86031.972	0.0			
Emerald	P	111366.306	86028.182	0.0			
Emerald	P	111365.276	86021.882	0.0			
Emerald	P	111364.136	86019.332	0.0			
Emerald	P	111359.426	86014.182	0.0			
Emerald	P	111353.646	86003.972	0.0			
Emerald	P	111351.256	86002.652	0.0			
Emerald	P	111346.696	85992.482	0.0			
Emerald	P	111343.086	85991.122	0.0			
Emerald	P	111341.876	85991.092	0.0			
Emerald	P	111339.476	85989.762	0.0			
Emerald	P	111328.736	85983.182	0.0			
Emerald	P	111326.306	85983.112	0.0			
Emerald	P	111325.096	85983.082	0.0			
Emerald	P	111314.236	85980.252	0.0			
Emerald	P	111311.926	85976.422	0.0			
Emerald	P	111310.746	85975.132	0.0			
Emerald	P	111309.536	85975.102	0.0			
Emerald	P	111308.316	85975.062	0.0			
Emerald	P	111304.826	85969.942	0.0			
Emerald	P	111285.406	86219.072	0.0			
Emerald	P	111280.406	86223.942	0.0			
Emerald	P	111279.156	86225.162	0.0			
Emerald	P	111279.116	86226.422	0.0			
Emerald	P	111275.256	86233.832	0.0			
Emerald	P	111273.896	86238.812	0.0			
Emerald	P	111272.576	86242.542	0.0			
Emerald	P	111271.206	86247.522	0.0			
Emerald	P	111271.176	86248.772	0.0			
Emerald	P	111272.276	86252.572	0.0			
Emerald	P	111274.526	86258.912	0.0			
Emerald	P	111275.696	86260.192	0.0			
Emerald	P	111275.556	86265.212	0.0			
Emerald	P	111276.696	86267.752	0.0			
Emerald	P	111277.796	86271.552	0.0			
Emerald	P	111279.016	86271.582	0.0			
Emerald	P	111281.256	86277.922	0.0			
Emerald	P	111285.966	86283.082	0.0			
Emerald	P	111287.146	86284.362	0.0			
Emerald	P	111290.606	86290.742	0.0			
Emerald	P	111294.216	86292.102	0.0			
Emerald	P	111295.356	86294.642	0.0			
Emerald	P	111298.886	86298.512	0.0			
Emerald	P	111301.206	86302.342	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Emerald	P	111302.306	86306.132	0.0			
Emerald	P	111305.696	86315.012	0.0			
Emerald	P	111306.836	86317.562	0.0			
Emerald	P	111309.156	86321.392	0.0			
Emerald	P	111312.616	86327.762	0.0			
Emerald	P	111316.186	86330.372	0.0			
Emerald	P	111325.716	86336.922	0.0			
Emerald	P	111329.246	86340.792	0.0			
Emerald	P	111330.426	86342.072	0.0			
Emerald	P	111333.986	86344.692	0.0			
Emerald	P	111335.166	86345.982	0.0			
Emerald	P	111338.736	86348.592	0.0			
Emerald	P	111342.266	86352.452	0.0			
Emerald	P	111343.336	86357.502	0.0			
Emerald	P	111345.726	86358.832	0.0			
Emerald	P	111346.796	86363.882	0.0			
Emerald	P	111348.896	86375.232	0.0			
Emerald	P	111349.966	86380.282	0.0			
Emerald	P	111349.926	86381.532	0.0			
Emerald	P	111349.816	86385.292	0.0			
Emerald	P	111350.956	86387.842	0.0			
Emerald	P	111351.986	86394.142	0.0			
Emerald	P	111354.236	86400.482	0.0			
Emerald	P	111354.196	86401.732	0.0			
Emerald	P	111355.196	86409.292	0.0			
Emerald	P	111355.116	86411.802	0.0			
Emerald	P	111353.616	86421.792	0.0			
Emerald	P	111355.896	86426.882	0.0			
Emerald	P	111358.136	86433.212	0.0			
Emerald	P	111359.246	86437.012	0.0			
Emerald	P	111361.526	86442.092	0.0			
Emerald	P	111361.486	86443.352	0.0			
Emerald	P	111366.276	86446.002	0.0			
Emerald	P	111371.096	86447.392	0.0			
Emerald	P	111372.306	86447.422	0.0			
Emerald	P	111376.026	86445.022	0.0			
Emerald	P	111377.276	86443.802	0.0			
Emerald	P	111378.636	86438.822	0.0			
Emerald	P	111381.136	86436.392	0.0			
Emerald	P	111382.456	86432.662	0.0			
Emerald	P	111382.536	86430.152	0.0			
Emerald	P	111381.496	86423.852	0.0			
Emerald	P	111380.326	86422.562	0.0			
Emerald	P	111379.256	86417.512	0.0			
Emerald	P	111378.146	86413.722	0.0			
Emerald	P	111377.116	86407.412	0.0			
Emerald	P	111377.156	86406.162	0.0			
Emerald	P	111377.266	86402.402	0.0			
Emerald	P	111376.236	86396.092	0.0			
Emerald	P	111376.416	86389.832	0.0			
Emerald	P	111376.456	86388.572	0.0			
Emerald	P	111376.706	86379.802	0.0			
Emerald	P	111376.746	86378.542	0.0			
Emerald	P	111376.816	86376.042	0.0			
Emerald	P	111376.966	86371.022	0.0			
Emerald	P	111378.366	86364.792	0.0			
Emerald	P	111378.436	86362.282	0.0			
Emerald	P	111378.656	86354.762	0.0			
Emerald	P	111378.696	86353.512	0.0			
Emerald	P	111382.556	86346.092	0.0			
Emerald	P	111383.836	86343.622	0.0			
Emerald	P	111383.946	86339.862	0.0			
Emerald	P	111385.196	86338.642	0.0			
Emerald	P	111385.236	86337.382	0.0			
Emerald	P	111386.556	86333.662	0.0			
Emerald	P	111386.636	86331.152	0.0			
Emerald	P	111386.666	86329.902	0.0			
Emerald	P	111386.746	86327.392	0.0			
Emerald	P	111386.926	86321.122	0.0			
Emerald	P	111385.936	86313.562	0.0			
Emerald	P	111385.966	86312.312	0.0			
Emerald	P	111386.116	86307.302	0.0			
Emerald	P	111386.146	86306.042	0.0			
Emerald	P	111386.296	86301.032	0.0			
Emerald	P	111385.226	86295.982	0.0			
Emerald	P	111382.946	86290.892	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Emerald	P	111381.766	86289.602	0.0			
Emerald	P	111380.596	86288.322	0.0			
Emerald	P	111380.666	86285.812	0.0			
Emerald	P	111379.486	86284.522	0.0			
Emerald	P	111377.206	86279.432	0.0			
Emerald	P	111377.276	86276.932	0.0			
Emerald	P	111376.066	86276.892	0.0			
Emerald	P	111370.106	86272.962	0.0			
Emerald	P	111366.576	86269.092	0.0			
Emerald	P	111365.356	86269.062	0.0			
Emerald	P	111362.926	86268.992	0.0			
Emerald	P	111358.106	86267.592	0.0			
Emerald	P	111355.716	86266.272	0.0			
Emerald	P	111352.116	86264.912	0.0			
Emerald	P	111346.046	86264.732	0.0			
Emerald	P	111344.826	86264.702	0.0			
Emerald	P	111343.656	86263.412	0.0			
Emerald	P	111340.086	86260.802	0.0			
Emerald	P	111336.546	86256.932	0.0			
Emerald	P	111332.906	86256.832	0.0			
Emerald	P	111332.946	86255.572	0.0			
Emerald	P	111331.726	86255.542	0.0			
Emerald	P	111325.696	86254.112	0.0			
Emerald	P	111324.516	86252.822	0.0			
Emerald	P	111320.986	86248.952	0.0			
Emerald	P	111315.026	86245.022	0.0			
Emerald	P	111313.926	86241.222	0.0			
Emerald	P	111312.706	86241.192	0.0			
Emerald	P	111311.606	86237.392	0.0			
Emerald	P	111310.426	86236.102	0.0			
Emerald	P	111306.896	86232.242	0.0			
Emerald	P	111302.146	86228.342	0.0			
Emerald	P	111299.756	86227.012	0.0			
Emerald	P	111298.576	86225.722	0.0			
Emerald	P	111296.186	86224.402	0.0			
Emerald	P	111291.366	86223.012	0.0			
Emerald	P	111290.186	86221.722	0.0			
Emerald	P	111287.796	86220.392	0.0			
Emerald	P	111286.616	86219.102	0.0			
Emerald	P	111285.406	86219.072	0.0			
Vail	1	731882.280	4954034.198	5.2	11	0.118590	0.466
Vail	2	731896.206	4954051.560	9.0	11	0.157965	0.467
Vail	3	731910.639	4954070.900	11.6	11	0.075394	0.693
Vail	4	731925.110	4954087.247	12.9	25	0.080255	0.678
Vail	5	731946.618	4954111.346	11.7	11	0.056849	0.693
Vail	6	731962.354	4954129.850	7.4	14	0.141508	0.685
Vail	7	731950.468	4954160.572	6.0	15	0.220711	0.660
Vail	8	731933.901	4954138.445	11.1	20	0.083891	0.655
Vail	9	731918.349	4954119.278	13.3	23	0.137936	0.652
Vail	10	731900.630	4954097.699	12.8	21	0.060902	0.654
Vail	11	731885.211	4954077.059	10.2	27	0.172796	0.648
Vail	12	731870.453	4954060.334	7.3	26	0.088725	0.649
Vail	13	731845.685	4954063.804	4.7	12	0.117234	0.586
Vail	14	731860.622	4954084.041	8.9	15	0.126067	0.581
Vail	15	731874.534	4954102.647	11.4	17	0.072915	0.579
Vail	16	731891.051	4954124.064	13.2	20	0.054855	0.522
Vail	17	731905.780	4954144.057	13.3	25	0.123496	0.487
Vail	18	731921.751	4954164.861	9.7	14	0.061415	0.495
Vail	19	731936.757	4954188.392	4.5	15	0.065946	0.494
Vail	20	731918.251	4954211.879	2.6	13	0.075446	0.496
Vail	21	731904.984	4954190.989	7.1	15	0.062330	0.494
Vail	22	731891.480	4954172.178	10.5	26	0.063420	0.486
Vail	23	731877.095	4954149.618	12.0	19	0.048281	0.491
Vail	24	731863.404	4954129.246	12.0	25	0.090382	0.385
Vail	25	731848.512	4954106.574	9.7	16	0.073218	0.270
Vail	26	731835.136	4954087.552	6.6	21	0.077068	0.289
Vail	27	731808.120	4954082.723	4.1	30	0.107012	0.285
Vail	28	731821.405	4954111.975	8.4	17	0.087361	0.290
Vail	29	731834.871	4954134.712	10.0	20	0.097698	0.289
Vail	30	731847.287	4954154.010	9.7	31	0.126280	0.284
Vail	31	731862.354	4954178.152	8.6	21	0.070199	0.289
Vail	32	731875.341	4954198.191	6.5	17	0.103602	0.377
Vail	33	731891.215	4954224.882	3.5	14	0.051196	0.270
Vail	34	731857.324	4954227.449	5.2	14	0.071460	0.396
Vail	35	731844.671	4954202.591	7.6	16	0.136450	0.393

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Vail	36	731831.071	4954180.669	8.2	22	0.036049	0.290
Vail	37	731818.578	4954159.351	8.4	18	0.034794	0.293
Vail	38	731806.298	4954137.212	8.7	18	0.058219	0.293
Vail	39	731790.331	4954111.032	6.4	19	0.080995	0.293
Vail	40	731974.163	4954105.262	8.3	26	0.069089	0.368
Vail	41	731954.249	4954081.745	11.9	21	0.104364	0.300
Vail	42	731938.232	4954061.850	11.6	23	0.050292	0.302
Vail	43	731924.289	4954045.292	9.9	19	0.060782	0.303
Vail	44	731907.961	4954025.594	7.2	19	0.059949	0.308
Vail	45	731911.665	4954125.920	13.2	30	0.150662	0.454
Vail	46	731919.530	4954130.178	13.0	11	0.084479	0.468
Vail	47	731928.032	4954132.178	12.2	11	0.073808	0.273
Vail	48	731938.075	4954119.451	11.9	11	0.118537	0.454
Vail	49	731918.233	4954118.806	13.2	12	0.105966	0.273
Vail	50	731900.500	4954116.945	13.1	11	0.039348	0.449
Vail	51	731909.072	4954099.793	12.9	13	0.052271	0.272
Vail	52	731937.743	4954101.138	12.5	11	0.057483	0.273
Vail	53	731926.356	4954094.016	12.9	11	0.042752	0.273
Vail	54	731934.259	4954026.090	8.9	15	0.055631	0.388
Vail	55	731951.281	4954040.559	10.0	12	0.043159	0.390
Vail	56	731970.011	4954056.874	10.4	11	0.029607	0.390
Vail	57	731986.116	4954070.616	8.9	13	0.063857	0.298
Vail	58	732013.451	4954057.356	6.5	12	0.040265	0.293
Vail	59	731992.925	4954040.480	8.5	12	0.055145	0.272
Vail	60	731974.127	4954024.603	8.7	11	0.049312	0.272
Vail	61	731955.896	4954009.503	8.0	12	0.085259	0.390
Vail	62	731968.665	4953983.106	5.2	11	0.218280	0.299
Vail	63	731988.932	4954001.488	5.8	12	0.079395	0.390
Vail	64	732006.123	4954016.904	6.1	11	0.046177	0.293
Vail	65	732022.473	4954031.559	5.9	11	0.054083	0.293
Vail	66	732038.868	4954045.871	4.4	11	0.095762	0.293
Vail	67	732046.390	4954022.313	2.8	11	0.077337	0.404
Vail	68	732027.904	4954003.883	4.0	11	0.079240	0.272
Vail	69	731997.547	4953967.492	2.9	11	0.079374	0.293
Vail	70	731916.647	4954140.462	12.9	11	0.048057	0.271
Vail	71	731922.437	4954148.844	11.6	11	0.055738	0.271
Vail	72	731906.600	4954139.761	13.2	10	0.067603	0.272
Vail	73	731907.033	4954149.816	12.9	10	0.053857	0.294
Vail	74	731901.118	4954166.952	11.2	10	0.068873	0.294
Vail	75	731867.134	4954222.315	5.0	11	0.028973	0.271
Vail	76	731840.190	4954228.157	6.0	10	0.053796	0.384
Vail	77	731856.970	4954207.911	6.5	10	0.068821	0.381
Vail	78	731841.584	4954185.503	9.2	10	0.068574	0.396
Vail	79	731825.919	4954161.660	8.5	10	0.034407	0.295
Vail	80	731809.657	4954137.846	8.9	10	0.042513	0.296
Vail	81	731794.390	4954115.554	7.3	11	0.084582	0.394
Vail	82	731782.862	4954096.755	4.3	10	0.039813	0.332
Vail	83	731755.322	4954100.883	3.6	10	0.039589	0.296
Vail	84	731768.489	4954120.749	6.2	10	0.042018	0.296
Vail	85	731781.295	4954139.908	8.1	10	0.030810	0.296
Vail	86	731795.599	4954161.169	8.1	10	0.044628	0.296
Vail	87	731811.424	4954184.515	8.0	10	0.067518	0.298
Vail	88	731826.932	4954207.832	7.6	10	0.046950	0.393
Vail	89	731812.926	4954228.720	5.2	10	0.038041	0.393
Vail	90	731793.525	4954203.182	7.2	10	0.032656	0.393
Vail	91	731775.832	4954179.158	7.4	10	0.036728	0.393
Vail	92	731762.879	4954161.851	7.4	10	0.033684	0.393
Vail	93	731746.258	4954139.864	6.7	10	0.032921	0.393
Vail	94	731729.963	4954118.325	4.0	11	0.051169	0.302
Vail	95	731716.698	4954100.475	2.0	10	0.039923	0.303
Vail	96	731710.989	4954129.572	3.3	10	0.050005	0.394
Vail	97	731687.225	4954139.516	2.2	10	0.074069	0.395
Vail	98	731702.839	4954152.679	3.5	10	0.085147	0.395
Vail	99	731724.116	4954149.145	4.7	10	0.116263	0.395
Vail	100	731714.549	4954170.465	3.8	10	0.082878	0.419
Vail	101	731738.440	4954170.023	4.9	10	0.079048	0.419
Vail	102	731732.478	4954192.485	4.2	10	0.137823	0.421
Vail	103	731753.993	4954193.278	5.5	10	0.136398	0.421
Vail	104	731768.571	4954214.443	5.3	10	0.123930	0.421
Vail	105	731893.961	4954137.692	13.2	11	0.049737	0.340
Vail	106	731924.509	4954106.091	13.0	10	0.049713	0.395
Vail	107	732013.202	4953987.220	2.8	10	0.107452	0.397
Vail	C	731911.811	4954134.684	13.3	20	0.061032	0.387
Vail	P	731697.880	4954050.500	0.0			
Vail	P	731697.810	4954051.500	0.0			
Vail	P	731696.750	4954052.500	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Vail	P	731695.620	4954054.500	0.0			
Vail	P	731695.560	4954055.500	0.0			
Vail	P	731697.250	4954062.500	0.0			
Vail	P	731698.120	4954065.500	0.0			
Vail	P	731699.000	4954069.000	0.0			
Vail	P	731698.750	4954073.000	0.0			
Vail	P	731698.560	4954077.000	0.0			
Vail	P	731698.380	4954081.000	0.0			
Vail	P	731698.250	4954083.000	0.0			
Vail	P	731698.060	4954087.000	0.0			
Vail	P	731695.880	4954090.000	0.0			
Vail	P	731693.560	4954094.500	0.0			
Vail	P	731691.440	4954096.500	0.0			
Vail	P	731687.120	4954100.500	0.0			
Vail	P	731685.940	4954103.500	0.0			
Vail	P	731684.880	4954104.500	0.0			
Vail	P	731680.620	4954107.000	0.0			
Vail	P	731678.380	4954111.000	0.0			
Vail	P	731676.250	4954113.000	0.0			
Vail	P	731672.060	4954115.000	0.0			
Vail	P	731669.940	4954116.500	0.0			
Vail	P	731668.810	4954118.500	0.0			
Vail	P	731667.750	4954119.500	0.0			
Vail	P	731664.380	4954124.500	0.0			
Vail	P	731663.190	4954128.500	0.0			
Vail	P	731662.000	4954131.500	0.0			
Vail	P	731661.940	4954132.500	0.0			
Vail	P	731662.750	4954136.500	0.0			
Vail	P	731663.440	4954143.500	0.0			
Vail	P	731664.250	4954147.500	0.0			
Vail	P	731664.190	4954148.500	0.0			
Vail	P	731664.120	4954149.500	0.0			
Vail	P	731665.000	4954152.500	0.0			
Vail	P	731666.000	4954154.000	0.0			
Vail	P	731666.940	4954155.000	0.0			
Vail	P	731667.940	4954156.000	0.0			
Vail	P	731668.880	4954157.000	0.0			
Vail	P	731672.880	4954159.000	0.0			
Vail	P	731673.810	4954160.500	0.0			
Vail	P	731680.750	4954164.500	0.0			
Vail	P	731685.810	4954166.000	0.0			
Vail	P	731686.810	4954167.000	0.0			
Vail	P	731693.810	4954170.500	0.0			
Vail	P	731693.750	4954171.500	0.0			
Vail	P	731699.750	4954173.500	0.0			
Vail	P	731700.750	4954173.500	0.0			
Vail	P	731703.690	4954177.000	0.0			
Vail	P	731705.500	4954181.000	0.0			
Vail	P	731707.310	4954186.000	0.0			
Vail	P	731710.190	4954190.500	0.0			
Vail	P	731710.000	4954193.500	0.0			
Vail	P	731710.880	4954196.500	0.0			
Vail	P	731715.810	4954199.500	0.0			
Vail	P	731720.440	4954209.000	0.0			
Vail	P	731720.440	4954210.000	0.0			
Vail	P	731724.380	4954212.000	0.0			
Vail	P	731729.250	4954217.500	0.0			
Vail	P	731735.190	4954222.000	0.0			
Vail	P	731737.120	4954223.000	0.0			
Vail	P	731745.190	4954225.500	0.0			
Vail	P	731750.310	4954225.500	0.0			
Vail	P	731755.380	4954227.000	0.0			
Vail	P	731761.380	4954229.500	0.0			
Vail	P	731768.310	4954234.500	0.0			
Vail	P	731769.250	4954235.500	0.0			
Vail	P	731778.310	4954239.000	0.0			
Vail	P	731782.310	4954240.500	0.0			
Vail	P	731783.310	4954241.500	0.0			
Vail	P	731785.380	4954240.500	0.0			
Vail	P	731792.500	4954241.000	0.0			
Vail	P	731797.500	4954244.000	0.0			
Vail	P	731801.500	4954245.500	0.0			
Vail	P	731804.560	4954245.500	0.0			
Vail	P	731808.620	4954246.000	0.0			
Vail	P	731809.690	4954246.000	0.0			
Vail	P	731817.810	4954246.500	0.0			

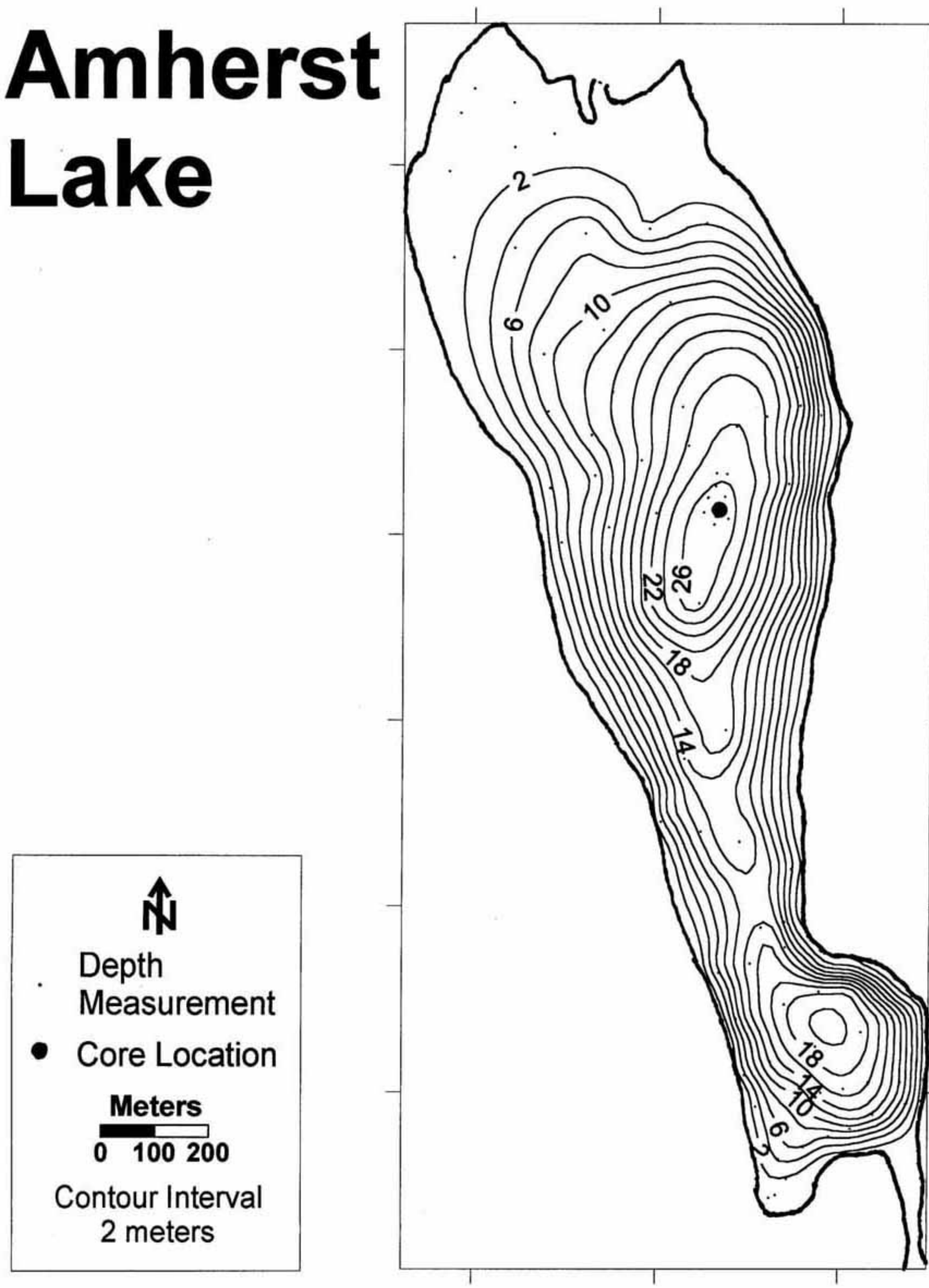
Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Vail	P	731818.810	4954247.500	0.0			
Vail	P	731828.880	4954251.000	0.0			
Vail	P	731829.810	4954252.000	0.0			
Vail	P	731832.880	4954252.000	0.0			
Vail	P	731838.000	4954252.500	0.0			
Vail	P	731839.000	4954253.500	0.0			
Vail	P	731842.060	4954253.500	0.0			
Vail	P	731850.250	4954253.000	0.0			
Vail	P	731851.310	4954252.000	0.0			
Vail	P	731854.500	4954250.000	0.0			
Vail	P	731855.560	4954249.000	0.0			
Vail	P	731863.690	4954250.500	0.0			
Vail	P	731866.690	4954252.000	0.0			
Vail	P	731870.690	4954254.000	0.0			
Vail	P	731878.750	4954256.500	0.0			
Vail	P	731880.750	4954257.500	0.0			
Vail	P	731882.750	4954257.500	0.0			
Vail	P	731883.810	4954257.500	0.0			
Vail	P	731885.810	4954258.000	0.0			
Vail	P	731888.000	4954256.000	0.0			
Vail	P	731890.190	4954253.000	0.0			
Vail	P	731893.310	4954251.000	0.0			
Vail	P	731896.560	4954248.500	0.0			
Vail	P	731898.620	4954247.500	0.0			
Vail	P	731903.880	4954245.500	0.0			
Vail	P	731907.000	4954244.000	0.0			
Vail	P	731908.060	4954243.000	0.0			
Vail	P	731910.190	4954242.000	0.0			
Vail	P	731914.380	4954240.000	0.0			
Vail	P	731915.500	4954238.000	0.0			
Vail	P	731916.690	4954235.000	0.0			
Vail	P	731918.810	4954233.500	0.0			
Vail	P	731920.060	4954229.500	0.0			
Vail	P	731921.310	4954224.500	0.0			
Vail	P	731921.440	4954222.500	0.0			
Vail	P	731923.620	4954219.500	0.0			
Vail	P	731923.690	4954217.500	0.0			
Vail	P	731924.940	4954213.500	0.0			
Vail	P	731927.060	4954211.500	0.0			
Vail	P	731933.500	4954207.000	0.0			
Vail	P	731933.500	4954206.000	0.0			
Vail	P	731935.620	4954205.000	0.0			
Vail	P	731937.750	4954203.000	0.0			
Vail	P	731939.880	4954201.000	0.0			
Vail	P	731944.060	4954200.500	0.0			
Vail	P	731948.250	4954198.500	0.0			
Vail	P	731951.310	4954197.500	0.0			
Vail	P	731955.500	4954196.000	0.0			
Vail	P	731958.750	4954193.000	0.0			
Vail	P	731960.880	4954191.000	0.0			
Vail	P	731965.250	4954185.500	0.0			
Vail	P	731966.380	4954184.500	0.0			
Vail	P	731967.500	4954181.500	0.0			
Vail	P	731968.690	4954178.500	0.0			
Vail	P	731969.000	4954172.500	0.0			
Vail	P	731969.190	4954169.500	0.0			
Vail	P	731968.190	4954168.500	0.0			
Vail	P	731968.380	4954164.500	0.0			
Vail	P	731968.500	4954162.500	0.0			
Vail	P	731968.810	4954156.500	0.0			
Vail	P	731970.120	4954150.500	0.0			
Vail	P	731971.500	4954143.500	0.0			
Vail	P	731972.620	4954142.500	0.0			
Vail	P	731973.880	4954137.500	0.0			
Vail	P	731976.190	4954132.500	0.0			
Vail	P	731977.380	4954128.500	0.0			
Vail	P	731980.750	4954122.500	0.0			
Vail	P	731980.880	4954120.500	0.0			
Vail	P	731983.120	4954116.500	0.0			
Vail	P	731985.440	4954112.000	0.0			
Vail	P	731986.690	4954107.000	0.0			
Vail	P	731988.810	4954106.000	0.0			
Vail	P	731994.120	4954101.000	0.0			
Vail	P	731994.190	4954100.000	0.0			
Vail	P	731998.560	4954095.500	0.0			
Vail	P	732000.620	4954094.500	0.0			

Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Vail	P	732005.060	4954087.500	0.0			
Vail	P	732007.250	4954085.500	0.0			
Vail	P	732010.500	4954082.000	0.0			
Vail	P	732014.750	4954079.000	0.0			
Vail	P	732016.940	4954076.000	0.0			
Vail	P	732019.060	4954074.000	0.0			
Vail	P	732023.190	4954073.500	0.0			
Vail	P	732024.310	4954071.500	0.0			
Vail	P	732030.690	4954067.500	0.0			
Vail	P	732032.750	4954067.000	0.0			
Vail	P	732036.880	4954066.000	0.0			
Vail	P	732039.000	4954065.000	0.0			
Vail	P	732043.120	4954064.500	0.0			
Vail	P	732047.190	4954064.500	0.0			
Vail	P	732049.310	4954063.500	0.0			
Vail	P	732053.440	4954063.000	0.0			
Vail	P	732055.500	4954063.000	0.0			
Vail	P	732060.690	4954061.000	0.0			
Vail	P	732062.810	4954059.500	0.0			
Vail	P	732064.940	4954058.500	0.0			
Vail	P	732066.000	4954057.500	0.0			
Vail	P	732068.250	4954053.500	0.0			
Vail	P	732069.310	4954052.500	0.0			
Vail	P	732069.440	4954049.500	0.0			
Vail	P	732069.560	4954047.500	0.0			
Vail	P	732069.750	4954044.500	0.0			
Vail	P	732069.750	4954043.500	0.0			
Vail	P	732070.000	4954039.500	0.0			
Vail	P	732070.120	4954036.500	0.0			
Vail	P	732070.190	4954035.500	0.0			
Vail	P	732070.310	4954032.500	0.0			
Vail	P	732070.380	4954031.500	0.0			
Vail	P	732070.440	4954030.500	0.0			
Vail	P	732070.620	4954027.500	0.0			
Vail	P	732069.560	4954027.500	0.0			
Vail	P	732067.560	4954026.500	0.0			
Vail	P	732067.620	4954025.500	0.0			
Vail	P	732062.690	4954022.000	0.0			
Vail	P	732061.690	4954021.000	0.0			
Vail	P	732057.940	4954014.500	0.0			
Vail	P	732057.000	4954013.500	0.0			
Vail	P	732057.060	4954011.500	0.0			
Vail	P	732057.190	4954009.500	0.0			
Vail	P	732056.250	4954007.500	0.0			
Vail	P	732056.440	4954003.500	0.0			
Vail	P	732056.500	4954002.500	0.0			
Vail	P	732056.750	4953997.500	0.0			
Vail	P	732055.810	4953996.500	0.0			
Vail	P	732055.880	4953995.500	0.0			
Vail	P	732054.940	4953993.500	0.0			
Vail	P	732054.120	4953989.500	0.0			
Vail	P	732053.190	4953988.000	0.0			
Vail	P	732051.120	4953988.000	0.0			
Vail	P	732047.310	4953983.000	0.0			
Vail	P	732046.440	4953980.000	0.0			
Vail	P	732045.500	4953977.500	0.0			
Vail	P	732042.560	4953975.500	0.0			
Vail	P	732041.560	4953974.500	0.0			
Vail	P	732035.880	4953966.000	0.0			
Vail	P	732032.810	4953966.000	0.0			
Vail	P	732030.000	4953961.000	0.0			
Vail	P	732028.000	4953959.500	0.0			
Vail	P	732025.000	4953958.500	0.0			
Vail	P	732022.060	4953955.500	0.0			
Vail	P	732020.120	4953953.500	0.0			
Vail	P	732015.250	4953949.000	0.0			
Vail	P	732012.380	4953945.000	0.0			
Vail	P	732009.440	4953942.500	0.0			
Vail	P	732005.440	4953940.500	0.0			
Vail	P	732003.440	4953940.500	0.0			
Vail	P	732001.380	4953940.000	0.0			
Vail	P	731993.380	4953936.000	0.0			
Vail	P	731992.500	4953933.500	0.0			
Vail	P	731989.380	4953934.500	0.0			
Vail	P	731979.060	4953936.000	0.0			
Vail	P	731972.060	4953932.500	0.0			

