Geomorphology and Shoreline History

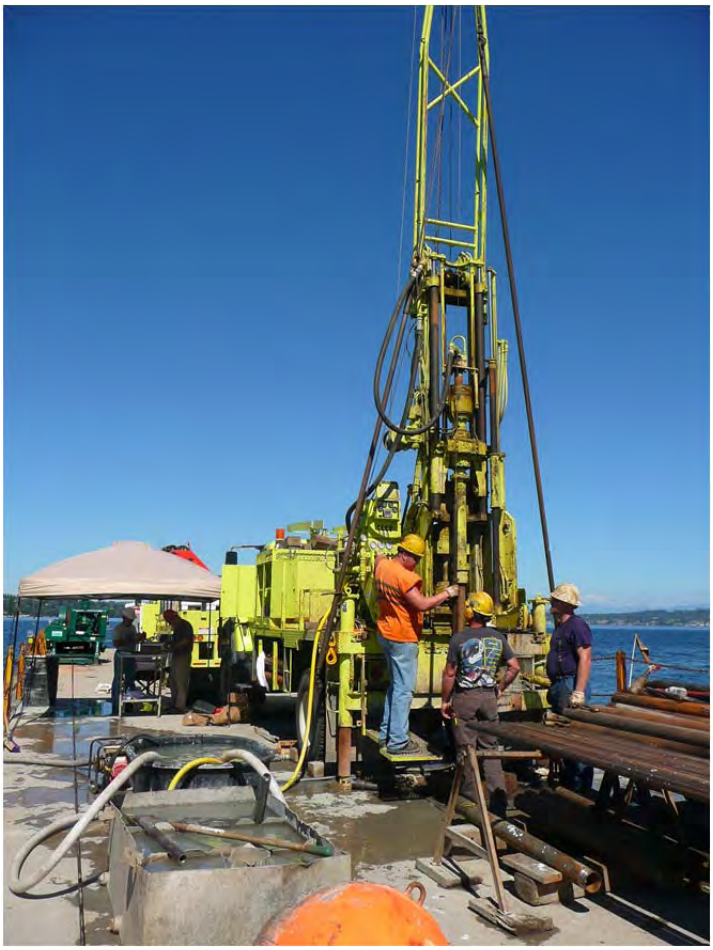
of Lake Washington, Union Bay and Portage Bay

Appendix B

Selected Photographs

Method of transport to and from the drilling barge using the dock at the UW Waterfront Activities Center.

Lake Washington borings were drilled with two truck rigs on a large barge.



View of drilling operation on the large barge.

WSDOT and Shannon & Wilson representative working on the large barge.

Working in close proximity to the SR-520 bridge and ramps near the Arboretum on boring H-500-10.

Drilling proceeded with great care in the sensitive ecosystem.

Shelby tube extruder at Shannon & Wilson's second laboratory facility.

Describing core from H-349-10 at Shannon & Wilson's primary soils lab.

H-500-10, 12-14’ below mudline. Split spoon sampler showing poor recovery in peat deposit.

H-540-10, 14’-17’ below mudline. Poor recovery in peat using split spoon sampler.

Picking through peat sample for seeds at TGC lab.

Fibrous peat sample ready to be picked for seeds.

Smear slides for viewing and estimating percentage of diatoms present by volume.

H-495-10, 30’-32’ below mudline. Photo showing process of picking through peat from a Shelby tube sample and collecting individual samples in foil.

H-488-10, 3.9’below mudline. Remains from a humification test, solids on the left and fluids on the right.

H-442-10, 8’-10’ below the mudline. Qvro unit consisting of sand with gravel on submerged ridge.

H-461-10, 53.7’ below mudline. Concretion, cemented with calcium carbonate, in unit Qvrl.

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H-457-10, 62.8’ below the mudline in unit Qvrl. Note pebble, a dropstone, suspended in the mud. Dropstones are found most commonly in glacial lake deposits.

H-457-10, 62.6’ below mudline in unit Qvrl. Note shiny faces (slickensided surfaces) at a steep angle to the core. Slickensides are formed when surfaces slide past one another, sometimes creating a striated polish.

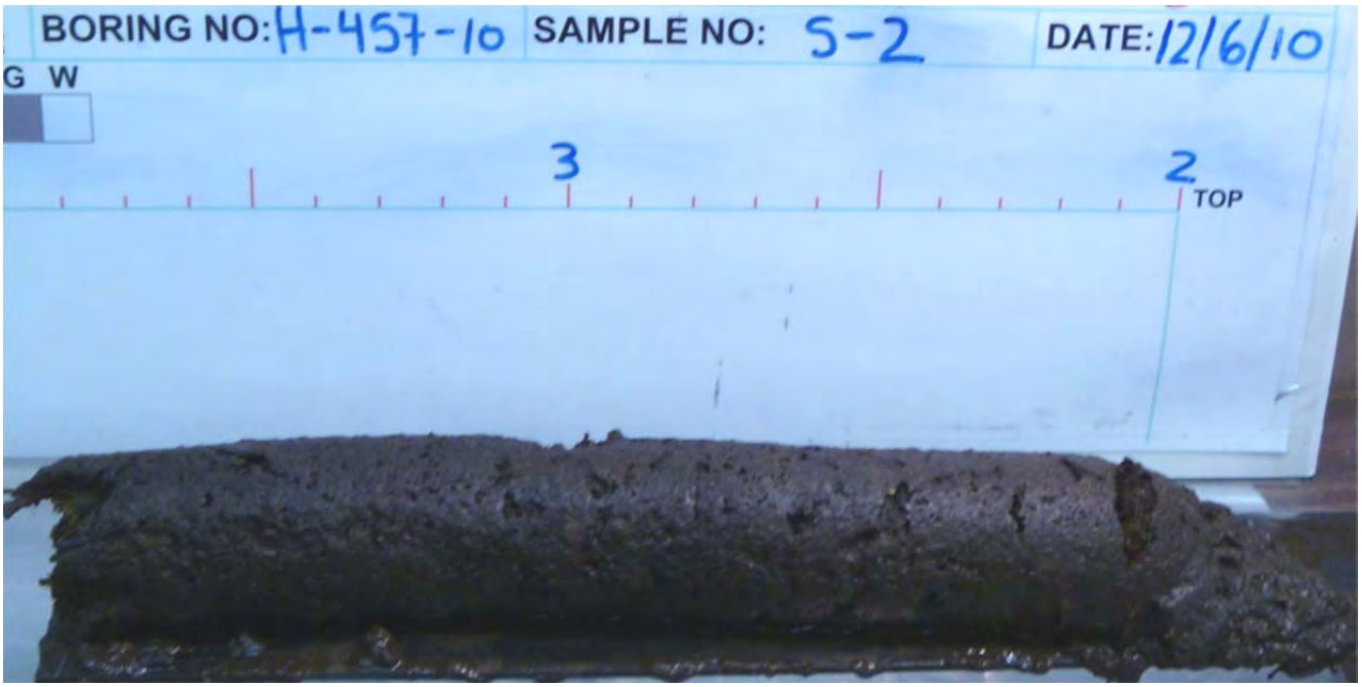
H-453-10, 32-34’ below mudline. Transition from peat (right) to ash to unit Ql/Qvrl (left). Top is to the right.

H-457-10, 38-40’ below mudline, unit Ql/Qvrl. Note organic-rich nature of the sediment at the top of this interval (to the right). Core is split lengthwise.

H-488-10, 38.8-39.9’ below mudline. Contact between peat (right), organic clay, and unit Ql/Qvrl (left). Core split lengthwise; top is to the right.

H-349-10, 16.9-17.25’ below mudline. Photo shows bioturbation extending down into the darker colored thinly laminated organic-rich dark material (to the left) vs. the light brown diatomaceous ooze (unit Qlg)above (right). Light laminae are diatoms, dark laminae consist predominantly of silt and organic matter. Note the light gray silt lens near bottom of sample.

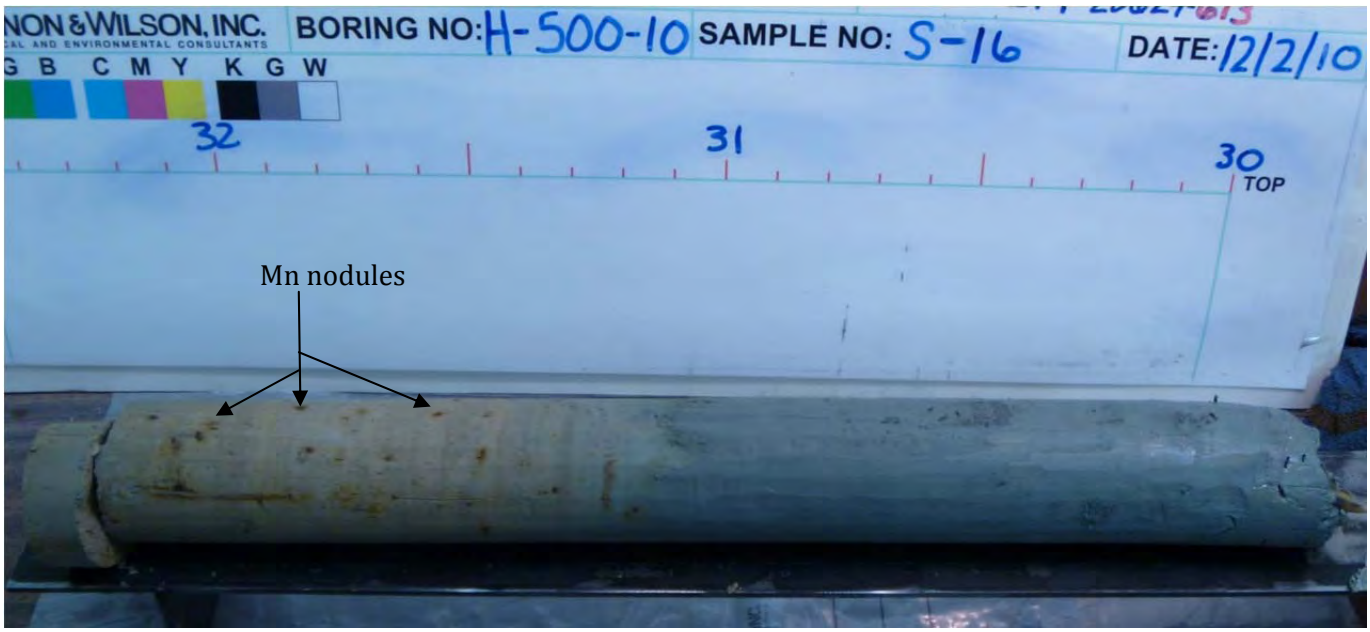
H-457-10, 2-2.5’ below mudline. Close up of split core showing vegetation in the peat. Top is to the right. Note the softness of the peat.



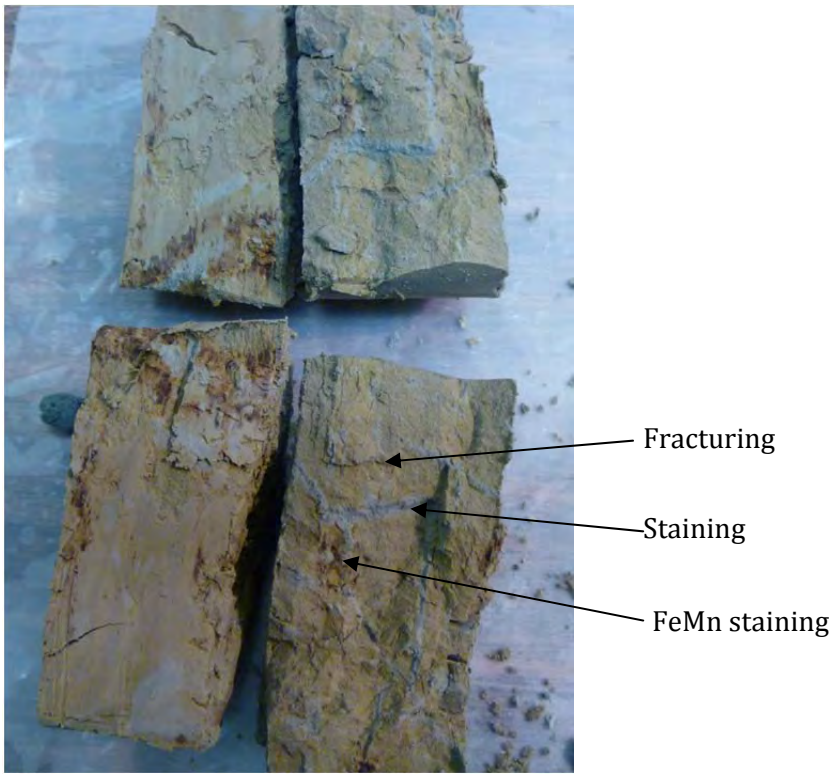
H-457-10, 2-3.8’ below mudline. Core of very soft peat, note the organic fragments causing pitting in the sides of the core. Top is to the right.

H-481-10, 7.7’ below mudline. Sphagnum moss is a major component of the peat here.

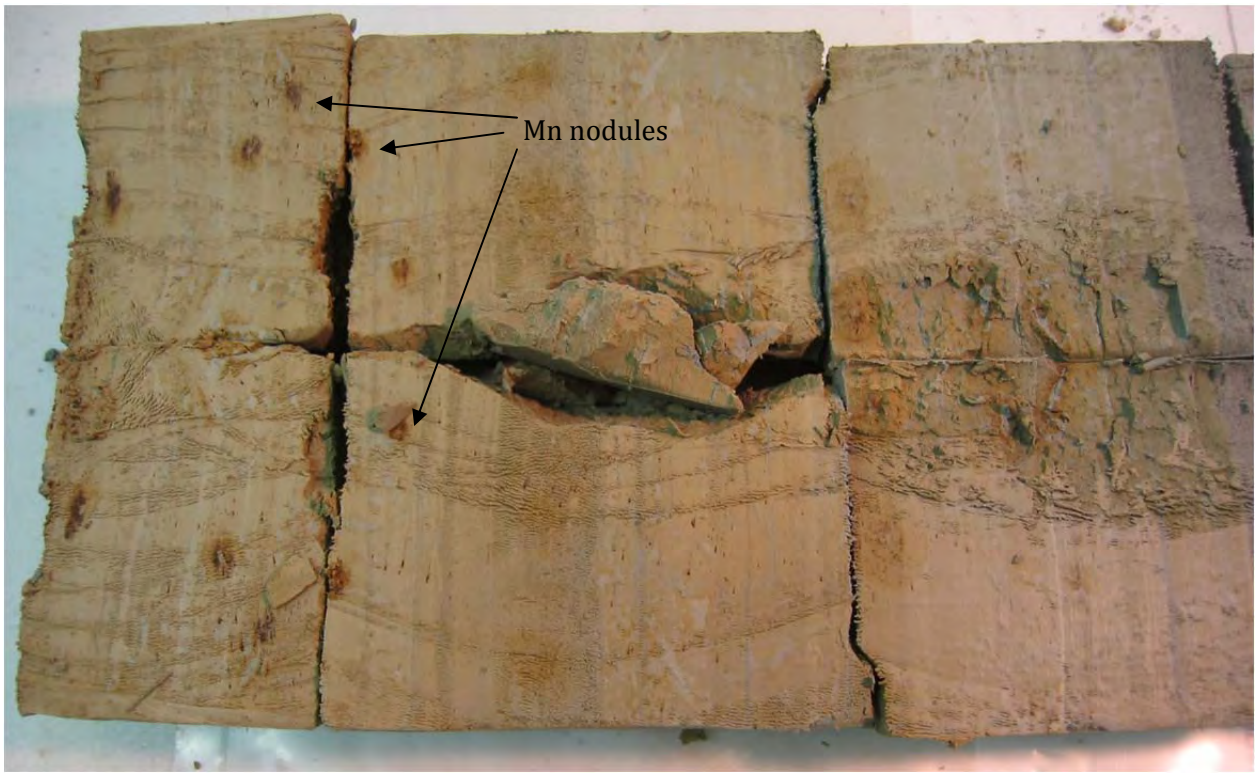
H-485-10, 45.8’ below mudline. Field photo of horizontal oxidation zones in unit Ql/Qvrl. Note how core dries first along horizontal planes.



H-500-10, 30-32.3’ below mudline in unit Ql/Qvrl. Note change from gray to oxidized coloring and magnesium nodules in a weathered part of the unit.



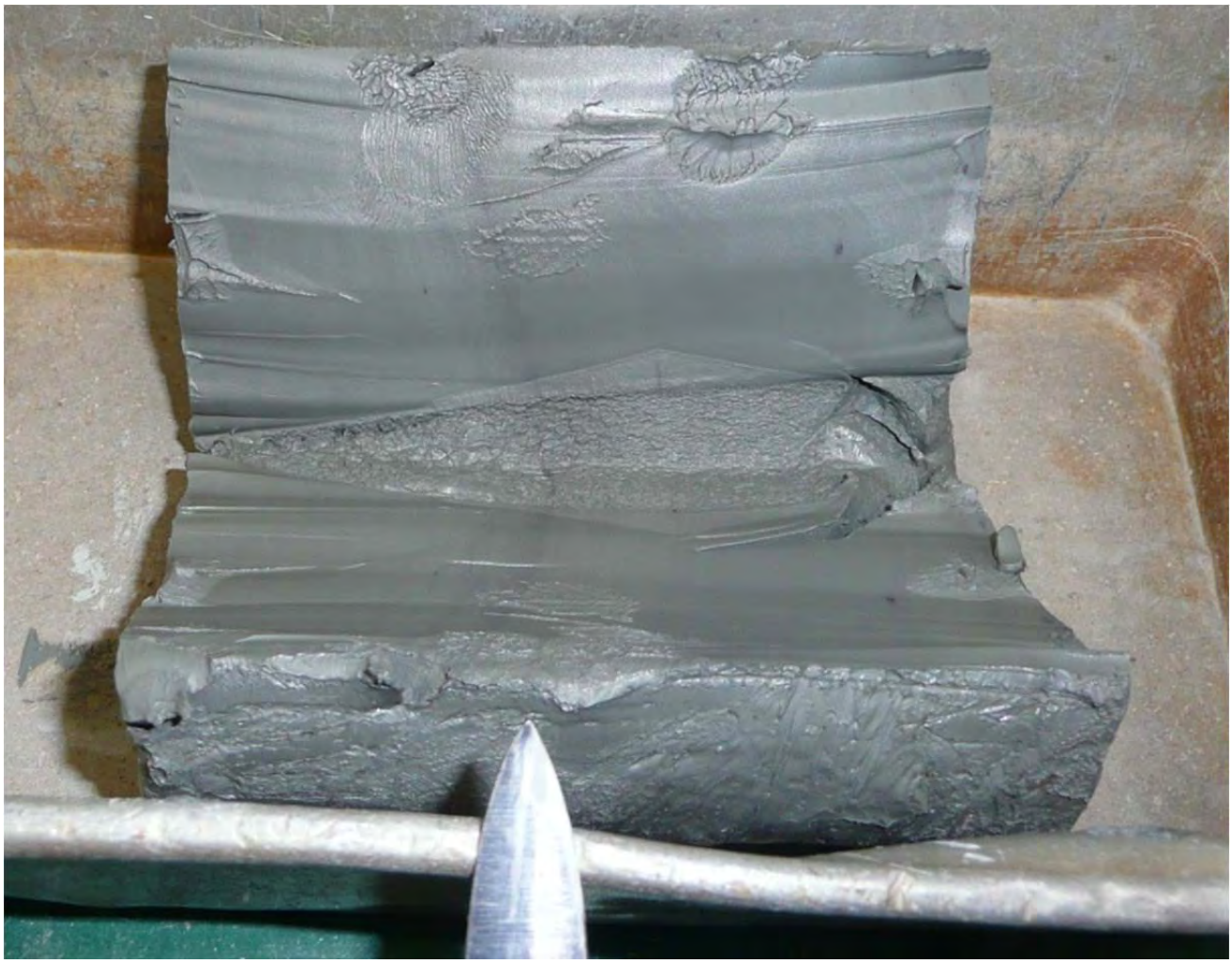
H-500-10, 31.3-32.1’ below mudline in unit Ql/Qvrl. Note fracturing, staining along fracturing, and blotches of iron/magnesium staining.



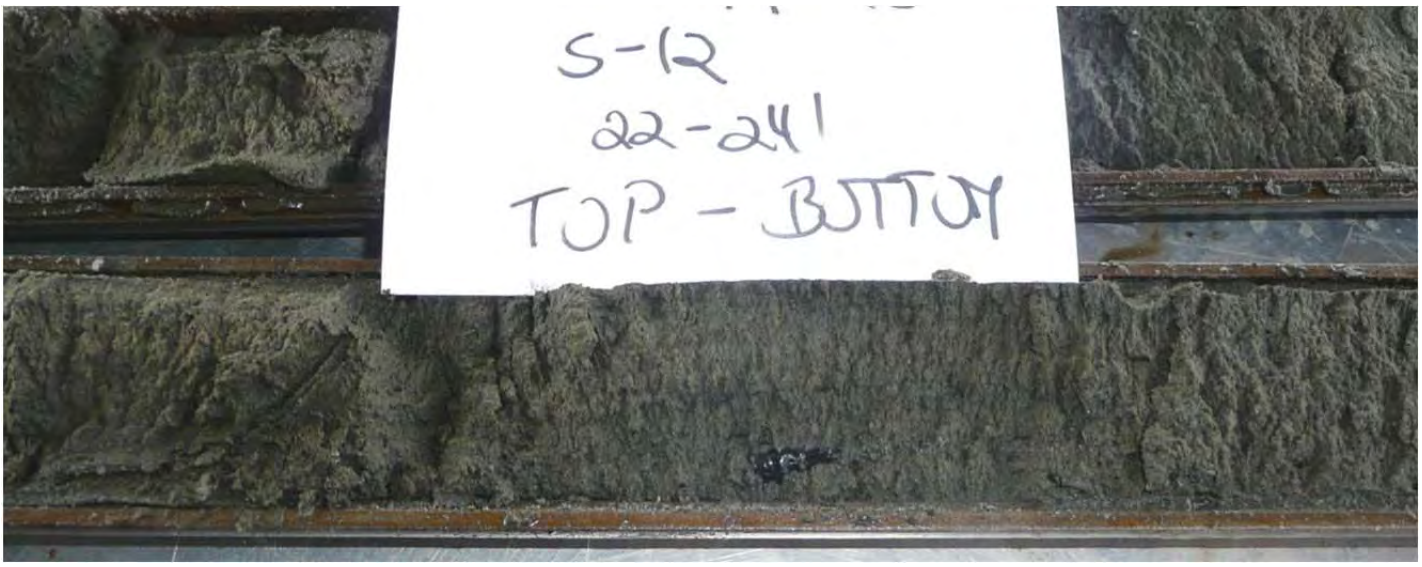
H-499-10, 31.5-32.4’ below mudline. Example of weathering in unit Ql/Qvrl, note iron/magnesium nodules and staining. Also note rhythmic laminations. Core split lengthwise in this photo (top is to the right).