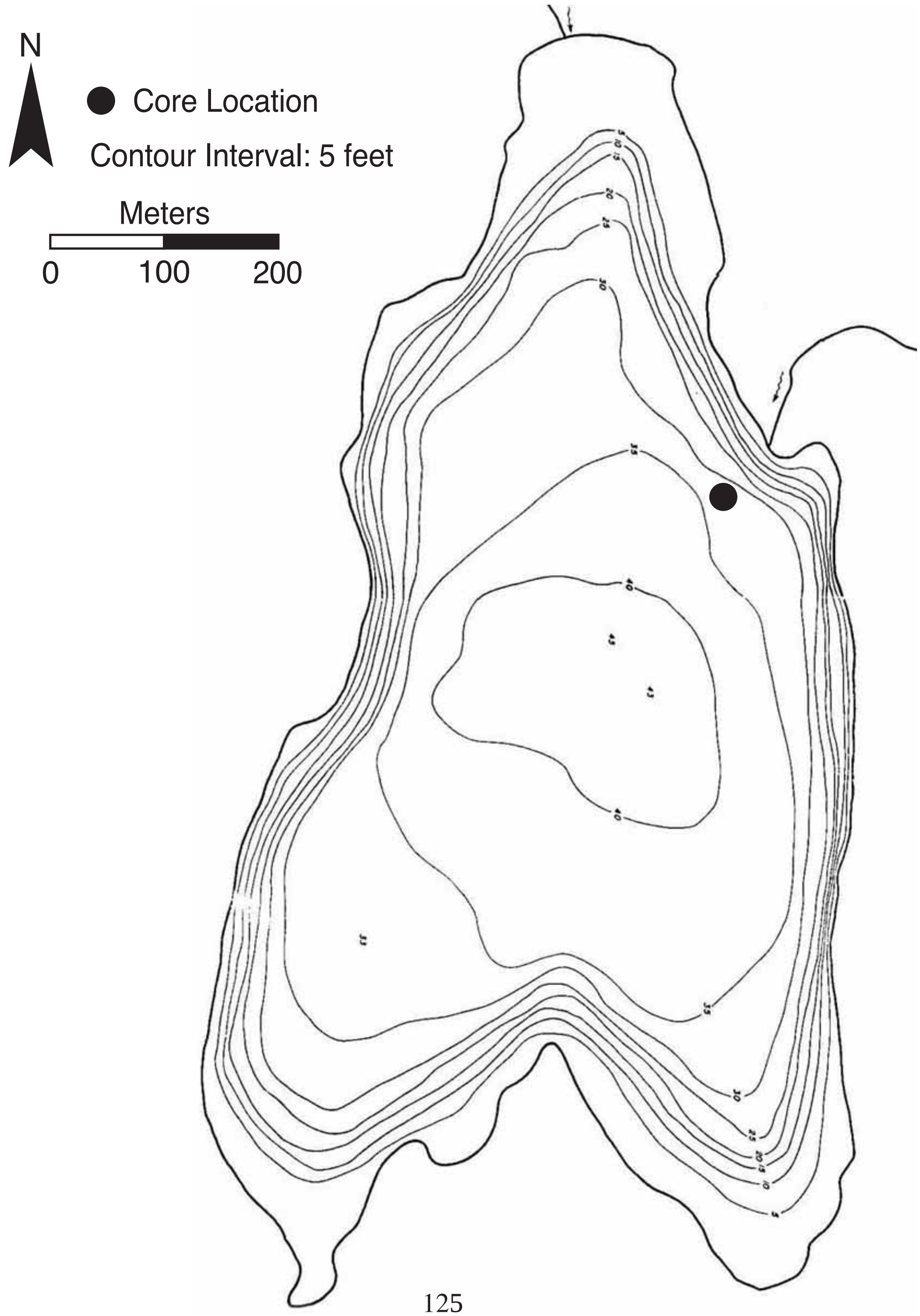
Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Vail	P	731970.060	4953931.500	0.0			
Vail	P	731965.810	4953935.500	0.0			
Vail	P	731963.620	4953937.000	0.0			
Vail	P	731960.380	4953941.000	0.0			
Vail	P	731957.060	4953946.000	0.0			
Vail	P	731953.810	4953950.000	0.0			
Vail	P	731951.440	4953956.000	0.0			
Vail	P	731949.120	4953960.500	0.0			
Vail	P	731945.880	4953964.500	0.0			
Vail	P	731936.190	4953974.000	0.0			
Vail	P	731934.000	4953977.000	0.0			
Vail	P	731928.690	4953981.000	0.0			
Vail	P	731923.440	4953982.500	0.0			
Vail	P	731918.120	4953986.500	0.0			
Vail	P	731915.000	4953988.000	0.0			
Vail	P	731909.690	4953992.000	0.0			
Vail	P	731907.380	4953997.000	0.0			
Vail	P	731903.120	4953999.500	0.0			
Vail	P	731898.880	4954003.500	0.0			
Vail	P	731893.380	4954010.000	0.0			
Vail	P	731891.250	4954012.000	0.0			
Vail	P	731888.000	4954015.000	0.0			
Vail	P	731881.560	4954020.500	0.0			
Vail	P	731876.250	4954024.500	0.0			
Vail	P	731871.000	4954027.000	0.0			
Vail	P	731865.690	4954031.000	0.0			
Vail	P	731861.500	4954033.000	0.0			
Vail	P	731857.190	4954037.500	0.0			
Vail	P	731854.060	4954038.500	0.0			
Vail	P	731850.880	4954040.500	0.0			
Vail	P	731844.690	4954042.000	0.0			
Vail	P	731843.560	4954044.000	0.0			
Vail	P	731842.440	4954046.000	0.0			
Vail	P	731835.120	4954048.500	0.0			
Vail	P	731833.000	4954050.500	0.0			
Vail	P	731828.810	4954052.500	0.0			
Vail	P	731826.690	4954053.000	0.0			
Vail	P	731821.500	4954055.000	0.0			
Vail	P	731816.380	4954054.500	0.0			
Vail	P	731812.120	4954057.500	0.0			
Vail	P	731803.880	4954059.000	0.0			
Vail	P	731799.560	4954064.000	0.0			
Vail	P	731794.380	4954064.500	0.0			
Vail	P	731785.000	4954068.000	0.0			
Vail	P	731782.880	4954070.000	0.0			
Vail	P	731777.690	4954071.000	0.0			
Vail	P	731773.560	4954071.500	0.0			
Vail	P	731771.440	4954073.500	0.0			
Vail	P	731768.380	4954073.500	0.0			
Vail	P	731764.190	4954074.000	0.0			
Vail	P	731759.120	4954074.000	0.0			
Vail	P	731755.000	4954074.500	0.0			
Vail	P	731751.810	4954076.500	0.0			
Vail	P	731751.750	4954077.500	0.0			
Vail	P	731748.690	4954077.500	0.0			
Vail	P	731743.620	4954076.000	0.0			
Vail	P	731742.620	4954076.000	0.0			
Vail	P	731740.560	4954076.000	0.0			
Vail	P	731739.560	4954076.000	0.0			
Vail	P	731738.560	4954076.000	0.0			
Vail	P	731734.440	4954075.500	0.0			
Vail	P	731733.500	4954074.500	0.0			
Vail	P	731731.440	4954074.500	0.0			
Vail	P	731727.380	4954074.500	0.0			
Vail	P	731726.310	4954074.000	0.0			
Vail	P	731725.380	4954073.000	0.0			
Vail	P	731724.380	4954072.000	0.0			
Vail	P	731721.440	4954070.000	0.0			
Vail	P	731718.440	4954069.000	0.0			
Vail	P	731716.500	4954066.500	0.0			
Vail	P	731711.500	4954064.500	0.0			
Vail	P	731710.500	4954063.500	0.0			
Vail	P	731707.440	4954063.000	0.0			
Vail	P	731706.500	4954062.000	0.0			
Vail	P	731704.560	4954060.000	0.0			
Vail	P	731703.560	4954059.000	0.0			

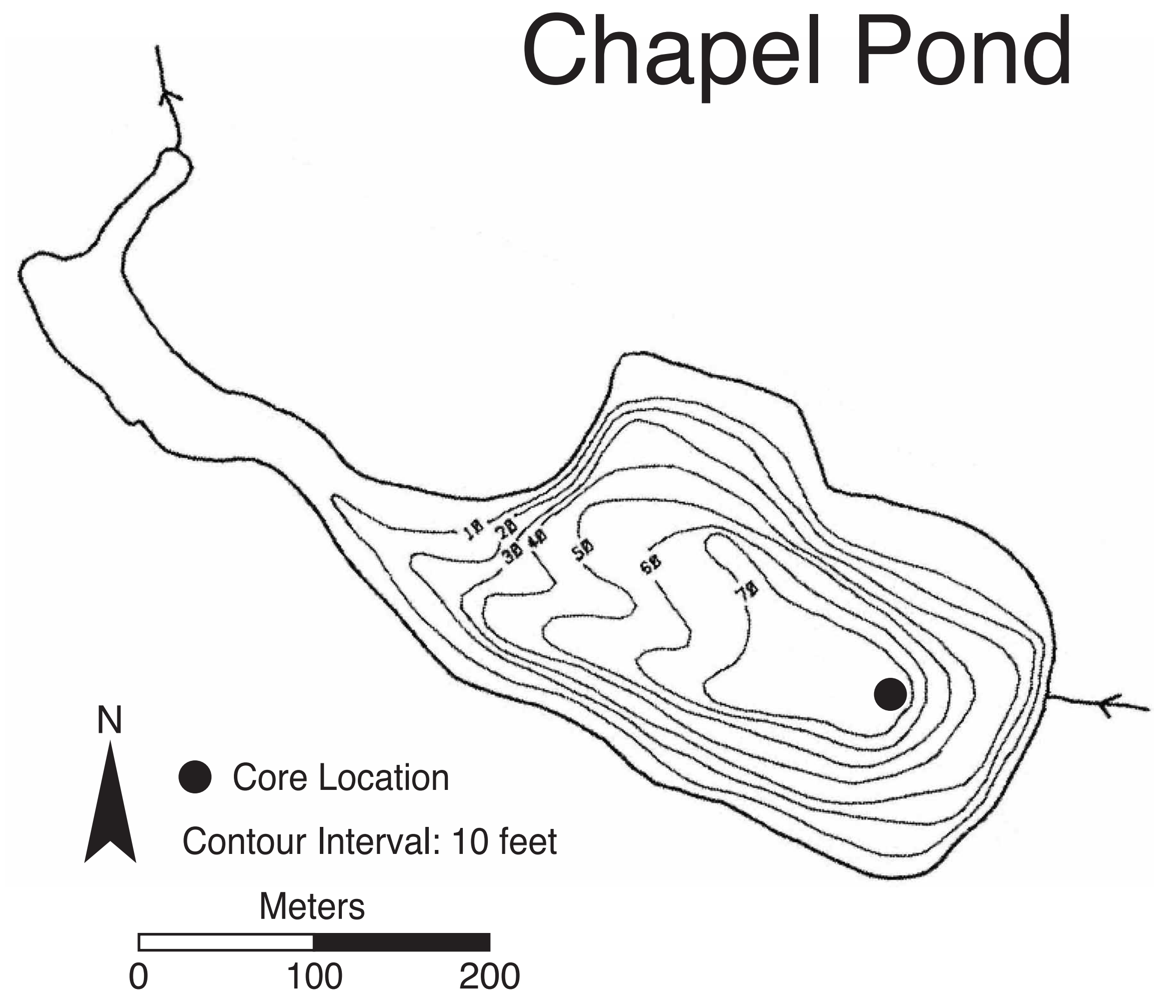
Lake	Point	Easting (m)	Northing (m)	Depth (m)	Filtered Positions	StDev	Horizontal Precision (m)
Vail	P	731702.620	4954058.000	0.0			
Vail	P	731701.620	4954057.000	0.0			
Vail	P	731698.690	4954054.500	0.0			
Vail	P	731697.690	4954053.500	0.0			
Vail	P	731697.880	4954050.500	0.0			

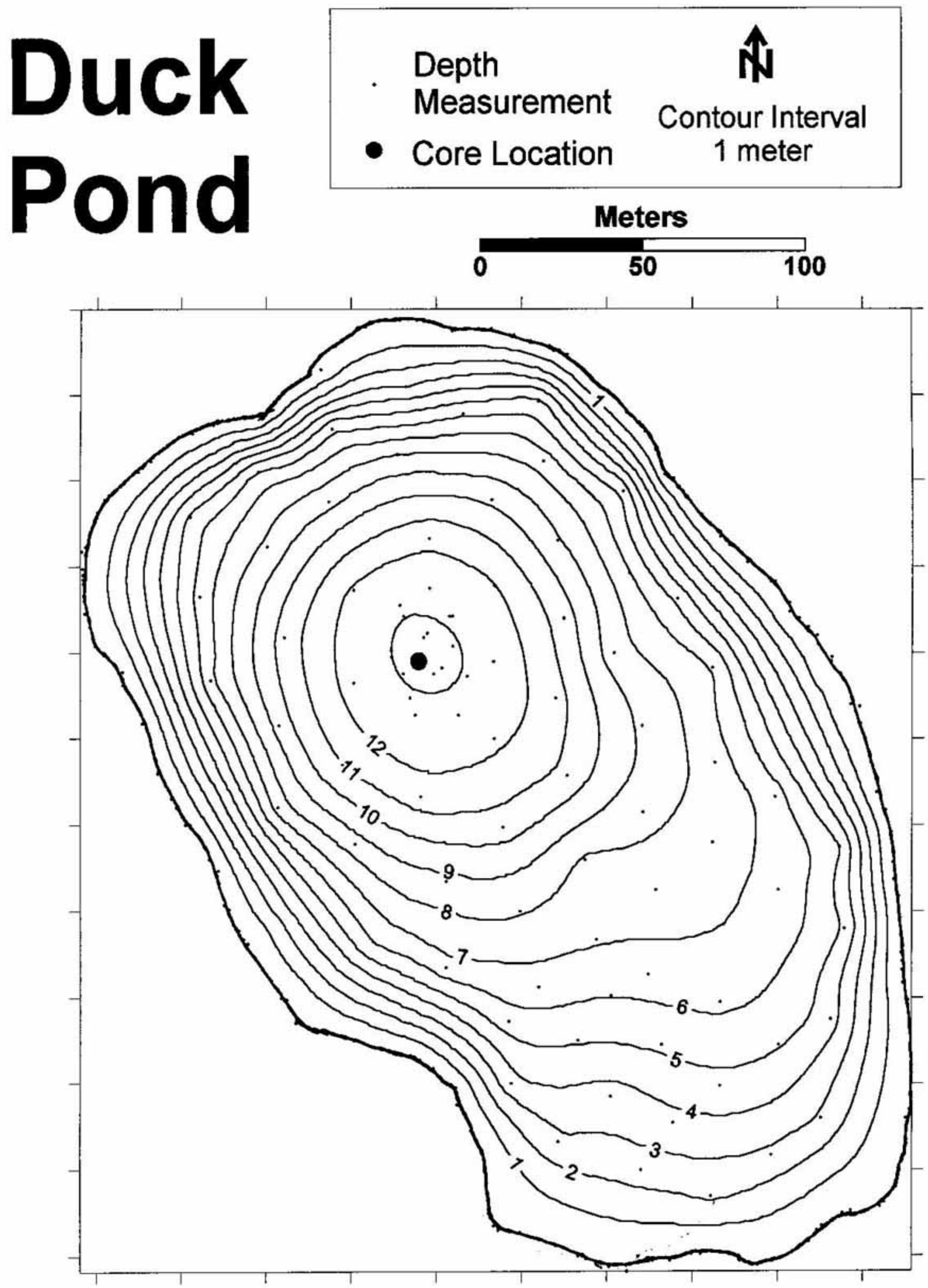
APPENDIX B: BATHYMETRIC MAPS



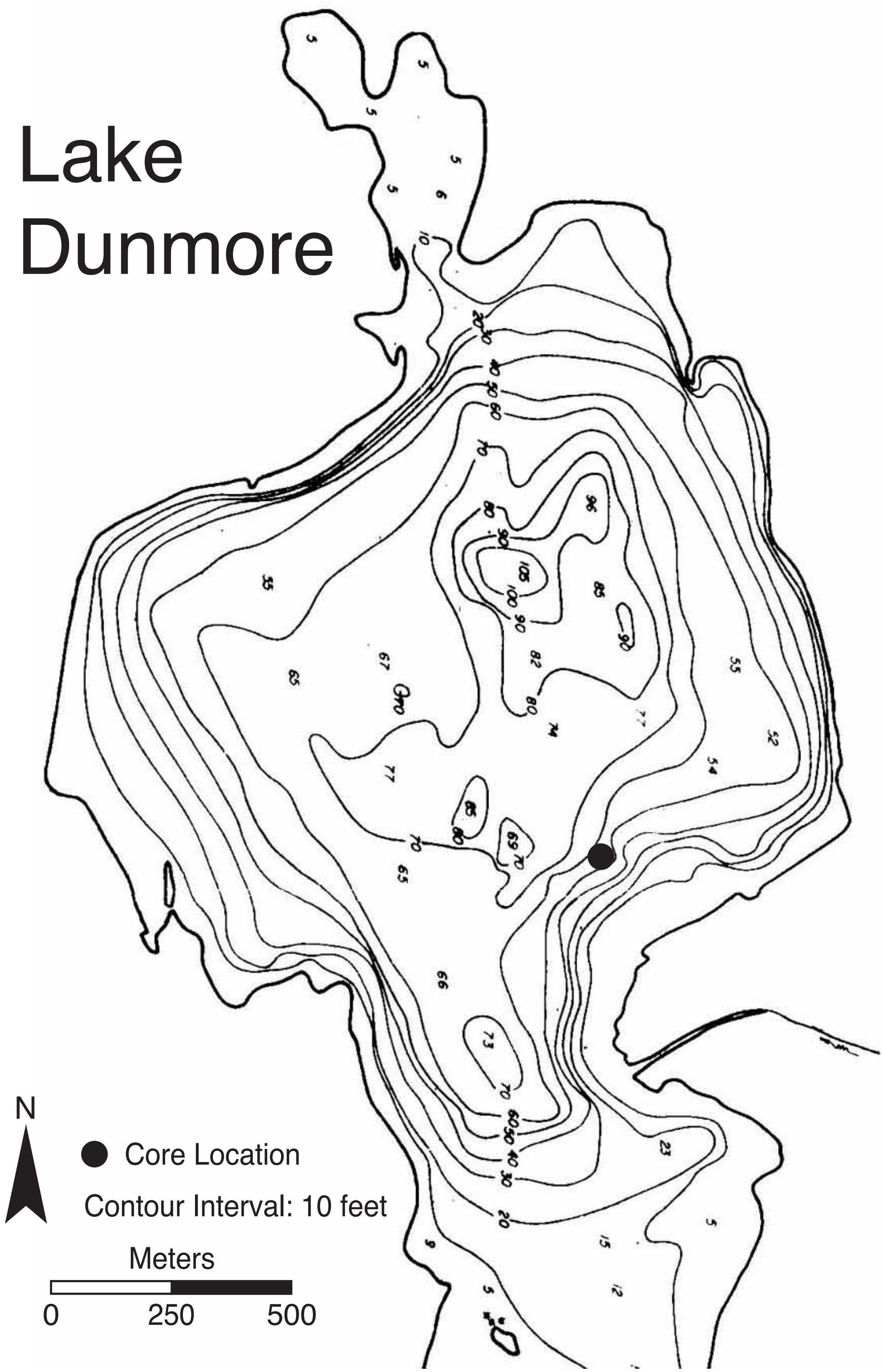
Beebe Pond

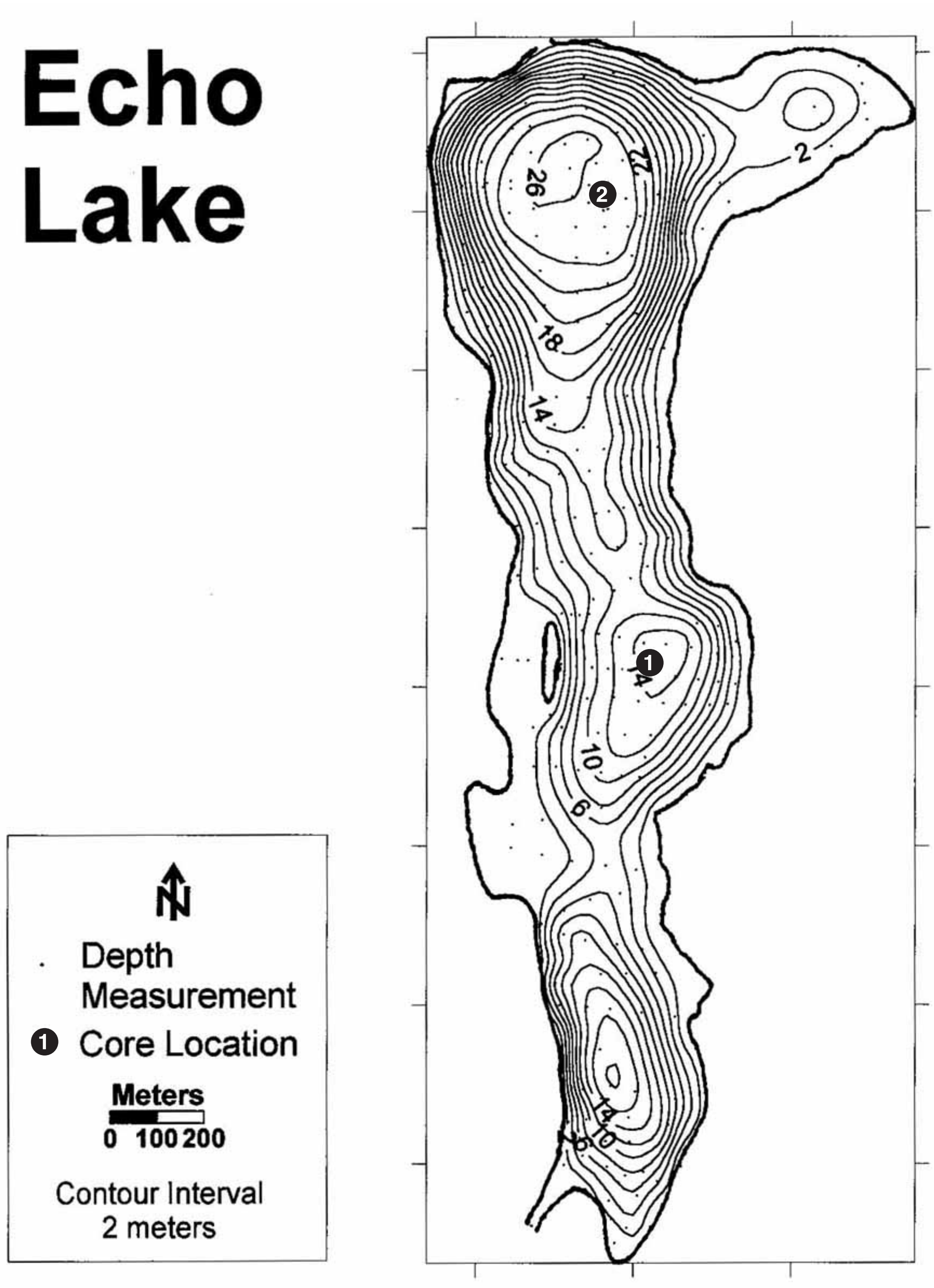


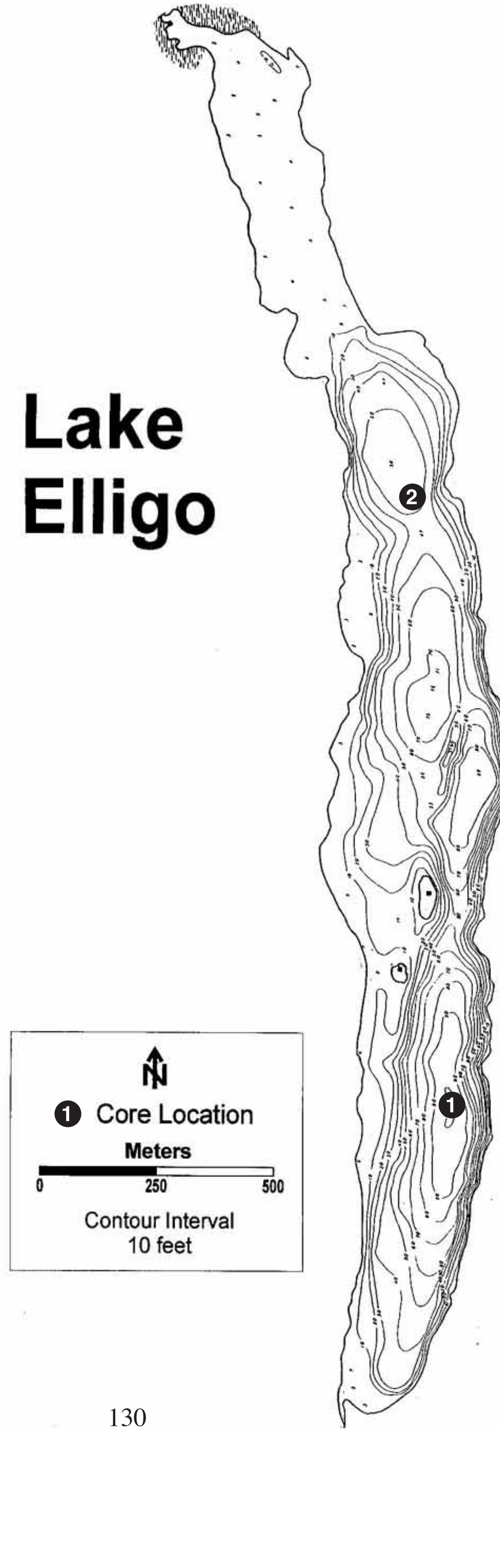

Chapel Pond
10
20
30
40
50
60
70
N
Core Location
Contour Interval: 10 feet
Meters
0
100
200



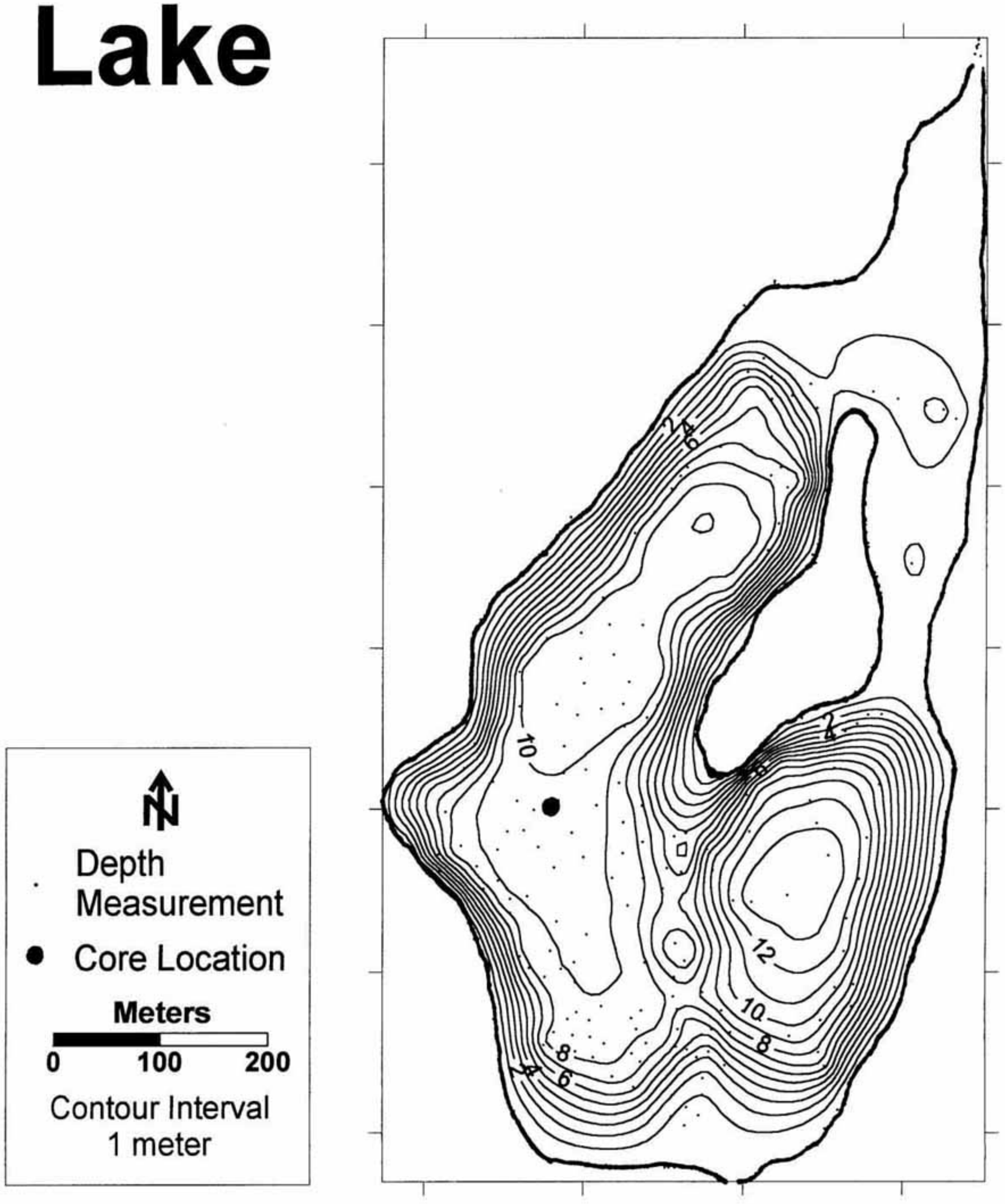
Duck Pond
Depth Measurement
Core Location
Contour Interval 1 meter
N
Meters
0
50
100
1
2
3
4
5
6
7
8
9
10
11
12
1

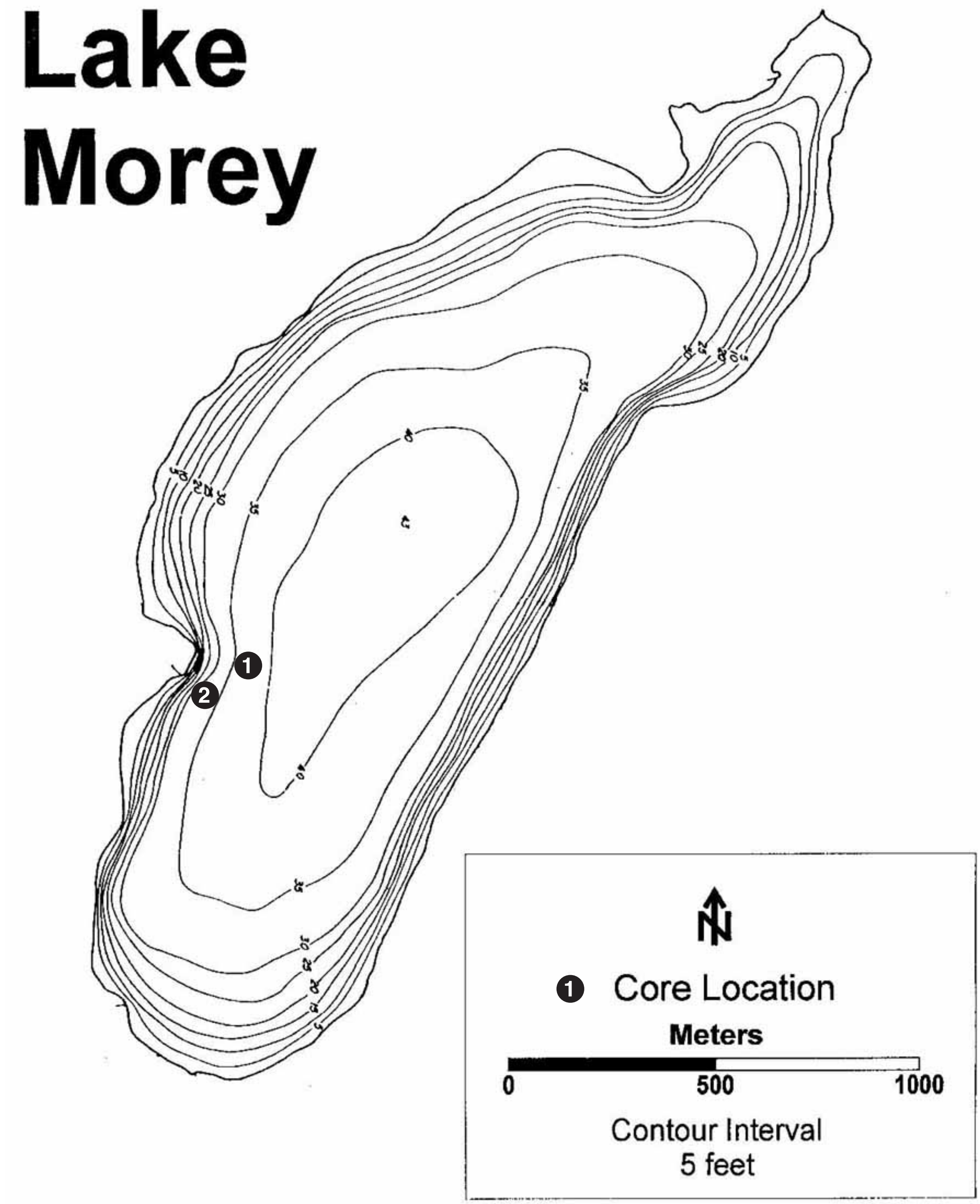

Lake
Dunmore
N
Core Location
Contour Interval: 10 feet
Meters
0
250
500

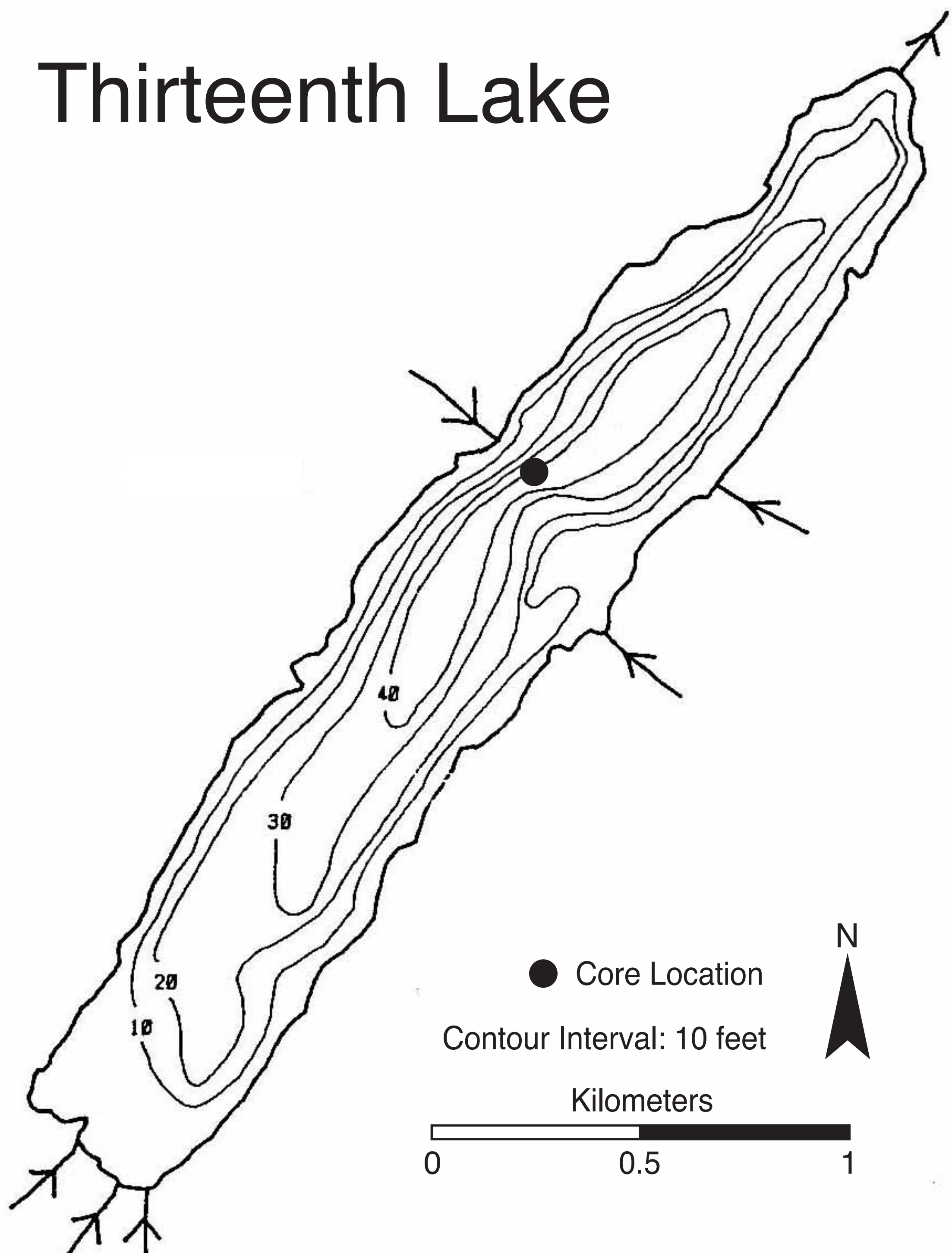

Echo Lake
Depth Measurement
Core Location
Meters
0 100 200
Contour Interval
2 meters
2
22
26
18
14
10
6

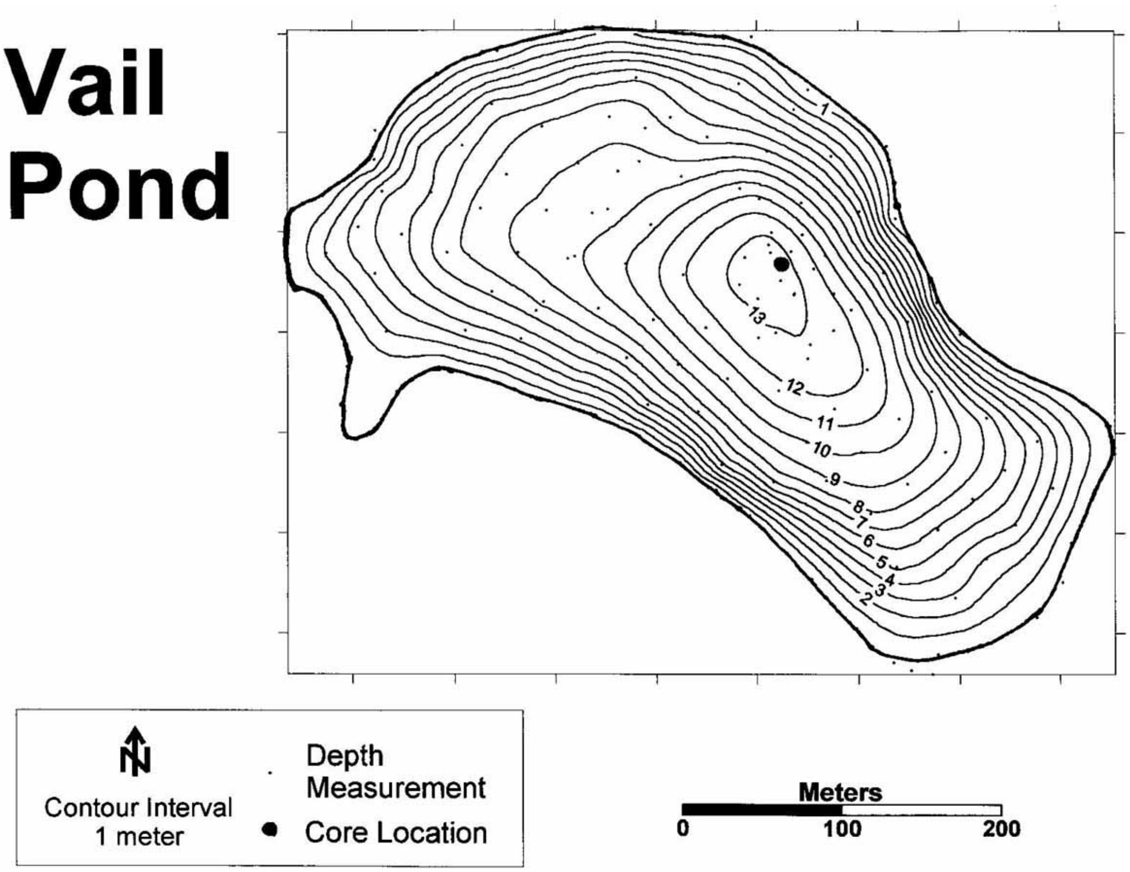

Lake
Elligo
N
1 Core Location
Meters
0
250
500
Contour Interval
10 feet
2
1

Emerald Lake




Lake
Morey
Core Location
Meters
0
500
1000
Contour Interval
5 feet


Thirteenth Lake
40
30
20
10
Core Location
Contour Interval: 10 feet
N
Kilometers
0
0.5
1


Vail
Pond
1
2
3
4
5
6
7
8
9
10
11
12
13
N
Contour Interval
1 meter
Depth
Measurement
Core Location
Meters
0
100
200

APPENDIX C: MAGNETIC SUSCEPTIBILITY DATA

Raw magnetic susceptibility values for each core (SI units). AM = Amherst; BB = Beebe; CH = Chapel; DU = Duck; DM = Dunmore; EC = Echo; EL = Elligo; EM = Emerald; MO = Morey; TH = Thirteenth; VA = Vail

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EL2	EM	MO1	MO2	TH	VA
0.95	10.5	3.8	12.4	2.0	3.0	39.5	26.0	11.9	0.2	11.9	0.7	3.1	-0.2	-0.1
1.90	14.0	4.9	15.7	2.4	3.8	59.6	31.4	15.5	0.2	16.2	0.9	4.4	-0.3	-0.2
2.85	16.4	5.6	18.1	2.4	4.4	76.5	33.0	18.5	0.3	18.3	0.9	6.0	-0.3	-0.3
3.80	17.5	5.8	19.7	2.2	4.6	87.8	32.9	20.1	0.5	18.7	0.8	7.3	-0.1	-0.2
4.75	17.7	5.8	20.8	2.0	4.6	94.1	32.4	21.6	0.2	18.2	1.2	8.3	-0.3	-0.2
5.70	17.3	5.4	21.5	1.8	4.5	97.0	31.7	22.6	0.3	17.1	0.9	9.0	-0.4	-0.3
6.65	16.7	4.9	22.0	1.5	4.5	97.7	31.5	23.5	0.4	15.9	1	9.7	-0.3	-0.5
7.60	16.1	4.3	22.0	1.5	4.5	97.5	33.7	24.2	0.4	14.7	0.9	10.1	-0.3	-0.3
8.55	15.4	3.5	21.4	1.4	4.4	97.4	38.3	24.7	0.4	13.5	0.7	10.9	-0.3	-0.5
9.50	14.8	2.8	20.3	1.3	4.4	97.2	44.6	25.3	0.4	12.4	0.8	11.8	-0.2	-0.4
10.45	14.3	2.2	19.2	1.1	4.4	96.9	48.5	25.9	0.4	11.6	0.9	13.0	-0.2	-0.3
11.40	14.0	1.9	17.9	1.0	4.6	96.6	47.1	26.2	0.5	11.0	0.9	13.9	-0.2	-0.4
12.35	13.8	1.5	16.7	0.8	4.7	96.4	43.1	26.4	0.6	10.4	0.9	14.7	0.0	-0.4
13.30	13.6	1.2	15.6	0.7	4.9	96.5	41.3	26.8	0.8	9.9	0.9	15.0	0.1	-0.4
14.25	13.7	0.8	14.4	0.7	5.0	97.3	42.7	27.5	0.9	9.6	1.1	14.3	0.2	-0.2
15.20	13.9	0.6	13.1	0.7	5.0	97.9	45.7	28.1	0.7	9.5	1	12.8	0.3	-0.3
16.15	14.4	0.6	12.2	0.7	4.7	98.3	46.1	27.8	0.8	8.6	0.9	10.7	0.5	-0.4
17.10	14.8	0.5	11.5	0.8	4.1	98.9	42.2	27.9	0.9	7.8	1	8.8	1.0	-0.3
18.05	14.9	0.6	11.1	0.8	3.4	99.6	36.6	27.7	0.9	7.1	0.9	7.4	0.9	-0.4
19.00	14.3	0.6	11.0	1.1	4.6	99.8	32.5	27.5	1.1	6.7	1	6.2	0.9	-0.4
19.95	13.3	0.6	11.0	1.1	5.7	99.9	31.4	27.0	1.1	6.5	0.9	5.3	0.8	-0.3
20.90	12.3	0.6	11.1	0.9	6.4	99.9	32.3	26.8	1.2	6.2	1	4.8	0.9	-0.2
21.85	11.8	0.7	11.8	0.8	6.9	99.8	33.1	26.4	1.1	5.8	0.9	4.4	0.9	-0.2
22.80	11.2	0.9	12.8	0.7	7.2	99.7	32.9	25.9	0.9	5.2	0.9	4.0	0.7	0.0
23.75	10.8	1.0	14.4	0.8	7.5	99.4	32.7	25.3	0.8	4.6	1.1	3.5	0.7	-0.3
24.70	10.2	1.4	16.5	0.7	7.6	98.8	34.5	24.9	0.7	4.2	1.2	3.1	0.5	-0.4
25.65	10.0	1.9	18.9	0.6	7.9	97.6	40.0	24.4	0.7	3.7	1.1	2.9	0.3	-0.4
26.60	9.8	2.5	21.9	0.6	7.9	95.1	50.6	24.0	0.6	3.5	1	2.8	0.1	-0.4
27.55	9.3	2.7	25.7	0.7	7.8	91.3	68.2	23.9	0.5	3.5	1	2.6	0.0	-0.4
28.50	8.9	3.0	30.7	0.5	7.7	86.9	94.3	23.8	0.5	3.4	1	2.4	-0.1	-0.4
29.45	8.5	3.4	36.3	0.6	7.3	82.8	125.3	23.8	0.6	3.4	1	2.4	-0.2	-0.5
30.40	8.1	3.8	41.7	0.6	6.8	79.6	146.7	23.9	0.5	3.1	0.9	2.3	-0.2	-0.6
31.35	7.5	4.1	45.9	0.6	6.5	77.5	139.9	24.2	0.5	3.0	1.1	2.2	-0.2	-0.5
32.30	7.1	4.4	48.2	0.6	6.1	76.2	111.6	24.6	0.5	3.0	1.1	2.1	-0.1	-0.6
33.25	6.6	5.0	48.6	0.6	5.8	76.2	83.7	25.4	0.5	2.6	1.1	2.2	0.0	-0.6
34.20	6.4	5.6	47.2	0.7	5.6	77.6	64.8	26.9	0.6	2.4	1.1	2.3	-0.1	-0.5
35.15	6.2	6.2	44.3	0.7	5.4	79.9	53.5	29.1	0.6	2.4	1.1	2.2	-0.1	-0.6
36.10	6.0	6.9	41.2	0.8	5.3	82.3	47.6	31.9	0.7	2.2	1.1	2.2	-0.1	-0.5
37.05	5.9	7.5	38.6	0.7	5.1	84.5	45.1	34.8	0.6	2.1	1.1	2.2	-0.2	-0.6
38.00	5.8	8.0	35.9	0.7	5.0	86.7	45.7	36.6	0.7	2.2	1.2	2.3	-0.2	-0.6
38.95	5.8	8.3	33.1	0.8	5.0	89.2	49.1	36.1	0.7	2.1	1.4	2.4	-0.2	-0.6
39.90	5.9	8.5	29.9	0.8	5.0	91.5	55.2	33.7	0.6	2.1	1.3	2.4	-0.2	-0.6
40.85	6.0	8.8	26.7	0.9	5.0	93.1	64.2	30.4	0.6	1.9	1.3	2.6	-0.2	-0.7
41.80	6.1	9.0	23.3	0.8	5.5	93.3	75.2	27.3	0.7	1.9	1.4	2.7	-0.1	-0.6
42.75	6.3	9.2	20.1	1.0	5.9	91.9	85.7	25.5	0.7	1.9	1.3	2.8	-0.2	-0.8
43.70	6.1	9.3	17.6	1.0	5.8	88.9	89.7	24.6	0.8	1.9	1.4	2.9	-0.1	-0.7
44.65	6.2	9.2	15.9	1.0	5.9	84.7	82.2	24.3	0.7	1.8	1.5	3.1	0.0	-0.7
45.60	6.1	9.2	14.9	1.0	5.8	80.0	67.0	24.5	0.7	1.8	1.5	3.2	-0.1	-0.6
46.55	6.0	9.3	14.2	1.1	5.6	75.2	53.0	24.8	0.6	1.8	1.6	3.4	-0.1	-0.6
47.50	5.9	9.3	13.9	1.1	5.3	70.8	43.5	25.1	0.7	1.8	1.5	3.5	0.0	-0.7
48.45	5.8	9.0	13.7	1.0	5.1	67.6	37.8	25.1	0.6	1.8	1.6	3.5	-0.1	-0.6
49.40	5.8	7.6	13.4	1.0	5.1	66.2	34.9	25.2	0.6	1.6	1.6	3.6	-0.1	-0.6
50.35	5.7	5.5	12.8	1.0	5.2	66.0	33.6	25.0	0.6	1.7	1.7	3.7	-0.2	-0.5
51.30	5.9	4.2	12.1	0.9	5.2	65.8	32.9	24.9	0.6	1.7	1.7	3.7	-0.1	-0.5
52.25	5.8	3.9	11.3	1.0	5.3	65.3	32.8	25.3	0.6	1.6	1.9	3.6	-0.2	-0.4
53.20	5.7	3.3	11.1	0.9	5.5	64.9	33.8	26.5	0.5	1.6	2	3.6	-0.2	-0.4
54.15	5.5	2.8	11.5	0.9	5.6	64.9	35.9	28.5	0.5	1.6	1.9	3.6	-0.2	-0.4
55.10	5.5	2.6	12.5	0.8	5.6	66.0	39.6	31.2	0.6	1.6	1.9	3.5	-0.2	-0.4
56.05	5.5	2.3	13.8	0.9	5.7	67.7	44.8	34.7	0.8	1.5	1.9	3.5	-0.2	-0.5
57.00	5.5	2.2	15.3	0.9	5.7	68.4	51.6	38.4	0.7	1.2	2.1	3.3	-0.2	-0.5
57.95	5.5	2.0	17.2	0.9	5.8	67.3	61.7	42.0	0.8	1.4	2	3.3	0.0	-0.4
58.90	5.6	1.8	18.8	0.9	6.0	64.1	77.7	46.0	0.7	1.4	2	3.3	0.0	-0.4
59.85	5.8	1.7	19.8	0.9	6.2	59.8	103.1	49.4	0.8	1.5	2	3.3	-0.1	-0.4
60.80	5.9	1.6	20.9	0.9	6.3	55.8	140.2	50.7	0.9	1.3	2	3.3	0.0	-0.4
61.75	6.0	1.4	22.7	0.8	6.7	53.2	190.6	48.5	1	1.3	1.9	3.3	-0.1	-0.4
62.70	6.0	1.3	25.2	0.8	7.0	52.4	249.1	43.2	0.9	1.3	1.9	3.3	0.0	-0.3
63.65	6.2	1.3	27.8	0.9	7.4	52.8	308.5	37.0	0.8	1.3	1.9	3.4	0.0	-0.2
64.60	6.1	1.2	29.2	0.8	7.6	53.6	360.0	32.4	0	1.3	1.8	3.5	0.0	-0.1

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EL2	EM	MO1	MO2	TH	VA
65.55	6.0	1.1	28.3	0.7	7.9	54.3	400.5	29.9	0.8	1.3	1.8	3.7	0.0	-0.1
66.50	5.8	1.1	25.8	0.7	8.0	55.2	437.0	28.1	0.8	1.4	1.8	3.7	0.0	-0.3
67.45	5.6	1.0	22.1	0.9	8.0	56.5	473.1	26.5	0.8	1.4	1.8	3.8	0.0	-0.4
68.40	5.5	1.1	18.1	0.8	7.7	58.3	501.4	25.0	0.8	1.4	1.8	3.7	0.1	-0.4
69.35	5.4	1.2	14.8	0.8	7.6	59.7	516.8	23.7	0.7	1.4	1.8	3.9	0.1	-0.4
70.30	5.4	1.4	12.2	0.7	7.3	60.4	525.2	22.6	0.8	1.4	1.9	4.0	0.2	-0.4
71.25	5.5	1.6	10.4	0.9	7.2	61.4	535.4	22.0	0.7	1.4	2	4.0	0.2	-0.4
72.20	5.3	1.9	9.4	0.9	6.9	64.0	551.8	21.3	0.6	1.4	2	4.0	0.2	-0.5
73.15	5.2	2.0	9.1	0.9	6.7	68.8	574.3	20.1	0.7	1.5	2.1	4.2	0.2	-0.5
74.10	5.2	2.0	9.4	0.9	6.6	76.3	598.2	18.3	0.7	1.4	2	4.2	0.2	-0.5
75.05	5.3	1.8	10.1	0.8	6.5	87.0	617.0	15.8	0.7	1.4	2.1	4.4	0.3	-0.5
76.00	5.3	1.7	11.1	0.8	6.5	100.2	628.3	13.9	0.7	1.4	2.1	4.5	0.2	-0.5
76.95	5.6	1.2	12.0	0.9	6.7	114.4	633.6	12.7	0.7	1.4	2.4	4.5	0.1	-0.4
77.90	5.7	0.8	12.5	0.8	6.8	127.6	636.0	12.0	0.7	1.5	2.4	4.6	0.2	-0.4
78.85	5.8	0.6	12.3	0.8	7.0	136.8	632.4	11.5	0.6	1.4	2.4	4.6	0.1	-0.3
79.80	6.1	0.5	11.7	0.8	7.1	138.5	613.4	11.5	0.6	1.5	2.4	4.7	0.1	-0.3
80.75	6.2	0.5	11.2	0.7	7.3	132.5	563.0	11.4	0.6	1.5	2.4	4.8	0.2	-0.2
81.70	6.2	0.5	11.3	0.7	7.4	121.8	475.7	11.3	0.6	1.5	2.5	4.7	0.2	-0.1
82.65	6.2	0.5	11.7	0.6	7.6	110.8	371.2	11.2	0.7	1.5	2.6	4.7	0.3	-0.1
83.60	6.5	0.5	12.3	0.6	7.6	101.8	271.1	11.1	0.9	1.5	2.4	4.6	0.3	0.0
84.55	6.5	0.6	12.6	0.7	7.7	95.6	191.3	11.0	0.7	1.4	2.3	4.5	0.3	0.2
85.50	6.3	0.6	12.9	0.7	7.9	92.8	135.9	10.9	0.8	1.4	2.4	4.4	0.4	0.2
86.45	6.1	0.6	13.1	0.7	7.9	92.2	100.3	10.9	0.7	1.3	2.4	4.3	0.4	0.2
87.40	6.0	0.6	13.4	0.7	7.9	92.6	81.6	10.8	0.8	1.4	2.4	4.1	0.5	0.2
88.35	5.8	0.5	13.9	0.6	8.0	93.7	76.3	10.8	0.7	1.4	2.5	4.1	0.6	0.2
89.30	5.6	0.5	14.1	0.7	8.1	94.7	78.2	11.2	0.8	1.5	2.5	4.0	0.6	0.2
90.25	5.5	0.5	14.0	0.7	8.3	96.0	81.2	11.9	0.7	1.4	2.5	3.9	0.6	0.2
91.20	5.4	0.5	13.6	0.6	8.6	97.8	82.4	12.8	0.8	1.5	2.3	3.9	0.6	0.2
92.15	5.3	0.4	13.3	0.5	8.9	99.8	80.1	13.6	0.9	1.5	2.4	3.9	0.7	0.2
93.10	5.2	0.3	13.7	0.4	9.3	102.1	75.4	14.5	0.9	1.4	2.4	3.9	0.8	0.2
94.05	5.5	0.3	14.3	0.5	9.7	104.7	70.5	15.3	1	1.4	2.5	3.9	0.7	0.1
95.00	5.7	0.3	15.5	0.4	10.3	106.9	65.7	16.1	1	1.6	2.6	3.7	0.8	0.3
95.95	5.8	0.3	17.1	0.4	11.1	108.8	60.6	16.6	0.9	1.6	2.6	3.7	0.8	0.1
96.90	5.7	0.4	18.7	0.4	12.3	110.3	56.3	17.1	1.1	1.5	2.6	3.7	1.0	0.1
97.85	5.7	0.4	20.1	0.4	13.8	111.3	52.6	17.6	1	1.5	2.7	3.7	1.0	0.0
98.80	5.8	0.5	21.0	0.5	16.0	112.0	48.9	18.0	0.9	1.5	2.7	3.7	1.1	-0.1
99.75	5.8	0.6	21.4	0.7	18.4	112.1	44.8	18.1	0.9	1.3	2.8	3.7	1.2	-0.2
100.70	5.8	0.6	21.3	0.7	20.7	111.5	42.0	18.2	1	1.4	2.8	3.8	1.4	-0.2
101.65	5.7	0.7	20.0	1.0	22.2	110.1	40.6	18.3	0.8	1.4	2.9	3.7	1.6	-0.4
102.60	5.7	0.7	17.9	1.3	24.2	107.9	39.6	18.4	0.8	1.4	2.9	3.9	1.8	-0.2
103.55	5.6	0.6	15.5	1.6	27.4	105.3	38.3	18.5	0.8	1.4	2.9	3.9	1.9	-0.3
104.50	5.5	0.7	13.3	1.8	32.7	102.9	38.4	18.4	0.8	1.6	3.1	3.9	1.7	-0.6
105.45	5.7	0.7	11.8	1.8	39.7	100.7	40.1	18.1	0.8	1.5	3.2	3.9	1.6	-0.5
106.40	5.8	0.8	10.7	1.7	46.9	98.9	41.9	17.7	0.8	1.4	3.2	4.1	1.4	-0.4
107.35	5.6	0.8	10.3	1.3	51.0	97.2	43.6	17.2	0.8	1.5	3.3	4.2	1.1	-0.4
108.30	5.7	0.9	9.7	0.9	52.2	95.5	44.3	16.9	0.7	1.4	3.3	4.2	0.8	-0.4
109.25	5.9	0.9	9.1	0.7	48.6	93.5	44.1	16.7	0.7	1.5	3.4	4.2	0.7	-0.3
110.20	6.0	1.0	8.6	0.4	41.8	91.5	43.8	16.6	0.6	1.5	3.4	4.2	0.6	-0.2
111.15	6.1	1.0	8.4	0.4	33.4	89.7	42.3	16.2	0.6	1.6	3.5	4.3	0.5	-0.3
112.10	6.1	1.0	8.5	0.3	26.3	87.8	39.6	15.8	0.5	1.6	3.5	4.4	0.4	-0.4
113.05	6.0	1.0	8.5	0.3	21.5	85.6	38.1	15.2	0.6	1.6	3.5	4.7	0.4	-0.3
114.00	5.9	1.1	8.4	0.2	18.7	82.8	39.3	14.8	0.6	1.6	3.6	4.9	0.4	-0.3
114.95	6.0	1.2	8.2	0.1	16.7	79.9	40.7	14.4	0.6	1.8	3.4	5.2	0.4	-0.4
115.90	5.9	1.3	7.7	0.1	14.8	77.4	38.9	14.0	0.6	1.7	3.4	5.6	0.4	-0.3
116.85	5.9	1.6	7.2	0.0	13.0	75.8	34.6	13.7	0.6	1.7	3.3	6.1	0.5	-0.4
117.80	5.6	1.8	6.6	0.1	11.8	74.4	34.3	13.2	0.7	1.7	3.2	6.8	0.4	-0.4
118.75	5.5	2.2	5.9	0.1	11.0	73.6	34.0	12.6	0.7	1.8	3.2	7.7	0.4	-0.5
119.70	5.2	2.6	5.3	0.1	10.6	73.8	33.7	12.0	0.7	1.5	3.2	9.1	0.2	-0.3
120.65	4.9	3.3	4.9	0.1	10.2	75.0	33.4	11.8	0.7	1.6	3.2	10.5	0.1	-0.4
121.60	4.8	4.0	4.6	0.2	9.9	76.2	31.6	11.3	0.8	1.6	3.1	11.7	0.0	-0.3
122.55	4.6	5.1	4.8	0.2	9.5	76.1	33.1	11.0	0.8	1.6	3.1	12.0	0.0	-0.4
123.50	4.7	6.3	4.7	0.2	9.0	74.0	32.9	10.9	0.8	1.6	3.4	11.6	-0.1	-0.3
124.45	5.1	7.4	4.7	0.3	8.6	70.5	32.6	10.7	0.7	1.5	3.5	10.5	-0.2	-0.2
125.40	5.7	8.3	4.5	0.3	8.3	66.5	32.5	10.7	0.6	1.5	3.6	9.1	-0.1	-0.3
126.35	6.3	8.8	3.8	0.4	8.1	62.5	32.0	10.8	0.6	1.5	3.5	7.4	-0.1	-0.3
127.30	6.6	9.1	3.1	0.4	8.1	58.8	31.7	10.9	0.2	1.5	3.6	5.1	-0.1	-0.3
128.25	6.3	8.9	3.0	0.5	8.1	55.2	31.7	10.8	0.4	1.3	3.6	3.0	-0.2	-0.2
129.20	5.6	8.6	4.0	0.6	8.1	51.8	30.9	10.7	0.5	1.1	3.5	4.3	-0.3	-0.1
130.15	4.8	8.0	4.2	0.5	8.3	48.7	30.4	10.4	0.5	0.8	3.5	4.9	-0.3	-0.2
131.10	4.2	7.4	4.3	0.5	8.7	46.0	31.7	9.6	0.4	0.6	3.4	5.1	-0.3	-0.1
132.05	4.0	6.7	4.3	0.3	8.9	43.2	33.3	8.2	0.6	0.3	3.4	5.0	-0.3	-0.2
133.00	3.6	5.7	4.3	0.3	9.0	40.3	33.3	5.9	0.5	0.9	3.4	4.7	-0.3	-0.1
133.95	3.4	4.6	4.2	0.2	8.8	37.2	32.1	3.6	0.4	1.3	3.5	4.4	-0.2	-0.1
134.90	3.4	3.9	4.1	0.2	8.6	34.3	31.8	5.3	0.4	1.5	3.3	4.3	-0.2	0.0
135.85	3.6	3.5	4.2	0.1	8.5	32.1	32.6	6.8	0.3	2.0	3.4	4.3	0.0	-0.1
136.80	3.9	3.5	4.5	0.1	8.7	30.3	33.8	7.8	0.4	2.0	3.5	4.2	0.0	0.0
137.75	4.3	3.8	5.3	0.3	9.1	28.6	35.3	8.4	0.3	2.0	3.7	3.9	0.0	-0.1