H-500-10, 32’-34’ below mudline. Weathered and oxidized sediment in unit Ql/Qvrl. Note less oxidized gray clay toward the bottom (right).

H-522-10, 37.5’ below mudline. Core split lengthwise, top is to the right. Note distinct rhythmic laminations and variability in layer thickness.



H-349-10, 30.6-31.2’ below mudline, in unit Qvrl. Note the softness of the clay. Core is split lengthwise, top is to the right.

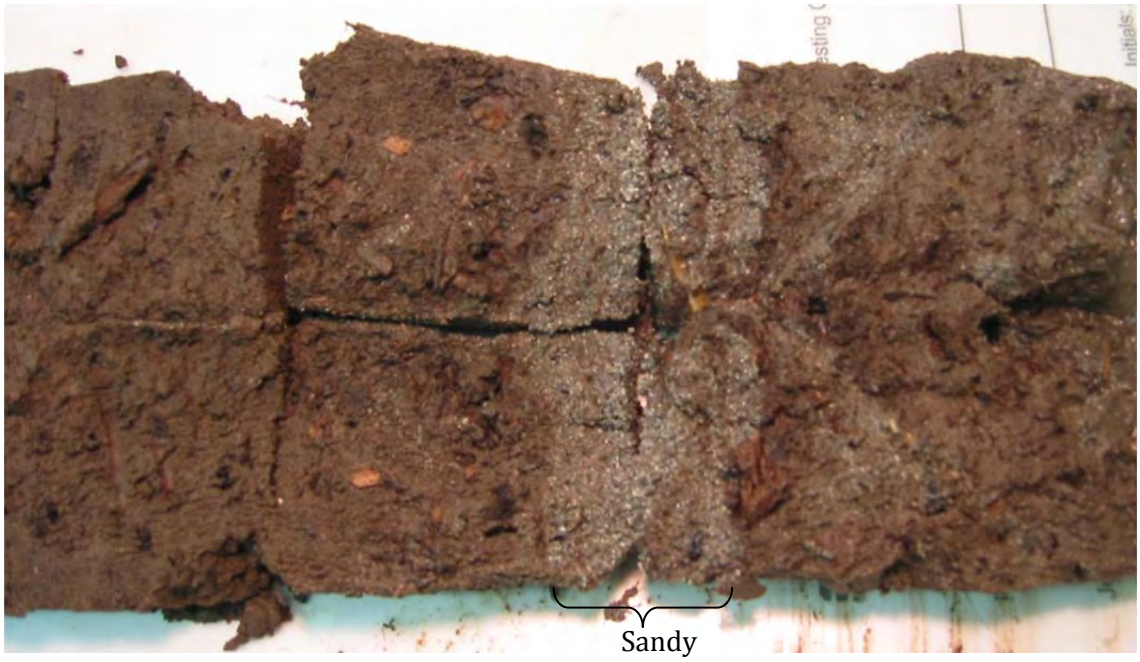


H-349-10, 22-24’ below mudline, open split spoon sample in the field. Note organic-rich nature of the diatomaceous ooze (unit Qlg). Top is to the left.

H-488-10, 18.5-19’ below mudline. Fibrous peat, top is to the right.

H-469-11, 26.2’ below mudline. Tightly woven root mat in fibrous peat.

H-489-10, 29.5’ below mudline. Cattail leaves bedded in fibrous peat.



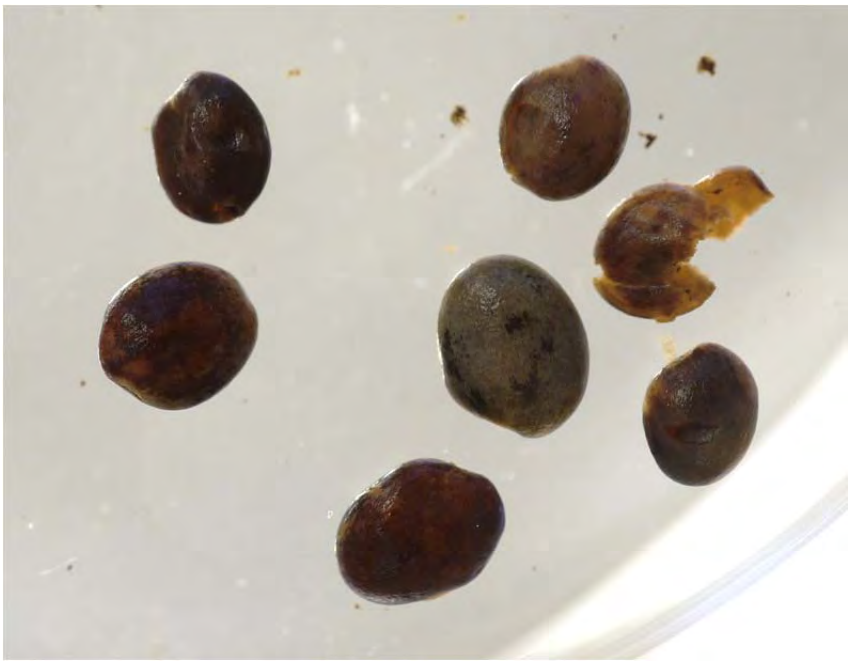
H-499-10, sandy layer from 22.5-22.6’ below mudline. Core showing peat with sandy layer with organic debris. Sandy layer may be from storm or landslide event. Core split lengthwise in this photo (top is to the right).

H-500-10, 20’-22’ below mudline. Sand in Qal/Ql unit.

H-349-10, 0.0-0.6’ below mudline. Note sandy pocket at left and gray silt layers and pockets. Matrix is diatomaceous ooze, within Qls.

H-349-10, 9.0’ below mudline. Deformed bedding captured in Shelby tube. Dark layer to the right is peat within Qls.

H-457-10, 22-22.9’ below mudline. Split core of fibrous peat. Note orange colored seed, likely a *Menyanthes trifoliata*, buckbean. Top is to the right.

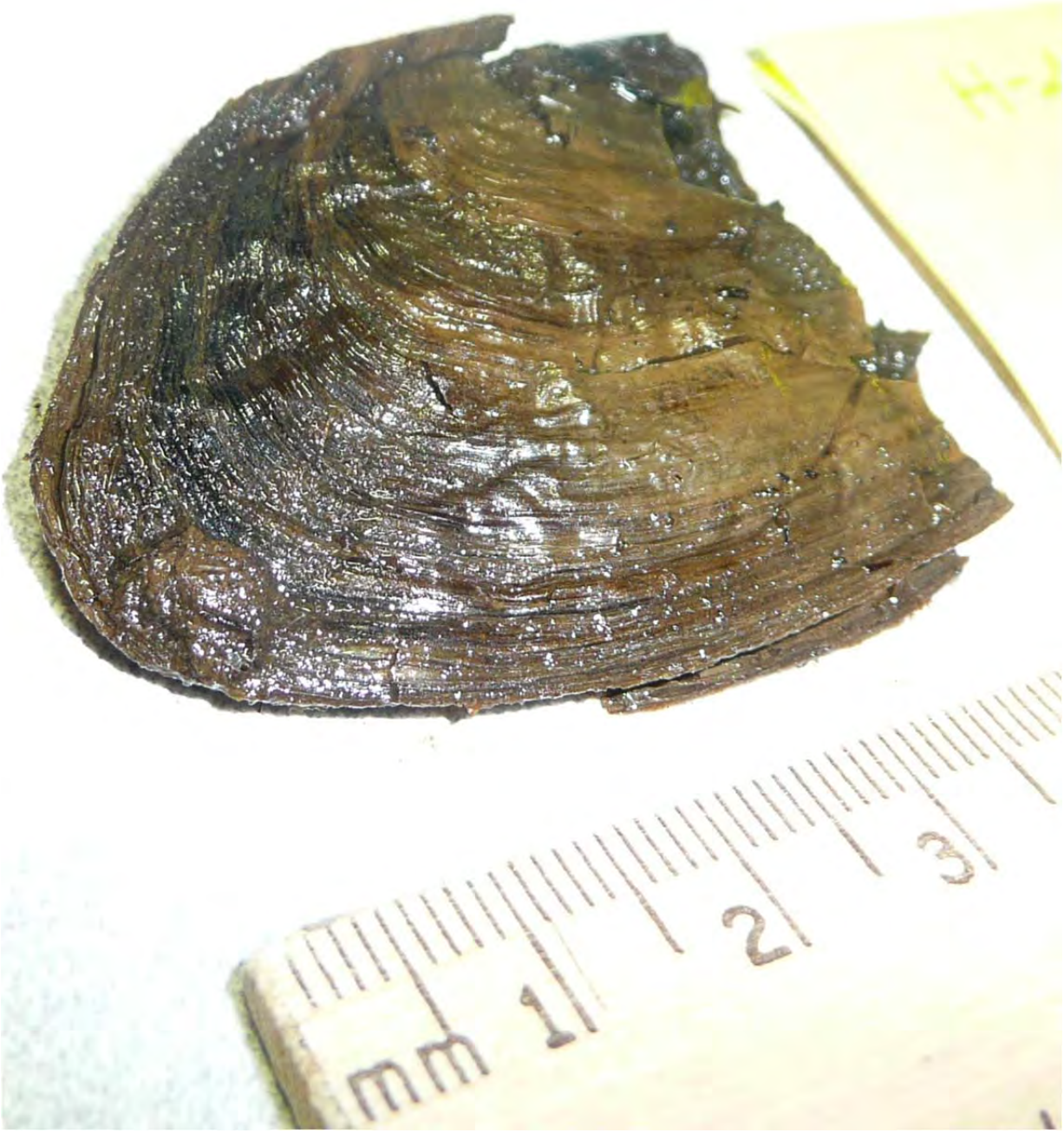


Menyanthes trifoliata seeds found during picking. Seeds approximately 2-3mm in length.

Delicate grass seeds extracted intact through peat picking process.

H-547-11, 19.2-19.5’ below mudline. Close up of beetle wings found in peat.

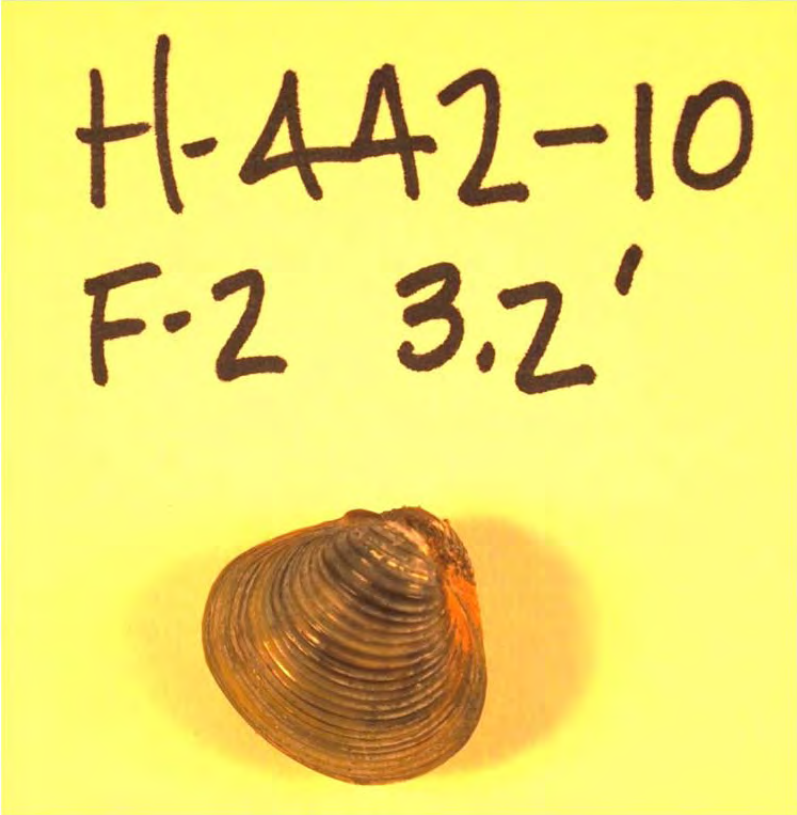
Same beetle as above. Identified as *Dytiscus cordieri*, predaceous diving beetle.



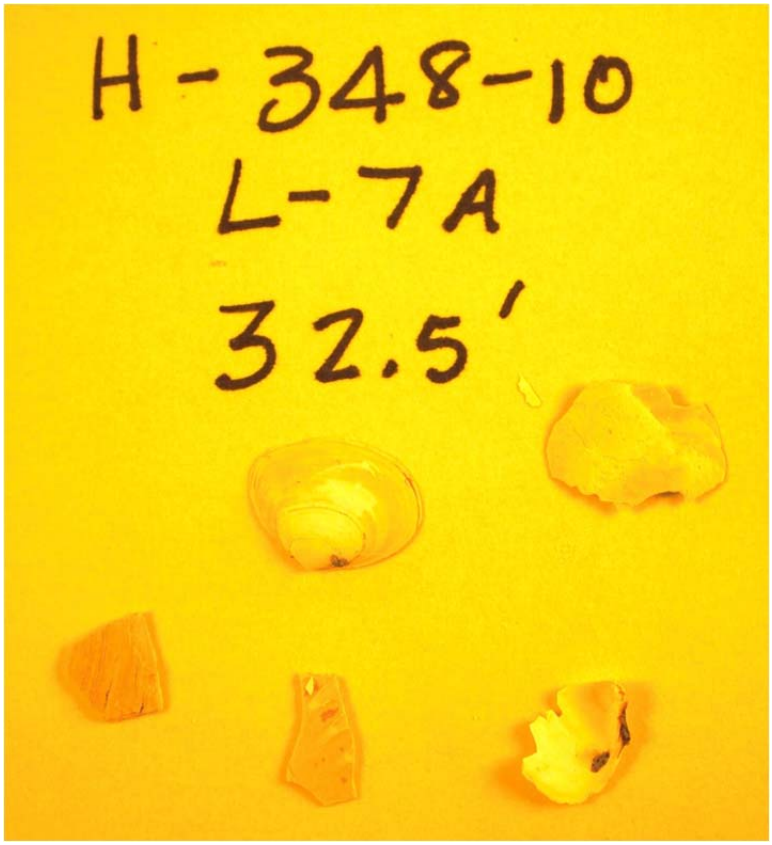
H-461-10, 1.6’ below mudline. Periostracum of freshwater mussel found in peat.

H-447-11, 1.8’ below mudline. Gastropod shell found in unit Qlo

H-442-10, 05-0.9’ below mudline. Live fresh water *Corbicula* clam.



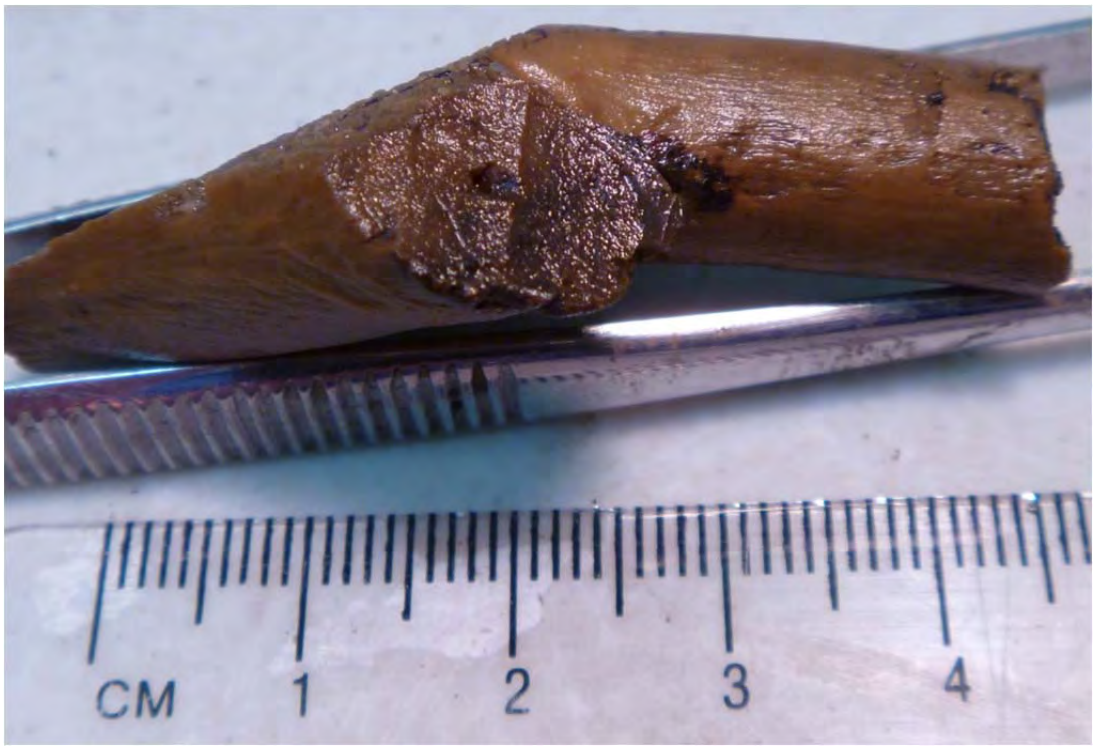
H-422-10, 3.2’ below mudline. Fresh to brackish *Corbicula fluminea*.



H-348-10, 32.5’ below mudline. Marine *Macoma brota* fragments.

H-481-10, 19.7’ below mudline. Most of a leaf preserved in peat. Possibly Red-osier dogwood or crab apple leaf.

H-533-10, 17.8’ below mudline. Maple seed; possibly vine maple, *Acer circinatum*, or bigleaf maple, *Acer macrophyllum*. Most likely bigleaf maple.



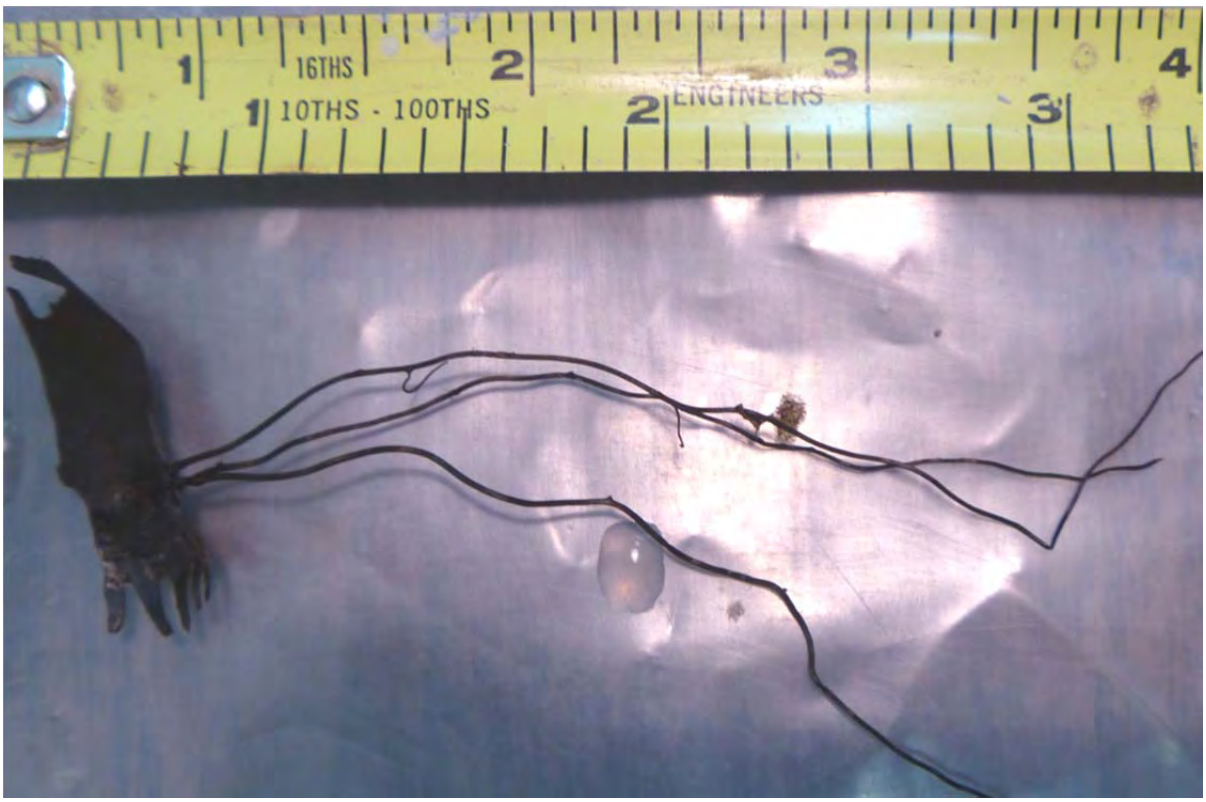
H-488-10, 27.3’ below mudline. Chew marks consistent with those made by a beaver. Collected from fibrous peat.