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EL2	EM	MO1	MO2	TH	VA
138.70	4.5	4.3	5.9	0.2	9.8	26.5	36.7	8.8	0.3	1.9	3.7	3.8	0.1	-0.2
139.65	4.6	5.0	6.3	0.2	10.8	24.0	38.8	9.2	0.3	1.9	3.8	3.7	0.2	-0.1
140.60	4.5	5.8	6.2	0.3	12.3	20.8	41.5	9.3	0.1	2.0	3.9	3.6	0.3	-0.2
141.55	4.5	6.6	6.1	0.2	14.4	16.4	43.5	9.4	0.2	1.9	3.9	3.5	0.3	-0.2
142.50	4.5	7.2	6.1	0.3	17.0	11.1	43.7	9.5	0.3	1.9	3.8	3.3	0.4	-0.1
143.45	4.6	7.7	6.4	0.2	20.0	10.8	40.3	9.5	0.2	2.0	3.9	3.3	0.5	-0.1
144.40	4.7	8.0	6.5	0.4	23.1	16.6	34.3	9.4	0.2	1.9	4.1	3.3	0.6	0.4
145.35	4.8	8.3	6.5	0.5	25.9	21.8	28.3	9.5	0.1	1.9	4.1	3.3	0.7	0.3
146.30	4.9	8.1	6.5	0.7	28.8	25.3	23.3	9.4	0.2	1.9	3.9	3.3	0.7	0.3
147.25	4.8	7.8	6.4	0.7	32.2	27.7	19.7	9.3	0.1	1.9	3.7	3.3	0.6	0.4
148.20	4.6	7.3	6.3	0.7	35.4	29.0	17.6	9.3	0.1	2.0	3.8	3.3	0.6	0.5
149.15	4.3	7.0	6.4	0.7	37.3	29.4	16.5	9.3	0.2	1.9	3.8	3.5	0.6	0.4
150.10	4.3	6.4	6.6	0.8	37.9	29.4	15.4	9.4	0.5	2.0	3.7	3.7	0.7	0.5
151.05	4.3	6.0	6.5	0.7	36.8	29.0	14.6	9.6	0.4	1.9	3.6	3.4	0.8	0.4
152.00	4.2	5.7	6.7	0.7	34.7	28.9	13.9	9.7	0	1.9	3.2	3.5	1.0	0.3
152.95	4.2	5.4	7.0	0.7	31.9	29.6	13.3	9.9	0	1.9	3.1	3.4	0.8	0.5
153.90	4.2	5.1	7.5	0.7	29.4	31.1	13.1	10.1	0	1.9	3	3.4	0.6	0.6
154.85	4.1	4.8	8.0	0.8	27.2	34.1	13.0	10.3	0	2.0	2.9	3.6	0.7	0.6
155.80	4.1	4.5	8.6	0.9	25.6	38.2	13.1	10.3	0.1	2.3	2.8	3.7	0.6	0.4
156.75	4.1	3.8	10.4	1.0	24.3	43.3	13.5	10.5	0	2.5	2.9	3.6	0.5	0.3
157.70	4.1	3.2	13.6	1.1	23.4	48.4	14.3	10.8	0	2.1	2.9	3.6	0.5	0.5
158.65	4.0	2.7	18.5	1.3	22.6	52.9	14.9	10.5	0	2.1	2.9	3.6	0.3	0.4
159.60	4.0	2.5	24.8	1.6	21.6	56.2	15.6	10.5	-0.1	2.1	3	3.7	0.3	0.4
160.55	4.0	2.3	30.8	1.4	20.6	59.3	16.8	10.4	-0.1	2.1	3	3.8	0.3	0.5
161.50	4.1	2.4	34.2	1.3	19.1	61.8	17.9	10.3	0	2.2	2.9	3.9	0.3	0.6
162.45	3.9	2.5	32.8	1.3	17.5	64.1	19.1	10.1	0.1	2.1	2.9	3.9	0.3	0.6
163.40	3.8	2.8	26.3	1.1	15.8	65.9	20.4	9.9	0.1	2.1	2.9	3.8	0.3	0.9
164.35	3.9	3.1	18.5	1.1	14.1	67.6	22.2	9.8	0.1	2.3	2.9	3.8	0.4	1.0
165.30	4.0	3.1	12.5	0.9	12.3	68.8	24.5	9.8	0.1	2.2	2.9	3.8	0.4	1.4
166.25	3.8	2.7	8.8	0.7	10.6	68.0	27.4	9.6	0.2	2.2	3	3.9	0.4	1.5
167.20	3.7	2.1	6.6	0.5	8.4	64.9	30.7	9.6	0.2	2.2	3	3.7	0.3	1.2
168.15	3.8	1.7	5.3	0.4	6.0	61.0	34.3	9.6	0.2	2.3	3.1	3.7	0.3	1.0
169.10	3.7	1.4	4.8	0.6	8.4	56.9	38.2	9.4	0.1	2.2	3.2	3.8	0.3	0.9
170.05	3.7	1.3	4.7	0.6	10.6	53.5	41.6	9.4	0.2	2.2	3.2	3.8	0.3	0.8
171.00	3.7	1.2	4.8	0.6	11.5	51.2	44.4	9.2	0.3	2.2	3.3	3.9	0.3	0.7
171.95	3.5	1.1	4.9	0.7	11.8	49.3	45.7	9.4	0.3	2.2	3.3	3.9	0.2	0.6
172.90	3.5	1.0	5.0	0.5	12.0	47.7	44.3	9.7	0.3	2.2	3.3	3.8	0.2	0.3
173.85	3.5	1.1	5.3	0.6	12.1	46.0	41.3	9.8	0.3	2.2	3.4	3.8	0.3	0.0
174.80	3.5	1.1	5.4	0.5	12.1	44.5	39.1	10.1	0.2	2.1	3.5	3.6	0.3	0.0
175.75	3.4	1.1	5.4	0.4	12.2	43.4	38.7	10.4	0.2	2.1	3.6	3.6	0.3	0.0
176.70	3.4	1.2	5.1	0.4	12.5	42.8	40.4	10.7	0.1	2.1	3.5	3.6	0.3	-0.1
177.65	3.6	1.4	4.8	0.3	12.8	43.0	43.4	11.0	0	2.1	3.5	3.5	0.3	-0.1
178.60	3.3	1.4	4.5	0.4	12.8	43.8	47.5	11.2	0.2	2.2	3.5	3.5	0.5	-0.1
179.55	3.1	1.4	4.4	0.5	12.3	44.8	51.4	11.1	0.1	2.1	3.4	3.5	0.6	-0.1
180.50	3.1	1.3	4.4	0.7	11.8	46.4	52.6	11.0	0.1	2.1	3.5	3.5	0.6	0.0
181.45	3.2	1.3	4.4	0.9	11.5	48.0	49.5	10.9	0.2	2.1	3.5	3.5	0.7	0.0
182.40	3.2	1.2	4.2	1.3	11.5	49.4	43.6	10.9	0.2	2.2	3.4	3.5	0.8	-0.1
183.35	3.1	1.1	3.8	1.5	11.8	50.3	37.2	10.9	0.1	2.1	3.5	3.4	0.9	0.0
184.30	3.0	1.1	3.4	1.6	12.2	50.6	32.9	10.8	0.1	2.0	3.5	3.5	1.0	0.0
185.25	3.0	0.9	3.0	1.6	13.0	50.5	30.6	11.0	0.1	2.1	3.6	3.6	1.1	0.2
186.20	3.0	0.8	2.9	1.7	13.9	49.1	28.8	11.1	0.1	2.1	3.6	3.6	1.1	0.3
187.15	3.0	0.7	2.8	1.4	14.7	47.5	27.9	11.1	0.1	2.2	3.7	3.6	1.1	0.4
188.10	3.0	0.8	2.6	1.4	15.4	46.2	27.7	11.1	0	2.2	3.8	3.6	1.1	0.5
189.05	3.1	0.6	2.7	1.3	16.3	45.9	28.5	11.0	0.1	2.2	3.9	3.6	0.9	0.7
190.00	3.1	0.6	2.7	1.2	17.2	46.9	29.9	11.1	0.1	2.2	3.9	3.6	0.8	0.9
190.95	3.0	0.6	2.8	1.0	18.0	48.6	31.6	11.0	0.1	2.3	4	3.7	0.6	1.1
191.90	3.2	0.5	2.8	0.9	18.8	50.8	33.6	11.0	0	2.1	4	3.8	0.5	1.3
192.85	3.2	0.5	2.8	0.8	19.8	53.4	35.4	11.2	0	2.1	4	3.7	0.4	1.2
193.80	3.0	0.5	2.8	0.9	20.5	56.2	37.0	11.4	0	2.1	4	4.0	0.4	1.0
194.75	3.0	0.6	2.6	1.0	20.9	58.0	38.0	11.8	0.1	2.0	3.9	4.1	0.4	0.8
195.70	3.1	0.7	2.4	1.0	21.3	58.7	38.4	12.2	0.2	2.0	3.9	4.1	0.5	0.8
196.65	2.9	0.8	2.2	1.3	21.4	57.9	38.5	12.6	0.1	2.2	3.8	4.1	0.6	1.0
197.60	2.9	0.6	2.1	1.1	21.0	55.4	39.0	13.2	0.1	2.0	3.7	4.2	0.7	1.1
198.55	2.8	0.7	2.3	1.2	19.8	52.5	40.7	13.5	0.1	2.1	3.6	4.2	0.8	1.3
199.50	2.7	0.7	2.4	1.1	18.1	49.8	44.3	13.6	0	2.1	3.4	4.4	0.8	1.4
200.45	2.7	0.6	2.5	1.1	16.5	47.8	50.5	13.2	-0.1	2.0	3.4	4.4	0.9	1.6
201.40	2.8	0.8	2.8	1.2	15.1	45.2	59.7	12.6	-0.1	2.0	3.4	4.3	0.8	1.6
202.35	2.9	1.0	3.2	1.3	13.9	41.1	70.3	11.8	-0.1	1.9	3.3	4.4	0.7	1.5
203.30	2.8	1.3	3.5	1.3	12.9	36.5	78.9	11.2	-0.2	1.8	3.2	4.4	0.7	1.2
204.25	2.7	1.5	3.9	1.2	12.0	32.5	84.0	10.6	-0.1	1.8	3.3	4.5	0.6	0.9
205.20	2.8	1.6	4.3	1.1	11.2	29.9	86.8	10.2	-0.1	1.7	3.2	4.6	0.6	0.9
206.15	2.9	1.7	4.7	1.1	10.5	28.6	88.8	9.8	-0.2	1.7	3.3	4.6	0.5	0.7
207.10	3.1	1.6	5.0	1.1	10.1	28.2	90.7	9.6	-0.1	1.8	3.2	4.8	0.7	0.8
208.05	3.1	1.4	5.0	1.3	9.9	29.2	92.2	9.5	-0.1	1.7	3.2	4.9	0.6	0.7
209.00	3.2	1.2	4.8	1.4	10.0	30.9	93.8	9.4	-0.1	1.7	3.1	4.9	0.6	0.7
209.95	3.1	0.9	4.5	1.4	10.1	33.5	95.5	9.5	-0.1	1.7	3	4.9	0.7	0.6
210.90	3.3	0.7	4.0	1.5	10.4	37.1	97.2	9.4	-0.1	1.8	3.2	4.8	0.6	0.4

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EL2	EM	MO1	MO2	TH	VA
211.85	3.2	0.5	3.5	1.8	10.4	41.8	98.3	9.5	-0.1	1.8	3.1	4.9	0.6	0.3
212.80	3.1	0.6	3.4	1.7	10.3	47.6	98.3	9.4	0	1.7	3.2	4.9	0.4	0.1
213.75	3.0	0.5	3.4	1.9	10.0	53.8	95.9	9.3	-0.1	1.8	3.2	4.8	0.6	0.1
214.70	2.9	0.5	3.8	2.0	9.7	59.5	90.8	9.3	-0.1	1.7	3.2	4.9	0.7	0.0
215.65	2.9	0.6	4.2	2.0	9.7	64.8	83.9	9.2	0	1.7	3.3	4.9	0.7	0.0
216.60	2.9	0.6	4.3	2.1	9.9	69.2	77.2	9.3	0	1.8	3.3	5.0	0.8	0.0
217.55	2.9	0.5	4.3	2.0	10.2	71.3	71.1	9.4	0	1.7	3.3	5.2	1.0	0.0
218.50	2.9	0.9	4.2	2.2	10.5	70.9	65.8	9.4	0	1.8	3.2	5.0	1.1	0.1
219.45	2.9	1.0	4.1	2.2	10.5	68.9	60.5	9.4	0.1	1.9	3.2	5.0	1.1	0.0
220.40	3.0	0.8	4.1	2.2	10.4	66.7	56.0	9.4	0	1.9	3.3	5.0	1.0	0.1
221.35	3.0	0.8	4.0	2.2	10.0	64.3	52.6	9.4	0	1.9	3.4	4.9	0.9	0.0
222.30	3.0	0.8	4.1	2.3	9.7	62.2	50.6	9.4	0	2.0	3.3	5.0	0.7	0.1
223.25	3.0	0.7	4.4	2.4	9.5	60.0	48.7	9.6	0	2.0	3.5	5.1	0.6	0.3
224.20	2.8	0.7	4.6	2.6	9.6	57.5	45.8	9.6	0	2.0	3.6	5.1	0.6	0.3
225.15	2.9	0.9	4.8	2.9	9.9	55.0	42.2	9.6	-0.1	2.1	3.5	5.1	0.4	0.3
226.10	2.9	1.0	4.7	2.8	10.4	53.1	38.6	9.6	-0.1	2.0	3.5	5.3	0.5	0.4
227.05	2.9	1.3	4.4	2.5	11.0	52.5	36.5	9.6	0.1	2.0	3.4	5.2	0.4	0.4
228.00	3.0	1.5	4.2	2.2	11.6	53.1	35.4	9.8	0	2.0	3.5	5.4	0.4	0.5
228.95	2.7	1.6	4.2	1.9	12.1	54.2	34.9	9.8	0.1	2.1	3.5	5.6	0.4	0.5
229.90	2.7	1.4	4.1	1.8	12.9	55.3	34.3	9.9	0.2	2.0	3.5	5.7	0.2	0.4
230.85	2.6	0.9	3.9	1.6	14.0	56.1	34.3	10.1	0.1	2.1	3.5	5.7	0.2	0.5
231.80	2.6	0.6	3.8	1.5	15.7	56.3	34.5	10.2	0	2.1	3.5	5.7	0.3	0.6
232.75	2.6	0.4	4.0	1.3	18.0	56.5	34.6	10.3	-0.1	2.1	3.6	5.6	0.2	0.6
233.70	2.6	0.2	4.2	1.2	20.6	54.6	34.5	10.3	-0.1	2.0	3.6	5.5	0.2	0.6
234.65	2.8	0.2	4.4	1.3	23.8	50.0	34.3	10.3	-0.1	2.0	3.7	5.5	0.2	0.4
235.60	2.7	0.1	4.3	1.4	27.7	44.1	34.8	10.3	-0.2	0.0	3.7	5.4	0.2	0.5
236.55	2.7	0.2	4.0	1.1	32.2	39.6	36.2	10.4	-0.2	2.0	3.9	5.4	0.2	0.7
237.50	2.7	0.1	3.5	1.0	36.1	37.3	38.8	10.4	-0.2	2.0	3.9	5.4	0.4	0.8
238.45	2.7	0.1	3.0	1.2	37.9	36.7	42.1	10.3	-0.3	1.9	4.1	5.5	0.5	0.9
239.40	2.8	0.3	2.8	1.0	37.5	36.4	45.8	10.1	-0.1	1.8	4.1	5.5	0.6	1.1
240.35	2.9	0.4	2.7	1.1	36.6	35.8	48.1	10.0	-0.2	1.7	4	5.4	0.9	1.3
241.30	2.9	0.4	2.7	1.0	36.4	35.2	47.2	9.9	-0.2	1.8	4.2	5.4	1.0	1.3
242.25	3.2	0.5	2.7	1.1	36.9	36.1	42.0	9.6	-0.3	1.8	4.3	5.4	1.2	1.4
243.20	3.1	0.6	2.8	1.1	36.3	39.5	33.5	9.4	-0.2	1.8	4.3	5.3	1.2	1.5
244.15	3.2	0.7	2.9	1.3	33.5	45.3	24.0	9.3	-0.2	1.8	4.5	5.4	1.2	1.7
245.10	3.3	0.7	3.0	1.4	29.2	54.1	21.9	9.2	-0.1	1.8	4.5	5.4	1.0	2.2
246.05	3.5	0.6	3.1	1.3	24.7	65.1	19.8	9.2	-0.2	1.8	4.7	5.4	0.9	2.4
247.00	3.5	0.5	3.3	1.1	20.9	77.5	17.7	9.1	-0.2	1.8	4.8	5.4	0.7	2.5
247.95	3.5	0.3	3.4	0.9	17.9	87.9	17.4	8.8	-0.3	1.8	4.9	5.4	0.5	2.8
248.90	3.4	0.3	3.4	1.0	15.9	94.1	16.8	8.5	-0.2	1.9	4.9	5.3	0.4	3.1
249.85	3.6	0.2	3.5	1.0	14.9	95.5	16.7	8.3	-0.2	1.9	5	5.2	0.4	3.3
250.80	3.7	0.2	3.8	1.1	14.8	91.7	17.1	8.1	-0.3	1.8	4.9	5.1	0.3	3.4
251.75	3.8	0.3	3.9	1.1	15.0	84.7	17.4	8.0	-0.2	1.9	4.9	5.0	0.4	3.4
252.70	4.0	0.4	4.1	1.2	15.3	76.8	17.6	7.8	-0.2	1.9	4.9	4.9	0.5	3.4
253.65	3.9	0.6	4.2	1.0	15.4	69.3	17.6	7.7	-0.2	1.9	4.8	4.9	0.5	3.4
254.60	4.1	0.7	4.5	0.9	15.3	63.3	17.5	7.8	-0.2	1.8	4.8	4.8	0.7	3.4
255.55	4.1	0.9	4.8	0.9	15.3	59.5	17.3	7.7	-0.2	1.8	4.8	4.7	0.8	3.5
256.50	4.2	1.0	5.1	0.8	15.4	57.4	16.8	7.6	-0.2	1.9	4.7	4.6	0.8	3.4
257.45	4.2	1.1	5.3	0.8	15.8	56.5	16.1	7.5	-0.2	1.8	4.7	4.6	0.8	3.4
258.40	4.1	1.1	5.4	0.8	16.5	55.9	15.2	7.4	-0.3	1.9	4.8	4.6	0.7	3.4
259.35	4.1	1.1	5.4	0.9	17.0	55.0	14.5	7.2	-0.1	1.8	4.8	4.7	0.6	3.2
260.30	4.0	1.1	5.4	1.2	17.8	53.5	13.9	7.0	-0.2	1.9	4.9	4.6	0.4	2.8
261.25	3.8	1.2	5.3	1.6	19.0	51.7	13.2	6.7	-0.2	1.8	4.9	4.7	0.3	2.4
262.20	3.9	1.3	5.1	1.8	21.0	51.5	12.6	6.6	-0.2	1.8	5	4.7	0.3	1.9
263.15	3.8	1.4	5.1	2.1	24.0	53.3	12.3	6.4	-0.2	1.8	5	4.7	0.2	1.2
264.10	4.0	1.8	5.2	2.1	28.0	57.1	12.1	6.2	-0.2	1.8	5	4.6	0.2	0.7
265.05	4.1	2.3	5.6	2.4	31.8	62.7	12.5	5.9	-0.2	1.8	5.1	4.7	0.2	0.3
266.00	4.2	2.8	6.2	2.6	34.0	69.3	12.9	5.8	-0.1	1.8	5.3	4.6	0.1	0.0
266.95	4.3	3.1	6.9	2.6	32.5	76.3	13.8	5.9	-0.2	2.0	5.3	4.7	0.1	-0.1
267.90	4.3	3.2	6.4	2.4	28.4	82.5	14.6	5.9	0	2.0	5.3	4.7	0.1	-0.2
268.85	4.3	2.7	7.7	2.1	24.2	86.1	15.3	5.9	-0.1	2.1	5.3	4.9	0.1	-0.1
269.80	4.2	2.1	7.8	1.7	21.6	85.2	15.9	5.8	-0.1	2.0	4.9	5.0	0.1	-0.1
270.75	4.1	1.3	8.2	1.6	20.9	79.8	16.1	5.8	-0.1	2.0	4.2	5.3	0.2	-0.1
271.70	3.9	0.9	8.3	1.4	21.5	71.9	16.2	5.7	0	2.2	3.3	5.4	0.1	0.0
272.65	3.7	0.6	7.5	1.4	22.8	65.5	16.0	5.7	0	2.1	2.3	5.5	0.2	-0.1
273.60	3.7	0.4	5.6	1.4	23.8	62.4	16.0	5.7	0	2.0	2.9	5.6	0.2	-0.1
274.55	3.7	0.3	3.9	1.6	24.2	60.7	16.2	5.6	0	1.9	4.2	5.5	0.3	0.0
275.50	3.6	0.2	2.6	1.5	24.1	59.1	17.1	5.6	-0.1	1.6	5.5	5.2	0.4	-0.1
276.45	3.6	0.2	1.9	1.7	23.6	57.3	18.2	5.5	0	1.5	6.1	4.4	0.3	0.0
277.40	3.4	0.3	1.5	1.6	22.8	55.4	19.6	5.6	0.1	1.5	6.3	3.2	0.4	0.1
278.35	3.4	0.2	1.3	1.6	22.2	52.9	20.5	5.8	0.4	1.4	6.5	3.8	0.5	0.2
279.30	3.4	0.3	0.3	1.6	21.7	49.9	21.2	5.8	0.3	1.4	6.7	4.1	0.5	0.1
280.25	3.5	0.2	0.3	1.7	21.2	47.0	21.4	6.0	0.1	1.5	6.7	4.2	0.5	0.3
281.20	3.5	0.3	0.3	1.8	21.0	44.2	21.5	6.0	0.2	1.5	6.9	4.2	0.5	0.3
282.15	3.4	0.3	0.1	1.8	21.4	41.7	21.1	6.1	0.1	1.5	7	4.0	0.5	0.3
283.10	3.5	0.3	0.0	1.7	22.1	40.0	20.4	5.9	0.1	1.5	7.2	3.8	0.6	0.2
284.05	3.6	0.3	-0.1	1.5	23.0	38.8	20.1	5.1	0.1	1.4	7.3	3.9	0.4	0.2

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EL2	EM	MO1	MO2	TH	VA
285.00	3.6	0.3	-0.1	1.5	23.3	38.6	19.9	3.6	0.1	1.2	7.4	4.0	0.3	0.0
285.95	3.6	0.3	-0.1	1.4	23.6	38.8	20.0	2.0	0.1	0.6	7.6	4.1	0.3	0.2
286.90	3.5	0.3	-0.2	1.1	23.8	39.5	19.9	3.3	0.2	0.6	7.6	4.4	0.2	0.3
287.85	3.6	0.3	-0.2	1.5	24.1	39.9	18.9	5.0	0.2	0.7	7.7	4.8	0.2	0.2
288.80	3.6	0.2	-0.2	2.1	24.3	40.1	17.2	6.0	0.2	0.7	7.8	4.9	0.2	0.2
289.75	3.8	0.2	-0.3	2.6	24.2	39.8	15.5	6.5	0.3	0.7	7.8	5.2	0.2	0.2
290.70	3.7	0.3	-0.2	2.7	23.9	38.4	14.2	6.8	0.4	0.8	7.8	5.4	0.4	0.2
291.65	3.7	0.3	-0.2	2.8	23.2	34.4	13.1	7.2	0.4	0.8	7.8	5.4	0.4	0.2
292.60	3.7	0.4	-0.1	2.6	22.3	27.3	12.5	7.5	0.5	0.7	7.6	5.6	0.4	0.2
293.55	3.8	0.5	0.0	2.6	21.4	27.9	11.9	7.8	0.3	0.7	7.5	5.7	0.5	0.4
294.50	3.9	0.6	0.1	2.5	20.5	37.1	11.6	8.0	0.2	0.7	7.1	5.7	0.3	0.5
295.45	4.0	0.6	0.1	2.6	19.7	43.6	11.5	8.1	0.3	0.6	7	5.8	0.3	0.5
296.40	3.9	0.5	0.1	2.6	19.1	48.2	11.6	8.0	0.4	0.7	6.9	6.0	0.4	0.6
297.35	4.0	0.6	0.2	2.3	18.9	49.5	12.0	7.8	0.3	0.7	6.9	6.2	0.3	0.5
298.30	4.0	0.8	0.2	2.0	18.8	47.6	12.2	7.5	0.3	0.7	7	6.2	0.3	0.4
299.25	4.2	0.8	0.1	1.9	19.0	43.8	12.7	7.5	0.2	0.6	7.1	5.9	0.2	0.7
300.20	4.1	0.8	0.1	1.6	19.6	40.4	13.1	7.5	0.4	0.6	6.9	5.8	0.3	0.5
301.15	4.1	0.8	-0.1	1.5	20.6	38.3	13.4	7.5	0.3	0.6	6.7	5.8	0.3	0.5
302.10	4.1	0.9	-0.1	1.7	22.0	37.6	13.9	7.5	0.2	0.7	6.7	5.9	0.5	0.5
303.05	3.8	1.0	0.2	1.6	23.7	37.7	14.3	7.6	0.3	0.7	6.7	5.9	0.8	0.5
304.00	3.8	1.3	0.2	1.6	25.6	38.9	15.0	7.5	0.4	0.6	6.6	5.7	0.4	0.7
304.95	4.9	1.7	0.2	1.8	27.3	40.3	15.6	7.3	0.6	0.6	6.5	5.5	0.3	0.6
305.90	5.6	2.3	0.2	1.8	29.1	42.1	16.5	6.9	0.4	0.7	6.3	5.3	0.3	0.6
306.85	5.9	2.8	0.5	1.9	31.6	44.2	16.9	6.7	0.4	0.6	6.2	5.2	0.2	0.5
307.80	6.1	2.9	0.7	2.0	34.5	46.3	17.2	6.4	0.4	0.8	6.1	5.1	0.2	0.6
308.75	6.1	2.6	0.8	1.9	37.2	48.2	17.5	6.2	0.5	1.0	6	4.9	0.1	0.7
309.70	5.9	2.2	0.6	1.8	39.0	49.9	18.2	6.3	0.6	0.6	5.9	4.7	0.2	0.9
310.65	5.8	2.5	0.5	1.9	39.8	51.8	19.0	6.2	0.6	0.4	5.8	4.4	0.3	1.0
311.60	5.6	3.3	0.3	1.9	38.2	54.2	19.5	6.1	0.7	0.3	5.7	4.3	0.2	1.3
312.55	5.5	4.7	0.2	1.6	34.1	58.3	19.7	6.3	1	0.3	5.6	3.9	0.2	1.8
313.50	5.6	6.2	0.2	1.4	29.0	64.8	19.9	6.4	0.9	0.2	5.4	4.0	0.1	2.3
314.45	5.9	6.9	0.2	1.2	25.0	72.7	20.4	6.4	1	0.3	5.2	3.8	0.2	2.5
315.40	6.3	6.2	0.2	1.1	22.2	79.6	21.0	6.4	1	0.1	5.2	3.8	0.2	2.6
316.35	6.7	4.5	0.2	1.0	19.8	82.6	22.8	6.5	1.1	0.0	5.1	3.8	0.1	2.7
317.30	7.0	3.1	0.2	0.9	17.5	84.0	24.3	6.6	1	0.0	5	3.8	0.2	2.2
318.25	7.2	2.1	0.2	0.9	15.0	86.8	25.8	6.7	0.9	0.0	4.9	3.8	0.2	1.6
319.20	7.2	1.6	0.4	1.0	11.4	90.6	28.1	6.8	0.7	0.0	4.8	3.9	0.3	1.3
320.15	7.3	1.2	0.8	1.1	7.5	92.9	30.8	6.9	0.5	-0.1	4.8	4.0	0.4	1.4
321.10	7.5	1.0	1.4	1.1	18.0	92.6	33.0	6.9	0.6	0.0	4.7	4.0	0.5	0.8
322.05	7.6	0.8	1.9	1.3	24.4	90.1	33.8	6.9	0.5	-0.1	4.8	4.1	0.4	0.7
323.00	7.7	0.6	2.2	1.2	29.7	85.5	34.0	6.7	0.5	-0.2	4.7	4.2	0.4	0.6
323.95	7.5	0.5	2.1	1.4	33.4	80.0	33.5	6.6	0.5	-0.2	4.8	4.1	0.3	0.6
324.90	7.4	0.5	1.6	1.5	34.9	73.6	32.4	6.4	0.6	-0.2	4.8	4.0	0.3	0.5
325.85	7.6	0.4	0.5	1.4	33.6	66.2	31.3	6.3	0.6	-0.1	4.9	4.1	0.1	0.4
326.80	7.3	0.3	0.3	1.4	30.3	58.5	30.8	6.2	0.8	0.0	4.7	4.1	0.0	0.4
327.75	6.8	0.2	0.0	1.2	26.3	51.0	31.0	6.1	0.9	0.0	4.7	4.1	-0.2	0.3
328.70	6.7	0.1	-0.2	1.0	22.8	44.6	32.0	6.1	1.1	0.1	4.7	4.3	-0.3	0.2
329.65	6.5	0.0	-0.3	0.8	20.1	39.7	32.8	6.0	1.1	0.2	4.8	4.3	-0.4	0.3
330.60	6.4	-0.1	-0.4	0.8	18.1	36.8	33.2	5.9	1	0.3	4.8	4.4	-0.4	0.0
331.55	6.1	-0.1	-0.4	0.6	16.8	35.4	32.9	5.9	0.9	0.3	4.8	4.6	-0.4	0.2
332.50	5.7	-0.1	-0.5	0.7	15.7	35.0	32.5	5.9	1	0.5	4.8	4.8	-0.4	0.2
333.45	5.5	0.0	-0.4	0.7	14.9	35.1	32.8	5.9	1	0.7	4.9	5.0	-0.4	0.3
334.40	5.4	0.1	-0.4	0.8	14.0	35.5	34.1	5.9	1.1	0.9	5	5.2	-0.4	0.2
335.35	5.4	0.2	-0.4	0.9	12.9	35.8	36.2	5.9	1.1	1.1	5	5.2	-0.3	0.1
336.30	5.2	0.2	-0.4	1.0	11.9	36.0	38.9	5.8	1.2	1.3	5.2	5.1	-0.4	0.2
337.25	5.0	0.4	-0.3	1.1	11.2	35.9	41.1	5.8	1.2	1.5	5.4	5.2	-0.5	0.2
338.20	5.0	0.5	-0.3	1.3	10.7	36.1	42.1	5.8	1.2	1.6	5.7	5.3	-0.5	0.3
339.15	5.0	0.6	-0.3	1.7	10.6	36.3	42.6	5.8	1.1	1.4	5.8	5.3	-0.5	0.2
340.10	4.8	0.7	-0.2	2.0	10.9	36.8	46.0	5.9	1.1	1.1	5.9	4.4	-0.6	0.2
341.05	4.7	0.7	-0.1	2.4	11.5	37.3	55.0	5.8	1	0.7	5.8	5.5	-0.5	0.1
342.00	4.6	0.9	-0.1	2.6	12.2	37.3	70.5	5.7	1	0.3	5.7	5.4	-0.5	0.2
342.95	4.6	0.9	-0.1	2.6	13.3	37.3	90.2	5.6	1	0.0	5.4	5.6	-0.5	0.2
343.90	4.6	0.9	-0.2	2.6	14.4	37.2	108.1	5.5	1	-0.1	5.2	5.8	-0.3	0.3
344.85	4.7	1.0	-0.3	2.8	15.9	37.3	115.3	5.6	1.1	-0.3	5.1	5.8	-0.3	0.4
345.80	4.7	0.8	-0.4	3.0	17.3	37.2	106.3	5.3	1	-0.3	5	5.9	-0.3	0.5
346.75	4.7	0.5	-0.5	3.4	19.4	36.8	85.0	5.3	1.1	-0.3	4.8	6.1	-0.2	0.5
347.70	4.8		-0.5	3.6	22.0	36.5	62.9	5.1	1	-0.4	5	6.2	-0.2	0.8
348.65	4.8		-0.6	3.5	25.2	36.8	47.9	5.2	0.9	-0.5	4.9	5.4	-0.2	0.9
349.60	4.8		-0.5	3.2	28.6	37.4	39.0	5.2	0.8	-0.4	4.9	6.4	-0.2	1.0
350.55	4.7		-0.4	2.6	31.3	38.2	34.2	5.3	0.9	-0.4	4.5	6.6	-0.2	1.1
351.50	4.5		-0.4	2.1	34.6	39.3	31.6	5.5	0.7	-0.5	4.3	6.6	-0.3	0.9
352.45	4.4		-0.4	1.7	36.4	40.3	28.3	5.5	0.8	-0.4	3.7	6.7	-0.3	0.7
353.40	4.4		-0.4	1.5	37.3	41.2	26.1	5.4	0.8	-0.5	3.2	6.6	-0.4	0.5
354.35	4.3		-0.4	1.4	38.0	42.2	25.5	5.5	0.6	-0.6	2.9	6.5	-0.3	0.5
355.30	4.3		-0.3	1.3	38.3	42.8	26.8	5.9	0.7	-0.5	2.8	6.5	-0.4	0.5
356.25	4.2		-0.4	1.1	37.4	43.2	29.2	6.0	0.7	-0.5	2.8	6.4	-0.3	0.4
357.20	4.1		-0.4	1.1	35.4	43.4	31.9	6.1	0.6	-0.5	3.1	6.2	-0.4	0.3

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EL2	EM	MO1	MO2	TH	VA
358.15	4.1		-0.4	0.9	33.1	43.3	34.0	6.2	0.7	-0.5	3.4	6.2	-0.3	0.4
359.10	4.0		-0.5	0.8	31.3	42.5	33.8	6.6	0.9	-0.4	3.7	6.1	-0.3	0.2
360.05	3.9		-0.5	0.9	29.8	41.3	30.6	6.9	0.8	-0.5	3.8	6.2	-0.3	0.3
361.00	3.8		-0.5	0.8	28.7	40.3	26.6	7.0	0.9	-0.6	4	6.2	-0.2	0.2
361.95	3.9		-0.5	0.9	27.6	39.4	23.9	7.2	1	-0.5	4.1	6.2	-0.2	0.2
362.90	4.3		-0.5	0.9	25.9	38.0	22.5	7.2	1	-0.5	4.3	6.2	-0.2	0.1
363.85	4.5		-0.6	0.9	23.9	36.2	21.9	7.2	0.9	-0.6	4.4	6.2	-0.2	0.2
364.80	4.7		-0.6	0.8	22.0	34.3	21.9	7.2	0.9	-0.5	4.5	6.2	-0.2	0.3
365.75	4.8		-0.6	0.7	20.5	33.2	22.1	7.2	1	-0.5	4.7	6.0	-0.2	0.3
366.70	5.1		-0.7	0.7	19.0	32.7	22.5	7.1	1.1	-0.5	4.7	5.9	-0.1	0.2
367.65	5.2		-0.6	0.8	17.9	32.7	22.9	7.1	1.3	-0.5	4.7	5.8	-0.1	0.3
368.60	5.5		-0.7	0.7	17.1	33.1	23.7	6.9	1.2	-0.6	4.7	5.8	-0.1	0.3
369.55	5.5		-0.6	0.8	16.8	33.7	23.8	6.8	1.3	-0.6	4.7	5.8	-0.1	0.2
370.50	5.6		-0.7	0.7	16.7	34.5	23.2	6.7	1.1	-0.5	4.8	5.7	-0.1	0.3
371.45	5.7		-0.7	0.7	16.7	35.3	22.6	6.6	1	-0.6	4.7	5.7	-0.1	0.2
372.40	5.9		-0.6	0.7	16.8	36.4	22.6	6.5	1	-0.5	4.7	5.8	0.0	0.3
373.35	5.9		-0.6	0.7	16.8	37.5	22.4	6.4	0.9	-0.5	4.7	5.8	-0.1	0.2
374.30	5.9		-0.6	0.8	16.6	38.5	22.3	6.5	0.9	-0.5	4.6	5.8	-0.1	0.3
375.25	5.8		-0.5	1.0	16.4	38.9	21.6	6.5	0.8	-0.6	4.6	5.9	-0.1	0.3
376.20	5.8		-0.5	1.0	16.2	38.6	21.8	6.8	0.7	-0.4	4.6	6.2	0.0	0.3
377.15	5.7		-0.5	0.8	15.9	37.2	22.8	7.1	0.7	-0.5	4.6	6.5	0.0	0.4
378.10	5.7		-0.4	0.6	15.8	34.8	24.0	7.4	0.7	-0.5	4.7	6.8	0.0	0.5
379.05	5.6		-0.2	0.5	15.9	32.3	25.0	7.5	0.6	-0.4	4.7	7.0	-0.1	0.4
380.00	5.5		-0.2	0.5	16.2	29.5	25.2	7.7	0.7	-0.5	4.6	7.1	-0.2	0.5
380.95	5.3		0.0	0.5	16.4	26.9	24.7	8.1	0.7	-0.5	4.4	7.4	-0.2	0.6
381.90	5.2		0.1	0.3	16.7	24.7	23.6	8.1	0.4	-0.5	4.4	7.8	0.0	0.6
382.85	5.0		0.2	0.5	17.0	23.2	22.3	8.1	0.5	-0.6	4.4	8.2	0.1	0.9
383.80	4.9		0.0	0.5	17.6	22.6	21.3	8.2	0.6	-0.6	4.2	8.3	-0.1	1.1
384.75	4.7		-0.3	0.5	18.5	22.6	21.1	8.5	0.8	-0.5	4.1	8.5	-0.1	1.3
385.70	4.7		-0.5	0.5	19.6	23.2	21.4	8.7	0.6	-0.7	4	8.7	-0.1	1.1
386.65	4.6		-0.5	0.7	20.6	23.9	21.5	8.9	0.6	-0.6	3.9	8.8	0.0	1.1
387.60	4.5		-0.6	0.4	21.2	24.8	22.4	9.1	0.7	-0.6	3.9	8.8	0.0	1.1
388.55	4.4		-0.7	0.2	21.4	25.9	23.4	9.2	0.7	-0.4	3.8	8.9	0.2	1.0
389.50	4.4		-0.7	0.3	21.4	27.2	24.3	9.4	0.7	-0.6	3.5	9.0	0.2	0.9
390.45	4.4		-0.7	0.7	21.1	28.7	24.5	8.9	0.8	-0.8	3.3	9.2	0.4	0.7
391.40	4.6		-0.7	0.8	20.6	30.6	24.4	8.0	0.7	-0.8	3.2	9.5	0.6	0.7
392.35	4.5		-0.7	0.7	20.3	32.1	24.8	7.5	0.8	-0.8	3.1	9.7	0.9	0.6
393.30	4.5		-0.6	0.6	19.8	33.5	25.4	7.1	0.8	-0.7	3	10.0	1.1	0.5
394.25	4.8		-0.6	0.4	19.1	34.7	26.2	7.0	0.7	-0.8	3	10.1	1.4	0.5
395.20	5.0		-0.6	0.5	18.0	35.5	26.8	6.9	0.8	-0.9	3	10.4	1.6	0.5
396.15	5.2		-0.6	0.5	16.5	35.6	27.9	7.0	0.6	-0.8	3.1	10.4	2.0	0.7
397.10	5.3		-0.6	0.6	15.0	35.1	27.8	6.9	0.6	-0.8	3.2	10.4	2.3	0.5
398.05	5.3		-0.5	0.7	14.0	33.9	24.4	6.8	0.7	-0.8	3.1	10.4	2.5	0.3
399.00	5.6		-0.3	0.8	13.4	32.7		6.7	0.6	-0.9	3.1	10.4	2.8	0.3
399.95	5.8		-0.2	0.8	13.3	31.3		6.8	0.6	-0.9	3.2	10.4	3.1	0.4
400.90	5.8		0.2	1.1	13.5	30.0		6.7	0.6	-0.8	3.2	10.6	3.7	0.4
401.85	6.0		0.5	1.3	14.1	29.3		6.8	0.5	-0.8	3.3	10.5	4.3	0.5
402.80	5.9		0.9	1.2	15.0	28.7		6.9	0.5	-0.9	3.4	10.7	4.9	0.7
403.75	6.1		1.3	1.1	15.5	28.7		6.9	0.6	-0.9	3.4	10.9	5.6	0.9
404.70	6.2		1.6	1.1	15.6	29.2		7.1	0.6	-0.9	3.4	11.1	5.8	1.1
405.65	6.3		1.8	1.2	15.6	30.3		7.2	0.5	-0.9	3.3	11.4	5.7	1.6
406.60	6.1		2.0	1.1	15.4	31.3		7.2	0.5	-0.9	3.4	11.6	5.1	2.0
407.55	5.9		2.2	1.0	15.3	32.6		7.2	0.5	-0.8	3.4	11.8	4.0	2.5
408.50	5.8		2.6	0.9	15.6	33.5		7.2	0.5	-0.8	3.3	12.0	3.0	3.0
409.45	5.5		3.0	0.8	16.3	34.1		6.9	0.6	-0.9	3.4	12.1	2.0	3.2
410.40	5.1		2.7	0.6	17.6	34.3		6.8	0.6	-0.7	3.4	12.3	1.4	3.3
411.35	4.8		1.8	0.7	18.4	34.3		6.7	0.5	-0.8	3.5	12.3	1.0	3.4
412.30	4.8		1.0	0.6	18.1	34.3		6.9	0.5	-0.7	3.5	12.3	0.7	3.1
413.25	4.8		0.4	0.6	16.9	34.4		7.0	0.6	-0.7	3.6	12.3	0.5	2.8
414.20	4.7		0.0	0.9	15.9	34.4		7.3	0.6	-0.6	3.6	12.3	0.4	2.2
415.15	4.8		-0.1	1.0	15.2	33.7		7.7	0.5	-0.6	3.7	12.5	0.3	1.6
416.10	4.9		-0.2	1.2	14.5	32.9		8.0	0.7	-0.5	3.7	12.9	0.3	1.0
417.05	4.9		-0.1	1.3	13.9	32.5		8.2	0.6	-0.5	3.7	13.2	0.2	0.7
418.00	4.9		0.0	1.2	13.2	32.4		8.3	0.7	-0.5	3.7	13.7	0.2	0.7
418.95	4.9		0.0	1.1	12.8	32.4		8.2	0.7	-0.5	3.6	14.1	0.2	0.5
419.90	4.9		0.1	1.0	12.5	32.7		7.8	0.8	-0.6	3.6	14.4	0.2	0.4
420.85	4.7		0.2	0.8	12.4	33.1		7.4	0.9	-0.5	3.6	14.7	0.2	0.3
421.80	4.6		0.3	0.7	12.4	33.8		6.9	0.9	-0.6	3.5	14.9	0.1	0.3
422.75	4.4		0.3	0.6	12.5	34.6		6.9	1.1	-0.5	3.3	14.4	0.2	0.2
423.70	4.5		0.5	0.6	13.0	35.4		6.7	1.1	-0.5	3.3	13.3	0.2	0.3
424.65	4.4		0.7	0.7	13.7	36.3		6.6	1.3	-0.5	3	11.1	0.2	0.5
425.60	4.3		0.9	0.9	14.7	37.4		6.5	1.3	-0.5	2.4	8.1	0.1	0.5
426.55	4.0		1.1	1.0	16.9	38.8		6.5	1.4	-0.5	1.9	7.6	0.1	0.7
427.50	4.3		1.3	1.2	19.7	40.9		6.5	1.7	-0.6	2.3	10.9	0.1	1.1
428.45	4.1		1.4	1.4	22.0	42.8		6.7	1.8	-0.5	2.9	14.1	0.2	1.3
429.40	4.1		1.4	1.5	23.1	44.3		6.9	2.1	-0.5	3.2	16.4	-0.1	1.8
430.35	4.0		1.0	1.5	23.2	44.6		7.1	2.3	-0.6	3.5	18.7	-0.2	2.3

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EL2	EM	MO1	MO2	TH	VA
431.30	4.1		0.9	1.4	22.6	43.9		7.3	2	-0.5	3.6	21.1	-0.1	2.8
432.25	4.1		1.1	1.5	21.6	42.6		7.6	1.5	-0.4	3.7	23.4	-0.2	3.2
433.20	4.0		1.2	1.6	20.0	40.4		8.0	1.2	-0.4	3.8	25.7	-0.2	3.2
434.15	4.1		0.7	1.7	17.2	38.5		8.3	0.9	-0.4	4	27.4	0.0	2.9
435.10	4.0		0.5	1.9	13.5	37.3		7.5	1.4	-0.3	4	28.4	0.0	2.5
436.05	4.0		0.3	1.9	9.8	37.3		8.4	1.6	-0.2	4.1	29.0	0.1	1.8
437.00	4.0		0.2	1.8	7.4	37.5		7.0	1.6	-0.1	4.4	29.2	0.4	1.2
437.95	3.9		0.1	1.5	6.4	37.5		4.9	1.6	-0.1	4.6	29.4	0.8	0.8
438.90	4.0		0.1	1.2	6.8	36.9		4.6	1.7	0.0	4.7	29.8	0.2	0.5
439.85	4.0		0.0	1.3	7.9	35.5		5.8	1.8	0.0	4.8	30.1	-0.2	0.4
440.80	4.1		0.1	1.5	9.3	33.1		6.3	1.9	-0.1	4.7	29.7	-0.3	0.3
441.75	4.1		0.2	1.9	10.6	28.7		6.2	1.9	-0.1	4.8	29.2	-0.4	0.4
442.70	4.2		0.6	1.9	11.5	21.5		6.2	2	-0.1	4.9	28.8	-0.3	0.5
443.65	4.1		1.0	2.0	11.8	14.1		6.2	2.2	-0.2	4.9	29.2	-0.3	0.8
444.60	4.1		1.6	1.9	11.6	8.6		6.1	2.2	-0.2	4.9	30.3	-0.2	1.1
445.55	4.1		2.2	1.9	11.3			6.1	2.3	-0.2	5	31.2	-0.3	1.5
446.50	4.1		2.3	1.8	11.2			6.0	2.3	-0.2	5.4	32.3	-0.3	1.5
447.45	3.9		2.3	2.0	12.0			6.0	2.3	-0.2	5.2	33.1	-0.4	1.3
448.40	3.9		2.0	1.9	13.4			5.8	2.4	-0.2	4.9	33.6	-0.3	1.4
449.35	3.7		1.6	1.7	15.1			5.7	2.4	-0.2	4.8	34.1	-0.2	1.4
450.30	3.6		1.4	1.9	16.5			5.7	2.4	-0.2	4.8	34.1	-0.2	1.5
451.25	3.6		1.4	2.1	17.2			5.5	2.6	-0.3	4.9	34.3	-0.2	1.5
452.20	3.6		1.7	2.4	17.2			5.5	2.7	-0.2	4.9	35.1	-0.1	1.4
453.15	3.6		2.2	2.5	16.4			5.5	2.9	-0.2	4.8	36.7	0.0	1.0
454.10	3.6		3.1	2.5	15.3			5.5	3	-0.2	4.9	38.9	0.0	0.9
455.05	3.6		4.3	2.5	14.7			5.4	3.2	-0.3	4.9	40.9	0.1	0.8
456.00	3.6		5.2	2.8	14.2			5.5	3.4	-0.2	5	42.7	0.1	0.8
456.95	3.5		5.7	2.8	13.7			5.8	3.5	-0.2	5	43.5	0.2	0.6
457.90	3.5		6.3	3.5	13.3			5.8	4	0.0	5	43.8	0.2	0.6
458.85	3.5		7.6	4.3	13.1			6.1	3.7	-0.1	5.1	44.0	0.1	0.6
459.80	3.5		9.8	4.6	13.5			6.5	3.7	-0.1	5.2	45.0	-0.1	0.7
460.75	3.5		12.5	5.0	14.1			7.0	3.7	0.0	5.1	46.0	-0.2	0.9
461.70	3.5		14.9	4.7	15.1			6.9	3.8	0.3	5.1	47.0	-0.2	0.9
462.65	3.5		16.6	4.3	16.2			7.0	3.9	0.0	5	47.5	-0.2	1.0
463.60	3.7		17.8	4.0	17.4			7.1	3.8	-0.1	4.9	47.6	-0.2	1.0
464.55	3.6		18.8	4.0	18.8			7.3	3.8	-0.3	4.9	46.5	-0.2	1.0
465.50	3.7		19.2	4.1	20.1			7.2	3.6	-0.2	5.1	45.3	-0.3	1.0
466.45	3.7		19.4	4.2	20.9			7.0	3.6	-0.3	5.2	43.6	-0.3	1.1
467.40	3.9		19.9	4.1	20.5			6.7	3.5	-0.2	5.2	41.9	-0.2	1.3
468.35	3.9		20.4	4.1	17.6			6.6	3.5	-0.3	5.1	41.3	-0.3	1.6
469.30	4.0		20.6	4.3	12.9			6.6	3.5	-0.2	5.2	41.1	-0.4	1.5
470.25	3.9		20.6	4.9	8.1			6.7	3.8	-0.3	5.1	41.5	-0.3	1.5
471.20	3.8		20.6	5.6				6.9	3.9	-0.3	4.8	43.2	-0.4	1.3
472.15	3.7		20.5	6.4				7.2	4.1	-0.3	4.9	46.5	-0.4	1.4
473.10	3.7		20.3	6.8				7.4	4.4	-0.3	4.9	50.1	-0.4	0.9
474.05	3.7		20.1	6.4				7.5	4.7	-0.3	4.8	53.4	-0.3	0.7
475.00	3.7		19.8	5.4				7.5	4.9	-0.4	4.8	55.9	-0.3	0.5
475.95	3.7		19.5	4.4				7.7	5.2	-0.4	4.6	58.1	-0.2	0.5
476.90	3.6		19.1	3.7				7.8	5.4	-0.4	4.4	58.9	-0.2	0.5
477.85	3.8		18.7	3.2				7.7	5.4	-0.5	4.4	58.5	0.0	0.5
478.80	3.8		18.7	2.9				7.6	5.5	-0.4	4.2	57.4	0.1	0.7
479.75	4.2		19.2	2.5				7.6	5.4	-0.4	4.2	56.2	0.1	0.7
480.70	4.0		20.1	2.3				7.6	5.2	-0.4	4.2	55.3	0.2	0.7
481.65	3.9		20.4	2.1				7.7	4.9	-0.4	4.2	54.8	0.1	0.7
482.60	4.0		19.2	1.8				7.8	4.5	-0.3	4.3	54.7	0.3	0.6
483.55	4.1		17.2	1.6				7.8	4.3	-0.4	4.3	55.0	0.2	0.6
484.50	4.1		15.6	1.4				7.8	4	-0.3	4.6	55.6	0.1	0.6
485.45	4.1		14.8	1.2				7.8	3.7	-0.4	4.7	56.3	0.1	0.7
486.40	4.2		14.7	1.1				7.9	3.7	-0.4	4.9	57.0	0.1	0.5
487.35	4.3		15.0	1.1				8.0	3.6	-0.4	5.1	57.3	0.1	0.4
488.30	4.5		15.4	1.1				8.2	3.6	-0.4	5.3	56.6	0.0	0.5
489.25	4.5		16.0	1.1				8.4	3.6	-0.3	5.5	56.4	0.0	0.7
490.20	4.7		16.1	1.1				8.7	3.5	-0.3	5.9	56.2	0.1	0.7
491.15	4.8		15.6	1.2				9.0	3.5	-0.3	6.1	55.9	0.1	0.8
492.10	5.1		14.4	1.2				9.2	3.3	-0.4	6.2	55.8	0.2	0.9
493.05	5.2		12.7	1.2				9.4	3	-0.2	6.6	55.9	0.4	1.3
494.00	5.4		11.2	1.3				9.3	2.8	-0.4	6.6	55.9	0.7	1.6
494.95	5.4		11.1	1.3				9.1	2.7	-0.4	6.8	55.2	1.0	2.2
495.90	5.4		13.0	1.4				8.6	2.6	-0.3	7	53.8	1.4	2.5
496.85	5.5		17.2	1.5				8.2	2.5	-0.3	7.1	51.8	1.6	2.7
497.80	5.4		23.5	1.4				7.6	2.4	-0.3	7.3	50.2	1.8	2.7
498.75	5.2		30.1	1.4				7.4	2.4	-0.2	7.4	49.0	1.8	2.3
499.70	4.8		36.2	1.5				7.1	2.4	-0.3	7.4	48.4	1.4	2.2
500.65	4.7		44.2	1.5				6.9	2.5	-0.3	7.4	49.0	1.1	2.3
501.60	4.6		55.9	1.4				6.7	2.5	-0.2	7.3	51.5	0.7	2.3
502.55	4.7		71.1	1.4				6.4	2.5	-0.2	7.1	55.5	0.5	2.0
503.50	4.8		87.2	1.2				6.4	2.6	-0.1	7	59.8	0.3	1.7

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EL2	EM	MO1	MO2	TH	VA
504.45	5.0		103.0	1.1				6.5	2.6	-0.2	6.9	62.7	0.3	1.2
505.40	5.0		117.7	1.2				6.4	2.6	-0.1	6.9	64.4	0.3	0.9
506.35	5.2		130.8	1.1				6.4	2.6	-0.1	6.9	65.1	0.4	0.7
507.30	5.4		140.9	1.2				6.3	2.5	0.0	7	65.1	0.5	0.6
508.25	5.4		147.3	1.3				6.3	2.5	-0.1	7	65.3	0.6	0.7
509.20	5.3		147.3	1.5				6.2	2.5	-0.1	7.2	65.0	0.7	0.8
510.15	5.1		138.5	1.7				6.2	2.5	-0.1	7.4	64.7	0.7	0.8
511.10	5.0		122.7	1.9				6.3	2.6	0.0	7.5	64.7	0.8	0.8
512.05	4.9		103.6	2.1				6.4	2.6	-0.2	7.6	65.0	0.9	0.7
513.00	4.6		85.8	2.3				6.5	2.7	-0.3	7.7	65.6	1.1	0.9
513.95	4.5		71.7	2.6				6.6	2.7	-0.3	7.6	66.8	1.1	0.8
514.90	4.3		60.8	3.0				6.5	2.8	-0.2	7.8	68.8	1.2	0.7
515.85	4.7		52.9	3.7				6.5	2.8	-0.3	8	71.3	1.1	0.6
516.80	5.2		47.9	4.1				6.4	2.9	-0.2	7.9	74.0	1.0	0.6
517.75	5.5		45.0	4.1				6.2	2.9	-0.3	8.3	76.4	0.9	0.6
518.70	5.8		43.7	3.9				6.3	3	-0.3	8.4	78.4	0.7	0.5
519.65	6.1		44.7	3.6				6.3	2.9	-0.3	8.6	80.8	0.6	0.7
520.60	6.1		47.7	3.4				6.3	2.9	-0.3	8.8	84.1	0.5	0.5
521.55	6.1		51.6	3.2				6.5	2.8	-0.3	9.1	87.9	0.5	0.4
522.50	5.9		54.1	3.3				6.5	2.8	-0.2	9.1	91.1	0.3	0.3
523.45	5.4		55.6	3.4				6.7	2.7	-0.2	9.4	93.4	0.1	0.3
524.40	5.0		57.3	3.6				6.8	2.7	-0.2	9.4	94.3	0.1	0.4
525.35	4.9		59.3	4.1				6.6	2.7	-0.1	9.5	94.9	0.1	0.3
526.30	4.8		61.9	4.4				6.6	2.8	0.0	9.6	95.9	0.1	0.2
527.25	4.6		66.2	4.4				6.4	3.1	-0.1	9.4	97.9	0.2	0.3
528.20	4.5		73.8	4.5				6.2	3.1	0.0	9.2	101.1	0.3	0.3
529.15	4.7		86.0	4.4				6.0	3.3	0.0	8.9	105.1	0.6	0.4
530.10	4.9		101.0	4.3				5.8	3.6	-0.1	8.7	109.3	0.9	0.4
531.05	4.7		114.6	4.5				5.6	3.7	0.0	8.3	112.9	1.3	0.6
532.00	4.5		122.3	4.8				5.5	3.9	-0.1	8.2	115.5	1.6	0.7
532.95	4.2		121.4	5.4				5.4	4	-0.1	8	117.0	2.0	0.8
533.90	4.2		111.5	5.9				5.4	4	-0.1	7.9	117.4	2.2	0.8
534.85	4.2		95.4	6.6				5.3	3.8	-0.1	7.7	116.4	2.4	0.7
535.80	4.1		75.5	7.2				5.3	3.9	-0.1	7.8	114.3	2.4	0.7
536.75	4.0		53.0	7.9				5.4	4	-0.1	7.9	111.0	2.4	0.9
537.70	3.8		32.5	8.8				5.5	4.1	-0.1	8	107.0	2.1	0.8
538.65	3.8		18.7	9.8				5.6	3.9	-0.2	8.2	102.9	1.7	0.9
539.60	3.8			11.1				5.7	3.7	-0.1	8.5	99.2	1.5	1.0
540.55	3.7			12.5				6.1	3.6	-0.1	9	96.4	1.4	1.0
541.50	3.7			14.4				6.2	3.4	0.0	9.6	95.0	1.4	1.3
542.45	3.5			16.5				6.5	3.5	-0.1	10.1	95.0	1.2	1.8
543.40	3.7			18.2				6.7	3.3	-0.2	10.9	95.9	1.0	2.1
544.35	3.7			19.3				6.9	3.3	-0.1	11.4	97.4	0.9	2.2
545.30	3.7			20.7				7.1	3.3	-0.1	11.9	98.9	0.7	2.3
546.25	3.7			22.7				7.5	3.4	-0.2	12.3	100.3	0.6	2.8
547.20	3.9			24.6				7.6	3.3	-0.1	12.5	101.5	0.6	3.5
548.15	3.9			26.0				7.7	3.3	-0.2	12.7	102.9	0.6	4.2
549.10	3.9			27.6				7.8	3.2	-0.2	12.8	104.9	0.6	4.2
550.05	4.0			28.8				7.9	3.2	-0.2	12.9	107.5	0.6	3.5
551.00	4.2			30.1				7.8	3.3	-0.2	13	110.9	0.6	3.1
551.95	4.1			30.4				7.6	3.3	-0.2	13	114.6	0.7	2.8
552.90	4.1			31.1				7.3	3.3	-0.3	13.1	118.3	0.6	2.8
553.85	4.2			31.6				7.2	3.3	-0.5	13.2	121.3	0.6	3.0
554.80	4.2			32.7				7.0	3.2	-0.6	13.2	123.9	0.6	3.0
555.75	4.2			34.4				7.0	3.3	-0.6	13.1	125.4	0.4	3.2
556.70	4.1			36.9				6.9	3.2	-0.7	13.1	125.3	0.3	3.1
557.65	4.0			39.9				6.9	3.2	-0.8	12.9	122.2	0.3	3.2
558.60	3.8			44.4				6.7	3.3	-0.8	12.9	114.9	0.2	3.2
559.55	3.9			49.9				6.4	3.4	-0.9	12.7	103.5	0.2	3.5
560.50	3.8			54.9				5.8	3.5	-0.9	12.7	88.1	0.3	3.5
561.45	3.5			58.5				4.7	3.6		12.6	69.6	0.5	3.7
562.40	3.5			60.0				3.0	3.5		12.6	51.6	0.6	3.8
563.35	3.5			58.9				0.0	3.5		12.7	36.8	0.8	4.0
564.30	3.7			55.4					3.6		12.9		0.9	4.1
565.25	3.7			50.1					3.6		13.3		1.0	4.3
566.20	3.7			43.3					3.8		13.4		1.1	4.1
567.15	3.7			36.8					3.8		13.6		1.1	3.9
568.10	3.8			31.8					3.8		13.9		1.1	3.9
569.05	3.8			28.3					3.9		14.2		1.0	3.9
570.00	3.8			25.6					3.8		14.4		1.0	4.0
570.95	3.7			23.1					3.8		14.5		1.0	4.5
571.90	3.6			20.9					3.7		14.4		1.1	4.6
572.85	3.6			18.9					3.7		13.4		1.2	4.5
573.80	3.6			17.5					3.6		10.8		1.3	4.2
574.75	3.8			16.6					3.5		7.3		1.5	4.2
575.70	3.6			16.1					3.6		4.5		1.6	4.2
576.65	3.6			15.5					3.7		2.7		1.8	4.4

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EL2	EM	MO1	MO2	TH	VA
577.60	3.6			14.7					3.8		1.6		1.9	4.6
578.55	3.6			13.0					3.9				2.0	5.0
579.50	3.6			10.0					4				1.9	5.4
580.45	3.5			6.4					4				1.7	5.8
581.40	3.3			3.7					3.9				1.6	6.4
582.35	3.4								3.9				1.5	7.2
583.30	3.4								3.7				1.3	8.0
584.25	3.5								3.4				0.9	8.6
585.20	3.4								2.8				0.4	8.7
586.15	3.4								2.2				3.4	8.3
587.10	3.5								1.7				3.4	8.0
588.05	3.5												3.3	8.1
589.00	3.4												3.2	8.4
589.95	3.3												3.3	8.4
590.90	3.5												3.1	8.0
591.85	3.4												3.0	7.7
592.80	3.4												2.9	7.1
593.75	3.4												2.8	6.2
594.70	3.2												2.8	4.9
595.65	3.3												2.7	3.5
596.60	3.4												2.4	
597.55	3.3												2.0	
598.50	3.4												1.7	
599.45	3.4												1.5	
600.40	3.4												1.3	
601.35	3.4												1.1	
602.30	3.4												1.1	
603.25	3.4												1.0	
604.20	3.4												1.1	
605.15	3.3												1.1	
606.10	3.1												1.2	
607.05	2.6												1.2	
608.00	1.8												1.2	
608.95	1.2												1.2	
609.90													1.2	
610.85													1.2	
611.80													1.3	
612.75													1.6	
613.70													1.7	
614.65													1.9	
615.60													2.2	
616.55													2.5	
617.50													2.6	
618.45													2.7	
619.40													2.8	
620.35													2.9	
621.30													2.9	
622.25													3.1	
623.20													3.2	
624.15													3.3	
625.10													3.4	
626.05													3.6	
627.00													3.8	
627.95													4.2	
628.90													4.4	
629.85													4.6	
630.80													4.5	
631.75													4.1	
632.70													4.1	
633.65													4.1	
634.60													4.4	
635.55													4.6	
636.50													4.9	
637.45													4.8	
638.40													4.6	
639.35													4.2	
640.30													3.9	
641.25													3.7	
642.20													3.4	
643.15													3.3	
644.10													3.5	
645.05													3.7	
646.00													4.2	
646.95													4.7	
647.90													5.1	
648.85													4.9	
649.80													4.4	

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EL2	EM	MO1	MO2	TH	VA
650.75													3.8	
651.70													3.4	
652.65													3.0	
653.60													2.7	
654.55													2.4	
655.50													2.1	
656.45													1.9	
657.40													1.7	
658.35													1.5	
659.30													1.4	
660.25													1.3	
661.20													1.4	
662.15													1.4	
663.10													1.5	
664.05													1.8	
665.00													2.1	
665.95													2.6	
666.90													3.1	
667.85													3.7	
668.80													4.1	
669.75													4.6	
670.70													5.2	
671.65													6.2	
672.60													7.4	
673.55													8.6	
674.50													9.5	
675.45													10.2	
676.40													10.6	
677.35													11.0	
678.30													11.2	
679.25													11.4	
680.20													11.9	
681.15													12.6	
682.10													13.5	
683.05													14.5	
684.00													15.7	
684.95													17.9	
685.90													21.9	
686.85													28.2	
687.80													37.0	
688.75													48.1	
689.70													59.0	
690.65													63.6	
691.60													57.5	
692.55													43.9	
693.50													28.8	
694.45													17.4	

APPENDIX D: LOSS-ON-IGNITION DATA

Raw loss on ignition (LOI) values for each core (%). AM = Amherst; BB = Beebe; CH = Chapel; DU = Duck; DM = Dunmore; EC = Echo; EL = Elligo; EM = Emerald; MO = Morey; TH = Thirteenth; VA = Vail

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EM	MO1	MO2	TH	VA
1	21.74	17.88	25.62	41.50	21.97	5.78	16.14	16.40	22.11	22.25	13.29	46.13	47.78
2	22.44	18.12	21.04	45.39	19.90	5.08	10.64	18.77	14.97	21.96	11.71	44.62	46.59
3	23.22	18.20	23.70	46.74	21.25	4.54	10.90	15.96	12.16	22.56	11.27	44.29	46.65
4	21.93	17.82	25.13	47.40	21.49	4.35	13.74	15.84	12.40	23.11	10.05	40.24	47.58
5	24.00	17.99	21.48	48.19	23.13	4.23	14.57	15.50	12.86	21.54	8.86	39.33	46.59
6	24.42	18.60	23.37	49.46	24.37	4.47	20.56	15.75	13.98	21.42	9.14	39.46	47.09
7	27.64	20.11	19.35	49.20	24.43	4.16	25.45	14.64	16.61	21.32	9.63	40.87	46.69
8	32.15	21.33	20.95	48.88	25.28	4.62	20.82	15.24	18.13	22.14	8.83	39.85	46.36
9	30.35	26.40	23.75	50.11	23.92	4.46	10.78	12.24	22.81	22.38	7.69	39.68	45.87
10	30.18	29.51	20.51	51.01	24.78	4.85	12.80	12.99	21.81	22.59	6.80	39.36	46.73
11	27.65	30.28	27.33	51.84	23.26	4.95	14.95	13.07	23.75	22.97	5.89	39.82	45.82
12	29.31	29.81	27.40	56.43	22.85	5.45	23.55	14.88	24.30	23.28	6.21	39.97	45.59
13	29.90	31.11	28.95	53.24	23.24	5.72	19.02	13.51	22.83	22.09	5.93	39.43	44.04
14	32.31	33.05	31.08	54.83	22.76	6.41	15.80	9.24	22.58	23.29	6.87	41.67	45.27
15	33.37	31.82	26.15	54.68	22.18	5.29	18.94	8.01	22.84	23.06	8.85	37.89	45.13
16	30.29	31.68	23.04	54.49	21.31	5.70	12.84	8.79	24.88	23.33	9.18	46.69	44.89
17	18.69	30.31	19.23	53.68	20.05	5.21	25.63	8.94	32.84	23.32	13.23	52.06	45.35
18	21.43	29.24	21.05	54.26	21.18	4.95	24.44	8.66	38.64	22.74	15.29	42.09	44.59
19	32.61	29.36	15.45	54.22	20.55	6.05	29.43	6.57	42.19	22.62	13.90	39.78	45.13
20	31.97	30.58	19.34	53.82	20.66	4.67	29.44	6.78	38.07	21.80	17.21	35.11	44.35
21	31.51	28.87	19.54	55.32	20.43	3.82	19.41	6.64	44.42	21.88	18.14	36.20	43.69
22	31.19	28.53	22.94	56.58	22.65	4.32	16.09	5.43	43.89	22.34	22.18	31.24	43.46
23	30.34	29.07	26.91	57.25	20.80	4.07	21.34	11.27	43.43	22.87	23.13	33.18	40.57
24	31.50	30.49	36.38	60.37	20.44	3.53	23.91	4.85	43.24	22.42	24.04	39.65	41.51
25	30.91	28.03	27.27	58.90	18.69	3.71	26.00	6.16	47.51	21.76	24.88	36.60	42.34
26	31.21	19.96	25.39	59.92	18.85	3.58	39.14	5.85	44.79	22.33	24.81	39.82	41.63
27	30.18	21.11	15.23	60.53	18.67	3.67	32.51	5.45	43.01	21.71	24.89	41.93	43.57
28	30.80	20.97	12.11	57.42	19.30	3.95	25.17	6.35	45.62	21.43	25.17	43.81	43.13
29	32.13	19.83	17.55	54.86	19.35	4.47	13.99	7.67	43.07	21.43	24.75	45.29	44.03
30	33.29	21.13	16.74	53.74	22.31	6.26	12.30	9.11	43.41	20.83	25.08	46.58	43.30
31	35.14	19.73	14.75	52.40	21.34	8.38	5.34	12.14	46.61	21.33	24.76	48.32	43.57
32	37.31	18.89	11.98	52.12	22.05	11.16	5.81	10.48	47.17	21.23	25.11	40.55	42.26
33	38.59	14.72	14.73	53.69	22.10	9.01	15.91	11.57	46.39	20.26	25.33	40.97	43.26
34	42.02	6.45	8.42	55.39	23.11	8.02	21.61	7.80	46.77	20.63	24.89	43.12	42.46
35	41.45	7.08	29.40	55.96	23.06	11.81	19.13	5.40	45.83	20.49	25.40	51.97	39.69
36	38.71	4.35	21.76	52.98	22.56	12.62	22.43	4.73	44.44	19.36	23.75	47.00	42.19
37	37.63	2.55	19.27	52.81	21.17	9.69	16.08	6.43	44.37	19.04	24.98	47.24	44.92
38	37.10	2.59	20.74	53.32	21.82	7.78	18.37	10.63	45.89	18.91	25.19	47.14	47.87
39	38.21	3.98	24.71	53.54	22.86	5.60	14.51	10.96	47.40	17.84	24.95	47.62	48.66
40	38.09	3.48	23.91	56.31	22.49	7.92	13.35	12.12	47.52	17.85	24.43	47.48	48.79
41	38.40	2.13	25.52	57.62	22.72	7.18	11.78	12.62	47.98	18.24	26.65	47.51	49.16
42	37.82	2.04	26.81	56.20	22.47	7.01	9.40	11.32	48.63	17.00	24.12	46.79	49.33
43	37.85	2.37	24.47	55.76	22.17	5.32	8.96	11.81	48.42	16.96	24.46	45.36	48.57
44	37.83	4.34	23.50	51.73	20.30	4.68	8.26	11.68	48.70	17.21	23.98	45.90	48.05
45	37.26	2.83	24.46	53.95	18.53	5.42	10.25	11.58	47.23	17.10	23.65	46.77	48.12
46	38.94	3.30	27.30	53.58	16.14	6.69	15.31	11.76	45.70	17.13	23.67	46.86	47.44
47	37.53	1.56	32.72	54.74	18.76	7.43	13.69	12.21	45.70	20.08	23.04	43.28	46.99
48	36.08	1.56	35.55	55.21	21.74	8.68	17.02	12.75	47.03	20.27	22.76	43.45	48.82
49	36.40	1.14	28.67	60.79	22.53	11.73	18.51	15.01	48.29	21.60	22.10	44.44	48.82
50	36.05	1.26	28.91	61.28	20.55	9.61	18.01	15.54	49.05	20.51	21.96	43.06	49.06
51	37.10	3.42	31.62	61.03	19.49	13.33	20.02	16.44	50.00	19.91	20.92	41.17	47.39
52	36.26	14.06	31.29	63.29	19.63	12.07	20.87	17.72	51.05	19.49	20.44	43.68	47.15
53	35.62	18.52	32.52	62.26	20.27	7.28	19.78	17.08	50.96	19.04	21.54	41.54	43.98
54	33.33	20.40	29.24	61.43	19.13	6.54	19.12	14.51	50.08	19.68	12.02	40.86	37.60
55	35.10	21.06	29.59	62.00	19.71	10.12	19.31	9.43	48.81	18.36	21.00	41.75	42.69
56	34.37	15.97	29.07	61.40	17.72	10.96	17.66	9.96	47.05	16.51	19.69	41.06	46.83
57	34.74	16.44	28.71	61.08	17.74	11.67	15.34	12.38	46.49	17.90	20.57	41.09	47.34
58	33.87	18.77	26.44	62.72	17.30	10.60	45.31	7.40	46.31	17.14	21.00	39.94	46.08
59	33.20	19.23	29.72	62.40	18.27	7.03	14.56	5.26	48.40	18.71	21.00	39.63	44.49
60	32.15	21.11	34.52	60.70	18.51	7.05	15.89	5.00	49.16	21.76	20.99	42.15	49.62
61	30.89	21.88	35.10	69.12	18.81	8.77	14.63	3.57	49.11	22.00	20.77	42.70	50.52
62	31.62	23.16	32.29	63.50	18.18	10.55	11.18	4.26	49.36	21.44	20.13	42.58	48.70
63	33.03	23.58	34.47	62.21	15.86	14.31	9.57	8.04	50.59	21.46	19.79	42.45	47.11
64	33.29	22.59	31.36	78.96	16.29	15.70	10.47	17.37	50.72	21.45	18.71	44.20	45.48
65	33.25	23.56	31.27	61.90	14.16	18.36	13.22	16.71	48.49	21.35	18.02	41.06	44.38
66	32.97	24.08	31.68	62.30	14.43	9.91	18.55	15.07	49.38	20.91	18.88	41.24	46.89
67	30.40	27.39	31.42	63.23	12.93	15.24	34.37	16.79	50.00	20.33	17.80	39.85	47.66
68	31.59	33.47	31.60	61.41	12.91	12.92	10.28	19.04	49.57	20.37	18.38	40.71	48.81
69	32.43	31.95	33.91	62.57	13.83	14.80	8.25	20.55	48.53	20.51	18.78	39.63	49.10
70	32.11	34.09	29.73	62.82	15.06	13.95	10.07	19.74	47.48	20.13	17.98	39.94	50.46