H-473-10, at the mudline. Pondweed captured in the top most Shelby tube.

H-488-10, 31.4’-31.9’ below mudline. Largest piece of wood recovered in project, sampled by Shelby tube.

H-488-10, 31.4-31.9’ below mudline. Piece of wood, possibly Douglas Fir, *Pseudotsuga menziesii*. Top is to the right. Same wood as in photo above.

H-349-10, 20.1’ below mudline. Identified Douglas fir cone, 62 mm long.



H-500-10, 0-1.2’ below mudline. Equisetum (horsetail) sheath and roots.

H-505-10, 2.8’ below mudline. Equisetum (horsetail) sheath and roots.

H-501-10, 0.9’ below mudline. Pond lily tuber with stems and young “leaves”.

H-349-10, 20.0-20.5’ below mudline. Note Mazama O tephra at top of core, Douglas fir cone below ash, and dark mottling in olive green diatomaceous ooze. Top is to the right.

H-540-10, 14.1’ below the mudline. Volcanic ash duplex of unidentified “lower” ash preserved in Shelby tube sample.

H-453-10, 32.5-33.5’ below mudline. Mazama ash in bottom of peat, on top of unit Ql/Qvrl.

Geomorphology and Shoreline History

of Lake Washington, Union Bay and Portage Bay

Appendix C

Results of Diatom Counts

Appendix C

Results of Diatom Counts

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Diatom Summary for boring H-349-10

Diatom Summary for boring H-457-10

Diatom Summary for boring H-488-10

Diatom Summary for boring H-500-10

Diatom Summary for boring H-534-10

Raw Diatom Report 1

Raw Diatom Report 2

Raw Diatom Report 3

Diatom Summary for boring H-349-10

basin	station	boring	depth (ft)	Count	plankton	benthic	rare taxa	Marine	comment
Lake Washington	S-9A	H-349-10	16.4-16.6	436	0.865	0.071	0.030	0.000	deeper environment
Lake Washington	S-9E	H-349-10	17.9-18.0	421	0.758	0.197	0.045	0.000	deeper environment
Lake Washington	S-11C	H-349-10	20.2	416	0.904	0.067	0.029	0.000	deeper environment
Lake Washington	S-11F	H-349-10	21.7-22.0	421	0.964	0.014	0.021	0.000	deeper environment
Lake Washington	S-12B	H-349-10	22-24	421	0.967	0.010	0.024	0.000	deeper environment
Lake Washington	S-13	H-349-10	24-26	432	0.870	0.104	0.025	0.000	deeper environment
Lake Washington	S-14A	H-349-10	26.3	443	0.903	0.059	0.025	0.819	**marine** planktonic environment

Diatom Summary for boring H-457-10

BASIN	STATION	SITE	BORING	DEPTH	Plankton	Littoral	Rare (1-2)	comment
Union Bay	L-1C	East Union Bay	H-457-10	1.15	10.8	85.7	3.4	very shallow environment
Union Bay	L-4D	East Union Bay	H-457-10	7.85	21.3	72.2	6.5	shallow environment
Union Bay	F-9ST	East Union Bay	H-457-10	16-18	26.4	66.2	7.4	shallow environment
Union Bay	L-12B	East Union Bay	H-457-10	22.65	55.8	36.8	7.4	deeper environment
Union Bay	L-16B	East Union Bay	H-457-10	30.9	71.9	25.1	3.1	deeper environment
Union Bay	F-19ST	East Union Bay	H-457-10	36-38	47.3	48.0	4.6	equivocal. Perhaps getting wash-in from a littoral zone
Union Bay	L-20D	East Union Bay	H-457-10	39.20	20.0	76.8	3.2	shallow environment

No evidence of marine or brackish water obligate genera, such as Coscinodiscus, Chaetoceras, Stephanopyxis or Thalassionema

Diatom Summary for boring H-488-10

BASIN	SAMPLE	BORING	DEPTH	Plankton	Littoral	Rare (1-2)	comment
West Union Bay	L-1C	H-488-10	0.9	2.7	93.5	3.9	very shallow environment
West Union Bay	L-4D	H-488-10	7.7	25.1	73.1	1.8	shallow environment
West Union Bay	L-8C	H-488-10	15.7	65.2	29.4	5.4	deeper environment
West Union Bay	F-9A	H-488-10	18	47.2	45.5	7.3	equivocal. Perhaps getting wash-in from a littoral zone.
West Union Bay	L-10D	H-488-10	19.5	30.7	64.8	4.5	shallow environment
West Union Bay	F-11C	H-488-10	22	57.7	36.5	5.8	deeper environment
West Union Bay	L-14G	H-488-10	27.85	54.3	40.3	5.4	equivocal. Perhaps getting wash-in from a littoral zone.
West Union Bay	L-16C	H-488-10	31.2	60.0	34.3	5.7	deeper environment
West Union Bay	F-19B-3	H-488-10	37.1	37.1	58.5	4.5	shallow environment
West Union Bay	L-20D	H-488-10	38.9	15.3	82.1	2.6	shallow environment

Diatom Summary for boring H-500-10

BASIN	SAMPLE	BORING	DEPTH	Plankton	Littoral	Rare (1-2)	comment
West Union Bay	L-1E	H-500-10	1.3	3.8	91.8	4.5	very shallow environment
West Union Bay	L-4C	H-500-10	7.2	21.5	75.1	3.4	shallow environment
West Union Bay	L-8D	H-500-10	15.5	40.3	54.0	5.7	equivocal. Perhaps getting wash-in from a littoral zone
West Union Bay	L-10B	H-500-10	19.4	34.9	57.9	7.2	equivocal. Perhaps getting wash-in from a littoral zone

Diatom Summary for boring H-534-10

basin	station	boring	depth (ft)	Count	plankton	benthic	rare taxa	Marine	comment
Portage Bay	L-1C	H-534-10	1.05-1.4	429	0.233	0.683	0.084	0.000	shallow environment
Portage Bay	F-4A	H-534-10	8	425	0.118	0.840	0.042	0.000	shallow environment
Portage Bay	F-8A	H-534-10	17.0-20.0	450	0.811	0.142	0.047	0.000	deeper environment
Portage Bay	F-12A	H-534-10	27.8	423	0.258	0.702	0.040	0.000	shallow environment
Portage Bay	F-12B	H-534-10	28.9	405	0.092	0.806	0.059	0.000	very shallow environment

Raw Diatom Report 1

BASIN	STATION	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	MARINE=M
Portage Bay	L-1C	H-534-10	1.05-1.4	Achnanthes submarina	Bacillariophyta	1	0.23	
Portage Bay	L-1C	H-534-10	1.05-1.4	Achnanthidium exiguum	Bacillariophyta	1	0.23	
Portage Bay	L-1C	H-534-10	1.05-1.4	Achnanthidium ventralis	Bacillariophyta	2	0.47	
Portage Bay	L-1C	H-534-10	1.05-1.4	Aulacoseira subarctica	Bacillariophyta	42	9.79	
Portage Bay	L-1C	H-534-10	1.05-1.4	Cocconeis placentula	Bacillariophyta	17	3.96	
Portage Bay	L-1C	H-534-10	1.05-1.4	Cyclostephanos sp.	Bacillariophyta	2	0.47	
Portage Bay	L-1C	H-534-10	1.05-1.4	Cyclotella schumannii	Bacillariophyta	1	0.23	
Portage Bay	L-1C	H-534-10	1.05-1.4	Eunotia sp.	Bacillariophyta	1	0.23	
Portage Bay	L-1C	H-534-10	1.05-1.4	Fragilaria crotonensis	Bacillariophyta	7	1.63	
Portage Bay	L-1C	H-534-10	1.05-1.4	Fragilaria vaucheriae	Bacillariophyta	1	0.23	
Portage Bay	L-1C	H-534-10	1.05-1.4	Gomphoneis olivacea	Bacillariophyta	1	0.23	
Portage Bay	L-1C	H-534-10	1.05-1.4	Navicula capitatoradiata	Bacillariophyta	1	0.23	
Portage Bay	L-1C	H-534-10	1.05-1.4	Navicula cryptocephala	Bacillariophyta	1	0.23	
Portage Bay	L-1C	H-534-10	1.05-1.4	Nitzschia amphibia	Bacillariophyta	1	0.23	
Portage Bay	L-1C	H-534-10	1.05-1.4	Planothidium lanceolatum	Bacillariophyta	1	0.23	
Portage Bay	L-1C	H-534-10	1.05-1.4	Psammothidium marginulatum	Bacillariophyta	1	0.23	
Portage Bay	L-1C	H-534-10	1.05-1.4	Psammothidium sacculum	Bacillariophyta	5	1.17	
Portage Bay	L-1C	H-534-10	1.05-1.4	Pseudostaurosira brevistriata	Bacillariophyta	7	1.63	
Portage Bay	L-1C	H-534-10	1.05-1.4	Pseudostaurosira pseudoconstruens	Bacillariophyta	7	1.63	
Portage Bay	L-1C	H-534-10	1.05-1.4	Rhoicosphenia abbreviata	Bacillariophyta	2	0.47	
Portage Bay	L-1C	H-534-10	1.05-1.4	Staurosira construens	Bacillariophyta	101	23.54	
Portage Bay	L-1C	H-534-10	1.05-1.4	Staurosira construens var. venter	Bacillariophyta	1	0.23	
Portage Bay	L-1C	H-534-10	1.05-1.4	Staurosira elliptica	Bacillariophyta	25	5.83	
Portage Bay	L-1C	H-534-10	1.05-1.4	Staurosirella pinnata	Bacillariophyta	148	34.50	
Portage Bay	L-1C	H-534-10	1.05-1.4	Stephanodiscus hantzschii	Bacillariophyta	8	1.86	
Portage Bay	L-1C	H-534-10	1.05-1.4	Stephanodiscus medius	Bacillariophyta	33	7.69	
Portage Bay	L-1C	H-534-10	1.05-1.4	Stephanodiscus minutulus	Bacillariophyta	3	0.70	
Portage Bay	L-1C	H-534-10	1.05-1.4	Stephanodiscus niagarae	Bacillariophyta	7	1.63	
Portage Bay	L-1C	H-534-10	1.05-1.4	Ulnaria ulna	Bacillariophyta	1	0.23	
				Total		429		

Raw Diatom Report 1

BASIN	STATION	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	MARINE=M
Portage Bay	F-4A	H-534-10	8	Achnanthidium ventralis	Bacillariophyta	1	0.24	
Portage Bay	F-4A	H-534-10	8	Aulacoseira islandica	Bacillariophyta	4	0.94	
Portage Bay	F-4A	H-534-10	8	Aulacoseira subarctica	Bacillariophyta	14	3.29	
Portage Bay	F-4A	H-534-10	8	Cocconeis placentula	Bacillariophyta	10	2.35	
Portage Bay	F-4A	H-534-10	8	Ctenophora pulchella	Bacillariophyta	1	0.24	
Portage Bay	F-4A	H-534-10	8	Cyclostephanos sp.	Bacillariophyta	1	0.24	
Portage Bay	F-4A	H-534-10	8	Encyonema caespitosum	Bacillariophyta	1	0.24	
Portage Bay	F-4A	H-534-10	8	Epithemia sp.	Bacillariophyta	2	0.47	
Portage Bay	F-4A	H-534-10	8	Eunotia sp.	Bacillariophyta	1	0.24	
Portage Bay	F-4A	H-534-10	8	Fragilaria crotonensis	Bacillariophyta	2	0.47	
Portage Bay	F-4A	H-534-10	8	Gomphonema angustatum	Bacillariophyta	1	0.24	
Portage Bay	F-4A	H-534-10	8	Gomphonema angustum	Bacillariophyta	1	0.24	
Portage Bay	F-4A	H-534-10	8	Melosira varians	Bacillariophyta	4	0.94	
Portage Bay	F-4A	H-534-10	8	Pseudostaurosira brevistriata	Bacillariophyta	12	2.82	
Portage Bay	F-4A	H-534-10	8	Pseudostaurosira pseudoconstruens	Bacillariophyta	17	4.00	
Portage Bay	F-4A	H-534-10	8	Staurosira construens	Bacillariophyta	120	28.24	
Portage Bay	F-4A	H-534-10	8	Staurosira construens var. binodis	Bacillariophyta	2	0.47	
Portage Bay	F-4A	H-534-10	8	Staurosira construens var. venter	Bacillariophyta	10	2.35	
Portage Bay	F-4A	H-534-10	8	Staurosira elliptica	Bacillariophyta	48	11.29	
Portage Bay	F-4A	H-534-10	8	Staurosirella pinnata	Bacillariophyta	140	32.94	
Portage Bay	F-4A	H-534-10	8	Stephanodiscus medius	Bacillariophyta	28	6.59	
Portage Bay	F-4A	H-534-10	8	Stephanodiscus minutulus	Bacillariophyta	1	0.24	
Portage Bay	F-4A	H-534-10	8	Stephanodiscus niagarae	Bacillariophyta	1	0.24	
Portage Bay	F-4A	H-534-10	8	Tabellaria flocculosa	Bacillariophyta	2	0.47	
Portage Bay	F-4A	H-534-10	8	Ulnaria ulna	Bacillariophyta	1	0.24	
				Total		425		

Raw Diatom Report 1

BASIN	STATION	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	MARINE=M
Portage Bay	F-8A	H-534-10	17.0-20.0	Achnanthes submarina	Bacillariophyta	2	0.44	
Portage Bay	F-8A	H-534-10	17.0-20.0	Achnanthidium exiguum	Bacillariophyta	1	0.22	
Portage Bay	F-8A	H-534-10	17.0-20.0	Achnanthidium hungaricum	Bacillariophyta	1	0.22	
Portage Bay	F-8A	H-534-10	17.0-20.0	Aulacoseira subarctica	Bacillariophyta	138	30.67	
Portage Bay	F-8A	H-534-10	17.0-20.0	Cocconeis placentula	Bacillariophyta	23	5.11	
Portage Bay	F-8A	H-534-10	17.0-20.0	Encyonema caespitosum	Bacillariophyta	5	1.11	
Portage Bay	F-8A	H-534-10	17.0-20.0	Encyonema silesiacum	Bacillariophyta	1	0.22	
Portage Bay	F-8A	H-534-10	17.0-20.0	Epithemia sp.	Bacillariophyta	2	0.44	
Portage Bay	F-8A	H-534-10	17.0-20.0	Epithemia turgida	Bacillariophyta	2	0.44	
Portage Bay	F-8A	H-534-10	17.0-20.0	Eunotia pectinalis var. undulata	Bacillariophyta	1	0.22	
Portage Bay	F-8A	H-534-10	17.0-20.0	Gomphonema angustatum	Bacillariophyta	1	0.22	
Portage Bay	F-8A	H-534-10	17.0-20.0	Gomphonema angustum	Bacillariophyta	2	0.44	
Portage Bay	F-8A	H-534-10	17.0-20.0	Gomphonema sp.	Bacillariophyta	2	0.44	
Portage Bay	F-8A	H-534-10	17.0-20.0	Navicula cari	Bacillariophyta	1	0.22	
Portage Bay	F-8A	H-534-10	17.0-20.0	Navicula recens	Bacillariophyta	1	0.22	
Portage Bay	F-8A	H-534-10	17.0-20.0	Nitzschia incognita	Bacillariophyta	1	0.22	
Portage Bay	F-8A	H-534-10	17.0-20.0	Psammothidium sacculum	Bacillariophyta	2	0.44	
Portage Bay	F-8A	H-534-10	17.0-20.0	Pseudostaurosira pseudoconstruens	Bacillariophyta	3	0.67	
Portage Bay	F-8A	H-534-10	17.0-20.0	Staurosira construens	Bacillariophyta	9	2.00	
Portage Bay	F-8A	H-534-10	17.0-20.0	Staurosira elliptica	Bacillariophyta	3	0.67	
Portage Bay	F-8A	H-534-10	17.0-20.0	Staurosirella pinnata	Bacillariophyta	17	3.78	
Portage Bay	F-8A	H-534-10	17.0-20.0	Stephanodiscus medius	Bacillariophyta	160	35.56	
Portage Bay	F-8A	H-534-10	17.0-20.0	Stephanodiscus minutulus	Bacillariophyta	1	0.22	
Portage Bay	F-8A	H-534-10	17.0-20.0	Stephanodiscus niagarae	Bacillariophyta	67	14.89	
Portage Bay	F-8A	H-534-10	17.0-20.0	Ulnaria ulna	Bacillariophyta	4	0.89	
				Total		450		

Raw Diatom Report 1

BASIN	STATION	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	MARINE=M
Portage Bay	F-12A	H-534-10	27.8	Achnanthes submarina	Bacillariophyta	1	0.24	
Portage Bay	F-12A	H-534-10	27.8	Achnanthes rupestoides	Bacillariophyta	6	1.42	
Portage Bay	F-12A	H-534-10	27.8	Achnanthidium exiguum	Bacillariophyta	1	0.24	
Portage Bay	F-12A	H-534-10	27.8	Achnanthidium minutissimum	Bacillariophyta	5	1.18	
Portage Bay	F-12A	H-534-10	27.8	Amphora inariensis	Bacillariophyta	7	1.65	
Portage Bay	F-12A	H-534-10	27.8	Amphora ovalis	Bacillariophyta	3	0.71	
Portage Bay	F-12A	H-534-10	27.8	Amphora pediculus	Bacillariophyta	13	3.07	
Portage Bay	F-12A	H-534-10	27.8	Aulacoseira granulata	Bacillariophyta	8	1.89	
Portage Bay	F-12A	H-534-10	27.8	Aulacoseira subarctica	Bacillariophyta	53	12.53	
Portage Bay	F-12A	H-534-10	27.8	Cavinula scutelloides	Bacillariophyta	2	0.47	
Portage Bay	F-12A	H-534-10	27.8	Cocconeis placentula	Bacillariophyta	17	4.02	
Portage Bay	F-12A	H-534-10	27.8	Cyclotella ocellata	Bacillariophyta	1	0.24	
Portage Bay	F-12A	H-534-10	27.8	Cymbella cistula	Bacillariophyta	1	0.24	
Portage Bay	F-12A	H-534-10	27.8	Encyonema caespitosum	Bacillariophyta	1	0.24	
Portage Bay	F-12A	H-534-10	27.8	Encyonema silesiacum	Bacillariophyta	1	0.24	
Portage Bay	F-12A	H-534-10	27.8	Epithemia sp.	Bacillariophyta	3	0.71	
Portage Bay	F-12A	H-534-10	27.8	Epithemia turgida	Bacillariophyta	2	0.47	
Portage Bay	F-12A	H-534-10	27.8	Gyrosigma acuminatum	Bacillariophyta	7	1.65	
Portage Bay	F-12A	H-534-10	27.8	Navicula cari	Bacillariophyta	5	1.18	
Portage Bay	F-12A	H-534-10	27.8	Navicula radiosa	Bacillariophyta	1	0.24	
Portage Bay	F-12A	H-534-10	27.8	Navicula recens	Bacillariophyta	1	0.24	
Portage Bay	F-12A	H-534-10	27.8	Nitzschia amphibia	Bacillariophyta	3	0.71	
Portage Bay	F-12A	H-534-10	27.8	Nitzschia fonticola	Bacillariophyta	1	0.24	
Portage Bay	F-12A	H-534-10	27.8	Pinnularia interrupta	Bacillariophyta	5	1.18	
Portage Bay	F-12A	H-534-10	27.8	Planothidium lanceolatum	Bacillariophyta	1	0.24	
Portage Bay	F-12A	H-534-10	27.8	Planothidium oestrupii	Bacillariophyta	3	0.71	
Portage Bay	F-12A	H-534-10	27.8	Planothidium rostratum	Bacillariophyta	2	0.47	
Portage Bay	F-12A	H-534-10	27.8	Psammothidium sacculum	Bacillariophyta	1	0.24	
Portage Bay	F-12A	H-534-10	27.8	Pseudostaurosira brevistriata	Bacillariophyta	57	13.48	
Portage Bay	F-12A	H-534-10	27.8	Pseudostaurosira pseudoconstruens	Bacillariophyta	7	1.65	
Portage Bay	F-12A	H-534-10	27.8	Rhopalodia gibba	Bacillariophyta	7	1.65	
Portage Bay	F-12A	H-534-10	27.8	Sellaphora pupula	Bacillariophyta	1	0.24	
Portage Bay	F-12A	H-534-10	27.8	Staurosira construens	Bacillariophyta	71	16.78	
Portage Bay	F-12A	H-534-10	27.8	Staurosira elliptica	Bacillariophyta	4	0.95	
Portage Bay	F-12A	H-534-10	27.8	Staurosirella pinnata	Bacillariophyta	42	9.93	
Portage Bay	F-12A	H-534-10	27.8	Stephanodiscus medius	Bacillariophyta	31	7.33	

Raw Diatom Report 1

BASIN	STATION	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	MARINE=M
Portage Bay	F-12A	H-534-10	27.8	Stephanodiscus minutulus	Bacillariophyta	8	1.89	
Portage Bay	F-12A	H-534-10	27.8	Stephanodiscus niagarae	Bacillariophyta	9	2.13	
Portage Bay	F-12A	H-534-10	27.8	Ulnaria biceps	Bacillariophyta	1	0.24	
Portage Bay	F-12A	H-534-10	27.8	Ulnaria ulna	Bacillariophyta	30	7.09	
				Total		423		

Raw Diatom Report 1

BASIN	STATION	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	MARINE=M
Portage Bay	F-12B	H-534-10	28.9	Achnanthes joursacense	Bacillariophyta	3	0.74	
Portage Bay	F-12B	H-534-10	28.9	Achnanthes submarina	Bacillariophyta	1	0.25	
Portage Bay	F-12B	H-534-10	28.9	Achnanthes ziegleri	Bacillariophyta	7	1.73	
Portage Bay	F-12B	H-534-10	28.9	Achnanthidium ventralis	Bacillariophyta	1	0.25	
Portage Bay	F-12B	H-534-10	28.9	Amphora inariensis	Bacillariophyta	1	0.25	
Portage Bay	F-12B	H-534-10	28.9	Amphora pediculus	Bacillariophyta	6	1.48	
Portage Bay	F-12B	H-534-10	28.9	Amphora thumensis	Bacillariophyta	1	0.25	
Portage Bay	F-12B	H-534-10	28.9	Aulacoseira subarctica	Bacillariophyta	24	5.93	
Portage Bay	F-12B	H-534-10	28.9	Cavinula scutelloides	Bacillariophyta	2	0.49	
Portage Bay	F-12B	H-534-10	28.9	Cocconeis placentula	Bacillariophyta	5	1.23	
Portage Bay	F-12B	H-534-10	28.9	Cyclotella ocellata	Bacillariophyta	2	0.49	
Portage Bay	F-12B	H-534-10	28.9	Epithemia sp.	Bacillariophyta	1	0.25	
Portage Bay	F-12B	H-534-10	28.9	Epithemia turgida	Bacillariophyta	1	0.25	
Portage Bay	F-12B	H-534-10	28.9	Eunotia implicata	Bacillariophyta	1	0.25	
Portage Bay	F-12B	H-534-10	28.9	Gyrosigma acuminatum	Bacillariophyta	2	0.49	
Portage Bay	F-12B	H-534-10	28.9	Navicula cari	Bacillariophyta	2	0.49	
Portage Bay	F-12B	H-534-10	28.9	Pinnularia borealis	Bacillariophyta	1	0.25	
Portage Bay	F-12B	H-534-10	28.9	Planothidium conspicuum	Bacillariophyta	2	0.49	
Portage Bay	F-12B	H-534-10	28.9	Planothidium lanceolatum	Bacillariophyta	1	0.25	
Portage Bay	F-12B	H-534-10	28.9	Planothidium oestrupii	Bacillariophyta	1	0.25	
Portage Bay	F-12B	H-534-10	28.9	Psammothidium sp.	Bacillariophyta	1	0.25	
Portage Bay	F-12B	H-534-10	28.9	Pseudostaurosira brevistriata	Bacillariophyta	40	9.88	
Portage Bay	F-12B	H-534-10	28.9	Pseudostaurosira pseudoconstruens	Bacillariophyta	5	1.23	
Portage Bay	F-12B	H-534-10	28.9	Rhopalodia gibba	Bacillariophyta	2	0.49	
Portage Bay	F-12B	H-534-10	28.9	Staurosira construens	Bacillariophyta	221	54.57	
Portage Bay	F-12B	H-534-10	28.9	Staurosira construens var. binodis	Bacillariophyta	2	0.49	
Portage Bay	F-12B	H-534-10	28.9	Staurosira elliptica	Bacillariophyta	7	1.73	
Portage Bay	F-12B	H-534-10	28.9	Staurosirella lapponica	Bacillariophyta	26	6.42	
Portage Bay	F-12B	H-534-10	28.9	Staurosirella pinnata	Bacillariophyta	19	4.69	
Portage Bay	F-12B	H-534-10	28.9	Stephanodiscus medius	Bacillariophyta	9	2.22	
Portage Bay	F-12B	H-534-10	28.9	Stephanodiscus niagarae	Bacillariophyta	6	1.48	
Portage Bay	F-12B	H-534-10	28.9	Ulnaria ulna	Bacillariophyta	2	0.49	
				Total		405		

Raw Diatom Report 1

BASIN	STATION	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	MARINE=M
Lake Washington	S-9A	H-349-10	16.4-16.6	Achnanthidium minutissimum	Bacillariophyta	1	0.23	
Lake Washington	S-9A	H-349-10	16.4-16.6	Amphora pediculus	Bacillariophyta	2	0.46	
Lake Washington	S-9A	H-349-10	16.4-16.6	Asterionella formosa	Bacillariophyta	37	8.49	
Lake Washington	S-9A	H-349-10	16.4-16.6	Aulacoseira islandica	Bacillariophyta	4	0.92	
Lake Washington	S-9A	H-349-10	16.4-16.6	Aulacoseira subarctica	Bacillariophyta	153	35.09	
Lake Washington	S-9A	H-349-10	16.4-16.6	Caloneis sp.	Bacillariophyta	1	0.23	
Lake Washington	S-9A	H-349-10	16.4-16.6	Cocconeis placentula	Bacillariophyta	6	1.38	
Lake Washington	S-9A	H-349-10	16.4-16.6	Cyclostephanos sp.	Bacillariophyta	7	1.61	
Lake Washington	S-9A	H-349-10	16.4-16.6	Cyclotella caspia	Bacillariophyta	1	0.23	
Lake Washington	S-9A	H-349-10	16.4-16.6	Cyclotella ocellata	Bacillariophyta	3	0.69	
Lake Washington	S-9A	H-349-10	16.4-16.6	Diploneis parma	Bacillariophyta	1	0.23	
Lake Washington	S-9A	H-349-10	16.4-16.6	Discostella pseudostelligera	Bacillariophyta	3	0.69	
Lake Washington	S-9A	H-349-10	16.4-16.6	Encyonema caespitosum	Bacillariophyta	2	0.46	
Lake Washington	S-9A	H-349-10	16.4-16.6	Fragilaria crotonensis	Bacillariophyta	134	30.73	
Lake Washington	S-9A	H-349-10	16.4-16.6	Fragilaria vaucheriae	Bacillariophyta	1	0.23	
Lake Washington	S-9A	H-349-10	16.4-16.6	Planothidium conspicuum	Bacillariophyta	1	0.23	
Lake Washington	S-9A	H-349-10	16.4-16.6	Planothidium delicatulum	Bacillariophyta	1	0.23	
Lake Washington	S-9A	H-349-10	16.4-16.6	Pseudostaurosira brevistriata	Bacillariophyta	3	0.69	
Lake Washington	S-9A	H-349-10	16.4-16.6	Puncticulata bodanica	Bacillariophyta	6	1.38	
Lake Washington	S-9A	H-349-10	16.4-16.6	Staurosira construens	Bacillariophyta	9	2.06	
Lake Washington	S-9A	H-349-10	16.4-16.6	Staurosira elliptica	Bacillariophyta	1	0.23	
Lake Washington	S-9A	H-349-10	16.4-16.6	Staurosira oldenburgiana	Bacillariophyta	1	0.23	
Lake Washington	S-9A	H-349-10	16.4-16.6	Staurosirella pinnata	Bacillariophyta	3	0.69	
Lake Washington	S-9A	H-349-10	16.4-16.6	Stephanodiscus medius	Bacillariophyta	5	1.15	
Lake Washington	S-9A	H-349-10	16.4-16.6	Stephanodiscus niagarae	Bacillariophyta	26	5.96	
Lake Washington	S-9A	H-349-10	16.4-16.6	Stephanodiscus subtranssylvanicus	Bacillariophyta	14	3.21	
Lake Washington	S-9A	H-349-10	16.4-16.6	Ulnaria ulna	Bacillariophyta	10	2.29	
				Total		436		

Raw Diatom Report 1

BASIN	STATION	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	MARINE=M
Lake Washington	S-9E	H-349-10	17.9-18.0	Achnanthes joursacense	Bacillariophyta	1	0.24	
Lake Washington	S-9E	H-349-10	17.9-18.0	Asterionella formosa	Bacillariophyta	36	8.55	
Lake Washington	S-9E	H-349-10	17.9-18.0	Aulacoseira crassipunctata	Bacillariophyta	64	15.20	
Lake Washington	S-9E	H-349-10	17.9-18.0	Aulacoseira islandica	Bacillariophyta	6	1.43	
Lake Washington	S-9E	H-349-10	17.9-18.0	Aulacoseira subarctica	Bacillariophyta	29	6.89	
Lake Washington	S-9E	H-349-10	17.9-18.0	Cocconeis placentula	Bacillariophyta	30	7.13	
Lake Washington	S-9E	H-349-10	17.9-18.0	Cyclotella caspia	Bacillariophyta	11	2.61	
Lake Washington	S-9E	H-349-10	17.9-18.0	Cyclotella ocellata	Bacillariophyta	24	5.70	
Lake Washington	S-9E	H-349-10	17.9-18.0	Cyclotella radiosa	Bacillariophyta	1	0.24	
Lake Washington	S-9E	H-349-10	17.9-18.0	Diatoma moniliformis	Bacillariophyta	1	0.24	
Lake Washington	S-9E	H-349-10	17.9-18.0	Discostella pseudostelligera	Bacillariophyta	2	0.48	
Lake Washington	S-9E	H-349-10	17.9-18.0	Encyonema caespitosum	Bacillariophyta	1	0.24	
Lake Washington	S-9E	H-349-10	17.9-18.0	Encyonema silesiacum	Bacillariophyta	1	0.24	
Lake Washington	S-9E	H-349-10	17.9-18.0	Epithemia turgida	Bacillariophyta	5	1.19	
Lake Washington	S-9E	H-349-10	17.9-18.0	Eunotia veneris	Bacillariophyta	1	0.24	
Lake Washington	S-9E	H-349-10	17.9-18.0	Fragilaria crotonensis	Bacillariophyta	73	17.34	
Lake Washington	S-9E	H-349-10	17.9-18.0	Fragilaria vaucheriae	Bacillariophyta	3	0.71	
Lake Washington	S-9E	H-349-10	17.9-18.0	Frustulia rhomboides var. viridula	Bacillariophyta	1	0.24	
Lake Washington	S-9E	H-349-10	17.9-18.0	Gomphonema ventricosum	Bacillariophyta	1	0.24	
Lake Washington	S-9E	H-349-10	17.9-18.0	Nitzschia amphibia	Bacillariophyta	1	0.24	
Lake Washington	S-9E	H-349-10	17.9-18.0	Planothidium lanceolatum	Bacillariophyta	1	0.24	
Lake Washington	S-9E	H-349-10	17.9-18.0	Planothidium oestrupii	Bacillariophyta	1	0.24	
Lake Washington	S-9E	H-349-10	17.9-18.0	Pseudostaurosira brevistriata	Bacillariophyta	35	8.31	
Lake Washington	S-9E	H-349-10	17.9-18.0	Puncticulata bodanica	Bacillariophyta	16	3.80	
Lake Washington	S-9E	H-349-10	17.9-18.0	Reimeria sinuata	Bacillariophyta	2	0.48	
Lake Washington	S-9E	H-349-10	17.9-18.0	Rhopalodia gibba	Bacillariophyta	4	0.95	
Lake Washington	S-9E	H-349-10	17.9-18.0	Staurosira construens	Bacillariophyta	5	1.19	
Lake Washington	S-9E	H-349-10	17.9-18.0	Staurosira elliptica	Bacillariophyta	2	0.48	
Lake Washington	S-9E	H-349-10	17.9-18.0	Staurosirella lapponica	Bacillariophyta	2	0.48	
Lake Washington	S-9E	H-349-10	17.9-18.0	Staurosira oldenburgiana	Bacillariophyta	4	0.95	
Lake Washington	S-9E	H-349-10	17.9-18.0	Stephanodiscus minutulus	Bacillariophyta	4	0.95	
Lake Washington	S-9E	H-349-10	17.9-18.0	Stephanodiscus niagarae	Bacillariophyta	25	5.94	
Lake Washington	S-9E	H-349-10	17.9-18.0	Stephanodiscus subtranssylvanicus	Bacillariophyta	28	6.65	
				Total		421		

Raw Diatom Report 1

BASIN	STATION	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	MARINE=M
Lake Washington	S-11C	H-349-10	20.2	Achnanthes joursacense	Bacillariophyta	1	0.24	
Lake Washington	S-11C	H-349-10	20.2	Asterionella formosa	Bacillariophyta	38	9.13	
Lake Washington	S-11C	H-349-10	20.2	Aulacoseira crassipunctata	Bacillariophyta	18	4.33	
Lake Washington	S-11C	H-349-10	20.2	Aulacoseira islandica	Bacillariophyta	54	12.98	
Lake Washington	S-11C	H-349-10	20.2	Aulacoseira subarctica	Bacillariophyta	30	7.21	
Lake Washington	S-11C	H-349-10	20.2	Cocconeis placentula	Bacillariophyta	4	0.96	
Lake Washington	S-11C	H-349-10	20.2	Cyclotella ocellata	Bacillariophyta	1	0.24	
Lake Washington	S-11C	H-349-10	20.2	Discostella pseudostelligera	Bacillariophyta	4	0.96	
Lake Washington	S-11C	H-349-10	20.2	Encyonema silesiacum	Bacillariophyta	1	0.24	
Lake Washington	S-11C	H-349-10	20.2	Fragilaria crotonensis	Bacillariophyta	156	37.50	
Lake Washington	S-11C	H-349-10	20.2	Gomphonema angustum	Bacillariophyta	1	0.24	
Lake Washington	S-11C	H-349-10	20.2	Navicula radiosa	Bacillariophyta	2	0.48	
Lake Washington	S-11C	H-349-10	20.2	Nitzschia amphibia	Bacillariophyta	1	0.24	
Lake Washington	S-11C	H-349-10	20.2	Planothidium conspicuum	Bacillariophyta	1	0.24	
Lake Washington	S-11C	H-349-10	20.2	Planothidium lanceolatum	Bacillariophyta	1	0.24	
Lake Washington	S-11C	H-349-10	20.2	Pseudostaurosira brevistriata	Bacillariophyta	6	1.44	
Lake Washington	S-11C	H-349-10	20.2	Puncticulata bodanica	Bacillariophyta	7	1.68	
Lake Washington	S-11C	H-349-10	20.2	Staurosira construens	Bacillariophyta	5	1.20	
Lake Washington	S-11C	H-349-10	20.2	Staurosirella lapponica	Bacillariophyta	2	0.48	
Lake Washington	S-11C	H-349-10	20.2	Staurosirella pinnata	Bacillariophyta	3	0.72	
Lake Washington	S-11C	H-349-10	20.2	Stephanodiscus minutulus	Bacillariophyta	1	0.24	
Lake Washington	S-11C	H-349-10	20.2	Stephanodiscus niagarae	Bacillariophyta	9	2.16	
Lake Washington	S-11C	H-349-10	20.2	Stephanodiscus subtranssylvanicus	Bacillariophyta	67	16.11	
Lake Washington	S-11C	H-349-10	20.2	Ulnaria ulna	Bacillariophyta	3	0.72	
				Total		416		

Raw Diatom Report 1

BASIN	STATION	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	MARINE=M
Lake Washington	S-11F	H-349-10	21.7-22.0	Asterionella formosa	Bacillariophyta	4	0.95	
Lake Washington	S-11F	H-349-10	21.7-22.0	Aulacoseira crassipunctata	Bacillariophyta	32	7.60	
Lake Washington	S-11F	H-349-10	21.7-22.0	Aulacoseira islandica	Bacillariophyta	72	17.10	
Lake Washington	S-11F	H-349-10	21.7-22.0	Aulacoseira subarctica	Bacillariophyta	119	28.27	
Lake Washington	S-11F	H-349-10	21.7-22.0	Cocconeis placentula	Bacillariophyta	6	1.43	
Lake Washington	S-11F	H-349-10	21.7-22.0	Cyclotella ocellata	Bacillariophyta	9	2.14	
Lake Washington	S-11F	H-349-10	21.7-22.0	Encyonema caespitosum	Bacillariophyta	1	0.24	
Lake Washington	S-11F	H-349-10	21.7-22.0	Fragilaria crotonensis	Bacillariophyta	62	14.73	
Lake Washington	S-11F	H-349-10	21.7-22.0	Gomphonema clevei	Bacillariophyta	1	0.24	
Lake Washington	S-11F	H-349-10	21.7-22.0	Navicula reinhardtii	Bacillariophyta	1	0.24	
Lake Washington	S-11F	H-349-10	21.7-22.0	Nitzschia palea	Bacillariophyta	1	0.24	
Lake Washington	S-11F	H-349-10	21.7-22.0	Pseudostaurosira brevistriata	Bacillariophyta	6	1.43	
Lake Washington	S-11F	H-349-10	21.7-22.0	Staurosira construens	Bacillariophyta	2	0.48	
Lake Washington	S-11F	H-349-10	21.7-22.0	Staurosirella pinnata	Bacillariophyta	1	0.24	
Lake Washington	S-11F	H-349-10	21.7-22.0	Stephanocyclus meneghiniana	Bacillariophyta	3	0.71	
Lake Washington	S-11F	H-349-10	21.7-22.0	Stephanodiscus minutulus	Bacillariophyta	3	0.71	
Lake Washington	S-11F	H-349-10	21.7-22.0	Stephanodiscus niagarae	Bacillariophyta	31	7.36	
Lake Washington	S-11F	H-349-10	21.7-22.0	Stephanodiscus subtranssylvanicus	Bacillariophyta	65	15.44	
Lake Washington	S-11F	H-349-10	21.7-22.0	Ulnaria delicatissima	Bacillariophyta	1	0.24	
Lake Washington	S-11F	H-349-10	21.7-22.0	Ulnaria ulna	Bacillariophyta	1	0.24	
				Total		421		

Raw Diatom Report 1

BASIN	STATION	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	MARINE=M
Lake Washington	S-12B	H-349-10	22-24	Asterionella formosa	Bacillariophyta	13	3.09	
Lake Washington	S-12B	H-349-10	22-24	Aulacoseira crassipunctata	Bacillariophyta	30	7.13	
Lake Washington	S-12B	H-349-10	22-24	Aulacoseira islandica	Bacillariophyta	57	13.54	
Lake Washington	S-12B	H-349-10	22-24	Aulacoseira subarctica	Bacillariophyta	77	18.29	
Lake Washington	S-12B	H-349-10	22-24	Cocconeis placentula	Bacillariophyta	2	0.48	
Lake Washington	S-12B	H-349-10	22-24	Cyclotella ocellata	Bacillariophyta	11	2.61	
Lake Washington	S-12B	H-349-10	22-24	Discostella pseudostelligera	Bacillariophyta	1	0.24	
Lake Washington	S-12B	H-349-10	22-24	Epithemia turgida	Bacillariophyta	1	0.24	
Lake Washington	S-12B	H-349-10	22-24	Fragilaria crotonensis	Bacillariophyta	88	20.90	
Lake Washington	S-12B	H-349-10	22-24	Fragilaria vaucheriae	Bacillariophyta	6	1.43	
Lake Washington	S-12B	H-349-10	22-24	Planothidium oestrupii	Bacillariophyta	1	0.24	
Lake Washington	S-12B	H-349-10	22-24	Pseudostaurosira brevistriata	Bacillariophyta	4	0.95	
Lake Washington	S-12B	H-349-10	22-24	Pseudostaurosira pseudoconstruens	Bacillariophyta	1	0.24	
Lake Washington	S-12B	H-349-10	22-24	Puncticulata bodanica	Bacillariophyta	5	1.19	
Lake Washington	S-12B	H-349-10	22-24	Staurosira construens	Bacillariophyta	2	0.48	
Lake Washington	S-12B	H-349-10	22-24	Staurosira construens var. binodis	Bacillariophyta	1	0.24	
Lake Washington	S-12B	H-349-10	22-24	Staurosirella pinnata	Bacillariophyta	1	0.24	
Lake Washington	S-12B	H-349-10	22-24	Stephanodiscus alpinus	Bacillariophyta	5	1.19	
Lake Washington	S-12B	H-349-10	22-24	Stephanodiscus minutulus	Bacillariophyta	3	0.71	
Lake Washington	S-12B	H-349-10	22-24	Stephanodiscus niagarae	Bacillariophyta	5	1.19	
Lake Washington	S-12B	H-349-10	22-24	Stephanodiscus subtranssylvanicus	Bacillariophyta	103	24.47	
Lake Washington	S-12B	H-349-10	22-24	Ulnaria ulna	Bacillariophyta	4	0.95	
				Total		421		