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EM	MO1	MO2	TH	VA
71	31.01	27.91	34.02	61.03	15.23	8.99	5.96	23.62	47.90	19.87	18.32	42.06	51.55
72	30.53	28.69	46.32	61.65	14.97	8.67	6.74	20.93	46.13	19.81	19.55	38.49	52.22
73	30.47	21.84	39.76	63.79	16.24	12.02	14.57	18.94	45.34	19.43	18.18	41.25	52.30
74	28.57	22.93	29.98	65.28	17.98	11.84	6.09	17.82	45.18	19.22	19.27	43.01	52.19
75	28.72	26.01	27.61	61.68	17.69	11.68	4.59	39.15	44.89	18.77	18.86	47.32	51.77
76	29.07	28.08	25.37	60.96	18.34	8.70	4.31	45.64	44.70	18.67	18.88	43.10	51.27
77	29.25	33.91	20.30	62.39	17.96	6.14	3.85	45.97	45.92	18.67	19.65	46.30	50.07
78	29.01	33.42	16.25	63.18	17.11	6.15	5.14	47.66	46.35	18.73	19.10	44.36	49.13
79	30.13	30.76	30.21	61.83	16.63	5.77	3.67	47.15	46.49	18.73	18.07	46.96	47.49
80	30.26	30.31	30.37	62.11	17.78	5.67	3.15	47.26	45.67	18.82	18.49	46.96	46.31
81	29.84	28.52	30.12	62.50	17.03	5.57	2.95	46.43	43.74	18.83	17.03	44.23	45.13
82	28.84	29.58	20.55	61.78	16.42	6.32	1.60	47.18	44.64	19.47	17.52	42.04	34.09
83	30.22	28.98	27.16	60.21	15.99	5.89	2.58	48.50	44.24	18.76	18.18	43.37	44.06
84	29.32	27.51	24.83	58.25	16.19	5.25	13.37	47.16	42.65	17.67	17.57	39.65	39.47
85	29.39	25.97	16.58	59.33	16.65	4.25	22.53	47.29	41.00	18.78	17.09	44.19	34.41
86	28.93	25.55	16.55	61.92	15.93	6.67	23.11	45.81	42.98	18.44	17.53	45.36	37.67
87	29.61	26.64	15.07	64.86	16.82	9.88	23.35	46.57	44.00	18.18	17.34	45.14	37.97
88	30.18	28.23	19.56	64.01	17.85	8.70	23.38	46.53	43.91	18.17	17.13	39.65	39.08
89	30.21	28.01	21.15	61.43	16.92	8.02	21.66	48.42	46.11	17.76	17.18	38.25	41.56
90	30.30	27.50	21.69	62.17	17.58	7.65	19.80	48.01	46.32	18.16	16.92	41.29	41.71
91	31.10	29.36	18.19	62.73	16.41	7.70	18.63	47.25	47.05	18.48	16.59	44.05	42.97
92	30.34	29.67	19.92	61.83	15.08	8.30	16.18	45.59	47.26	16.97	16.56	42.02	43.56
93	29.64	28.80	16.29	63.68	15.73	6.78	13.73	41.55	47.77	18.11	15.19	39.82	39.39
94	29.76	29.25	13.62	61.68	16.32	7.12	12.37	42.22	47.36	17.70	14.81	39.38	40.51
95	30.08	30.53	12.13	61.49	16.16	6.13	9.56	31.88	49.26	18.26	15.12	38.90	43.29
96	29.27	31.88	12.69	62.17	16.20	6.48	5.64	50.85	48.74	18.18	15.00	47.57	40.75
97	30.78	31.86	14.58	61.04	14.79	6.80	14.43	30.64	49.26	17.15	14.94	46.79	38.52
98	31.08	31.42	17.38	60.62	14.75	6.13	16.88	27.46	48.79	17.56	14.75	42.92	39.30
99	30.03	30.78	16.62	60.53	12.74	5.16	16.27	31.29	50.91	17.63	14.23	33.79	44.41
100	28.99	28.98	15.34	61.16	11.92	5.87	16.83	28.57	50.25	18.13	14.54	34.37	45.59
101	29.46	27.89	14.67	63.77	8.59	5.09	18.75	40.66	50.49	17.10	14.33	37.23	42.65
102	29.11	27.95	12.95	62.40	4.31	5.86	20.62	28.03	52.09	17.09	13.94	24.91	43.81
103	29.00	27.26	16.53	58.16	11.08	6.83	20.59	27.62	50.66	18.12	13.43	32.22	46.01
104	28.47	29.18	28.99	48.46	11.83	10.21	19.56	25.46	50.39	16.67	13.59	22.67	47.92
105	27.76	28.28	20.35	44.92	6.96	7.13	17.88	24.74	51.09	15.40	13.15	35.55	46.82
106	27.65	30.72	37.69	41.80	4.07	9.00	16.68	25.00	50.43	15.89	13.00	47.12	47.10
107	27.45	28.62	24.85	43.12	2.80	9.81	16.13	32.48	50.30	15.64	12.79	38.02	45.62
108	28.59	30.86	22.73	56.16	3.05	8.35	14.98	36.21	51.48	14.99	13.10	42.55	45.92
109	27.69	26.76	21.06	59.79	3.04	7.73	14.12	34.13	50.55	14.70	13.39	50.00	46.37
110	29.64	25.54	27.98	59.47	2.72	6.99	12.75	33.59	49.91	14.45	13.22	51.66	46.67
111	28.68	25.79	24.84	62.02	2.76	7.81	3.12	29.28	50.00	15.05	13.68	45.35	44.97
112	28.90	24.06	22.15	61.35	8.71	7.58	17.48	34.34	50.35	15.09	13.19	51.47	44.16
113	28.91	24.16	21.83	60.26	14.64	8.69	18.25	35.95	49.28	14.01	13.74	52.48	41.11
114	28.34	24.53	22.91	70.68	14.78	7.61	23.54	34.18	50.63	13.96	12.27	47.38	39.23
115	28.46	26.95	25.91	57.06	12.04	7.06	23.83	33.58	50.63	14.44	11.43	42.23	44.22
116	27.66	25.46	29.01	56.27	12.12	9.41	27.84	34.15	49.73	15.25	10.26	40.21	45.77
117	26.47	22.71	34.25	60.97	16.42	8.96	28.91	33.87	50.00	16.51	9.80	40.68	47.30
118	25.52	23.51	53.13	59.22	21.23	8.38	29.09	33.53	48.68	16.35	10.03	42.43	46.15
119	28.84	22.57	70.92	62.88	21.33	8.65	29.33	36.26	49.00	16.34	7.78	39.01	45.97
120	33.29	23.28	67.63	58.42	20.14	8.72	30.09	43.80	49.22	15.43	6.04	38.99	45.86
121	35.78	15.63	71.33	60.78	19.98	7.61	31.43	45.04	48.93	15.83	3.31	41.88	45.38
122	37.34	13.55	74.87	61.72	18.94	6.00	29.55	44.98	48.29	16.10	3.60	42.22	45.99
123	38.18	10.09	77.31	60.12	20.94	3.82	30.76	44.00	47.62	15.11	6.43	41.49	45.44
124	40.43	7.06	71.30	78.60	22.18	6.71	29.90	44.53	48.96	15.09	8.60	41.65	43.72
125	38.89	3.37	56.96	71.49	22.09	9.02	32.03	46.41	48.48	14.22	8.60	39.37	43.28
126	38.46	5.17	59.15	57.70	21.76	8.57	30.57	45.94	47.99	13.53	10.64	38.85	43.02
127	37.63	7.02	67.16	59.66	22.55	9.51	30.75	45.70	47.92	13.19	9.06	39.25	43.16
128	26.39	2.20	72.36	55.57	22.66	8.86	29.97	44.39	47.38	13.27	13.75	40.26	43.26
129	29.19	1.47	42.52	60.74	22.51	9.54	30.52	44.08	48.06	11.81	13.60	39.49	43.30
130	33.75	1.90	63.71	71.18	21.98	18.21	30.13	43.71	46.61	13.33	13.05	39.22	41.50
131	38.66	4.43	51.82	61.38	22.65	14.53	29.67	43.11	45.48	13.41	13.81	38.25	40.86
132	37.23	5.51	37.05	60.40	22.06	14.59	27.69	40.50	44.93	14.69	13.38	38.86	39.48
133	39.79	4.79	31.47	53.67	20.43	18.03	26.31	37.47	45.26	14.40	14.09	44.27	40.80
134	38.82	4.12	24.25	56.55	19.04	20.34	24.13	46.34	44.85	14.81	13.55	37.29	42.31
135	37.83	11.76	31.41	57.77	21.01	20.30	21.00	44.75	44.91	15.21	12.56	40.19	41.73
136	36.96	20.96	48.26	58.62	23.06	20.54	17.58	45.76	45.42	14.43	14.68	35.81	42.38
137	39.19	22.17	37.99	58.97	22.09	22.15	13.75	44.52	45.27	14.41	16.50	35.83	43.49
138	39.97	21.99	25.41	58.74	18.04	39.31	14.36	42.38	45.64	14.57	19.00	36.63	44.22
139	39.04	15.53	22.28	55.79	17.97	27.27	13.16	43.55	46.25	14.92	19.24	36.54	42.28
140	38.18	12.77	24.68	56.27	21.21	25.10	11.82	43.50	46.00	15.12	20.50	40.68	41.99
141	38.91	14.03	28.53	56.79	20.22	25.05	9.86	43.62	46.53	14.51	19.61	40.85	43.19
142	38.52	3.51	56.99	58.49	19.05	24.16	6.10	44.56	47.74	14.73	20.32	39.95	43.34
143	38.04	7.05	48.54	59.27	17.09	22.54	2.53	44.16	47.34	13.60	19.88	42.42	42.43
144	36.10	4.88	24.13	60.49	13.68	20.48	5.75	43.70	47.54	13.55	20.42	40.43	41.22
145	36.77	7.81	25.05	59.47	11.13	18.80	16.04	44.17	47.39	14.10	20.48	35.62	39.55
146	38.26	3.47	30.88	58.66	12.22	16.39	22.63	44.55	47.43	14.45	21.22	34.38	39.45
147	36.01	3.08	31.09	51.84	8.36	15.58	24.73	43.76	46.71	15.01	21.12	41.92	38.59

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EM	MO1	MO2	TH	VA
148	35.03	5.95	30.18	56.84	8.72	15.42	24.98	43.64	47.55	13.94	21.06	43.86	35.00
149	36.09	5.89	32.71	56.50	7.82	17.20	25.88	43.18	47.56	13.43	21.79	39.45	38.69
150	36.52	3.97	36.56	52.43	8.52	18.12	23.80	42.28	48.47	13.65	21.04	39.53	38.85
151	37.54	10.10	32.56	55.27	7.48	19.19	24.20	42.34	49.07	14.49	20.13	41.16	36.65
152	36.07	8.27	31.67	55.74	9.66	19.21	24.06	41.90	47.72	14.23	19.64	43.91	36.33
153	36.98	5.75	34.07	57.51	10.33	18.45	28.82	41.83	49.17	14.97	21.11	48.34	37.79
154	35.36	8.17	32.20	58.73	15.21	17.11	26.24	41.75	49.90	15.80	20.34	50.16	40.37
155	34.76	10.10	36.56	58.53	14.14	13.18	26.20	39.98	48.11	16.86	19.38	40.56	37.37
156	33.82	14.42	43.56	54.22	15.56	10.77	26.29	40.21	47.85	17.19	18.08	41.12	34.78
157	34.11	15.92	51.82	56.60	15.50	9.78	24.81	41.25	47.63	15.26	18.71	41.21	36.11
158	32.60	12.30	49.62	53.92	17.10	9.99	23.10	41.93	48.11	17.35	18.05	44.89	38.24
159	32.87	26.09	32.73	54.71	14.06	9.88	22.56	41.12	47.88	17.10	18.03	44.88	36.32
160	31.72	26.27	2.29	58.57	16.46	8.84	24.49	41.20	48.39	17.01	17.88	47.98	35.24
161	32.01	22.88	1.68	56.43	16.43	8.86	22.99	40.62	47.42	17.87	16.98	48.02	34.07
162	31.65	18.25	1.63	56.86	17.76	7.83	22.03	41.27	48.06	17.65	16.73	45.97	32.83
163	30.88	30.33	1.65	56.95	17.15	7.05	21.27	42.31	47.32	17.78	16.31	42.80	35.99
164	30.12	21.51	16.00	55.61	18.37	3.06	20.61	42.64	48.07	17.35	15.81	42.88	33.33
165	30.61	18.42	45.40	54.38	17.95	4.81	19.00	43.20	48.31	17.40	15.32	46.86	30.99
166	32.04	8.77	45.15	58.72	18.48	5.81	18.03	41.72	48.12	15.56	15.87	41.62	35.76
167	30.90	34.38	47.59	58.36	20.14	9.51	16.40	41.81	49.14	17.07	15.40	42.78	35.59
168	30.72	17.15	47.09	56.87	19.30	10.85	14.27	40.50	47.92	16.93	15.76	45.15	33.40
169	30.44	24.50	42.25	56.50	20.93	12.89	12.16	41.88	48.68	17.34	15.77	49.59	33.42
170	30.92	29.69	42.25	58.65	19.41	14.39	10.94	41.24	48.20	16.52	15.39	49.88	38.64
171	32.48	26.32	41.12	62.30	17.23	14.32	9.13	41.18	47.76	16.32	14.65	53.82	39.90
172	32.15	22.37	39.56	57.00	16.19	14.96	7.83	39.69	48.62	16.25	15.29	48.87	37.07
173	32.81	25.73	41.87	59.04	17.61	15.86	5.81	39.28	50.20	16.51	15.38	45.03	38.95
174	32.90	22.21	42.75	58.30	17.45	17.00	10.96	38.11	49.31	15.95	15.47	53.03	39.36
175	33.53	26.02	33.42	57.41	17.67	19.13	14.23	38.36	48.15	15.49	16.39	50.47	41.01
176	33.30	23.19	37.34	57.66	18.03	16.67	15.36	35.85	48.62	15.36	16.54	42.25	43.19
177	33.82	23.34	37.53	56.76	15.73	15.91	14.19	31.37	47.02	15.38	16.55	47.15	43.51
178	33.11	19.72	37.85	54.88	13.95	16.02	13.90	25.52	47.95	15.21	16.83	44.67	40.96
179	33.71	15.82	49.46	55.47	14.64	15.75	12.69	31.25	46.94	15.02	17.60	45.44	40.66
180	32.41	16.88	51.72	53.77	17.10	13.50	7.19	33.41	45.84	14.64	17.59	44.48	39.80
181	31.87	16.27	46.39	55.82	19.19	12.90	3.89	34.59	46.10	14.44	17.88	38.61	39.79
182	31.99	19.23	43.81	53.53	20.02	13.35	7.47	36.25	46.08	14.12	18.20	49.86	36.58
183	33.47	23.04	36.62	53.11	17.62	12.76	14.91	36.43	45.80	14.38	18.26	33.30	37.77
184	33.26	19.28	41.51	59.92	19.13	13.35	25.19	35.92	46.41	13.85	18.20	34.96	37.58
185	32.44	21.82	40.85	56.91	16.85	14.39	18.32	38.35	46.87	14.02	17.54	38.56	39.20
186	32.82	27.24	50.39	55.68	15.71	18.00	17.18	37.64	46.51	14.30	17.31	36.97	39.10
187	33.52	25.56	50.07	55.21	15.02	20.19	18.57	38.00	45.89	14.35	16.97	35.72	40.60
188	34.00	32.52	46.90	53.71	15.24	19.70	20.03	38.62	46.15	14.34	16.20	34.14	42.18
189	32.02	33.83	53.22	54.66	14.47	21.50	18.69	41.10	45.09	14.36	16.10	37.70	39.76
190	34.16	35.42	45.11	54.91	12.55	14.47	17.34	40.65	45.31	14.06	15.77	41.80	39.34
191	33.08	35.77	42.35	53.92	12.63	17.12	15.82	40.00	46.03	14.10	15.80	37.82	31.13
192	34.23	36.15	44.55	54.87	13.19	16.15	14.48	39.05	44.77	13.96	15.28	37.32	35.52
193	32.99	35.98	42.80	54.75	12.44	11.77	12.83	37.61	45.23	13.53	15.33	37.25	41.41
194	34.31	39.79	41.26	52.53	11.67	11.99	11.49	37.71	44.39	13.14	15.90	37.18	41.76
195	34.31	38.04	42.19	66.13	11.53	10.81	10.94	37.75	43.48	12.67	15.51	38.49	40.81
196	34.60	37.47	43.40	59.11	12.22	9.72	9.55	33.38	44.91	13.77	15.81	35.66	41.28
197	35.19	35.61	42.95	56.78	11.74	11.45	11.97	28.53	43.97	14.07	14.75	32.04	38.25
198	35.37	35.13	46.95	52.23	10.58	12.47	12.42	25.06	43.23	14.03	13.76	36.13	37.80
199	36.31	34.58	48.71	51.43	11.56	13.80	13.38	21.70	43.21	14.84	13.80	37.91	31.31
200	35.91	31.57	46.29	59.09	15.59	13.40	12.41	20.26	43.80	14.90	14.67	36.07	30.66
201	35.13	27.26	42.46	62.73	15.85	12.99	11.51	33.33	43.64	17.15	14.17	35.42	30.38
202	36.26	26.23	44.56	59.24	17.51	15.94	8.47	38.52	43.50	16.75	15.13	35.75	31.51
203	35.45	24.45	48.40	58.20	17.22	18.08	4.20	35.08	44.87	16.61	14.45	33.38	38.43
204	35.54	20.46	46.11	57.10	17.78	17.87	1.95	36.61	43.05	15.39	13.81	33.91	45.20
205	36.00	16.70	43.46	60.75	19.49	19.40	2.30	40.38	45.38	15.62	13.80	37.23	44.02
206	34.58	12.16	37.23	56.53	18.46	19.63	1.56	40.50	46.87	16.16	13.04	35.79	41.90
207	33.01	20.33	32.06	56.88	20.78	18.93	2.94	39.08	45.27	15.73	12.87	35.06	39.62
208	32.06	17.22	34.19	58.90	20.53	17.77	2.88	39.37	43.95	16.28	12.09	35.02	37.62
209	31.68	26.14	33.01	57.88	19.59	18.36	2.58	37.93	44.24	16.56	12.34	36.61	38.44
210	30.08	31.09	33.65	55.67	20.38	17.74	1.74	33.33	46.12	16.64	12.29	34.02	44.53
211	32.48	33.18	32.72	56.37	19.71	14.15	2.01	34.02	45.08	17.23	12.66	35.76	47.93
212	33.53	35.80	35.90	55.36	16.19	12.77	1.76	37.58	45.45	17.44	12.69	35.24	46.74
213	33.72	33.64	43.30	55.02	15.03	11.66	1.69	40.41	46.51	15.04	12.93	38.03	45.83
214	34.67	32.53	45.47	55.90	19.13	10.91	2.04	38.62	46.64	16.80	11.90	47.61	46.12
215	34.66	32.67	39.86	61.55	18.94	11.08	3.05	37.01	47.52	16.45	13.32	42.36	46.22
216	34.39	32.68	35.81	59.38	19.11	8.39	6.10	33.81	47.56	16.75	13.46	39.76	44.69
217	33.23	33.70	31.36	59.83	18.66	8.05	8.11	28.17	48.28	16.12	13.57	39.80	44.56
218	34.05	32.27	30.15	58.07	18.07	7.30	8.42	25.42	48.09	15.67	13.69	32.09	45.17
219	32.58	29.42	43.87	57.31	16.70	7.64	8.12	23.16	48.82	15.73	13.66	33.94	44.52
220	32.23	28.64	39.46	57.20	15.79	8.68	11.93	26.47	47.81	15.25	16.35	40.15	43.93
221	32.44	29.33	37.81	57.04	15.77	8.48	11.39	37.75	48.91	16.30	22.57	37.30	44.18
222	32.29	27.68	33.58	56.71	17.66	7.93	11.53	39.45	46.61	16.11	16.12	44.18	42.30
223	30.78	30.42	38.44	58.73	19.82	9.36	11.05	38.82	45.22	15.99	15.69	47.25	44.34
224	32.03	33.80	46.40	57.40	20.91	10.90	10.07	33.33	44.80	15.72	15.12	49.91	44.63

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EM	MO1	MO2	TH	VA
225	31.05	30.75	36.44	46.81	19.66	12.43	9.87	41.40	44.54	15.44	13.20	48.61	42.16
226	30.44	28.87	29.87	60.45	19.35	12.69	12.79	40.67	43.02	15.58	14.61	42.52	44.57
227	31.55	33.00	34.85	62.13	17.43	11.82	18.98	42.23	45.76	15.33	13.77	39.05	43.50
228	32.49	22.51	39.72	60.29	14.49	11.75	16.87	41.25	47.64	14.88	12.25	46.44	42.90
229	34.62	30.72	36.33	59.65	15.42	9.39	14.03	38.73	47.78	15.19	11.27	40.17	41.13
230	33.29	40.38	35.64	61.56	17.14	10.53	13.80	37.95	48.09	14.87	11.86	42.86	43.49
231	33.11	42.72	37.93	61.07	17.03	9.63	16.00	39.53	46.52	13.64	12.48	39.24	44.44
232	34.08	35.33	38.22	61.45	15.99	8.08	13.62	40.78	46.28	15.89	11.22	39.09	45.80
233	35.16	39.15	41.62	57.92	13.62	7.62	10.53	41.03	47.44	15.69	11.64	40.47	46.12
234	34.29	41.00	36.72	58.30	12.02	9.08	13.68	39.44	45.51	15.61	11.03	41.08	43.88
235	34.51	50.77	37.17	57.72	10.62	13.89	15.27	38.99	46.50	13.84	10.90	39.38	43.93
236	34.29	39.69	29.86	58.33	10.71	13.96	16.00	38.45	46.60	15.47	11.29	38.16	43.25
237	33.71	36.58	27.65	58.18	9.03	13.72	15.44	37.09	46.68	16.32	11.64	45.09	42.60
238	33.02	41.73	38.37	57.49	5.78	13.29	14.00	35.84	49.35	14.59	10.80	36.82	40.14
239	32.36	34.00	44.62	53.20	5.63	8.97	12.77	32.06	51.45	14.73	10.88	36.43	41.76
240	31.82	35.13	49.19	54.94	6.18	16.21	9.63	32.44	51.35	13.65	11.74	34.76	41.41
241	31.96	30.04	50.62	53.43	8.49	17.63	8.98	35.89	51.13	14.58	10.95	33.38	37.02
242	31.47	31.20	49.83	52.37	8.29	18.15	5.85	34.96	51.29	15.49	10.72	34.04	40.69
243	30.72	31.00	46.34	55.05	5.27	16.21	14.77	34.91	51.15	14.84	11.46	34.99	39.31
244	31.40	30.16	45.89	53.64	6.11	14.43	14.81	37.15	49.20	14.87	10.65	36.43	40.02
245	29.01	32.09	44.78	54.05	6.75	11.56	15.77	33.12	50.00	14.77	10.75	34.61	39.14
246	29.34	35.65	44.40	53.51	9.24	9.13	20.34	34.62	49.60	14.30	10.90	33.59	38.68
247	28.65	38.47	45.80	51.57	11.76	6.02	21.56	39.39	48.93	14.80	10.02	37.85	38.39
248	29.98	40.08	41.96	51.01	13.33	4.26	23.22	33.85	47.33	13.54	10.48	35.86	37.20
249	27.52	37.86	40.34	51.46	15.27	3.75	25.31	40.34	48.45	14.31	10.87	36.95	34.82
250	26.66	38.36	45.56	52.24	18.05	5.77	26.21	38.15	46.89	14.40	11.10	36.51	22.17
251	27.70	38.80	45.39	52.39	17.21	8.31	33.52	37.37	47.03	14.82	10.53	37.74	20.38
252	25.80	32.96	37.55	52.84	14.97	9.05	24.74	35.66	47.16	14.66	11.11	38.50	21.35
253	24.68	33.96	42.21	55.12	16.06	9.80	22.59	40.18	46.21	15.54	11.65	36.44	22.98
254	25.25	32.79	43.58	56.58	14.19	12.37	20.05	40.14	47.21	14.91	11.13	36.73	22.82
255	26.76	24.43	38.52	55.49	14.17	12.23	22.40	37.82	47.61	15.02	11.78	38.76	22.59
256	25.83	25.02	33.85	52.81	15.09	12.00	21.49	43.29	47.63	14.04	12.79	34.45	21.63
257	26.74	23.66	46.82	53.44	15.47	11.92	20.74	38.81	47.50	14.25	12.68	41.42	22.00
258	28.18	26.30	33.37	48.58	15.33	11.82	21.97	44.23	46.75	14.72	12.41	44.37	21.58
259	27.93	23.04	36.56	50.56	13.95	12.15	19.71	44.67	47.27	14.61	12.59	42.18	21.50
260	27.41	20.73	31.34	50.94	13.74	11.87	24.64	37.90	47.47	14.07	12.58	42.37	20.97
261	29.22	24.26	40.87	52.68	13.94	13.25	23.30	37.27	47.55	14.08	13.36	42.76	19.95
262	28.32	35.16	34.69	49.34	13.22	13.14	24.69	41.80	45.55	13.64	14.35	40.75	14.68
263	27.85	31.78	36.06	53.14	12.95	11.85	27.03	41.01	45.08	12.98	14.24	41.40	44.29
264	26.72	31.44	39.16	53.26	11.09	11.41	27.21	42.68	45.26	13.87	13.58	38.32	44.66
265	27.87	33.06	36.66	53.99	9.46	9.34	27.97	44.89	44.12	12.98	12.77	37.56	42.86
266	27.03	28.97	35.14	53.44	6.09	7.65	26.98	45.81	43.86	13.55	13.26	37.70	42.36
267	25.80	27.85	34.48	53.91	5.85	6.22	26.89	41.79	41.21	14.98	12.82	41.09	41.84
268	23.94	23.52	30.21	54.98	9.06	4.94	28.45	43.04	41.98	14.40	12.77	38.71	41.91
269	22.60	25.50	22.10	56.23	16.36	3.71	23.87	43.07	39.80	15.33	13.28	38.52	42.53
270	26.89	29.18	23.04	54.14	15.19	4.29	21.61	43.23	37.28	16.51	13.00	39.23	42.14
271	27.35	37.74	24.28	52.71	15.45	12.26	22.00	42.15	39.21	13.44	12.54	38.74	42.02
272	28.21	38.87	27.14	51.63	13.73	17.63	22.43	41.92	40.49	13.64	11.77	38.92	40.72
273	28.24	35.71	20.80	52.92	12.41	11.43	19.77	41.19	44.70	12.95	11.88	38.82	39.46
274	29.63	36.46	8.16	51.39	11.24	9.85	18.80	41.63	49.09	12.30	11.00	40.13	39.04
275	29.36	40.31	45.30	52.80	11.29	8.33	21.39	41.57	49.12	11.80	10.02	41.77	39.15
276	28.70	38.16	45.35	56.72	11.24	8.54	24.90	40.89	50.91	11.06	10.69	41.46	41.68
277	28.33	36.42	47.85	63.89	12.61	8.20	24.62	42.52	51.50	11.09	14.11	39.43	41.05
278	28.53	34.66	47.88	54.40	13.39	8.61	22.02	43.23	51.04	10.62	13.55	38.01	42.44
279	28.22	35.58	45.58	52.67	13.36	8.81	21.81	42.02	49.62	10.95	13.37	34.07	42.14
280	28.42	36.74	43.04	52.31	12.31	9.60	21.82	42.06	49.29	10.32	13.56	40.30	41.58
281	28.20	37.04	48.20	52.76	15.52	9.80	20.17	39.26	48.90	10.23	13.41	38.95	42.74
282	27.50	37.35	46.25	52.12	15.24	10.20	22.70	35.81	50.33	9.73	13.28	40.00	43.97
283	28.00	33.69	46.28	53.48	13.28	10.80	19.14	37.19	52.39	10.18	13.94	40.90	42.35
284	28.68	41.67	48.02	51.44	12.96	12.22	19.01	36.20	52.53	9.73	16.15	36.78	41.12
285	28.69	34.36	49.49	53.40	12.52	12.41	26.06	40.06	53.53	9.71	17.79	38.79	42.57
286	28.38	33.37	48.87	52.61	11.64	11.78	25.84	37.43	53.11	9.19	14.66	38.03	42.88
287	28.97	37.37	48.58	54.66	12.45	11.06	22.73	38.13	52.88	9.73	14.21	41.24	41.23
288	28.94	39.82	48.42	56.14	11.88	11.39	19.84	40.16	52.26	9.58	13.85	39.55	43.51
289	28.17	38.53	47.85	53.96	11.17	10.52	14.54	41.57	53.29	9.49	13.42	35.15	43.51
290	27.64	36.88	48.15	54.55	11.50	9.86	20.78	41.79	52.49	8.29	12.57	32.69	44.46
291	28.55	38.51	48.22	55.36	11.81	10.11	29.34	40.83	52.12	9.18	12.54	36.13	42.42
292	27.33	38.72	44.88	51.62	12.01	9.86	26.93	38.60	51.62	8.21	12.41	38.95	44.35
293	27.33	38.42	42.64	53.14	12.32	11.16	26.56	36.17	52.32	9.24	12.53	36.66	44.87
294	27.06	31.55	44.19	52.09	12.26	12.93	32.55	33.16	52.17	10.36	11.88	41.85	41.48
295	27.74	34.23	46.95	51.29	12.95	12.21	30.02	30.00	50.89	11.04	6.66	37.70	39.86
296	28.88	30.38	45.72	53.64	13.27	10.44	30.39	26.02	52.26	11.06	11.90	37.16	40.65
297	28.21	32.63	46.59	50.75	13.78	6.44	28.69	30.01	53.45	10.89	11.62	36.77	40.61
298	28.38	33.30	46.09	51.08	13.93	8.09	34.25	38.46	52.70	11.20	11.58	37.79	39.56
299	28.00	32.72	41.75	51.80	13.17	13.84	29.40	37.42	51.94	10.64	15.00	38.98	44.03
300	28.86	29.67	49.10	51.98	13.85	16.23	28.70	34.80	52.23	10.92	13.96	38.89	43.71
301	26.70	32.24	49.53	50.53	12.91	15.82	26.43	32.39	51.03	10.72	14.04	38.39	41.91