Raw Diatom Report 1

BASIN	STATION	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	MARINE=M
Lake Washington	S-13	H-349-10	24-26	Achnanthes joursacense	Bacillariophyta	1	0.23	
Lake Washington	S-13	H-349-10	24-26	Achnanthes ziegleri	Bacillariophyta	1	0.23	
Lake Washington	S-13	H-349-10	24-26	Asterionella formosa	Bacillariophyta	13	3.01	
Lake Washington	S-13	H-349-10	24-26	Aulacoseira subarctica	Bacillariophyta	35	8.10	
Lake Washington	S-13	H-349-10	24-26	Cocconeis placentula	Bacillariophyta	7	1.62	
Lake Washington	S-13	H-349-10	24-26	Cyclotella caspia	Bacillariophyta	1	0.23	
Lake Washington	S-13	H-349-10	24-26	Cyclotella ocellata	Bacillariophyta	4	0.93	
Lake Washington	S-13	H-349-10	24-26	Cyclotella radiosa	Bacillariophyta	6	1.39	
Lake Washington	S-13	H-349-10	24-26	Discostella pseudostelligera	Bacillariophyta	4	0.93	
Lake Washington	S-13	H-349-10	24-26	Fragilaria crotonensis	Bacillariophyta	5	1.16	
Lake Washington	S-13	H-349-10	24-26	Navicula cryptotenella	Bacillariophyta	2	0.46	
Lake Washington	S-13	H-349-10	24-26	Navicula margalithii	Bacillariophyta	4	0.93	
Lake Washington	S-13	H-349-10	24-26	Navicula radiosa	Bacillariophyta	6	1.39	
Lake Washington	S-13	H-349-10	24-26	Nitzschia microcephala	Bacillariophyta	3	0.69	
Lake Washington	S-13	H-349-10	24-26	Planothidium delicatulum	Bacillariophyta	2	0.46	
Lake Washington	S-13	H-349-10	24-26	Planothidium lanceolatum	Bacillariophyta	3	0.69	
Lake Washington	S-13	H-349-10	24-26	Pseudostaurosira brevistriata	Bacillariophyta	6	1.39	
Lake Washington	S-13	H-349-10	24-26	Staurosira oldenburgiana	Bacillariophyta	2	0.46	
Lake Washington	S-13	H-349-10	24-26	Staurosirella lapponica	Bacillariophyta	4	0.93	
Lake Washington	S-13	H-349-10	24-26	Staurosirella pinnata	Bacillariophyta	2	0.46	
Lake Washington	S-13	H-349-10	24-26	Stephanodiscus alpinus	Bacillariophyta	29	6.71	
Lake Washington	S-13	H-349-10	24-26	Stephanodiscus hantzschii	Bacillariophyta	17	3.94	
Lake Washington	S-13	H-349-10	24-26	Stephanodiscus medius	Bacillariophyta	136	31.48	
Lake Washington	S-13	H-349-10	24-26	Stephanodiscus minutulus	Bacillariophyta	75	17.36	
Lake Washington	S-13	H-349-10	24-26	Stephanodiscus niagarae	Bacillariophyta	28	6.48	
Lake Washington	S-13	H-349-10	24-26	Stephanodiscus parvus	Bacillariophyta	21	4.86	
Lake Washington	S-13	H-349-10	24-26	Tabellaria flocculosa	Bacillariophyta	3	0.69	
Lake Washington	S-13	H-349-10	24-26	Ulnaria ulna	Bacillariophyta	12	2.78	
				Total		432		

Raw Diatom Report 1

BASIN	STATION	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	MARINE=M
Lake Washington	S-14A	H-349-10	26.3	Aulacoseira crassipunctata	Bacillariophyta	2	0.49	
Lake Washington	S-14A	H-349-10	26.3	Aulacoseira subarctica	Bacillariophyta	12	2.92	
Lake Washington	S-14A	H-349-10	26.3	Azpeitia spp.	Bacillariophyta	22	5.35	M
Lake Washington	S-14A	H-349-10	26.3	Chaetoceros didymus	Bacillariophyta	4	0.97	M
Lake Washington	S-14A	H-349-10	26.3	Chaetoceros sp. (resting spore)	Bacillariophyta	22	5.35	M
Lake Washington	S-14A	H-349-10	26.3	Cocconeis placentula	Bacillariophyta	4	0.97	
Lake Washington	S-14A	H-349-10	26.3	Coscinodiscus spp.	Bacillariophyta	23	5.60	M
Lake Washington	S-14A	H-349-10	26.3	Cyclotella ocellata	Bacillariophyta	6	1.46	
Lake Washington	S-14A	H-349-10	26.3	Cyclotella praetermissa	Bacillariophyta	3	0.73	
Lake Washington	S-14A	H-349-10	26.3	Cyclotella sp.	Bacillariophyta	3	0.73	
Lake Washington	S-14A	H-349-10	26.3	Discostella pseudostelligera	Bacillariophyta	2	0.49	
Lake Washington	S-14A	H-349-10	26.3	Fragilaria crotonensis	Bacillariophyta	19	4.62	
Lake Washington	S-14A	H-349-10	26.3	Gomphonema sp.	Bacillariophyta	4	0.97	
Lake Washington	S-14A	H-349-10	26.3	Navicula sp.	Bacillariophyta	1	0.24	
Lake Washington	S-14A	H-349-10	26.3	Pseudostaurosira brevistriata	Bacillariophyta	8	1.95	
Lake Washington	S-14A	H-349-10	26.3	Staurosira elliptica	Bacillariophyta	4	0.97	
Lake Washington	S-14A	H-349-10	26.3	Staurosirella lapponica	Bacillariophyta	6	1.46	
Lake Washington	S-14A	H-349-10	26.3	Stephanocyclus meneghiniana	Bacillariophyta	2	0.49	
Lake Washington	S-14A	H-349-10	26.3	Stephanodiscus niagarae	Bacillariophyta	2	0.49	
Lake Washington	S-14A	H-349-10	26.3	Stephanophyxis sp. (resting spore)	Bacillariophyta	60	14.60	M
Lake Washington	S-14A	H-349-10	26.3	Thalassionema spp.	Bacillariophyta	200	48.66	M
Lake Washington	S-14A	H-349-10	26.3	Ulnaria ulna	Bacillariophyta	2	0.49	
				Total		411		
						0.487		

Raw Diatom Report 2

BASIN	SAMPLE No.	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	NOTES
H-488-10								
Lake Washington	L-1C	H-488-10	0.9	Achnantheiopsis distincta	Bacillariophyta	5	1.02	
Lake Washington	L-1C	H-488-10	0.9	Achnanthidium exiguum	Bacillariophyta	1	0.20	
Lake Washington	L-1C	H-488-10	0.9	Achnanthidium minutissimum	Bacillariophyta	1	0.20	
Lake Washington	L-1C	H-488-10	0.9	Achnanthidium ventralis	Bacillariophyta	1	0.20	
Lake Washington	L-1C	H-488-10	0.9	Aulacoseira crenulata	Bacillariophyta	2	0.41	
Lake Washington	L-1C	H-488-10	0.9	Aulacoseira subarctica	Bacillariophyta	10	2.04	
Lake Washington	L-1C	H-488-10	0.9	Cocconeis placentula	Bacillariophyta	1	0.20	
Lake Washington	L-1C	H-488-10	0.9	Cyclotella michiganiana	Bacillariophyta	1	0.20	
Lake Washington	L-1C	H-488-10	0.9	Epithemia sp.	Bacillariophyta	1	0.20	
Lake Washington	L-1C	H-488-10	0.9	Fragilaria nitzschioides	Bacillariophyta	1	0.20	
Lake Washington	L-1C	H-488-10	0.9	Martyana martyii	Bacillariophyta	4	0.82	
Lake Washington	L-1C	H-488-10	0.9	Nitzschia inconspicua	Bacillariophyta	1	0.20	
Lake Washington	L-1C	H-488-10	0.9	Planothidium conspicuum	Bacillariophyta	3	0.61	
Lake Washington	L-1C	H-488-10	0.9	Planothidium lanceolatum	Bacillariophyta	1	0.20	
Lake Washington	L-1C	H-488-10	0.9	Pseudostaurosira brevistriata	Bacillariophyta	34	6.95	
Lake Washington	L-1C	H-488-10	0.9	Pseudostaurosira pseudoconstruens	Bacillariophyta	9	1.84	
Lake Washington	L-1C	H-488-10	0.9	Puncticulata bodanica	Bacillariophyta	1	0.20	
Lake Washington	L-1C	H-488-10	0.9	Sellaphora pupula	Bacillariophyta	1	0.20	
Lake Washington	L-1C	H-488-10	0.9	Staurosira construens	Bacillariophyta	202	41.31	
Lake Washington	L-1C	H-488-10	0.9	Staurosira construens var. binodis	Bacillariophyta	4	0.82	
Lake Washington	L-1C	H-488-10	0.9	Staurosira construens var. venter	Bacillariophyta	37	7.57	
Lake Washington	L-1C	H-488-10	0.9	Staurosira elliptica	Bacillariophyta	91	18.61	
Lake Washington	L-1C	H-488-10	0.9	Staurosira oldenburgiana	Bacillariophyta	2	0.41	
Lake Washington	L-1C	H-488-10	0.9	Staurosirella pinnata	Bacillariophyta	68	13.91	
Lake Washington	L-1C	H-488-10	0.9	Stephanodiscus medius	Bacillariophyta	3	0.61	
Lake Washington	L-1C	H-488-10	0.9	Stephanodiscus niagarae	Bacillariophyta	2	0.41	
Lake Washington	L-1C	H-488-10	0.9	Synedra cyclopum	Bacillariophyta	1	0.20	
Lake Washington	L-1C	H-488-10	0.9	Ulnaria ulna	Bacillariophyta	1	0.20	
				Total		**489**		

Raw Diatom Report 2

BASIN	SAMPLE No.	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	NOTES
Lake Washington	L-4D	H-488-10	7.7	Achnanthes rupestoides	Bacillariophyta	3	0.66	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Aulacoseira crenulata	Bacillariophyta	85	18.72	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Aulacoseira subarctica	Bacillariophyta	12	2.64	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Diatoma ehrenbergii	Bacillariophyta	1	0.22	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Encyonema silesiacum	Bacillariophyta	1	0.22	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Eunotia bilunaris	Bacillariophyta	3	0.66	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Eunotia glacialis	Bacillariophyta	154	33.92	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Eunotia implicata	Bacillariophyta	29	6.39	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Eunotia praerupta	Bacillariophyta	7	1.54	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Eunotia soleirolii	Bacillariophyta	28	6.17	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Gomphonema angustatum	Bacillariophyta	10	2.20	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Gomphonema contraturris	Bacillariophyta	13	2.86	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Gomphonema gracile	Bacillariophyta	10	2.20	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Gomphonema minutum	Bacillariophyta	2	0.44	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Meridion circulare var. constrictum	Bacillariophyta	9	1.98	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Naviculadicta parasemen	Bacillariophyta	1	0.22	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Nitzschia sp.	Bacillariophyta	5	1.10	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Pinnularia acrosphaeria	Bacillariophyta	1	0.22	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Pinnularia brevicostata	Bacillariophyta	6	1.32	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Pinnularia esoxiformis var. eifeliana	Bacillariophyta	8	1.76	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Pinnularia viridis	Bacillariophyta	46	10.13	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Planothidium lanceolatum	Bacillariophyta	6	1.32	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Stauroneis sp.	Bacillariophyta	2	0.44	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Staurosira construens var. venter	Bacillariophyta	4	0.88	many large, broken frustules
Lake Washington	L-4D	H-488-10	7.7	Ulnaria ulna	Bacillariophyta	8	1.76	many large, broken frustules
				Total		**454**		

Raw Diatom Report 2

BASIN	SAMPLE No.	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	NOTES
Lake Washington	L-8C	H-488-10	15.7	Achnanthes rupestoides	Bacillariophyta	2	0.49	
Lake Washington	L-8C	H-488-10	15.7	Aulacoseira crenulata	Bacillariophyta	157	38.48	
Lake Washington	L-8C	H-488-10	15.7	Aulacoseira muzzanensis	Bacillariophyta	8	1.96	
Lake Washington	L-8C	H-488-10	15.7	Aulacoseira sp.	Bacillariophyta	4	0.98	
Lake Washington	L-8C	H-488-10	15.7	Aulacoseira subarctica	Bacillariophyta	94	23.04	
Lake Washington	L-8C	H-488-10	15.7	Encyonema silesiacum	Bacillariophyta	9	2.21	
Lake Washington	L-8C	H-488-10	15.7	Eunotia arcus	Bacillariophyta	3	0.74	
Lake Washington	L-8C	H-488-10	15.7	Eunotia exigua	Bacillariophyta	1	0.25	
Lake Washington	L-8C	H-488-10	15.7	Eunotia flexuosa	Bacillariophyta	12	2.94	
Lake Washington	L-8C	H-488-10	15.7	Eunotia glacialis	Bacillariophyta	12	2.94	
Lake Washington	L-8C	H-488-10	15.7	Eunotia implicata	Bacillariophyta	6	1.47	
Lake Washington	L-8C	H-488-10	15.7	Eunotia praerupta	Bacillariophyta	2	0.49	
Lake Washington	L-8C	H-488-10	15.7	Fragilaria capucina	Bacillariophyta	2	0.49	
Lake Washington	L-8C	H-488-10	15.7	Gomphonema angustatum	Bacillariophyta	2	0.49	
Lake Washington	L-8C	H-488-10	15.7	Gomphonema contraturris	Bacillariophyta	2	0.49	
Lake Washington	L-8C	H-488-10	15.7	Gomphonema gracile	Bacillariophyta	6	1.47	
Lake Washington	L-8C	H-488-10	15.7	Gomphonema sp.	Bacillariophyta	1	0.25	
Lake Washington	L-8C	H-488-10	15.7	Meridion circulare var. constrictum	Bacillariophyta	3	0.74	
Lake Washington	L-8C	H-488-10	15.7	Navicula leptostriata	Bacillariophyta	4	0.98	
Lake Washington	L-8C	H-488-10	15.7	Nitzschia amphibia	Bacillariophyta	1	0.25	
Lake Washington	L-8C	H-488-10	15.7	Pinnularia brevicostata	Bacillariophyta	7	1.72	
Lake Washington	L-8C	H-488-10	15.7	Pinnularia interrupta	Bacillariophyta	6	1.47	
Lake Washington	L-8C	H-488-10	15.7	Pinnularia viridis	Bacillariophyta	11	2.70	
Lake Washington	L-8C	H-488-10	15.7	Pseudostaurosira brevistriata	Bacillariophyta	13	3.19	
Lake Washington	L-8C	H-488-10	15.7	Pseudostaurosira pseudoconstruens	Bacillariophyta	1	0.25	
Lake Washington	L-8C	H-488-10	15.7	Sellaphora alastos	Bacillariophyta	2	0.49	
Lake Washington	L-8C	H-488-10	15.7	Sellaphora pupula	Bacillariophyta	1	0.25	
Lake Washington	L-8C	H-488-10	15.7	Sellaphora rectangularis	Bacillariophyta	19	4.66	
Lake Washington	L-8C	H-488-10	15.7	Stauroneis anceps	Bacillariophyta	1	0.25	
Lake Washington	L-8C	H-488-10	15.7	Stauroneis javanica	Bacillariophyta	2	0.49	
Lake Washington	L-8C	H-488-10	15.7	Stauroneis kriegeri	Bacillariophyta	8	1.96	
Lake Washington	L-8C	H-488-10	15.7	Staurosira elliptica	Bacillariophyta	1	0.25	
Lake Washington	L-8C	H-488-10	15.7	Staurosirella lapponica	Bacillariophyta	4	0.98	
Lake Washington	L-8C	H-488-10	15.7	Ulnaria delicatissima	Bacillariophyta	1	0.25	
				Total		**408**		

Raw Diatom Report 2

BASIN	SAMPLE No.	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	NOTES
Lake Washington	F-11C	H-488-10	22	Achnanthidium exiguum	Bacillariophyta	1	0.21	
Lake Washington	F-11C	H-488-10	22	Amphora ovalis	Bacillariophyta	4	0.83	
Lake Washington	F-11C	H-488-10	22	Aulacoseira crenulata	Bacillariophyta	259	53.73	
Lake Washington	F-11C	H-488-10	22	Aulacoseira subarctica	Bacillariophyta	8	1.66	
Lake Washington	F-11C	H-488-10	22	Diploneis elliptica	Bacillariophyta	2	0.41	
Lake Washington	F-11C	H-488-10	22	Encyonema minutum	Bacillariophyta	1	0.21	
Lake Washington	F-11C	H-488-10	22	Eunotia glacialis	Bacillariophyta	26	5.39	
Lake Washington	F-11C	H-488-10	22	Eunotia implicata	Bacillariophyta	21	4.36	
Lake Washington	F-11C	H-488-10	22	Eunotia naegelii	Bacillariophyta	1	0.21	
Lake Washington	F-11C	H-488-10	22	Eunotia nymanniana	Bacillariophyta	1	0.21	
Lake Washington	F-11C	H-488-10	22	Eunotia praerupta	Bacillariophyta	2	0.41	
Lake Washington	F-11C	H-488-10	22	Eunotia trigibba	Bacillariophyta	2	0.41	
Lake Washington	F-11C	H-488-10	22	Fragilariaforma bicapitata	Bacillariophyta	7	1.45	
Lake Washington	F-11C	H-488-10	22	Gomphonema angustatum	Bacillariophyta	4	0.83	
Lake Washington	F-11C	H-488-10	22	Gomphonema bohemicum	Bacillariophyta	3	0.62	
Lake Washington	F-11C	H-488-10	22	Gomphonema contraturris	Bacillariophyta	4	0.83	
Lake Washington	F-11C	H-488-10	22	Gomphonema gracile	Bacillariophyta	8	1.66	
Lake Washington	F-11C	H-488-10	22	Gomphonema pumilum	Bacillariophyta	4	0.83	
Lake Washington	F-11C	H-488-10	22	Gomphonema truncatum	Bacillariophyta	6	1.24	
Lake Washington	F-11C	H-488-10	22	Hantzschia sp.	Bacillariophyta	2	0.41	
Lake Washington	F-11C	H-488-10	22	Meridion circulare var. constrictum	Bacillariophyta	2	0.41	
Lake Washington	F-11C	H-488-10	22	Navicula radiosa	Bacillariophyta	2	0.41	
Lake Washington	F-11C	H-488-10	22	Nitzschia sp.	Bacillariophyta	2	0.41	
Lake Washington	F-11C	H-488-10	22	Pinnularia acrosphaeria	Bacillariophyta	2	0.41	
Lake Washington	F-11C	H-488-10	22	Pinnularia brevicostata	Bacillariophyta	4	0.83	
Lake Washington	F-11C	H-488-10	22	Pinnularia interrupta	Bacillariophyta	4	0.83	
Lake Washington	F-11C	H-488-10	22	Pinnularia nobilis	Bacillariophyta	1	0.21	
Lake Washington	F-11C	H-488-10	22	Pinnularia nodosa	Bacillariophyta	2	0.41	
Lake Washington	F-11C	H-488-10	22	Pinnularia viridis	Bacillariophyta	8	1.66	
Lake Washington	F-11C	H-488-10	22	Planothidium lanceolatum	Bacillariophyta	31	6.43	
Lake Washington	F-11C	H-488-10	22	Planothidium rostratum	Bacillariophyta	2	0.41	
Lake Washington	F-11C	H-488-10	22	Pseudostaurosira brevistriata	Bacillariophyta	28	5.81	
Lake Washington	F-11C	H-488-10	22	Pseudostaurosira parasitica	Bacillariophyta	2	0.41	
Lake Washington	F-11C	H-488-10	22	Sellaphora rectangularis	Bacillariophyta	9	1.87	
Lake Washington	F-11C	H-488-10	22	Stauroneis kriegeri	Bacillariophyta	6	1.24	
Lake Washington	F-11C	H-488-10	22	Staurosira construens	Bacillariophyta	4	0.83	
Lake Washington	F-11C	H-488-10	22	Staurosirella pinnata	Bacillariophyta	6	1.24	
Lake Washington	F-11C	H-488-10	22	Ulnaria ulna	Bacillariophyta	1	0.21	
				Total		**482**		

Raw Diatom Report 2

BASIN	SAMPLE No.	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	NOTES
Lake Washington	L-16C	H-488-10	31.2	Aulacoseira crenulata	Bacillariophyta	151	32.83	
Lake Washington	L-16C	H-488-10	31.2	Aulacoseira subarctica	Bacillariophyta	74	16.09	
Lake Washington	L-16C	H-488-10	31.2	Aulacoseira sp.	Bacillariophyta	6	1.30	
Lake Washington	L-16C	H-488-10	31.2	Aulacoseira tethera	Bacillariophyta	45	9.78	
Lake Washington	L-16C	H-488-10	31.2	Diadesmis contenta	Bacillariophyta	1	0.22	
Lake Washington	L-16C	H-488-10	31.2	Diploneis finnica	Bacillariophyta	1	0.22	
Lake Washington	L-16C	H-488-10	31.2	Encyonema gracile	Bacillariophyta	1	0.22	
Lake Washington	L-16C	H-488-10	31.2	Encyonema minutum	Bacillariophyta	4	0.87	
Lake Washington	L-16C	H-488-10	31.2	Encyonema silesiacum	Bacillariophyta	2	0.43	
Lake Washington	L-16C	H-488-10	31.2	Eunotia glacialis	Bacillariophyta	37	8.04	
Lake Washington	L-16C	H-488-10	31.2	Eunotia implicata	Bacillariophyta	7	1.52	
Lake Washington	L-16C	H-488-10	31.2	Eunotia monodon	Bacillariophyta	1	0.22	
Lake Washington	L-16C	H-488-10	31.2	Eunotia praerupta	Bacillariophyta	2	0.43	
Lake Washington	L-16C	H-488-10	31.2	Fragilariaforma bicapitata	Bacillariophyta	1	0.22	
Lake Washington	L-16C	H-488-10	31.2	Gomphonema gracile	Bacillariophyta	1	0.22	
Lake Washington	L-16C	H-488-10	31.2	Gomphonema parvulum	Bacillariophyta	1	0.22	
Lake Washington	L-16C	H-488-10	31.2	Meridion circulare var. constrictum	Bacillariophyta	1	0.22	
Lake Washington	L-16C	H-488-10	31.2	Navicula lanceolata	Bacillariophyta	2	0.43	
Lake Washington	L-16C	H-488-10	31.2	Nitzschia hantzschiana	Bacillariophyta	1	0.22	
Lake Washington	L-16C	H-488-10	31.2	Pinnularia gibba	Bacillariophyta	1	0.22	
Lake Washington	L-16C	H-488-10	31.2	Pinnularia interrupta	Bacillariophyta	1	0.22	
Lake Washington	L-16C	H-488-10	31.2	Pinnularia streptoraphe	Bacillariophyta	1	0.22	
Lake Washington	L-16C	H-488-10	31.2	Pinnularia viridis	Bacillariophyta	4	0.87	
Lake Washington	L-16C	H-488-10	31.2	Planothidium lanceolatum	Bacillariophyta	3	0.65	
Lake Washington	L-16C	H-488-10	31.2	Planothidium rostratum	Bacillariophyta	2	0.43	
Lake Washington	L-16C	H-488-10	31.2	Psammothidium subatomoides	Bacillariophyta	1	0.22	
Lake Washington	L-16C	H-488-10	31.2	Pseudostaurosira brevistriata	Bacillariophyta	69	15.00	
Lake Washington	L-16C	H-488-10	31.2	Pseudostaurosira pseudoconstruens	Bacillariophyta	19	4.13	
Lake Washington	L-16C	H-488-10	31.2	Sellaphora americana	Bacillariophyta	1	0.22	
Lake Washington	L-16C	H-488-10	31.2	Sellaphora rectangularis	Bacillariophyta	8	1.74	
Lake Washington	L-16C	H-488-10	31.2	Stauroneis kriegeri	Bacillariophyta	1	0.22	
Lake Washington	L-16C	H-488-10	31.2	Staurosira construens var. venter	Bacillariophyta	2	0.43	
Lake Washington	L-16C	H-488-10	31.2	Staurosirella pinnata	Bacillariophyta	7	1.52	
Lake Washington	L-16C	H-488-10	31.2	Ulnaria ulna	Bacillariophyta	1	0.22	
				Total		**460**		

Raw Diatom Report 2

BASIN	SAMPLE No.	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	NOTES
Lake Washington	L-20D	H-488-10	38.9	Aulacoseira crenulata	Bacillariophyta	42	8.94	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Aulacoseira sp.	Bacillariophyta	2	0.43	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Cyclotella ocellata	Bacillariophyta	10	2.13	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Diploneis elliptica	Bacillariophyta	27	5.74	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Diploneis sp.	Bacillariophyta	28	5.96	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Epithemia sp.	Bacillariophyta	4	0.85	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Eunotia arculus	Bacillariophyta	1	0.21	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Eunotia glacialis	Bacillariophyta	54	11.49	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Eunotia monodon	Bacillariophyta	4	0.85	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Eunotia praerupta	Bacillariophyta	3	0.64	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Eunotia sp.	Bacillariophyta	31	6.60	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Fragilaria nitzschioides	Bacillariophyta	6	1.28	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Gomphonema sp.	Bacillariophyta	10	2.13	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Hantzschia sp.	Bacillariophyta	52	11.06	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Luticola goeppertiana	Bacillariophyta	8	1.70	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Meridion circulare var. constrictum	Bacillariophyta	8	1.70	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Naviculadicta sp.	Bacillariophyta	1	0.21	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Pinnularia borealis	Bacillariophyta	1	0.21	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Pinnularia brevicostata	Bacillariophyta	3	0.64	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Pinnularia gibba	Bacillariophyta	1	0.21	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Pinnularia sp.	Bacillariophyta	132	28.09	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Pinnularia streptoraphe	Bacillariophyta	9	1.91	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Pinnularia viridis	Bacillariophyta	8	1.70	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Planothidium lanceolatum	Bacillariophyta	2	0.43	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Planothidium rostratum	Bacillariophyta	3	0.64	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Sellaphora americana	Bacillariophyta	2	0.43	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Sellaphora rectangularis	Bacillariophyta	2	0.43	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Stauroneis sp.	Bacillariophyta	10	2.13	many diatoms are broken, few completely intact frustules, low cell density
Lake Washington	L-20D	H-488-10	38.9	Ulnaria ulna	Bacillariophyta	6	1.28	many diatoms are broken, few completely intact frustules, low cell density
				Total		**470**		

Raw Diatom Report 2

BASIN	SAMPLE No.	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	NOTES
H-500-10								
Lake Washington	L-1E	H-500-10	1.3	Achnanthes submarina	Bacillariophyta	1	0.22	
Lake Washington	L-1E	H-500-10	1.3	Achnanthidium exiguum	Bacillariophyta	1	0.22	
Lake Washington	L-1E	H-500-10	1.3	Achnanthidium ventralis	Bacillariophyta	1	0.22	
Lake Washington	L-1E	H-500-10	1.3	Aulacoseira crenulata	Bacillariophyta	11	2.45	
Lake Washington	L-1E	H-500-10	1.3	Cyclotella ocellata	Bacillariophyta	1	0.22	
Lake Washington	L-1E	H-500-10	1.3	Encyonema sp.	Bacillariophyta	1	0.22	
Lake Washington	L-1E	H-500-10	1.3	Eunotia incisa	Bacillariophyta	1	0.22	
Lake Washington	L-1E	H-500-10	1.3	Eunotia sp.	Bacillariophyta	1	0.22	
Lake Washington	L-1E	H-500-10	1.3	Pinnularia sp.	Bacillariophyta	1	0.22	
Lake Washington	L-1E	H-500-10	1.3	Pinnularia streptoraphe	Bacillariophyta	1	0.22	
Lake Washington	L-1E	H-500-10	1.3	Planothidium conspicuum	Bacillariophyta	1	0.22	
Lake Washington	L-1E	H-500-10	1.3	Planothidium frequentissimum	Bacillariophyta	1	0.22	
Lake Washington	L-1E	H-500-10	1.3	Planothidium granum	Bacillariophyta	1	0.22	
Lake Washington	L-1E	H-500-10	1.3	Planothidium oestrupii	Bacillariophyta	1	0.22	
Lake Washington	L-1E	H-500-10	1.3	Planothidium sp.	Bacillariophyta	2	0.45	
Lake Washington	L-1E	H-500-10	1.3	Psammothidium sacculum	Bacillariophyta	2	0.45	
Lake Washington	L-1E	H-500-10	1.3	Pseudostaurosira brevistriata	Bacillariophyta	19	4.23	
Lake Washington	L-1E	H-500-10	1.3	Pseudostaurosira pseudoconstruens	Bacillariophyta	22	4.90	
Lake Washington	L-1E	H-500-10	1.3	Staurosira construens	Bacillariophyta	77	17.15	
Lake Washington	L-1E	H-500-10	1.3	Staurosira construens var. binodis	Bacillariophyta	8	1.78	
Lake Washington	L-1E	H-500-10	1.3	Staurosira construens var. venter	Bacillariophyta	83	18.49	
Lake Washington	L-1E	H-500-10	1.3	Staurosira elliptica	Bacillariophyta	6	1.34	
Lake Washington	L-1E	H-500-10	1.3	Staurosira oldenburgiana	Bacillariophyta	2	0.45	
Lake Washington	L-1E	H-500-10	1.3	Staurosirella lapponica	Bacillariophyta	7	1.56	
Lake Washington	L-1E	H-500-10	1.3	Staurosirella pinnata	Bacillariophyta	190	42.32	
Lake Washington	L-1E	H-500-10	1.3	Stephanodiscus medius	Bacillariophyta	6	1.34	
Lake Washington	L-1E	H-500-10	1.3	Tabellaria flocculosa	Bacillariophyta	1	0.22	
				Total		**449**		

Raw Diatom Report 2

BASIN	SAMPLE No.	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	NOTES
Lake Washington	L-4C	H-500-10	7.2	Aulacoseira crenulata	Bacillariophyta	26	5.90	
Lake Washington	L-4C	H-500-10	7.2	Aulacoseira subarctica	Bacillariophyta	34	7.71	
Lake Washington	L-4C	H-500-10	7.2	Aulacoseira tethera	Bacillariophyta	25	5.67	
Lake Washington	L-4C	H-500-10	7.2	Cocconeis placentula	Bacillariophyta	3	0.68	
Lake Washington	L-4C	H-500-10	7.2	Epithemia sp.	Bacillariophyta	2	0.45	
Lake Washington	L-4C	H-500-10	7.2	Eunotia formica	Bacillariophyta	2	0.45	
Lake Washington	L-4C	H-500-10	7.2	Eunotia glacialis	Bacillariophyta	35	7.94	
Lake Washington	L-4C	H-500-10	7.2	Eunotia implicata	Bacillariophyta	3	0.68	
Lake Washington	L-4C	H-500-10	7.2	Eunotia incisa	Bacillariophyta	43	9.75	
Lake Washington	L-4C	H-500-10	7.2	Eunotia monodon	Bacillariophyta	1	0.23	
Lake Washington	L-4C	H-500-10	7.2	Eunotia soleirolii	Bacillariophyta	1	0.23	
Lake Washington	L-4C	H-500-10	7.2	Eunotia sp.	Bacillariophyta	1	0.23	
Lake Washington	L-4C	H-500-10	7.2	Gomphonema gracile	Bacillariophyta	17	3.85	
Lake Washington	L-4C	H-500-10	7.2	Gomphonema minutum	Bacillariophyta	1	0.23	
Lake Washington	L-4C	H-500-10	7.2	Gomphonema parvulum	Bacillariophyta	1	0.23	
Lake Washington	L-4C	H-500-10	7.2	Gomphonema sagitta	Bacillariophyta	1	0.23	
Lake Washington	L-4C	H-500-10	7.2	Gomphonema sp.	Bacillariophyta	2	0.45	
Lake Washington	L-4C	H-500-10	7.2	Navicula radiosa	Bacillariophyta	1	0.23	
Lake Washington	L-4C	H-500-10	7.2	Pinnularia sp.	Bacillariophyta	4	0.91	
Lake Washington	L-4C	H-500-10	7.2	Pinnularia viridis	Bacillariophyta	6	1.36	
Lake Washington	L-4C	H-500-10	7.2	Planothidium lanceolatum	Bacillariophyta	8	1.81	
Lake Washington	L-4C	H-500-10	7.2	Planothidium rostratum	Bacillariophyta	4	0.91	
Lake Washington	L-4C	H-500-10	7.2	Pseudostaurosira brevistriata	Bacillariophyta	101	22.90	
Lake Washington	L-4C	H-500-10	7.2	Pseudostaurosira pseudoconstruens	Bacillariophyta	15	3.40	
Lake Washington	L-4C	H-500-10	7.2	Sellaphora rectangularis	Bacillariophyta	2	0.45	
Lake Washington	L-4C	H-500-10	7.2	Stauroneis kriegeri	Bacillariophyta	5	1.13	
Lake Washington	L-4C	H-500-10	7.2	Stauroneis sp.	Bacillariophyta	3	0.68	
Lake Washington	L-4C	H-500-10	7.2	Staurosira construens	Bacillariophyta	14	3.17	
Lake Washington	L-4C	H-500-10	7.2	Staurosira construens var. venter	Bacillariophyta	26	5.90	
Lake Washington	L-4C	H-500-10	7.2	Staurosira elliptica	Bacillariophyta	8	1.81	
Lake Washington	L-4C	H-500-10	7.2	Staurosirella pinnata	Bacillariophyta	36	8.16	
Lake Washington	L-4C	H-500-10	7.2	Tabellaria flocculosa	Bacillariophyta	7	1.59	
Lake Washington	L-4C	H-500-10	7.2	Ulnaria ulna	Bacillariophyta	3	0.68	
				Total		**441**		

Raw Diatom Report 2

BASIN	SAMPLE No.	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	NOTES
Lake Washington	L-8D	H-500-10	15.5	Achnanthes grischuna	Bacillariophyta	26	6.47	
Lake Washington	L-8D	H-500-10	15.5	Achnanthes sp.	Bacillariophyta	1	0.25	
Lake Washington	L-8D	H-500-10	15.5	Achnanthidium exiguum	Bacillariophyta	4	1.00	
Lake Washington	L-8D	H-500-10	15.5	Adlafia sp.	Bacillariophyta	1	0.25	
Lake Washington	L-8D	H-500-10	15.5	Amphora ovalis	Bacillariophyta	1	0.25	
Lake Washington	L-8D	H-500-10	15.5	Aulacoseira crenulata	Bacillariophyta	98	24.38	
Lake Washington	L-8D	H-500-10	15.5	Aulacoseira subarctica	Bacillariophyta	25	6.22	
Lake Washington	L-8D	H-500-10	15.5	Aulacoseira tethera	Bacillariophyta	6	1.49	
Lake Washington	L-8D	H-500-10	15.5	Cocconeis placentula	Bacillariophyta	1	0.25	
Lake Washington	L-8D	H-500-10	15.5	Cymbella neogena	Bacillariophyta	1	0.25	
Lake Washington	L-8D	H-500-10	15.5	Encyonema minutum	Bacillariophyta	5	1.24	
Lake Washington	L-8D	H-500-10	15.5	Eunotia glacialis	Bacillariophyta	8	1.99	
Lake Washington	L-8D	H-500-10	15.5	Eunotia implicata	Bacillariophyta	3	0.75	
Lake Washington	L-8D	H-500-10	15.5	Eunotia monodon	Bacillariophyta	1	0.25	
Lake Washington	L-8D	H-500-10	15.5	Eunotia praerupta	Bacillariophyta	4	1.00	
Lake Washington	L-8D	H-500-10	15.5	Eunotia sp.	Bacillariophyta	1	0.25	
Lake Washington	L-8D	H-500-10	15.5	Fragilaria capucina	Bacillariophyta	6	1.49	
Lake Washington	L-8D	H-500-10	15.5	Fragilariaforma bicapitata	Bacillariophyta	10	2.49	
Lake Washington	L-8D	H-500-10	15.5	Gomphonema clavatum	Bacillariophyta	3	0.75	
Lake Washington	L-8D	H-500-10	15.5	Gomphonema minutum	Bacillariophyta	3	0.75	
Lake Washington	L-8D	H-500-10	15.5	Gomphonema parvulum	Bacillariophyta	4	1.00	
Lake Washington	L-8D	H-500-10	15.5	Gomphonema sp.	Bacillariophyta	3	0.75	
Lake Washington	L-8D	H-500-10	15.5	Meridion circulare var. constrictum	Bacillariophyta	2	0.50	
Lake Washington	L-8D	H-500-10	15.5	Navicula cryptocephala	Bacillariophyta	3	0.75	
Lake Washington	L-8D	H-500-10	15.5	Navicula lundi	Bacillariophyta	1	0.25	
Lake Washington	L-8D	H-500-10	15.5	Nitzschia dippelii	Bacillariophyta	2	0.50	
Lake Washington	L-8D	H-500-10	15.5	Nitzschia inconspicua	Bacillariophyta	1	0.25	
Lake Washington	L-8D	H-500-10	15.5	Nitzschia littorea	Bacillariophyta	1	0.25	
Lake Washington	L-8D	H-500-10	15.5	Nitzschia perminuta	Bacillariophyta	4	1.00	
Lake Washington	L-8D	H-500-10	15.5	Nitzschia sp.	Bacillariophyta	1	0.25	
Lake Washington	L-8D	H-500-10	15.5	Nupela finnica	Bacillariophyta	1	0.25	
Lake Washington	L-8D	H-500-10	15.5	Pinnularia gibba	Bacillariophyta	1	0.25	
Lake Washington	L-8D	H-500-10	15.5	Pinnularia sp.	Bacillariophyta	4	1.00	
Lake Washington	L-8D	H-500-10	15.5	Pinnularia viridis	Bacillariophyta	4	1.00	
Lake Washington	L-8D	H-500-10	15.5	Planothidium lanceolatum	Bacillariophyta	113	28.11	
Lake Washington	L-8D	H-500-10	15.5	Planothidium rostratum	Bacillariophyta	1	0.25	
Lake Washington	L-8D	H-500-10	15.5	Psammothidium subatomoides	Bacillariophyta	4	1.00	
Lake Washington	L-8D	H-500-10	15.5	Pseudostaurosira brevistriata	Bacillariophyta	8	1.99	
Lake Washington	L-8D	H-500-10	15.5	Pseudostaurosira pseudoconstruens	Bacillariophyta	6	1.49	
Lake Washington	L-8D	H-500-10	15.5	Stauroneis kriegeri	Bacillariophyta	8	1.99	
Lake Washington	L-8D	H-500-10	15.5	Staurosira oldenburgiana	Bacillariophyta	2	0.50	
Lake Washington	L-8D	H-500-10	15.5	Staurosirella pinnata	Bacillariophyta	2	0.50	
Lake Washington	L-8D	H-500-10	15.5	Synedra tenera	Bacillariophyta	4	1.00	
Lake Washington	L-8D	H-500-10	15.5	Tabellaria sp.	Bacillariophyta	1	0.25	
Lake Washington	L-8D	H-500-10	15.5	Ulnaria ulna	Bacillariophyta	13	3.23	
				Total		**402**		

Raw Diatom Report 2

BASIN	SAMPLE No.	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	NOTES
Lake Washington	L-10B	H-500-10	19.4	Achnanthes grischuna	Bacillariophyta	4	1.00	
Lake Washington	L-10B	H-500-10	19.4	Achnanthes sp.	Bacillariophyta	3	0.75	
Lake Washington	L-10B	H-500-10	19.4	Amphipleura pellucida	Bacillariophyta	1	0.25	
Lake Washington	L-10B	H-500-10	19.4	Aulacoseira crenulata	Bacillariophyta	69	17.21	
Lake Washington	L-10B	H-500-10	19.4	Aulacoseira subarctica	Bacillariophyta	22	5.49	
Lake Washington	L-10B	H-500-10	19.4	Aulacoseira tethera	Bacillariophyta	4	1.00	
Lake Washington	L-10B	H-500-10	19.4	Cocconeis placentula	Bacillariophyta	19	4.74	
Lake Washington	L-10B	H-500-10	19.4	Diploneis elliptica	Bacillariophyta	2	0.50	
Lake Washington	L-10B	H-500-10	19.4	Epithemia turgida	Bacillariophyta	2	0.50	
Lake Washington	L-10B	H-500-10	19.4	Eunotia formica	Bacillariophyta	2	0.50	
Lake Washington	L-10B	H-500-10	19.4	Eunotia glacialis	Bacillariophyta	23	5.74	
Lake Washington	L-10B	H-500-10	19.4	Eunotia implicata	Bacillariophyta	9	2.24	
Lake Washington	L-10B	H-500-10	19.4	Eunotia naegelii	Bacillariophyta	2	0.50	
Lake Washington	L-10B	H-500-10	19.4	Eunotia soleirolii	Bacillariophyta	2	0.50	
Lake Washington	L-10B	H-500-10	19.4	Eunotia sp.	Bacillariophyta	5	1.25	
Lake Washington	L-10B	H-500-10	19.4	Fragilaria capucina var. gracilis	Bacillariophyta	5	1.25	
Lake Washington	L-10B	H-500-10	19.4	Fragilariaforma bicapitata	Bacillariophyta	4	1.00	
Lake Washington	L-10B	H-500-10	19.4	Gomphonema gracile	Bacillariophyta	8	2.00	
Lake Washington	L-10B	H-500-10	19.4	Gomphonema minutum	Bacillariophyta	10	2.49	
Lake Washington	L-10B	H-500-10	19.4	Gomphonema parvulum	Bacillariophyta	8	2.00	
Lake Washington	L-10B	H-500-10	19.4	Gomphonema sp.	Bacillariophyta	3	0.75	
Lake Washington	L-10B	H-500-10	19.4	Gomphonema ventricosum	Bacillariophyta	4	1.00	
Lake Washington	L-10B	H-500-10	19.4	Hantzschia elongata	Bacillariophyta	4	1.00	
Lake Washington	L-10B	H-500-10	19.4	Hantzschia sp.	Bacillariophyta	1	0.25	
Lake Washington	L-10B	H-500-10	19.4	Melosira varians	Bacillariophyta	24	5.99	
Lake Washington	L-10B	H-500-10	19.4	Navicula krammerae	Bacillariophyta	1	0.25	
Lake Washington	L-10B	H-500-10	19.4	Navicula sp.	Bacillariophyta	1	0.25	
Lake Washington	L-10B	H-500-10	19.4	Neidium ampliatum	Bacillariophyta	1	0.25	
Lake Washington	L-10B	H-500-10	19.4	Nitzschia alpina	Bacillariophyta	1	0.25	
Lake Washington	L-10B	H-500-10	19.4	Nitzschia perminuta	Bacillariophyta	4	1.00	
Lake Washington	L-10B	H-500-10	19.4	Nitzschia pura	Bacillariophyta	1	0.25	
Lake Washington	L-10B	H-500-10	19.4	Nitzschia subacicularis	Bacillariophyta	1	0.25	
Lake Washington	L-10B	H-500-10	19.4	Nitzschia sp.	Bacillariophyta	4	1.00	
Lake Washington	L-10B	H-500-10	19.4	Pinnularia gibba	Bacillariophyta	1	0.25	
Lake Washington	L-10B	H-500-10	19.4	Pinnularia interrupta	Bacillariophyta	11	2.74	
Lake Washington	L-10B	H-500-10	19.4	Pinnularia nodosa	Bacillariophyta	2	0.50	
Lake Washington	L-10B	H-500-10	19.4	Pinnularia sp.	Bacillariophyta	1	0.25	
Lake Washington	L-10B	H-500-10	19.4	Placoneis elginensis	Bacillariophyta	1	0.25	
Lake Washington	L-10B	H-500-10	19.4	Planothidium lanceolatum	Bacillariophyta	97	24.19	
Lake Washington	L-10B	H-500-10	19.4	Pseudostaurosira parasitica	Bacillariophyta	1	0.25	
Lake Washington	L-10B	H-500-10	19.4	Sellaphora pupula	Bacillariophyta	3	0.75	
Lake Washington	L-10B	H-500-10	19.4	Sellaphora rectangularis	Bacillariophyta	2	0.50	
Lake Washington	L-10B	H-500-10	19.4	Stauroneis sp.	Bacillariophyta	3	0.75	
Lake Washington	L-10B	H-500-10	19.4	Staurosira oldenburgiana	Bacillariophyta	2	0.50	
Lake Washington	L-10B	H-500-10	19.4	Staurosirella pinnata	Bacillariophyta	3	0.75	
Lake Washington	L-10B	H-500-10	19.4	Surirella robusta	Bacillariophyta	7	1.75	
Lake Washington	L-10B	H-500-10	19.4	Synedra tenera	Bacillariophyta	6	1.50	
Lake Washington	L-10B	H-500-10	19.4	Synedra sp.	Bacillariophyta	1	0.25	