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EM	MO1	MO2	TH	VA
302	25.34	27.30	48.29	49.28	12.83	15.30	25.07	29.96	50.29	10.87	14.63	38.24	41.05
303	25.86	28.16	47.83	49.92	11.51	16.51	26.40	28.89	49.19	9.72	14.10	41.08	41.74
304	23.57	28.66	45.82	49.59	9.93	15.32	26.66	27.83	47.75	10.86	13.51	41.62	40.60
305	21.24	29.38	45.15	49.50	6.81	13.97	25.38	33.18	50.15	11.53	13.02	43.41	40.00
306	21.22	27.18	43.66	48.69	9.76	13.37	24.74	35.76	52.82	11.71	13.51	41.92	36.48
307	19.52	28.21	38.81	49.47	10.73	12.72	23.76	37.28	52.92	11.01	13.17	41.34	38.15
308	20.76	24.92	31.02	50.48	8.85	10.67	23.78	39.49	51.63	11.86	13.10	41.11	40.64
309	22.00	14.84	33.68	52.18	6.74	10.11	18.85	41.19	52.14	11.76	13.02	41.77	40.51
310	22.00	30.65	44.03	54.17	6.70	10.08	23.65	40.00	52.90	11.80	13.54	39.40	39.47
311	21.57	33.08	43.68	54.84	7.01	9.75	22.89	38.91	53.59	11.89	14.57	33.88	34.03
312	23.49	32.91	44.38	54.59	4.16	10.42	23.73	38.77	53.70	11.97	15.39	35.69	23.97
313	22.54	30.50	42.45	50.34	4.55	10.96	21.42	36.31	54.31	10.60	16.62	34.75	25.08
314	22.01	26.57	43.65	51.52	8.57	8.36	19.71	35.33	54.07	11.26	18.24	34.57	24.73
315	21.15	22.23	38.35	52.98	10.46	3.89	18.72	33.96	53.98	11.72	17.57	35.35	26.38
316	19.93	25.20	39.39	51.05	13.37	2.49	21.13	37.59	53.76	11.86	15.10	35.33	28.97
317	19.98	22.16	42.58	51.46	13.01	2.93	22.62	37.70	56.13	12.41	15.85	34.25	31.62
318	19.94	26.82	42.40	51.80	13.74	1.94	20.87	33.33	54.93	10.78	16.26	32.08	32.23
319	18.45	33.30	41.50	52.20	14.64	1.35	19.04	32.51	52.11	12.12	18.08	33.97	40.97
320	18.84	32.29	38.53	52.99	14.76	1.74	14.33	28.76	50.31	11.80	15.25	31.68	43.20
321	17.64	31.49	32.08	52.67	11.62	1.89	10.89	30.48	48.88	11.07	15.89	32.76	41.43
322	17.85	29.76	31.15	51.41	9.99	3.37	8.82	28.90	48.69	11.63	16.09	33.02	42.01
323	17.05	31.34	23.47	46.23	9.27	5.34	9.76	24.12	46.61	11.29	14.70	31.92	42.96
324	17.50	32.75	28.00	39.11	6.03	6.22	13.06	30.63	46.02	10.95	14.22	33.63	42.77
325	18.51	33.41	50.32	40.83	8.29	8.76	12.75	34.53	44.49	11.40	15.33	32.39	41.71
326	18.32	35.76	50.24	43.19	9.41	9.92	11.11	33.83	39.97	10.75	15.43	33.55	41.50
327	19.75	32.54	49.09	44.25	9.61	11.23	13.73	34.24	37.87	11.80	15.95	33.53	45.13
328	20.51	32.20	48.91	51.34	10.81	11.38	12.54	36.18	37.94	11.48	15.33	33.19	42.91
329	20.84	33.66	48.09	53.59	13.85	12.99	17.98	36.12	36.17	11.41	15.06	34.81	41.97
330	21.16	41.47	47.42	55.49	13.65	15.63	18.16	38.79	36.39	10.85	15.21	33.38	42.12
331	20.28	41.27	47.40	57.56	14.62	15.96	14.35	39.27	29.38	11.48	15.34	32.81	43.01
332	21.57	46.36	47.54	58.12	15.02	14.69	14.28	39.05	22.64	11.36	15.69	32.34	41.84
333	23.88	44.85	49.86	61.03	14.16	14.03	11.43	38.15	20.95	11.30	16.05	31.05	41.94
334	24.51	47.43	50.58	58.83	14.68	13.78	10.38	37.20	18.11	10.36	15.88	31.24	45.42
335	24.83	37.37	50.17	56.99	15.04	12.33	13.24	35.51	25.07	11.30	15.89	31.13	45.81
336	24.79	36.50	44.53	55.99	15.90	12.12	12.80	38.56	40.15	10.69	15.86	32.94	43.67
337	25.84	44.30	46.93	57.03	17.72	12.82	12.85	39.20	47.83	11.19	15.10	33.24	43.63
338	24.62	39.12	46.88	56.40	17.63	14.60	11.50	40.00	51.03	11.04	15.08	33.18	42.35
339	25.14	34.75	47.23	57.03	16.27	13.47	12.26	38.77	53.19	10.32	14.52	33.15	41.91
340	27.01	33.74	44.94	60.05	15.78	12.98	8.51	38.31	55.24	11.04	14.54	32.58	40.71
341	27.06	33.51	40.74	58.81	15.71	11.43	11.48	39.34	56.93	8.92	14.17	32.63	41.77
342	27.05	34.02	35.71	61.55	15.21	12.46	18.53	39.41	60.45	11.79	14.86	32.31	40.27
343	27.58	32.63	44.89	57.22	15.32	13.69	21.81	39.49	65.57	12.77	14.61	32.22	40.92
344	27.41	30.12	48.33	56.02	14.11	12.93	18.33	40.04	68.14	11.47	14.87	32.44	38.58
345	27.32	31.87	46.31	56.46	15.80	13.64	7.14	39.92	72.00	12.89	14.39	32.52	39.26
346	27.13	30.46	44.57	52.91	15.82	15.80	7.78	39.21	71.58	12.92	14.42	33.89	40.54
347	27.67	30.13	45.06	60.08	12.86	17.26	5.62	41.92	71.46	12.86	14.53	34.02	39.33
348	26.71		46.28	59.22	13.04	17.50	1.99	43.31	72.73	11.61	15.01	34.77	38.06
349	27.08		47.01	53.32	12.81	17.87	9.88	42.48	73.60	10.65	12.87	37.15	34.65
350	26.98		47.38	62.11	10.05	16.97	15.18	42.76	77.29	11.97	12.93	35.89	31.91
351	27.32		47.42	52.08	8.26	14.11	17.51	43.67	79.73	12.07	12.37	35.07	40.77
352	28.85		47.92	50.12	6.06	16.22	15.93	43.42	79.55	10.18	12.11	36.22	40.98
353	28.71		46.76	66.96	6.82	15.75	17.67	42.83	78.06	13.13	12.24	36.60	38.18
354	30.34		44.62	59.36	8.88	15.05	14.88	42.62	74.38	10.33	12.57	34.28	40.91
355	30.05		43.49	57.29	7.31	12.82	23.45	40.92	71.30	12.46	12.73	32.23	42.45
356	30.93		46.32	71.97	6.88	13.45	24.44	39.81	69.28	14.21	12.88	32.45	41.95
357	29.75		47.46	54.51	8.43	14.15	24.60	40.20	78.15	17.61	13.34	33.08	42.50
358	30.20		46.27	59.37	12.13	13.73	22.14	40.59	74.10	13.58	14.50	33.47	44.04
359	30.31		45.23	60.31	9.65	12.97	18.26	39.78	71.33	12.90	15.33	32.82	48.91
360	28.39		46.55	62.87	10.40	14.35	14.26	38.95	70.50	13.35	15.05	32.76	46.22
361	27.79		46.58	63.72	10.45	14.80	8.37	36.57	70.87	13.53	15.35	32.60	43.64
362	26.72		44.76	63.69	9.22	14.56	9.51	35.88	72.87	13.16	15.09	33.16	42.52
363	26.67		48.45	62.45	8.24	14.22	22.08	35.92	74.02	12.55	14.99	32.71	37.37
364	26.65		49.10	61.24	12.42	14.92	23.86	38.91	72.75	12.84	14.66	32.11	40.76
365	26.41		50.38	57.23	14.97	17.96	24.40	38.91	70.37	12.06	14.75	32.49	42.25
366	26.04		52.22	54.87	12.01	19.00	21.85	37.71	68.00	12.47	15.14	32.13	40.90
367	25.92		52.66	59.06	12.03	19.54	24.60	37.16	63.98	11.68	15.25	31.26	40.38
368	25.84		53.25	61.00	15.65	19.87	21.50	38.67	58.59	11.97	16.13	33.33	41.90
369	25.68		54.68	59.98	15.88	19.05	20.90	39.38	57.76	12.50	16.12	34.16	40.67
370	24.98		53.47	58.43	16.57	18.28	22.95	38.78	57.34	11.33	16.62	35.58	38.79
371	25.36		53.46	61.07	15.76	17.97	20.51	36.64	55.28	12.07	17.15	36.32	38.49
372	23.04		54.18	74.65	15.40	16.93	17.47	38.20	53.72	12.72	17.79	36.35	40.40
373	22.72		57.59	56.32	14.80	16.72	18.79	38.60	52.63	11.96	17.87	37.08	39.97
374	23.08		62.97	59.55	15.10	16.46	22.76	39.13	53.33	11.25	17.82	33.55	39.56
375	24.15		54.25	71.42	16.42	15.78	22.35	38.18	54.23	10.47	18.04	32.74	38.63
376	23.71		52.88	58.73	16.19	14.58	17.88	38.14	53.88	13.11	18.06	33.52	38.48
377	23.65		52.77	60.33	16.25	17.19	15.85	37.94	54.17	12.97	17.99	33.33	41.41
378	24.15		52.14	61.88	17.43	15.63	25.60	37.98	57.58	12.44	17.80	33.62	40.59

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EM	MO1	MO2	TH	VA
379	24.45		50.54	64.80	15.57	15.08	23.57	36.74	60.76	13.33	17.09	34.11	42.35
380	24.73		47.07	62.69	14.68	25.65	20.25	36.14	59.97	12.24	17.08	33.83	39.96
381	23.99		42.34	72.12	14.41	18.65	15.97	35.49	76.87	12.60	16.54	32.74	40.78
382	24.48		43.36	63.89	14.12	18.24	22.18	35.81	78.43	12.97	15.75	31.86	41.62
383	23.77		53.33	64.59	14.16	31.97	19.11	36.34	79.64	13.55	15.14	33.19	37.97
384	24.18		45.81	64.61	14.76	22.12	13.65	34.46	79.51	13.28	13.89	31.64	39.12
385	26.53		43.78	65.47	14.02	22.18	17.02	35.60	78.00	13.86	13.42	32.20	39.53
386	29.05		40.93	61.43	13.07	20.27	23.91	34.92	77.67	13.00	13.22	33.68	38.02
387	29.55		44.72	61.18	11.33	20.14	24.52	34.41	76.03	13.55	12.43	34.08	38.78
388	30.42		45.86	59.88	10.97	21.79	19.18	32.78	75.26	13.47	12.64	31.56	39.22
389	29.22		45.98	62.05	13.46	19.00	19.12	30.69	77.07	13.54	13.13	29.79	42.55
390	29.92		46.60	65.71	11.52	22.47	21.18	27.08	81.14	14.54	13.96	28.77	43.37
391	31.07		46.63	64.39	11.02	17.39	20.61	17.29	81.90	15.18	13.44	29.31	42.57
392	31.29		46.30	74.92	14.26	19.04	12.29	39.10	82.11	15.90	12.84	27.80	43.46
393	29.66		46.64	60.05	12.99	16.18	16.97	39.07	81.05	16.85	12.35	23.46	44.30
394	28.54		47.53	61.04	14.39	15.20	18.89	38.53	78.84	15.77	11.96	20.75	43.69
395	29.09		47.39	61.49	11.00	18.08	19.01	37.14	78.59	16.04	11.70	21.04	45.03
396	27.97		47.97	66.69	11.04	15.67	15.57	36.78	79.39	16.56	11.19	19.14	43.70
397	26.73		47.52	66.64	14.12	23.41	12.79	35.63	79.09	17.04	10.73	17.15	42.58
398	25.88		44.77	69.60	14.71	19.97	8.78	35.29	79.67	14.92	10.72	18.74	43.89
399	25.97		45.28	64.93	14.17	18.43		36.08	79.48	16.06	10.37	16.05	44.12
400	25.30		44.98	60.44	13.40	20.16		36.79	78.91	14.49	11.13	16.46	44.93
401	24.44		45.64	56.48	14.20	20.83		39.76	78.91	15.77	11.88	16.49	48.15
402	24.29		42.63	54.06	15.12	18.95		41.19	78.29	15.03	11.45	13.53	47.11
403	22.96		48.19	60.24	15.30	25.97		41.13	75.58	15.62	10.87	12.38	45.60
404	23.58		42.41	61.05	14.59	20.21		40.56	72.50	14.97	11.50	9.08	41.41
405	22.65		28.62	62.38	12.36	20.33		40.15	70.86	15.57	11.30	7.46	45.97
406	22.28		27.65	64.39	16.04	19.92		39.51	69.65	15.58	10.20	8.43	42.54
407	22.24		36.25	61.75	16.88	19.23		38.09	67.18	15.97	9.73	12.87	36.96
408	20.70		52.34	61.46	12.81	17.39		36.77	65.23	14.74	9.59	21.98	30.38
409	20.68		44.90	58.59	15.71	19.30		37.27	63.42	15.65	9.91	30.73	31.94
410	19.46		33.13	54.25	15.28	18.84		38.98	60.99	15.22	9.33	23.59	34.28
411	22.83		24.44	61.11	14.97	17.14		38.59	56.97	16.26	8.73	28.15	31.36
412	27.86		43.05	62.00	16.74	17.40		40.11	54.93	13.00	8.92	39.17	31.98
413	27.99		42.90	63.27	17.83	17.29		40.52	52.65	14.79	8.78	38.29	37.76
414	27.39		41.29	65.96	19.35	17.07		39.77	50.57	14.50	8.58	36.67	37.60
415	28.92		40.92	65.26	13.00	16.39		38.42	51.07	14.96	9.45	36.24	41.63
416	28.05		41.56	64.72	14.06	15.74		36.00	51.64	15.14	10.28	37.06	43.78
417	27.90		42.06	62.79	13.30	15.67		34.79	50.91	13.37	10.86	37.33	47.18
418	27.28		41.26	58.65	13.60	17.05		33.77	52.11	14.07	11.12	38.78	50.62
419	26.87		38.53	63.17	14.19	16.85		32.76	55.20	14.17	10.98	39.62	48.05
420	26.75		37.71	62.95	18.27	16.99		30.84	52.70	13.46	9.86	39.08	50.83
421	27.96		39.64	63.80	15.55	18.32		30.86	52.25	14.04	9.56	41.14	45.07
422	28.46		37.42	63.74	16.04	18.34		40.57	50.68	13.02	9.34	43.13	43.36
423	29.45		43.30	64.85	11.67	16.48		38.52	49.78	12.35	9.73	43.46	40.86
424	30.29		53.20	63.11	16.58	17.24		36.36	48.53	11.67	8.77	43.48	39.70
425	31.81		52.58	62.75	15.36	15.96		42.55	48.86	12.88	8.30	44.97	43.95
426	29.28		53.06	63.09	22.75	15.69		42.29	49.28	12.88	8.37	44.03	43.86
427	30.46		43.01	64.64	13.97	17.39		43.60	53.46	13.01	8.45	44.61	41.95
428	30.13		46.04	63.14	13.29	18.05		42.49	54.84	12.70	8.20	45.98	48.71
429	31.33		40.53	61.18	12.46	11.68		41.37	51.46	11.72	8.56	47.21	50.59
430	34.30		38.74	63.38	13.59	10.89		40.10	52.39	12.92	9.63	47.80	46.14
431	31.63		26.70	63.46	10.50	11.38		39.37	50.49	13.49	10.35	44.30	52.20
432	30.66		31.35	62.26	12.85	10.14		37.89	49.68	13.74	10.24	45.40	24.03
433	30.89		28.93	61.91	16.84	10.01		36.86	49.08	13.92	8.61	50.19	40.48
434	30.99		27.25	63.09	15.03	11.38		37.02	51.04	14.49	6.90	52.74	41.34
435	30.25		31.10	61.68	17.84	15.22		36.70	55.66	13.18	5.60	47.65	22.25
436	30.27		30.82	64.04	25.07	20.71		34.91	57.11	15.03	5.61	47.72	42.91
437	30.26		31.31	64.77	28.01	13.64		32.09	58.14	15.34	5.22	54.00	45.27
438	29.94		33.90	61.14	32.88	11.56		26.25	56.96	16.10	5.57	58.80	41.86
439	30.56		35.62	61.74	33.69	12.15		42.47	57.39	14.58	4.78	59.15	43.09
440	31.00		36.08	62.32	29.02	24.14		41.60	57.50	14.80	4.79	59.54	42.74
441	30.67		34.76	61.69	34.26	15.50		41.41	55.73	14.10	5.13	59.47	42.34
442	30.15		34.05	62.03	24.52	14.21		41.76	53.79	14.73	4.30	58.43	43.83
443	29.77		33.00	63.56	31.19	6.13		40.55	51.80	14.27	4.48	56.16	46.57
444	30.16		39.76	63.88	20.48	14.10		41.26	51.97	14.87	4.53	58.23	38.81
445	29.83		40.83	62.93	27.24			39.63	52.76	14.75	4.32	62.85	44.54
446	30.90		28.17	60.22	21.54			37.97	53.02	14.48	4.41	57.56	40.97
447	31.01		27.23	62.01	17.88			39.29	53.15	13.34	3.80	58.93	49.08
448	31.66		27.59	62.33	19.38			40.36	55.14	14.51	3.79	55.40	50.11
449	33.66		28.73	60.27	15.95			41.46	54.47	14.93	3.10	55.94	42.72
450	33.41		41.80	60.43	14.85			41.63	51.61	14.94	3.82	54.42	38.99
451	33.68		47.41	59.25	15.07			37.88	50.74	15.11	3.61	49.92	45.03
452	32.64		36.79	58.92	14.72			42.80	50.67	15.56	2.25	49.40	43.30
453	31.69		32.56	60.12	13.26			43.70	49.90	15.54	2.25	48.87	46.15
454	31.20		29.77	61.95	14.47			41.51	48.47	14.55	2.85	47.47	42.51
455	29.76		34.07	61.66	15.69			42.28	49.90	16.05	3.07	48.18	42.25

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EM	MO1	MO2	TH	VA
456	28.48		46.73	59.85	14.54			40.42	51.61	16.02	2.35	45.73	42.84
457	29.32		14.08	55.69	14.55			42.15	53.97	14.92	2.44	41.80	45.11
458	30.04		12.34	52.80	17.27			40.19	57.66	14.76	1.86	39.87	43.10
459	29.76		19.30	56.95	18.44			41.11	57.58	14.94	2.23	40.98	41.27
460	30.47		22.23	58.87	19.09			40.42	56.39	14.69	2.26	41.28	41.13
461	28.97		15.56	57.86	18.22			43.93	57.51	14.86	2.99	40.60	42.26
462	27.76		9.27	51.61	16.91			39.53	57.34	14.70	2.14	40.75	45.33
463	27.17		5.78	54.96	17.12			37.92	57.84	13.93	2.02	42.90	46.99
464	27.98		6.34	54.94	15.53			37.48	56.10	12.68	1.81	45.01	39.98
465	27.08		5.03	56.12	15.41			33.60	55.69	14.09	2.03	45.67	43.45
466	27.25		4.07	59.48	14.24			29.01	55.67	14.40	1.74	44.95	41.04
467	26.89		3.42	53.65	13.84			43.87	56.50	13.39	1.71	45.93	41.89
468	26.84		3.46	52.76	12.48			41.06	57.61	14.35	4.18	46.56	37.52
469	27.25		3.76	52.64	13.18			42.68	57.47	12.94	5.39	47.55	40.30
470	28.77		3.59	53.14	12.71			44.38	57.31	13.79	2.76	48.42	34.47
471	28.61		4.69	57.98				39.76	54.96	14.93	1.49	49.03	42.58
472	27.83		3.99	57.07				32.37	54.22	14.95	0.65	49.84	44.78
473	28.59		5.03	61.14				35.10	54.90	13.28	1.38	48.90	44.43
474	29.00		2.78	61.01				34.71	54.80	15.01	1.51	47.91	44.46
475	30.27		3.48	42.52				37.07	54.11	14.91	1.58	47.47	43.06
476	30.19		5.53	30.33				37.48	54.32	16.45	1.75	45.88	48.57
477	28.54		4.33	29.94				35.45	53.91	16.21	1.67	45.38	46.49
478	29.37		3.34	31.71				35.00	54.98	15.20	1.68	44.44	45.03
479	29.95		3.36	30.72				41.34	55.84	16.51	1.74	44.79	43.08
480	29.19		3.70	32.22				39.53	55.48	16.69	1.74	41.25	43.14
481	28.00		3.74	35.67				38.30	56.12	17.53	1.96	38.49	42.70
482	29.24		9.75	40.40				39.22	56.21	17.63	1.91	38.86	44.88
483	28.60		13.41	28.26				39.66	55.72	15.33	1.83	40.13	41.99
484	29.01		13.31	60.00				40.08	55.50	16.73	1.59	40.43	42.61
485	29.85		12.73	63.34				40.22	49.92	16.06	1.69	41.11	43.82
486	27.65		11.89	64.67				37.91	48.82	15.63	2.16	39.55	44.58
487	28.40		10.62	61.84				35.93	48.14	15.05	1.71	43.92	42.60
488	26.60		9.01	61.42				33.76	48.75	15.22	1.77	45.44	42.11
489	26.60		7.70	61.12				34.89	47.86	15.82	1.70	47.51	41.10
490	27.63		7.36	63.27				32.19	47.40	15.43	1.70	43.96	40.81
491	26.58		6.76	63.46				28.97	47.07	15.11	1.47	53.18	43.78
492	26.13		7.11	62.30				27.03	48.41	14.52	1.62	46.75	40.28
493	22.94		11.73	63.05				28.60	51.87	14.00	1.61	46.74	40.79
494	25.95		25.90	62.69				27.48	51.90	14.64	1.66	45.45	42.03
495	25.45		28.54	66.67				24.61	54.27	14.75	1.57	30.54	34.19
496	24.19		32.24	65.43				33.94	50.80	13.69	1.65	32.07	34.36
497	21.29		24.00	63.29				36.42	49.12	13.15	1.93	26.37	25.23
498	28.40		13.76	65.96				35.86	51.58	12.87	1.79	26.28	41.54
499	27.12		3.06	66.32				33.63	48.39	12.63	1.54	31.30	35.37
500	28.24		4.07	67.24				36.02	51.24	11.05	1.28	34.98	38.83
501	29.22		3.20	67.02				41.82	45.33	12.34	3.08	49.31	44.65
502	29.46		3.43	62.42				41.50	49.92	13.21	5.51	59.78	49.55
503	28.36		2.46	59.94				40.51	52.96	12.65	2.53	59.84	37.92
504	27.31		0.98	61.15				40.37	54.59	13.90	1.45	55.54	41.98
505	27.74		0.66	62.41				38.60	53.53	13.78	1.19	49.11	42.68
506	24.97		0.56	60.27				38.84	54.04	13.80	1.21	44.46	49.87
507	25.02		0.39	62.11				37.07	54.21	13.60	1.59	36.32	44.71
508	24.91		0.42	64.01				37.99	51.45	13.05	1.27	41.82	41.07
509	25.04		0.40	63.17				41.67	51.82	11.90	1.17	38.42	37.34
510	27.81		0.63	62.94				39.61	52.78	11.82	1.38	37.92	38.19
511	28.12		0.48	61.22				36.69	51.04	12.72	1.39	41.75	44.99
512	27.34		0.63	57.53				31.94	52.77	11.85	1.39	37.30	45.81
513	27.95		1.12	55.40				37.45	53.29	12.71	1.50	39.72	38.34
514	27.36		1.53	55.28				34.27	54.58	12.92	1.50	36.38	41.20
515	27.51		1.31	51.76				36.09	55.83	11.98	1.44	38.62	46.61
516	26.64		1.50	44.66				34.21	55.27	12.01	1.16	33.38	46.69
517	25.52		1.73	25.87				36.30	54.66	12.21	1.04	39.48	42.99
518	24.87		1.68	23.80				40.04	53.89	12.69	1.17	45.36	46.14
519	24.43		1.64	26.27				44.33	54.85	11.78	1.46	42.51	35.70
520	23.71		2.28	24.45				38.13	54.16	12.08	1.46	44.67	47.02
521	23.79		2.07	47.17				34.62	53.60	12.50	1.29	44.92	51.07
522	27.71		1.31	40.73				33.28	52.99	12.62	1.06	46.44	50.60
523	29.67		1.03	44.52				35.68	51.77	11.60	0.89	52.98	49.62
524	31.80		0.39	39.88				32.31	50.47	12.47	1.06	48.63	51.09
525	27.92		0.31	40.89				35.43	52.13	11.49	0.98	49.82	42.06
526	32.59		0.35	27.67				35.24	54.64	11.60	0.86	47.94	43.58
527	32.62		0.39	28.38				33.33	53.59	12.10	1.02	55.92	46.55
528	31.73		0.43	32.97				35.23	54.45	12.83	1.07	54.55	52.79
529	28.67		0.43	56.23				35.73	54.51	14.01	1.00	47.42	46.75
530	29.64		0.59	55.59				38.48	55.54	13.70	1.05	44.87	43.67
531	30.08		0.64	54.80				42.45	57.89	14.34	0.94	40.30	47.39
532	32.12		0.62	53.70				42.82	54.98	14.20	0.95	36.12	48.86

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EM	MO1	MO2	TH	VA
533	29.32		0.69	54.13				40.39	56.90	13.55	0.88	30.31	43.88
534	28.73		0.56	51.62				40.80	57.46	12.96	0.85	41.06	67.06
535	35.21		0.70	50.58				40.10	56.70	13.45	0.91	37.84	41.91
536	36.72		1.27	45.96				40.33	57.00	12.55	0.86	24.51	50.73
537	36.33		0.94	49.52				40.04	51.21	14.45	1.14	31.15	43.56
538	35.49			46.70				42.95	56.64	14.15	1.16	43.93	54.11
539	35.61			44.99				44.19	56.01	14.34	1.29	60.76	46.06
540	35.26			41.87				42.86	57.19	14.14	1.16	36.83	51.22
541	34.76			42.32				44.63	56.52	12.50	1.35	33.99	50.09
542	35.34			37.51				41.09	53.91	11.76	1.08	32.29	49.14
543	36.77			34.16				40.34	54.24	11.19	1.26	40.29	52.91
544	37.37			27.36				42.02	51.82	10.19	1.26	46.11	39.96
545	37.56			28.33				41.50	51.75	10.38	1.19	42.42	53.02
546	36.02			35.72				40.05	49.79	10.25	1.00	40.84	57.50
547	33.56			28.22				39.35	51.00	10.52	0.97	50.72	50.39
548	33.61			22.61				35.84	55.17	9.22	1.06	45.52	26.87
549	34.50			17.14				34.82	57.99	10.52	1.06	39.88	24.25
550	32.63			11.97				36.05	55.27	11.16	1.05	40.95	35.69
551	33.01			10.37				36.33	56.92	9.56	1.13	45.95	56.45
552	31.73			9.97				40.19	54.99		1.31	39.80	62.56
553	30.52			10.20				40.29	54.38	9.28	0.85	39.54	62.39
554	30.82			8.97				40.36	52.82	9.96	1.13	38.04	58.87
555	29.71			3.07				39.89	54.17	10.14	1.19	35.95	36.64
556	31.33			5.01				40.00	54.33	10.39	0.91	39.63	64.22
557	32.79			11.62				38.24	53.21	10.47	0.98	40.91	58.80
558	31.68			10.74				39.10	51.10	10.26	0.89	42.64	62.33
559	32.82			6.93				34.41	53.16	10.89	0.81	48.40	60.42
560	34.61			9.40				32.81	50.57	11.65	0.83	53.89	53.27
561	33.79			9.29				31.74	49.91	12.44	1.06	44.35	56.55
562	33.14			8.62				26.78	49.09	13.10	1.03	38.78	52.83
563	33.29			6.61				25.00	48.92	13.68	1.02	38.41	60.54
564	31.57			6.41				26.60	46.50	12.70	1.09	37.27	59.69
565	31.01			6.81				31.57	42.88	12.20		35.55	40.39
566	31.06			6.13				31.25	38.11	12.07		38.79	61.89
567	31.68			4.99				37.33	45.64	12.11		35.10	60.17
568	32.65			0.39				35.43	46.51	11.78		32.98	53.69
569	34.51			0.40				33.11	46.71	11.65		33.30	62.99
570	34.79			0.36				38.01	42.69	12.24		37.48	45.10
571	31.93			0.27				34.93	45.65	12.11		35.39	51.04
572	32.27			0.25				29.37	45.38	11.95		34.84	27.39
573	32.46			0.30				28.80	48.23	11.52		34.29	43.03
574	32.76			0.25				38.11	43.17			35.09	47.85
575	32.79			0.29				40.36	46.12			35.02	55.88
576	33.77			0.30				39.86	46.11			35.73	54.88
577	33.27			0.29				39.33	41.43			40.15	53.26
578	32.89			0.21				38.92	45.13			47.67	52.92
579	36.03			0.27				38.64	43.05			39.66	55.57
580	33.01			0.24				38.29	42.11			35.01	54.49
581	34.07			0.27				37.80	42.15			39.68	50.76
582	33.77							37.76	38.93			44.77	50.00
583	33.33							37.23	45.12			48.63	44.67
584	32.73							37.20				48.36	47.71
585	32.86							40.60				37.74	17.44
586	33.81							36.30				33.20	40.32
587	33.33							37.22				36.74	55.20
588	34.17							32.69				32.57	54.60
589	33.53							32.17				34.97	42.32
590	32.89							32.69				25.40	30.74
591	33.41							36.41				35.68	45.74
592	33.67											46.11	33.78
593	33.51											40.95	35.41
594	34.06											30.13	36.43
595	35.06											28.46	42.00
596	34.14											30.11	
597	34.06											36.71	
598	32.43											38.77	
599	32.73											35.72	
600	33.56											36.57	
601	33.02											40.90	
602	33.25											39.66	
603	32.85											41.37	
604	33.98											47.26	
605	35.19											47.39	
606	34.44											42.01	
607	33.58											44.34	
608												47.08	
609												42.08	

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EM	MO1	MO2	TH	VA
610												43.44	
611												40.68	
612												32.38	
613												33.47	
614												33.52	
615												32.81	
616												30.18	
617												28.03	
618												32.43	
619												30.34	
620												28.04	
621												28.53	
622												28.66	
623												26.96	
624												28.29	
625												28.42	
626												28.13	
627												28.63	
628												24.70	
629												19.63	
630												22.17	
631												27.18	
632												32.84	
633												20.82	
634												35.22	
635												25.47	
636												22.81	
637												19.32	
638												32.94	
639												35.03	
640												29.12	
641												33.33	
642												37.05	
643												35.78	
644												33.82	
645												32.98	
646												29.28	
647												24.13	
648												30.51	
649												31.65	
650												42.18	
651												39.45	
652												33.58	
653												39.45	
654												37.57	
655												41.55	
656												39.35	
657												36.89	
658												36.47	
659												36.91	
660												36.91	
661												43.36	
662												42.02	
663												49.64	
664												49.32	
665												46.22	
666												38.27	
667												37.31	
668												31.49	
669												31.29	
670												31.70	
671												30.47	
672												24.50	
673												22.49	
674												14.22	
675												17.68	
676												18.32	
677												18.68	
678												23.01	
679												23.19	
680												22.77	
681												19.40	
682												22.78	
683												21.71	
684												24.12	
685												25.63	
686												21.63	

Depth (cm)	AM	BB	CH	DU	DM	EC1	EC2	EL1	EM	MO1	MO2	TH	VA
687												23.51	
688												26.70	
689												10.70	
690												9.50	
691												11.40	
692												15.73	
693												15.27	

APPENDIX E: CORE LAYER BOUNDARIES

All core depths shown are in centimeters. Boundaries occur after the centimeter shown, and pairs of depths describe a layer. Layers alternate between terrigenous and gyttja; the Note column shows whether the first layer indicated is terrigenous (T) or gyttja (G). For example, in MS for the first core shown, the first layer occupies the 1st through 6th centimeters and is terrigenous; the second layer (cm 7-13) is gyttja, etc. LOI layers usually alternate between gyttja and low-LOI layers. Layers with significantly high LOI values are noted with H; significantly low-LOI layers bounding high-LOI layers are noted with L (in all other cases, gyttja layers bound both low- and high-LOI layers).