Raw Diatom Report 2

BASIN	SAMPLE No.	BORING	DEPTH (FT)	SPECIES	DIVISION	TALLY	% OF TOTAL	NOTES
Lake Washington	L-10B	H-500-10	19.4	Tabellaria fenestrata	Bacillariophyta	6	1.50	
				Total		**401**		

Raw Diatom Report 3

BASIN	STATION	SITE	BORING	DEPTH	SPECIES	DIVISION	TALLY	% OF TOTAL	NOTES
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Aulacoseira crenulata	Bacillariophyta	96	23.88	many broken frustules.
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Aulacoseira sp.	Bacillariophyta	37	9.20	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Aulacoseira tethera	Bacillariophyta	3	0.75	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Aulacoseira subarctica	Bacillariophyta	10	2.49	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Cyclotella sp.	Bacillariophyta	2	0.50	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Encyonema minutum	Bacillariophyta	4	1.00	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Eunotia formica	Bacillariophyta	2	0.50	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Eunotia glacialis	Bacillariophyta	30	7.46	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Eunotia monodon	Bacillariophyta	2	0.50	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Eunotia sp.	Bacillariophyta	78	19.40	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Fragilaria crotonensis	Bacillariophyta	2	0.50	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Fragilaria nitzschioides	Bacillariophyta	2	0.50	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Fragilaria sp.	Bacillariophyta	3	0.75	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Gomphonema angustatum	Bacillariophyta	2	0.50	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Gomphonema cf. bohemicum	Bacillariophyta	3	0.75	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Gomphonema gracile	Bacillariophyta	1	0.25	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Gomphonema longilineare	Bacillariophyta	1	0.25	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Gomphonema sp.	Bacillariophyta	6	1.49	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Hantzschia amphioxys	Bacillariophyta	21	5.22	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Luticola cohnii	Bacillariophyta	1	0.25	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Naviculadicta parasemen	Bacillariophyta	3	0.75	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Nitzschia sp.	Bacillariophyta	2	0.50	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Pinnularia brevicostata	Bacillariophyta	3	0.75	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Pinnularia sp.	Bacillariophyta	44	10.95	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Pinnularia viridis	Bacillariophyta	9	2.24	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Pseudostaurosira brevistriata	Bacillariophyta	18	4.48	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Pseudostaurosira pseudoconstruens	Bacillariophyta	4	1.00	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Stauroneis sp.	Bacillariophyta	4	1.00	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Staurosira construens var. binodis	Bacillariophyta	8	1.99	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Ulnaria sp.	Bacillariophyta	1	0.25	
Lake Washington	F-19B-3	Arboretum	H-488-10	37.1	Chrysophyte and or Synurophyte cysts/spores	Chrysophyta	184		These are not diatoms but are indicators of probable freshwater conditions.
					Total Diatoms		402		

Raw Diatom Report 3

BASIN	STATION	SITE	BORING	DEPTH	SPECIES	DIVISION	TALLY	% OF TOTAL	NOTES
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Achnanthes grischuna	Bacillariophyta	1	0.23	many broken frustules.
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Aulacoseira ambigua	Bacillariophyta	18	4.22	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Aulacoseira crenulata	Bacillariophyta	112	26.23	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Aulacoseira sp.	Bacillariophyta	33	7.73	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Aulacoseira subarctica	Bacillariophyta	51	11.94	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Aulacoseira tethera	Bacillariophyta	18	4.22	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Encyonema silesiacum	Bacillariophyta	4	0.94	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Eunotia bilunaris	Bacillariophyta	2	0.47	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Eunotia glacialis	Bacillariophyta	26	6.09	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Eunotia implicata	Bacillariophyta	1	0.23	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Eunotia praerupta	Bacillariophyta	1	0.23	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Eunotia sp.	Bacillariophyta	9	2.11	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Eunotia trigibba	Bacillariophyta	5	1.17	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Gomphonema angustatum	Bacillariophyta	1	0.23	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Gomphonema auritum	Bacillariophyta	3	0.70	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Gomphonema clavatum	Bacillariophyta	1	0.23	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Gomphonema gracile	Bacillariophyta	3	0.70	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Gomphonema sp.	Bacillariophyta	7	1.64	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Hantzschia amphioxys	Bacillariophyta	1	0.23	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Hantzschia sp.	Bacillariophyta	2	0.47	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Meridion circulare var. constrictum	Bacillariophyta	2	0.47	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Navicula leptostriata	Bacillariophyta	2	0.47	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Navicula radiosa	Bacillariophyta	1	0.23	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Navicula sp.	Bacillariophyta	1	0.23	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Naviculadicta parasemen	Bacillariophyta	3	0.70	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Nitzschia polaris	Bacillariophyta	2	0.47	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Nitzschia sp.	Bacillariophyta	3	0.70	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Pinnularia brevicostata	Bacillariophyta	5	1.17	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Pinnularia divergens	Bacillariophyta	2	0.47	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Pinnularia gibba	Bacillariophyta	6	1.41	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Pinnularia maior	Bacillariophyta	1	0.23	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Pinnularia sp.	Bacillariophyta	19	4.45	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Pinnularia streptoraphe	Bacillariophyta	1	0.23	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Pinnularia viridis	Bacillariophyta	14	3.28	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Planothidium lanceolatum	Bacillariophyta	3	0.70	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Pseudostaurosira brevistriata	Bacillariophyta	46	10.77	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Sellaphora rectangularis	Bacillariophyta	9	2.11	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Stauroneis javanica	Bacillariophyta	1	0.23	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Stauroneis kriegeri	Bacillariophyta	7	1.64	
Lake Washington	L-14G	Arboretum	H-488-10	27.85	Chrysophyte and or Synurophyte cysts/spores	Chrysophyta	17		These are not diatoms but are indicators of probable freshwater conditions.
					Total Diatoms		427		

Raw Diatom Report 3

BASIN	STATION	SITE	BORING	DEPTH	SPECIES	DIVISION	TALLY	% OF TOTAL	NOTES
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Achnantheiopsis distincta	Bacillariophyta	1	0.21	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Achnanthes sp.	Bacillariophyta	1	0.21	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Aulacoseira crenulata	Bacillariophyta	71	15.14	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Aulacoseira sp.	Bacillariophyta	22	4.69	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Aulacoseira subarctica	Bacillariophyta	35	7.46	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Aulacoseira tethera	Bacillariophyta	8	1.71	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Caloneis silicula	Bacillariophyta	1	0.21	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Cocconeis placentula	Bacillariophyta	1	0.21	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Encyonema silesiacum	Bacillariophyta	1	0.21	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Encyonema sp.	Bacillariophyta	1	0.21	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Eunotia bilunaris	Bacillariophyta	4	0.85	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Eunotia glacialis	Bacillariophyta	15	3.20	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Eunotia implicata	Bacillariophyta	15	3.20	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Eunotia soleirolii	Bacillariophyta	4	0.85	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Eunotia sp.	Bacillariophyta	27	5.76	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Fragilariaforma virescens	Bacillariophyta	1	0.21	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Gomphonema auritum	Bacillariophyta	4	0.85	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Gomphonema bavaricum	Bacillariophyta	2	0.43	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Gomphonema gracile	Bacillariophyta	12	2.56	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Gomphonema minutum	Bacillariophyta	11	2.35	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Gomphonema parvulum	Bacillariophyta	14	2.99	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Gomphonema sp.	Bacillariophyta	29	6.18	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Mayamaea sp.	Bacillariophyta	1	0.21	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Meridion circulare var. constrictum	Bacillariophyta	3	0.64	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Navicula leptostriata	Bacillariophyta	1	0.21	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Navicula radiosa	Bacillariophyta	3	0.64	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Neidium sp.	Bacillariophyta	1	0.21	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Nitzschia dippelii	Bacillariophyta	2	0.43	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Pinnularia acrosphaeria	Bacillariophyta	6	1.28	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Pinnularia gibba	Bacillariophyta	4	0.85	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Pinnularia sp.	Bacillariophyta	18	3.84	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Pinnularia viridis	Bacillariophyta	2	0.43	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Placoneis elginensis	Bacillariophyta	2	0.43	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Planothidium conspicuum	Bacillariophyta	1	0.21	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Planothidium daui	Bacillariophyta	4	0.85	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Planothidium lanceolatum	Bacillariophyta	102	21.75	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Pseudostaurosira brevistriata	Bacillariophyta	4	0.85	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Pseudostaurosira pseudoconstruens	Bacillariophyta	4	0.85	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Pseudostaurosira parasitica	Bacillariophyta	6	1.28	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Sellaphora pupula	Bacillariophyta	1	0.21	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Sellaphora rectangularis	Bacillariophyta	3	0.64	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Stauroneis kriegeri	Bacillariophyta	15	3.20	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Stauroneis sp.	Bacillariophyta	1	0.21	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Staurosirella pinnata	Bacillariophyta	1	0.21	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Ulnaria ulna	Bacillariophyta	5	1.07	
Lake Washington	L-10D	Arboretum	H-488-10	19.50	Chrysophyte and or Synurophyte cysts/spores	Chrysophyta	4		These are not diatoms but are indicators of probable freshwater conditions.
					Total		469		

Raw Diatom Report 3

BASIN	STATION	SITE	BORING	DEPTH	SPECIES	DIVISION	TALLY	% OF TOTAL	NOTES
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Achnanthes grischuna	Bacillariophyta	2	0.47	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Achnanthes sp.	Bacillariophyta	3	0.71	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Amphora ovalis	Bacillariophyta	2	0.47	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Aulacoseira ambigua	Bacillariophyta	26	6.13	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Aulacoseira crenulata	Bacillariophyta	37	8.73	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Aulacoseira sp.	Bacillariophyta	52	12.26	many Aulacoseira in girdle view, preventing species identification.
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Aulacoseira subarctica	Bacillariophyta	53	12.50	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Aulacoseira tethera	Bacillariophyta	22	5.19	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Encyonema minutum	Bacillariophyta	3	0.71	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Encyonema silesiacum	Bacillariophyta	3	0.71	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Epithemia adnata	Bacillariophyta	2	0.47	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Eunotia glacialis	Bacillariophyta	6	1.42	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Eunotia implicata	Bacillariophyta	2	0.47	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Eunotia incisa	Bacillariophyta	1	0.24	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Eunotia soleirolii	Bacillariophyta	10	2.36	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Eunotia sp.	Bacillariophyta	5	1.18	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Gomphonema auritum	Bacillariophyta	5	1.18	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Gomphonema gracile	Bacillariophyta	5	1.18	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Gomphonema minutum	Bacillariophyta	2	0.47	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Gomphonema parvulum	Bacillariophyta	1	0.24	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Gomphonema sp.	Bacillariophyta	7	1.65	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Hantzschia elongata	Bacillariophyta	1	0.24	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Navicula leptostriata	Bacillariophyta	5	1.18	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Navicula sp.	Bacillariophyta	3	0.71	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Nitzschia modesta	Bacillariophyta	1	0.24	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Pinnularia brevicostata	Bacillariophyta	2	0.47	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Pinnularia gibba	Bacillariophyta	1	0.24	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Pinnularia interrupta	Bacillariophyta	1	0.24	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Pinnularia lapponica	Bacillariophyta	1	0.24	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Pinnularia sp.	Bacillariophyta	5	1.18	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Pseudostaurosira brevistriata	Bacillariophyta	129	30.42	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Pseudostaurosira pseudoconstruens	Bacillariophyta	4	0.94	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Sellaphora americana	Bacillariophyta	1	0.24	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Sellaphora pupula	Bacillariophyta	1	0.24	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Sellaphora rectangularis	Bacillariophyta	2	0.47	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Stauroneis kriegeri	Bacillariophyta	2	0.47	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Stauroneis sp.	Bacillariophyta	2	0.47	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Staurosira construens	Bacillariophyta	2	0.47	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Synedra tenera	Bacillariophyta	5	1.18	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Tabellaria ventricosa	Bacillariophyta	5	1.18	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Ulnaria ulna	Bacillariophyta	2	0.47	
Lake Washington	F-9A	Arboretum	H-488-10	18.00	Chrysophyte and or Synurophyte cysts/spores	Chrysophyta	7		These are not diatoms but are indicators of probable freshwater conditions.
					Total		424		

Geomorphology and Shoreline History

of Lake Washington, Union Bay and Portage Bay

Appendix D

Radiocarbon Data Sheets

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Consistent Accuracy . . .
. . . Delivered On-time

Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

January 18, 2011

Dr. Kathy Goetz Troost
Troost Geological Consulting
17227 97th Drive SE
Snohomish, WA 98296

RE: Radiocarbon Dating Results For Samples H522-10 L-3B, H522-10 L-8B, H533-10 L-1B, H533-10 L-1C, H533-10 F12A, H533-10 F34A, H534-10 L-1C, H534-10 L-5C, H534-10 L31B, H534-10 L37A, H540-10 L-2A, H540-10 L13B, H540-10 L-16B + H540-10 S-16

Dear Kathy:

Enclosed are the radiocarbon dating results for 13 samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

You will notice that two of the samples are reported with the units “pMC” rather than BP. “pMC” stands for "percent modern carbon". Results are reported in the pMC format when the analyzed material had more ^{14}C than did the modern (AD 1950) reference standard. The source of this "extra" ^{14}C in the atmosphere is thermo-nuclear bomb testing which on-set in the 1950s. Its presence generally indicates the material analyzed was part of a system that was respiring carbon after the on-set of the testing (AD 1950s). On occasion, the two sigma lower limit will extend into the time region before this "bomb-carbon" onset (i.e. less than 100 pMC). In those cases, there is some probability for 18th, 19th, or 20th century antiquity.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

The cost of the analysis was charged to the VISA card provided. As always, if you have any questions or would like to discuss the results, don’t hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Kathy Goetz Troost — Report Date: 1/18/2011

Troost Geological Consulting — Material Received: 12/15/2010

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 289948	220 +/- 30 BP	-25.6 o/oo	210 +/- 30 BP
SAMPLE : H522-10 L-3B			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 1650 to 1680 (Cal BP 300 to 270) AND Cal AD 1740 to 1810 (Cal BP 210 to 140) Cal AD 1930 to 1950 (Cal BP 20 to 0)			
Beta - 289949	180 +/- 30 BP	-26.7 o/oo	150 +/- 30 BP
SAMPLE : H522-10 L-8B			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 1660 to 1890 (Cal BP 280 to 60) AND Cal AD 1910 to 1950 (Cal BP 40 to 0)			
Beta - 289950	300 +/- 30 BP	-23.6 o/oo	320 +/- 30 BP
SAMPLE : H533-10 L-1B			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 1470 to 1650 (Cal BP 480 to 300)			
Beta - 289951	340 +/- 30 BP	-23.8 o/oo	360 +/- 30 BP
SAMPLE : H533-10 L-1C			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 1450 to 1640 (Cal BP 500 to 310)			

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Kathy Goetz Troost

Report Date: 1/18/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 289952	10720 +/- 50 BP	-27.8 o/oo	10670 +/- 50 BP

SAMPLE : H533-10 F12A
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (peat): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 10870 to 10710 (Cal BP 12820 to 12660)

Beta - 289953	NA	-26.8 o/oo	> 43500 BP

SAMPLE : H533-10 F34A
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
COMMENTS:

(1) The 14C activity was extremely low and almost identical to the background signal. In such cases, indeterminant errors associated with the background add non-measurable uncertainty to the result. Always, the result should be considered along with other lines of evidence. The most conservative interpretation of age is infinite (i.e. greater than).

(2) A Measured Radiocarbon Age is not reported for infinite dates since corrections may imply a greater level of confidence than is appropriate.

Beta - 289954	100.7 +/- 0.5 pMC	-25.2 o/oo	100.7 +/- 0.5 pMC

SAMPLE : H534-10 L-1C
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid
COMMENT: The reported result indicates an age of post 0 BP and has been reported as a % of the modern reference standard, indicating the material was living about the last 60 years or so ("pMC" = percent modern carbon).

Beta - 289955	104.7 +/- 0.7 pMC	-27.6 o/oo	105.2 +/- 0.7 pMC

SAMPLE : H534-10 L-5C
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
COMMENT: The reported result indicates an age of post 0 BP and has been reported as a % of the modern reference standard, indicating the material was living about the last 60 years or so ("pMC" = percent modern carbon).

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Kathy Goetz Troost

Report Date: 1/18/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 289956	NA	-26.0 o/oo	> 43500 BP

SAMPLE : H534-10 L31B
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
COMMENTS:

(1) The 14C activity was extremely low and almost identical to the background signal. In such cases, indeterminant errors associated with the background add non-measurable uncertainty to the result. Always, the result should be considered along with other lines of evidence. The most conservative interpretation of age is infinite (i.e. greater than).
(2) A Measured Radiocarbon Age is not reported for infinite dates since corrections may imply a greater level of confidence than is appropriate.

Beta - 289957	NA	-29.3 o/oo	> 43500 BP

SAMPLE : H534-10 L37A
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
COMMENTS:

(1) The 14C activity was extremely low and almost identical to the background signal. In such cases, indeterminant errors associated with the background add non-measurable uncertainty to the result. Always, the result should be considered along with other lines of evidence. The most conservative interpretation of age is infinite (i.e. greater than).
(2) A Measured Radiocarbon Age is not reported for infinite dates since corrections may imply a greater level of confidence than is appropriate.

Beta - 289958	190 +/- 30 BP	-27.3 o/oo	150 +/- 30 BP

SAMPLE : H540-10 L-2A
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1660 to 1890 (Cal BP 280 to 60) AND Cal AD 1910 to 1950 (Cal BP 40 to 0)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Kathy Goetz Troost

Report Date: 1/18/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 289959 SAMPLE : H540-10 L13B ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (peat): acid/alkali/acid 2 SIGMA CALIBRATION : Cal BC 11520 to 11320 (Cal BP 13470 to 13270)	11580 +/- 60 BP	-27.5 o/oo	11540 +/- 60 BP
Beta - 289960 SAMPLE : H540-10 L-16B + H540-10 S-16 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (wood): acid/alkali/acid COMMENT: The result is outside of calibration range.	33920 +/- 230 BP	-27.6 o/oo	33880 +/- 230 BP

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

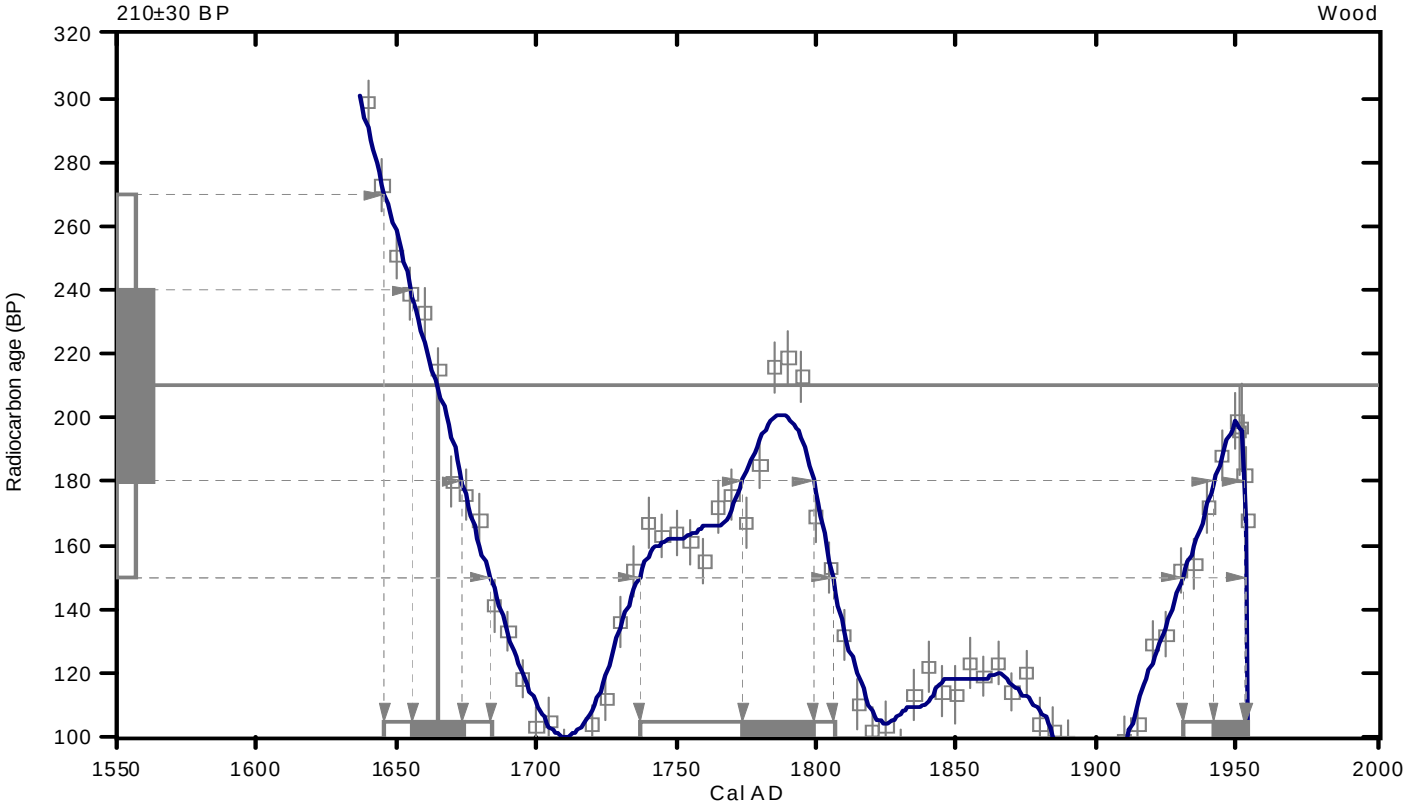
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.6:lab. mult=1)