Core	**MS**	Note	**XR**	Note	**VL**	Note	**LOI**	Note	**COMP**	Note
Amherst	0	T	0	T	0	T	0	L	0	T
Amherst	6		6		4		6		6	
Amherst	13		16.5		16		16		16	
Amherst	18		18		17.5		18		18	
Amherst	128		127		49.5		26		118	
Amherst	134		130		50		27		119	
Amherst	305		412		127		33	H	127	
Amherst	329		415		127.5		35		129	
Amherst	360		607		607		115		209	
Amherst	385						119		210	
Amherst	393						121	H	252	
Amherst	413						126		254	
Amherst	490						127		267	
Amherst	500						129		269	
Amherst	505						132	H	301	
Amherst	513						133		336	
Amherst	517						209		369	
Amherst	526						210		384	
Amherst	607						252		397	
Amherst							254		411	
Amherst							267		492	
Amherst							269		493	
Amherst							301		495	
Amherst							336		497	
Amherst							337		505	
Amherst							339		509	
Amherst							369		516	
Amherst							384		521	
Amherst							397		532	
Amherst							411		534	
Amherst							429	H	554	
Amherst							430		555	
Amherst							492		607	
Amherst							493			
Amherst							495			
Amherst							497			
Amherst							505			
Amherst							509			
Amherst							516			
Amherst							521			
Amherst							532			
Amherst							534			
Amherst							535	H		
Amherst							536			
Amherst							543	H		
Amherst							545			
Amherst							554			
Amherst							555			
Amherst							607			

Core	MS	Note	XR	Note	VL	Note	LOI	Note	COMP	Note
Echo 1	0	G	0	T	0	T	0	L	0	T
Echo 1	4		30		32		30		30	
Echo 1	32		32		33		38		32	
Echo 1	39		34		34		39		34	
Echo 1	47		35		34.5		42		38	
Echo 1	58		48.5		36		45		39	
Echo 1	62		50.5		37.5		64	H	42	
Echo 1	80		54.5		38		65		45	
Echo 1	88		55.5		38.5		76		54	
Echo 1	97		60.5		39.5		81		55	
Echo 1	112		63.5		40		82		59	
Echo 1	128		65		41		85		61	
Echo 1	130		66		43		121		63.5	
Echo 1	153		67		48		124		64.5	
Echo 1	168		69		49.5		127		66	
Echo 1	178		115		51		129		67	
Echo 1	186		117		54		137	H	72	
Echo 1	189		119		55		142		73	
Echo 1	197		122		59		161		77	
Echo 1	213		124.5		62		166		84	
Echo 1	223		125.5		63.5		174	H	86	
Echo 1	229		126.5		64.5		175		105	
Echo 1	233		129		66		186	H	114	
Echo 1	246		130		67		189		115	
Echo 1	256		155		72		195		122	
Echo 1	266		167		73		196		125	
Echo 1	275		192		77		204	H	127.5	
Echo 1	293		202		84		207		129	
Echo 1	297		213		86		208	H	163.5	
Echo 1	312		222		105		209		167	
Echo 1	326		231.5		114		240	H	190	
Echo 1	375		234.5		115		242		197	
Echo 1	381		239		122		246		214	
Echo 1	396		241		125		250		224	
Echo 1	403		246		127.5		266		231.5	
Echo 1	432		252		129		270	H	234	
Echo 1	438		265		163.5		271		238	
Echo 1	444		272		167		272		240	
Echo 1			289		188		296		246	
Echo 1			298.5		195		297		252	
Echo 1			313.5		215		314		265	
Echo 1			327		227		324		272	
Echo 1			444		246		379		295	
Echo 1					253		380		298.5	
Echo 1					265		382		314	
Echo 1					275		383		325	
Echo 1					297		393		376	
Echo 1					298		394		381	
Echo 1					314.5		402		393	
Echo 1					316		403		394	
Echo 1					317.5		431		431	
Echo 1					329		433		433	
Echo 1					444		435		439	
Echo 1							436		440	
Echo 1							439		442	
Echo 1							440		443	
Echo 1							442		444	
Echo 1							443			
Echo 1							444			
Echo 2	0	T	0	T	0	T	0	G	0	T

Core	MS	Note	XR	Note	VL	Note	LOI	Note	COMP	Note
Echo 2	9		5		5		1		5	
Echo 2	12		8		8		3		8	
Echo 2	14		11		10		6	H	10	
Echo 2	17		12		13		7		13	
Echo 2	28		14		14		8		14	
Echo 2	35		15.5		15.5		10		15.5	
Echo 2	42		16.5		16		15		16	
Echo 2	48		18		21		16		21	
Echo 2	61		18.5		23		18	H	23	
Echo 2	90		29		27		20		27	
Echo 2	93		33.5		32		21		32	
Echo 2	96		35.5		42		22		42	
Echo 2	112		47		46		25	H	46	
Echo 2	116		62		53.5		27		53.5	
Echo 2	140		83		59		28		59	
Echo 2	145		92		62.5		32		62.5	
Echo 2	172		95		83		40		83	
Echo 2	176		110.5		94.5		45		94.5	
Echo 2	181		112.5		95.5		57	H	95.5	
Echo 2	185		142		110		58		110	
Echo 2	206		144		111		61		111	
Echo 2	220		171		141.5		64		141.5	
Echo 2	244		173.5		143.5		66	H	143.5	
Echo 2	248		179		170		67	L	170	
Echo 2	346		184		172		72		172	
Echo 2	352		203		172.1		73		172.1	
Echo 2	360		217		173		83		173	
Echo 2	363		233		179.5		93		179.5	
Echo 2	398		234		183.5		96		183.5	
Echo 2			242.5		203		108		195	
Echo 2			244		226		111		196	
Echo 2			259.5		258.5		136		201	
Echo 2			260.5		259		144		219	
Echo 2			289		288		152	H	223	
Echo 2			290		289		153		225	
Echo 2			309.5		319		168		232	
Echo 2			310.5		322.5		174		233	
Echo 2			314.5		324		179		241.5	
Echo 2			315.5		327		182		243	
Echo 2			316.5		335		183	H	250	
Echo 2			317.5		340		184		251	
Echo 2			322		343		195		288	
Echo 2			328.5		348		196		289	
Echo 2			332		360.5		201		293	
Echo 2			335		362		219		294	
Echo 2			340		398		223		297	
Echo 2			342.5				225		298	
Echo 2			345.5				239		309.5	
Echo 2			351				242		310.5	
Echo 2			357				250	H	314.5	
Echo 2			358				251		315.5	
Echo 2			364				288		319	
Echo 2			366				289		322.5	
Echo 2			375				293	H	324	
Echo 2			376				294		327	
Echo 2			379				297	H	333	
Echo 2			380				298		334	
Echo 2			391				320		339	
Echo 2			391.5				323		341	
Echo 2			392				339		344	
Echo 2			393				340		349	

Core	MS	Note	XR	Note	VL	Note	LOI	Note	COMP	Note
Echo 2			395				344		359	
Echo 2			396				349		362	
Echo 2			397				359		373	
Echo 2			398				362		374	
Echo 2							383		377	
Echo 2							384		378	
Echo 2							391		383	
Echo 2							392		384	
Echo 2							396		391	
Echo 2							398		392	
Echo 2									397	
Echo 2									398	
Elligo 1	0	G	0	G	0	G	0	L	0	G
Elligo 1	32		18		17		74		17	
Elligo 1	43		23		26		77	H	26	
Elligo 1	53		35		34.5		78		35	
Elligo 1	66		38		36.5		82	H	38	
Elligo 1	90		56		54.5		83		55.5	
Elligo 1	124		57		66.5		88	H	65.5	
Elligo 1	149		59		199		91		73	
Elligo 1	165		60		200.5		94	L	74	
Elligo 1	174		61		218		95	H	95	
Elligo 1	186		63		220		96	L	105	
Elligo 1	193		66.5		320		100		110	
Elligo 1	204		67		323		101		111	
Elligo 1	288		73		387.5		106		132	
Elligo 1	308		74		388		110		133	
Elligo 1	315		100		458		111		176	
Elligo 1	327		105		458.5		114		179	
Elligo 1	380		178.5		463.5		115		195	
Elligo 1	400		179.5		466		116		201	
Elligo 1	418		201		470.5		118		210	
Elligo 1	428		202		476		119	H	211	
Elligo 1	436		220		494		122		216	
Elligo 1	442		222		496		124	H	220	
Elligo 1	458		294		523		126		223	
Elligo 1	468		295		524		132		224	
Elligo 1	487		389		591		133		238	
Elligo 1	498		390				176		240	
Elligo 1	545		420				180		244	
Elligo 1	559		421				188	H	245	
Elligo 1	565		465				189		281	
Elligo 1			466				195		282	
Elligo 1			524				201		290	
Elligo 1			525				216		294	
Elligo 1			562				220		297	
Elligo 1			563				223		301	
Elligo 1			571				224		320	
Elligo 1			573				226	H	323	
Elligo 1			591				227		389	
Elligo 1							238		390	
Elligo 1							240		418	
Elligo 1							244		421	
Elligo 1							245		436	
Elligo 1							257	H	438	
Elligo 1							259		458	
Elligo 1							265	H	458.5	
Elligo 1							266		463.5	
Elligo 1							281		466	
Elligo 1							282		470.5	

Core	MS	Note	XR	Note	VL	Note	LOI	Note	COMP	Note
Elligo 1							289	H	476	
Elligo 1							290		489	
Elligo 1							294		495	
Elligo 1							297		511	
Elligo 1							301		512	
Elligo 1							304		523	
Elligo 1							308	H	524	
Elligo 1							310		548	
Elligo 1							319		549	
Elligo 1							324		559	
Elligo 1							388		566	
Elligo 1							391		571	
Elligo 1							417		573	
Elligo 1							421		587	
Elligo 1							424	H	590	
Elligo 1							428		591	
Elligo 1							435			
Elligo 1							438			
Elligo 1							460	H		
Elligo 1							461			
Elligo 1							464	L		
Elligo 1							466	H		
Elligo 1							467			
Elligo 1							468	H		
Elligo 1							470			
Elligo 1							471			
Elligo 1							472			
Elligo 1							478	H		
Elligo 1							479			
Elligo 1							489			
Elligo 1							495			
Elligo 1							500	H		
Elligo 1							502			
Elligo 1							508	H		
Elligo 1							509			
Elligo 1							511			
Elligo 1							512			
Elligo 1							518	H		
Elligo 1							519			
Elligo 1							523			
Elligo 1							524			
Elligo 1							526			
Elligo 1							527			
Elligo 1							531	H		
Elligo 1							532			
Elligo 1							538	H		
Elligo 1							539			
Elligo 1							540	H		
Elligo 1							541			
Elligo 1							548			
Elligo 1							549			
Elligo 1							559			
Elligo 1							566			
Elligo 1							571			
Elligo 1							573			
Elligo 1							574	H		
Elligo 1							575			
Elligo 1							587			
Elligo 1							590			
Elligo 1							591			

Core	MS	Note	XR	Note	VL	Note	LOI	Note	COMP	Note
Elligo 2	NA		0	G	NA		NA		NA	
Elligo 2			11							
Elligo 2			20							
Elligo 2			192.5							
Elligo 2			195.5							
Elligo 2			312							
Elligo 2			314							
Elligo 2			439							
Elligo 2			441.5							
Elligo 2			446.5							
Elligo 2			449							
Elligo 2			450							
Elligo 2			451.5							
Elligo 2			471							
Elligo 2			474							
Elligo 2			476							
Elligo 2			478							
Elligo 2			486							
Elligo 2			488							
Elligo 2			514							
Elligo 2			516							
Elligo 2			525.5							
Elligo 2			527							
Elligo 2			531.5							
Elligo 2			535							
Elligo 2			563							
Elligo 2			564							
Elligo 2			565.5							
Elligo 2			566.5							
Elligo 2			574							
Elligo 2			576.5							
Elligo 2			581							
Dunmore	0	G	0	G	0	G	0	G	0	G
Dunmore	21		101.5		44.5		45		44.5	
Dunmore	30		103		48.5		46		48.5	
Dunmore	65		105.5		67		100		67	
Dunmore	70		112		69		103		69	
Dunmore	98		137.5		100.5		104		100.5	
Dunmore	115		140.5		102.5		112		102.5	
Dunmore	141		148		104		114		104	
Dunmore	162		156		108.5		116		109	
Dunmore	187		179		108.6		144		112	
Dunmore	202		180		111		153		114	
Dunmore	233		197		136		181	H	136	
Dunmore	248		197.5		139		182		139	
Dunmore	263		200		143		197		144	
Dunmore	269		201		164		199		153	
Dunmore	273		239.5		178		223	H	178	
Dunmore	277		243.5		179		224		179	
Dunmore	286		245		193		234		195	
Dunmore	291		247.5		199		246		199	
Dunmore	304		268		238		264		238	
Dunmore	314		270.5		241		268		241	
Dunmore	323		307.5		243.5		303		243.5	
Dunmore	329		308		246		306		246	
Dunmore	348		314.5		265.5		307		265.5	
Dunmore	364		316		268		315		268	
Dunmore	384		325.5		305		321		304.5	
Dunmore	396		327.5		305.5		328		305	
Dunmore	410		354		312		349		312	

Core	MS	Note	XR	Note	VL	Note	LOI	Note	COMP	Note
Dunmore	414		355		313		357		313	
Dunmore	426		358.5		324		358		324	
Dunmore	435		359.5		326.5		363		326.5	
Dunmore	449		364		351.5		413	H	351.5	
Dunmore	455		365.5		352.5		414		352.5	
Dunmore	463		368		357.5		422		357.5	
Dunmore	470		369		361		423		361	
Dunmore			388		363		425	H	363	
Dunmore			393.5		364		426		364	
Dunmore			432		391.5		427		387	
Dunmore			438		393		432		389	
Dunmore			469		395		433		391.5	
Dunmore			470		397		434		393	
Dunmore					406		435	H	395	
Dunmore					416		441		397	
Dunmore					422		442	H	406	
Dunmore					428		443		416	
Dunmore					433		444	H	422	
Dunmore					442.5		445		428	
Dunmore					445.5		448		433	
Dunmore					446.5		454		442.5	
Dunmore					452.5		470		445.5	
Dunmore					453				446.5	
Dunmore					467.5				452.5	
Dunmore					469.5				453	
Dunmore					470				467.5	
Dunmore									469.5	
Dunmore									470	
Emerald	0	T	0	T	0	T	0	L	0	T
Emerald	18		8		18.5		17		17	
Emerald	269		271		269		19		19	
Emerald	275		274		270		20		20	
Emerald	333		332		333.5		269		269	
Emerald	342		337		335.5		270		270	
Emerald	583		380		583		325		332	
Emerald			381				336		337	
Emerald			583				350	H	375	
Emerald							352		376	
Emerald							370		565	
Emerald							378		566	
Emerald							380	H	583	
Emerald							383			
Emerald							565			
Emerald							566			
Emerald							583			
Beebe	0	T	0	T	0	T	0	L	0	T
Beebe	9.5		6		8		8		8	
Beebe	32.3		36		33		25		33	
Beebe	51.3		66		52		26		52	
Beebe	70.3		73		54.5		28		54.5	
Beebe	76.95		77		56		29		56	
Beebe	122.55		88		57		30		57	
Beebe	133.95		89		58		53		58	
Beebe	140.6		121.5		74		55		74	
Beebe	153.9		134		75		59		75	
Beebe	164		140		88		67	H	88	
Beebe	168		161		90		68		90	
Beebe	177		164.5		120		69	H	121.5	
Beebe	183		167.5		121		70		134	

Core	MS	Note	XR	Note	VL	Note	LOI	Note	COMP	Note
Beebe	203		177		122		72		138	
Beebe	211		186		134.5		73		158	
Beebe	227		204		139		120		161	
Beebe	232		211		139.5		136		163.5	
Beebe	244		220.5		141		138		164.5	
Beebe	249		221.5		151		158		168	
Beebe	264		227		152.5		161		178	
Beebe	272		231		157.5		162		183	
Beebe	307		243		161		164	L	204	
Beebe	310		247		163.5		166	H	210	
Beebe	313		256		164.5		167	L	220.5	
Beebe	318		263		168		168		221.5	
Beebe	340		300		178		177		227	
Beebe	347		301		183		182		230	
Beebe			302.5		204		183		243	
Beebe			303		210		185		247	
Beebe			304.5		245.5		193	H	257	
Beebe			305		247.5		196		262	
Beebe			309		258		202		267	
Beebe			310.5		261		208		269	
Beebe			314.5		283.5		227		283.5	
Beebe			317.5		284.5		228		284.5	
Beebe			336.5		308		229	H	309	
Beebe			337.5		309		231		310.5	
Beebe			346		315		234	H	314.5	
Beebe			347		316		235		317.5	
Beebe					330		237	H	330	
Beebe					335.5		238		335.5	
Beebe					339		247	H	339	
Beebe					339.5		248		339.5	
Beebe					346		250	H	346	
Beebe					347		251		347	
Beebe							254			
Beebe							255			
Beebe							256			
Beebe							257			
Beebe							258			
Beebe							261			
Beebe							267			
Beebe							269			
Beebe							271	H		
Beebe							272			
Beebe							274	H		
Beebe							275			
Beebe							283	H		
Beebe							284			
Beebe							308			
Beebe							309			
Beebe							314			
Beebe							315			
Beebe							316			
Beebe							317			
Beebe							331	H		
Beebe							334			
Beebe							336	H		
Beebe							337			
Beebe							343			
Beebe							344			
Beebe							347			
Vail	0	G	0	G	0	G	0	G	0	G

Core	MS	Note	XR	Note	VL	Note	LOI	Note	COMP	Note
Vail	24		191		200		34		34	
Vail	29		193		202		35		35	
Vail	51		199		207.5		53		53	
Vail	55		204		208.5		54		54	
Vail	57		209		235.5		81		81	
Vail	67		211		236.5		82		82	
Vail	81		262		240.5		83		83	
Vail	99		264		241.5		87		87	
Vail	128		313		249.5		113		113	
Vail	129		320		262		114		114	
Vail	134		351		311.5		147		147	
Vail	135		353		320		148		148	
Vail	143		410		349		155		155	
Vail	151		412		349.5		156		156	
Vail	152		426		408.5		159		159	
Vail	156		427		413.5		162		162	
Vail	157		434		431		163		163	
Vail	172		435		431.5		169		169	
Vail	188		436.5		434		190		190	
Vail	209		437.5		434.5		192		192	
Vail	243		450.5		496		198		198	
Vail	262		451		496.5		202		202	
Vail	309		465.5		501.5		207		207	
Vail	321		466		502		208		208	
Vail	344		470		512		210	H	235.5	
Vail	356		470.5		512.5		211		236.5	
Vail	357		472		518		248		240.5	
Vail	358		472.5		518.5		262		241.5	
Vail	377		485.5		532		305		249.5	
Vail	378		486		532.5		306		262	
Vail	380		490.5		542		310		305	
Vail	389		491		542.5		318		306	
Vail	405		498		547		348		310	
Vail	415		498.5		549		350		318	
Vail	428		499		553.5		358	H	348	
Vail	437		499.5		554		359		350	
Vail	445		500.5		564		400	H	358	
Vail	452		501		564.5		401		359	
Vail	462		503.5		584.5		406		409	
Vail	472		504		585		414		414	
Vail	492		504.5		592.5		417	H	423	
Vail	504		505		593		418		424	
Vail	542		520		595		419	H	431	
Vail	556		520.5				420		432	
Vail	573		524.5				423		434	
Vail	595		525				424		435	
Vail			532.5				428	H	443	
Vail			533				429		444	
Vail			534				430	H	449	
Vail			534.5				431	L	450	
Vail			545.5				432		467	
Vail			546				434		468	
Vail			550				435		469	
Vail			552				443		470	
Vail			555				444		496	
Vail			556				446	H	497	
Vail			566				448		498	
Vail			566.5				467		499	
Vail			568.5				468		502	
Vail			569				469		503	
Vail			571				470		509	

Core	MS	Note	XR	Note	VL	Note	LOI	Note	COMP	Note
Vail			571.5				475	H	510	
Vail			572.5				476		512	
Vail			573				494		513	
Vail			574				497		518	
Vail			574.5				498		519	
Vail			585.5				499		524	
Vail			586.5				501	H	525	
Vail			590.5				502	L	532	
Vail			591				503		533	
Vail			591.5				505	H	534	
Vail			592				506		535	
Vail			593.5				508		536	
Vail			594				510		537	
Vail			594.5				512		543	
Vail			595				513		544	
Vail			595.5				518		547	
Vail			596				519		549	
Vail							520	H	554	
Vail							521		555	
Vail							524		564	
Vail							525		565	
Vail							527	H	569	
Vail							528		570	
Vail							532	L	572	
Vail							533	H	573	
Vail							534	L	585	
Vail							535		586	
Vail							536	L	590	
Vail							537	H	591	
Vail							538		592	
Vail							543		593	
Vail							544		595	
Vail							545	H		
Vail							546			
Vail							547			
Vail							550			
Vail							551	H		
Vail							554	L		
Vail							555	H		
Vail							556			
Vail							557	H		
Vail							559			
Vail							562	H		
Vail							564	L		
Vail							565	H		
Vail							567			
Vail							568	H		
Vail							569	L		
Vail							570			
Vail							571			
Vail							573			
Vail							578	H		
Vail							579			
Vail							582			
Vail							583			
Vail							584	L		
Vail							586	H		
Vail							588	L		
Vail							590			
Vail							591			
Vail							595			

Core	MS	Note	XR	Note	VL	Note	LOI	Note	COMP	Note
Thirteenth	0	G	0	G	0	G	0	G	0	G
Thirteenth	15		17		19		15	H	19	
Thirteenth	25		24		23		17		23	
Thirteenth	99		101		101		21		33	
Thirteenth	107		105		105		23		34	
Thirteenth	150		180.5		181.5		34	H	101	
Thirteenth	153		184		188		35		105	
Thirteenth	183		188		217		95	H	145	
Thirteenth	190		189		219		96		146	
Thirteenth	216		217.5		241		98		182	
Thirteenth	221		219.5		243		100		188	
Thirteenth	240		241		256.5		101		217	
Thirteenth	247		244		258		105		219	
Thirteenth	255		256		302.5		108	H	241	
Thirteenth	259		259		309		110		243	
Thirteenth	302		311		397		111	H	256.5	
Thirteenth	304		312		405		113		258	
Thirteenth	320		401		407		145		302.5	
Thirteenth	325		408		408		146		309	
Thirteenth	395		496.5		453		153	H	401	
Thirteenth	410		503		455		154		408	
Thirteenth	437		508		492		170	H	437	
Thirteenth	439		515		500		171		439	
Thirteenth	456		532.5		530		173	H	456	
Thirteenth	460		541.5		537.5		175		459	
Thirteenth	481		542.5		559		181	H	496	
Thirteenth	485		546.5		561		182	L	503	
Thirteenth	494		555		563		184		512	
Thirteenth	501		557		565		213	H	518	
Thirteenth	512		567		578		214		530	
Thirteenth	518		570.5		594		217		537.5	
Thirteenth	531		579		609		219		540	
Thirteenth	543		595		610		222	H	542	
Thirteenth	575		616		622		225		559	
Thirteenth	600		619		623		236	H	561	
Thirteenth	614		628.5		672		237		563	
Thirteenth	656		631		674		388		565	
Thirteenth	667		633		676.5		411		578	
Thirteenth	693		639		677.5		437	H	594	
Thirteenth			645		685.5		441		616	
Thirteenth			653		693		444	H	619	
Thirteenth			660				445		628.5	
Thirteenth			662				446	H	631	
Thirteenth			663.5				447		633	
Thirteenth			667.5				456		639	
Thirteenth			669				459		645	
Thirteenth			679				490	H	653	
Thirteenth			682.5				491		672	
Thirteenth			683.5				494		674	
Thirteenth			687				500	H	676.5	
Thirteenth			693				505		677.5	
Thirteenth							506		685.5	
Thirteenth							507		693	
Thirteenth							513			
Thirteenth							514			
Thirteenth							515			
Thirteenth							516			
Thirteenth							522	H		
Thirteenth							523			
Thirteenth							526	H		

Core	MS	Note	XR	Note	VL	Note	LOI	Note	COMP	Note
Thirteenth							528			
Thirteenth							531			
Thirteenth							533			
Thirteenth							535			
Thirteenth							537			
Thirteenth							538	H		
Thirteenth							539			
Thirteenth							540			
Thirteenth							542			
Thirteenth							546	H		
Thirteenth							547			
Thirteenth							558	H		
Thirteenth							560			
Thirteenth							577	H		
Thirteenth							578			
Thirteenth							581	H		
Thirteenth							584			
Thirteenth							585			
Thirteenth							586			
Thirteenth							587			
Thirteenth							588			
Thirteenth							589			
Thirteenth							590			
Thirteenth							591	H		
Thirteenth							592			
Thirteenth							593			
Thirteenth							596			
Thirteenth							603	H		
Thirteenth							605			
Thirteenth							607	H		
Thirteenth							608			
Thirteenth							611			
Thirteenth							612			
Thirteenth							614			
Thirteenth							631			
Thirteenth							632			
Thirteenth							633			
Thirteenth							634			
Thirteenth							637			
Thirteenth							639			
Thirteenth							640			
Thirteenth							645			
Thirteenth							649			
Thirteenth							662	H		
Thirteenth							665			
Thirteenth							667			
Thirteenth							693			
Chapel	0	T	0	G	0	G	0	G	0	G
Chapel	12		30		26		18		18	
Chapel	27		37		37		19		19	
Chapel	42		48		46		26		26	
Chapel	57		50		50.5		34		34	
Chapel	69		58.5		58.5		71	H	48	
Chapel	76		59.5		67		72		50	
Chapel	79		77		76.5		76		58.5	
Chapel	95		78		78		78		61	
Chapel	103		84		85		84		76.5	
Chapel	157		87		88		88		78	
Chapel	165		92		90.5		90		85	
Chapel	174		102		103		103		88	

Core	MS	Note	XR	Note	VL	Note	LOI	Note	COMP	Note
Chapel	177		114.5		105.5		104		90.5	
Chapel	205		115		106.5		105		103	
Chapel	211		159.5		109		107		105.5	
Chapel	215		165		111		109		106.5	
Chapel	237		274		113.5		110		109	
Chapel	255		275		114.5		117		111	
Chapel	262		299.5		117		118	H	113.5	
Chapel	265		300		131		124		114.5	
Chapel	273		309		133		126	H	117	
Chapel	308		310		135		128		131	
Chapel	311		321.5		137.5		129	H	133	
Chapel	320		324		143		130		135	
Chapel	326		343		154		132		137.5	
Chapel	381		343.5		163		135		143	
Chapel	387		382		176.5		137		154	
Chapel	403		384		177.5		140		163	
Chapel	412		404		178.5		141	H	176.5	
Chapel	426		406.5		179		143	L	177.5	
Chapel	435		408.5		179.5		145		178.5	
Chapel	445		411		180		156	H	179	
Chapel	449		429		188		158		179.5	
Chapel	460		432		189		159		180	
Chapel	483		445.5		196.5		164		188	
Chapel	488		447.5		197		235		189	
Chapel	492		456		207		237		196.5	
Chapel	501		458		208		268		197	
Chapel	515		459		211.5		274		207	
Chapel	528		483		212.5		307		208	
Chapel	537		488		218		308		211.5	
Chapel			494.5		219.5		321		212.5	
Chapel			499.5		223		324		218	
Chapel			536		224		341		219.5	
Chapel			537		225.5		342		223	
Chapel					226		373	H	224	
Chapel					232		374		225.5	
Chapel					233		404		226	
Chapel					234.5		406		232	
Chapel					235		407	H	233	
Chapel					236		408		234.5	
Chapel					236.5		410		235	
Chapel					242.5		411		236	
Chapel					243		423	H	236.5	
Chapel					260.5		426		242.5	
Chapel					263		430		243	
Chapel					270.5		431		260.5	
Chapel					271		450	H	263	
Chapel					273		451		270.5	
Chapel					274		455	H	271	
Chapel					298		456	L	273	
Chapel					299		493		274	
Chapel					306		496		298	
Chapel					310.5		536		299	
Chapel					321.5		537		306	
Chapel					322				310.5	
Chapel					324				321.5	
Chapel					324.5				322	
Chapel					372				324	
Chapel					375				324.5	
Chapel					382				341	
Chapel					383				342	
Chapel					401.5				372	

Core	MS	Note	XR	Note	VL	Note	LOI	Note	COMP	Note
Chapel					411				375	
Chapel					422				382	
Chapel					430				383	
Chapel					443				404	
Chapel					447.5				406.5	
Chapel					449.5				408.5	
Chapel					451				411	
Chapel					454.5				422	
Chapel					456.5				430	
Chapel					461.5				443	
Chapel					482				447.5	
Chapel					493				449.5	
Chapel					494.5				451	
Chapel					503.5				454.5	
Chapel					512				456.5	
Chapel					517.5				461.5	
Chapel					518.5				482	
Chapel					521				493	
Chapel					521.5				494.5	
Chapel					522				503.5	
Chapel					537				512	
Chapel									517.5	
Chapel									518.5	
Chapel									521	
Chapel									521.5	
Chapel									522	
Chapel									537	
Morey 1	0	G	0	G	0	G	0	G	0	G
Morey 1	59		56		12		55		12	
Morey 1	60		58		13		56		13	
Morey 1	110		113		54.5		57		42	
Morey 1	111		115		58		58		43	
Morey 1	144		293		113.5		128		54.5	
Morey 1	145		296		114.5		129		58	
Morey 1	192		342		251		340		113.5	
Morey 1	193		345		253.5		341		114.5	
Morey 1	290		355		290		499		128	
Morey 1	291		360		293		500		129	
Morey 1	340		470		573		551		290	
Morey 1	341		472				552		293	
Morey 1	499		477				573		342	
Morey 1	500		478						345	
Morey 1	528		573						355	
Morey 1	529								360	
Morey 1	552								470	
Morey 1	553								472	
Morey 1	573								499	
Morey 1									500	
Morey 1									551	
Morey 1									552	
Morey 1									573	
Morey 2	0	T	0	T	0	T	0	G	0	T
Morey 2	25		4		16		7		16	
Morey 2	120		8		120		16		53	
Morey 2	140		13		129		22	H	54	
Morey 2	279		14.5		217		26		120	
Morey 2	287		16		224		53		129	
Morey 2	290		120		261		54		217	
Morey 2	319		129		277		118		224	

Core	MS	Note	XR	Note	VL	Note	LOI	Note	COMP	Note
Morey 2	430		282		285		125		271	
Morey 2	440		284		286.5		126		277	
Morey 2	468		298		299.5		127		285	
Morey 2	474		304		300		220	H	286.5	
Morey 2	500		321		303.5		221		299	
Morey 2	506		323		305		284	H	300	
Morey 2	532		354		356		285		303.5	
Morey 2	546		356		358		294		305	
Morey 2	556		406		451.5		295		321	
Morey 2	564		411		454		433		323	
Morey 2			413		470		564		356	
Morey 2			414		472.5				358	
Morey 2			415		495.5				451.5	
Morey 2			416		501.5				454	
Morey 2			419		564				470	
Morey 2			564						472.5	
Morey 2									495.5	
Morey 2									501.5	
Morey 2									564	
Duck	0	G	0	G	0	G	0	L	0	T
Duck	104		215.5		43		4		4	
Duck	114		216.5		49		43		43	
Duck	157		226		146		44		49	
Duck	168		227		147		60	H	60	
Duck	183		277		149.5		61		61	
Duck	196		279		150.5		63	H	63	
Duck	227		466		171		64		64	
Duck	234		470		176		103		103	
Duck	267		479		191		107		107	
Duck	277		487		192.5		113	H	113	
Duck	290		521		276		114		114	
Duck	303		533		278		123	H	123	
Duck	325		548		307		125		125	
Duck	333		551		314		127		129	
Duck	342		559		323		128		130	
Duck	363		561		326		129	H	146	
Duck	408		563.5		331		130		147	
Duck	417		564.5		333		132		149.5	
Duck	423		572		392.5		133		150.5	
Duck	431		581		395		146		171	
Duck	456				459		147		176	
Duck	489				460		170	H	191	
Duck	524				471		171		192.5	
Duck	530				483		194	H	194	
Duck	535				515		195		195	
Duck	541				523.5		198		200	
Duck	543				524.5		199		201	
Duck	581				528.5		200	H	214	
Duck					549		201		215	
Duck					556		224		224	
Duck					565		225		225	
Duck					581		276	H	276	
Duck							277		277	
Duck							322		307	
Duck							327		314	
Duck							332	H	323	
Duck							333		326	
Duck							345		331	
Duck							346		333	
Duck							348		345	

Core	MS	Note	XR	Note	VL	Note	LOI	Note	COMP	Note
Duck							349		346	
Duck							350	L	348	
Duck							352	H	353	
Duck							353		355	
Duck							355	H	357	
Duck							356	L	365	
Duck							357		366	
Duck							365		371	
Duck							366		374	
Duck							371	H	380	
Duck							372	L	381	
Duck							373		391	
Duck							374	H	392	
Duck							375		397	
Duck							380	H	398	
Duck							381		400	
Duck							391	H	402	
Duck							392		409	
Duck							397	H	410	
Duck							398		457	
Duck							400		458	
Duck							402		461	
Duck							409		462	
Duck							410		474	
Duck							457		483	
Duck							458		515	
Duck							461		523.5	
Duck							462		524.5	
Duck							474		528.5	
Duck							483		543	
Duck							514		545	
Duck							528		549	
Duck							535		556	
Duck							536		565	
Duck							537		581	
Duck							581			