Laboratory number:	**Beta-289948**
Conventional radiocarbon age:	**210±30 BP**
2 Sigma calibrated results: **(95% probability)**	**Cal AD 1650 to 1680 (Cal BP 300 to 270) and** **Cal AD 1740 to 1810 (Cal BP 210 to 140) and** **Cal AD 1930 to 1950 (Cal BP 20 to 0)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal AD 1660 (Cal BP 280)
1 Sigma calibrated results: (68% probability)	Cal AD 1660 to 1670 (Cal BP 290 to 280) and Cal AD 1770 to 1800 (Cal BP 180 to 150) and Cal AD 1940 to 1950 (Cal BP 10 to 0)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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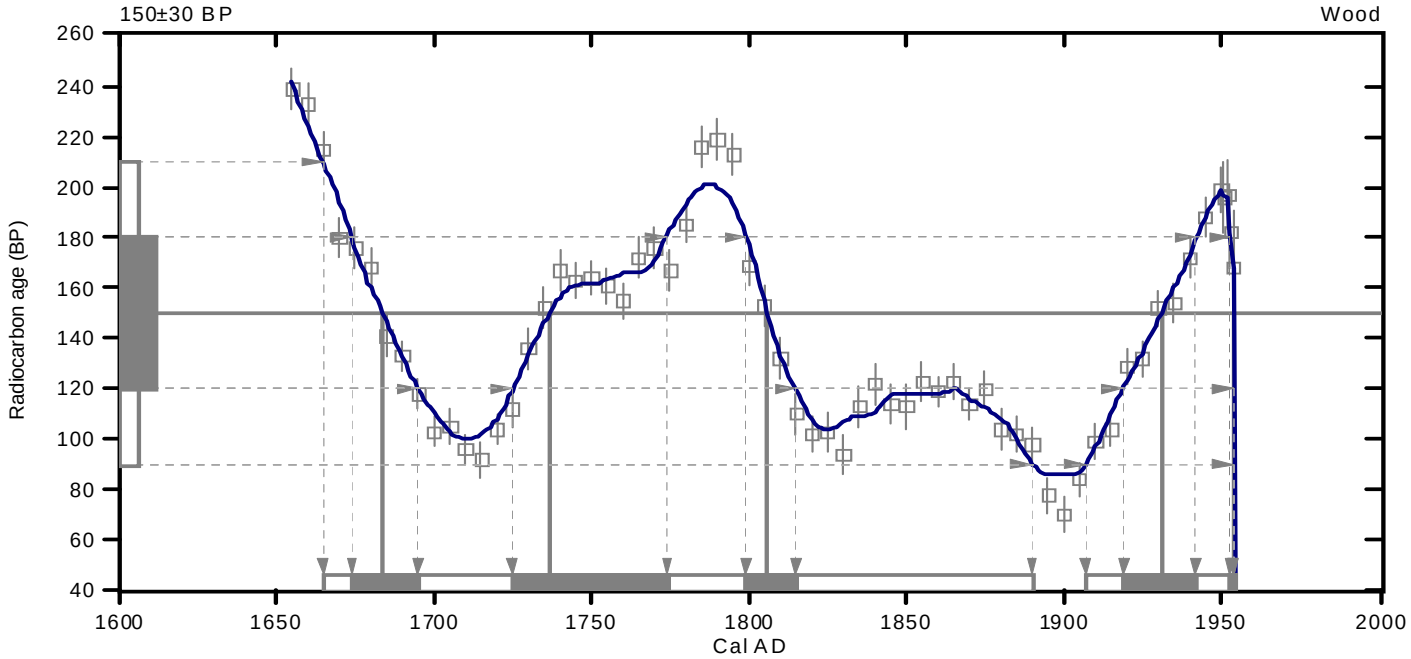
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.7:lab. mult=1)

Laboratory number:	**Beta-289949**
Conventional radiocarbon age:	**150±30 BP**
2 Sigma calibrated results: **(95% probability)**	**Cal AD 1660 to 1890 (Cal BP 280 to 60) and** **Cal AD 1910 to 1950 (Cal BP 40 to 0)**

Intercept data

Intercepts of radiocarbon age with calibration curve:	Cal AD 1680 (Cal BP 270) and Cal AD 1740 (Cal BP 210) and Cal AD 1810 (Cal BP 140) and Cal AD 1930 (Cal BP 20) and Cal AD 1950 (Cal BP 0)
1 Sigma calibrated results: (68% probability)	Cal AD 1670 to 1700 (Cal BP 280 to 260) and Cal AD 1720 to 1770 (Cal BP 220 to 180) and Cal AD 1800 to 1820 (Cal BP 150 to 140) and Cal AD 1920 to 1940 (Cal BP 30 to 10) and Cal AD 1950 to 1950 (Cal BP 0 to 0)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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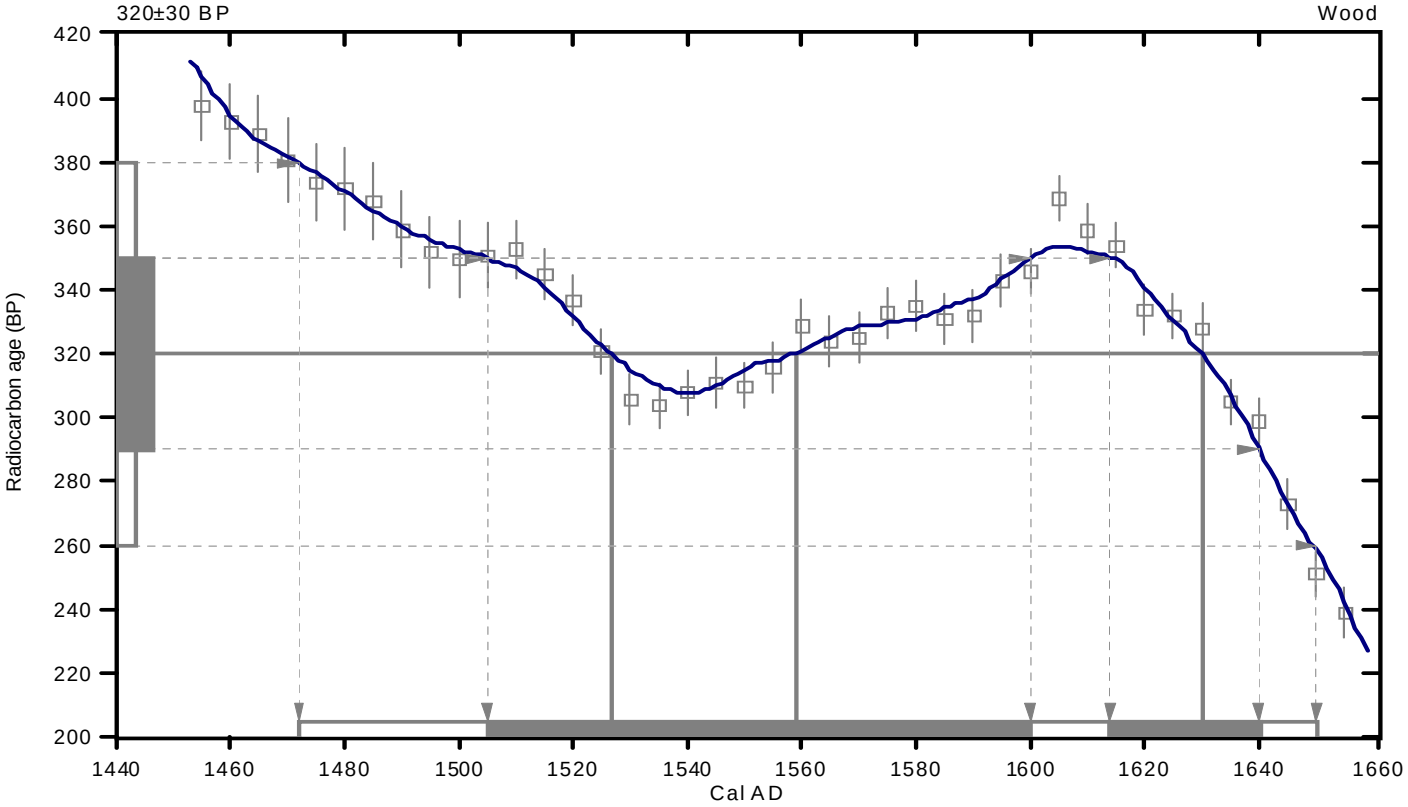
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.6:lab. mult=1)

Laboratory number:	**Beta-289950**
Conventional radiocarbon age:	**320±30 BP**
2 Sigma calibrated result: (95% probability)	**Cal AD 1470 to 1650 (Cal BP 480 to 300)**

Intercept data

Intercepts of radiocarbon age with calibration curve:	Cal AD 1530 (Cal BP 420) and Cal AD 1560 (Cal BP 390) and Cal AD 1630 (Cal BP 320)
1 Sigma calibrated results: (68% probability)	Cal AD 1500 to 1600 (Cal BP 440 to 350) and Cal AD 1610 to 1640 (Cal BP 340 to 310)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

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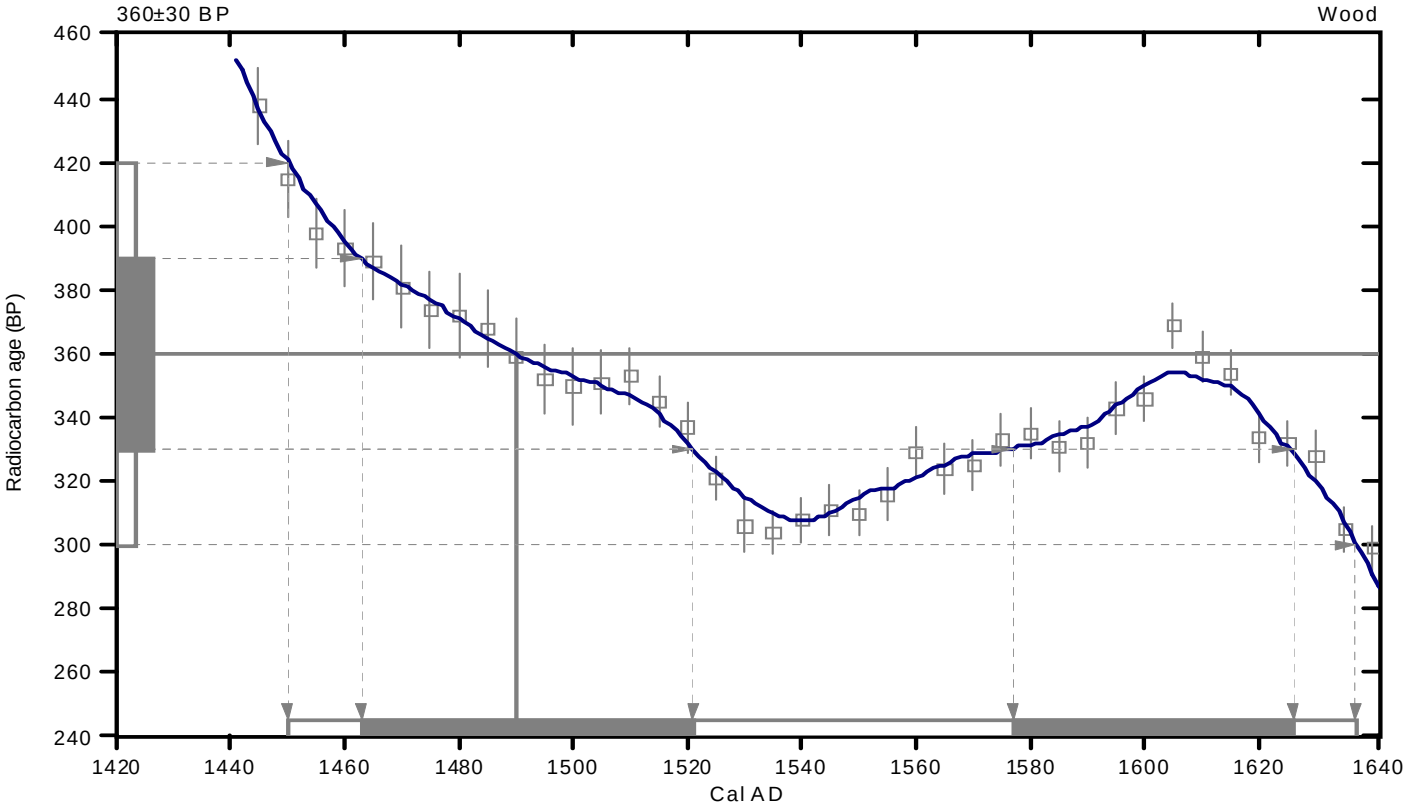
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.8:lab. mult=1)

Laboratory number:	**Beta-289951**
Conventional radiocarbon age:	**360±30 BP**
2 Sigma calibrated result: (95% probability)	**Cal AD 1450 to 1640 (Cal BP 500 to 310)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal AD 1490 (Cal BP 460)
1 Sigma calibrated results: (68% probability)	Cal AD 1460 to 1520 (Cal BP 490 to 430) and Cal AD 1580 to 1630 (Cal BP 370 to 320)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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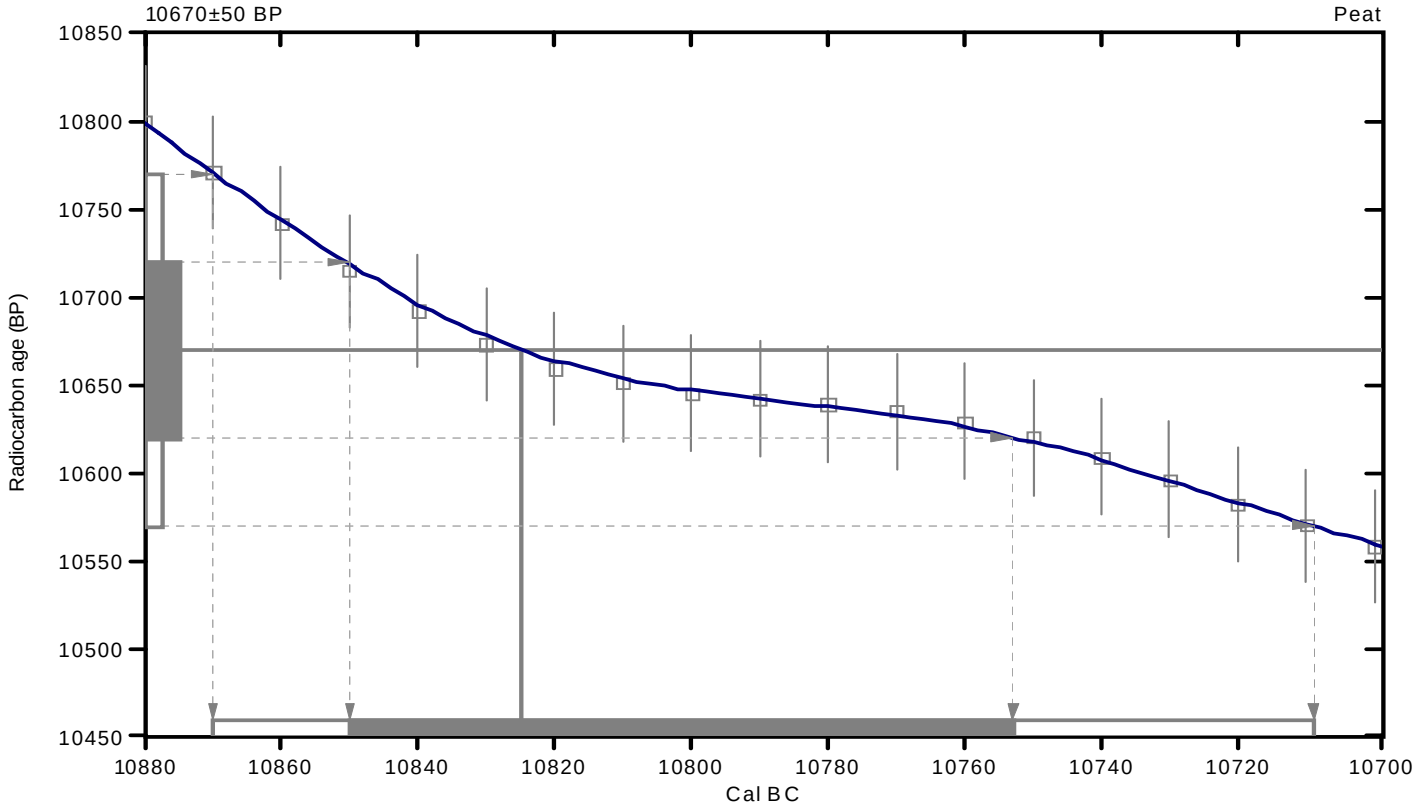
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.8:lab. mult=1)

Laboratory number:	**Beta-289952**
Conventional radiocarbon age:	**10670±50 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 10870 to 10710 (Cal BP 12820 to 12660)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 10820 (Cal BP 12780)
1 Sigma calibrated result: (68% probability)	Cal BC 10850 to 10750 (Cal BP 12800 to 12700)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

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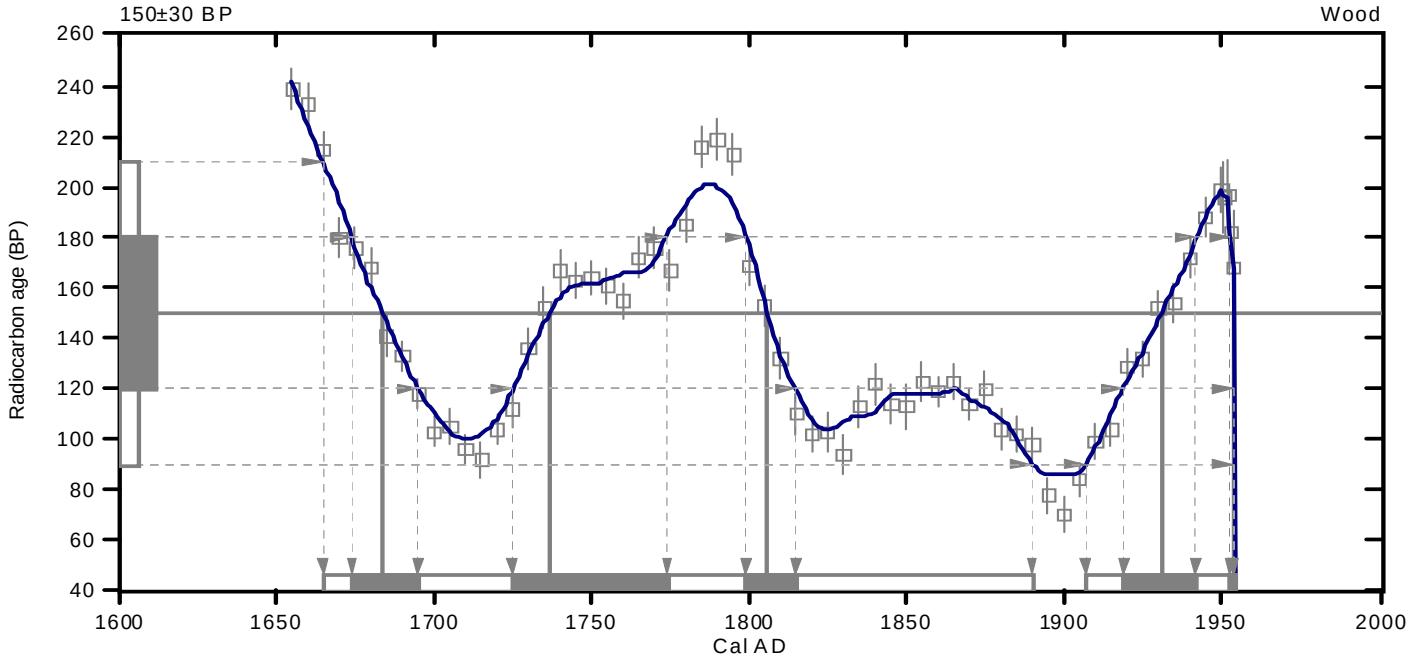
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.3:lab. mult=1)

Laboratory number:	**Beta-289958**
Conventional radiocarbon age:	**150±30 BP**
2 Sigma calibrated results: **(95% probability)**	**Cal AD 1660 to 1890 (Cal BP 280 to 60) and** **Cal AD 1910 to 1950 (Cal BP 40 to 0)**

Intercept data

Intercepts of radiocarbon age with calibration curve:	Cal AD 1680 (Cal BP 270) and Cal AD 1740 (Cal BP 210) and Cal AD 1810 (Cal BP 140) and Cal AD 1930 (Cal BP 20) and Cal AD 1950 (Cal BP 0)
1 Sigma calibrated results: (68% probability)	Cal AD 1670 to 1700 (Cal BP 280 to 260) and Cal AD 1720 to 1770 (Cal BP 220 to 180) and Cal AD 1800 to 1820 (Cal BP 150 to 140) and Cal AD 1920 to 1940 (Cal BP 30 to 10) and Cal AD 1950 to 1950 (Cal BP 0 to 0)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

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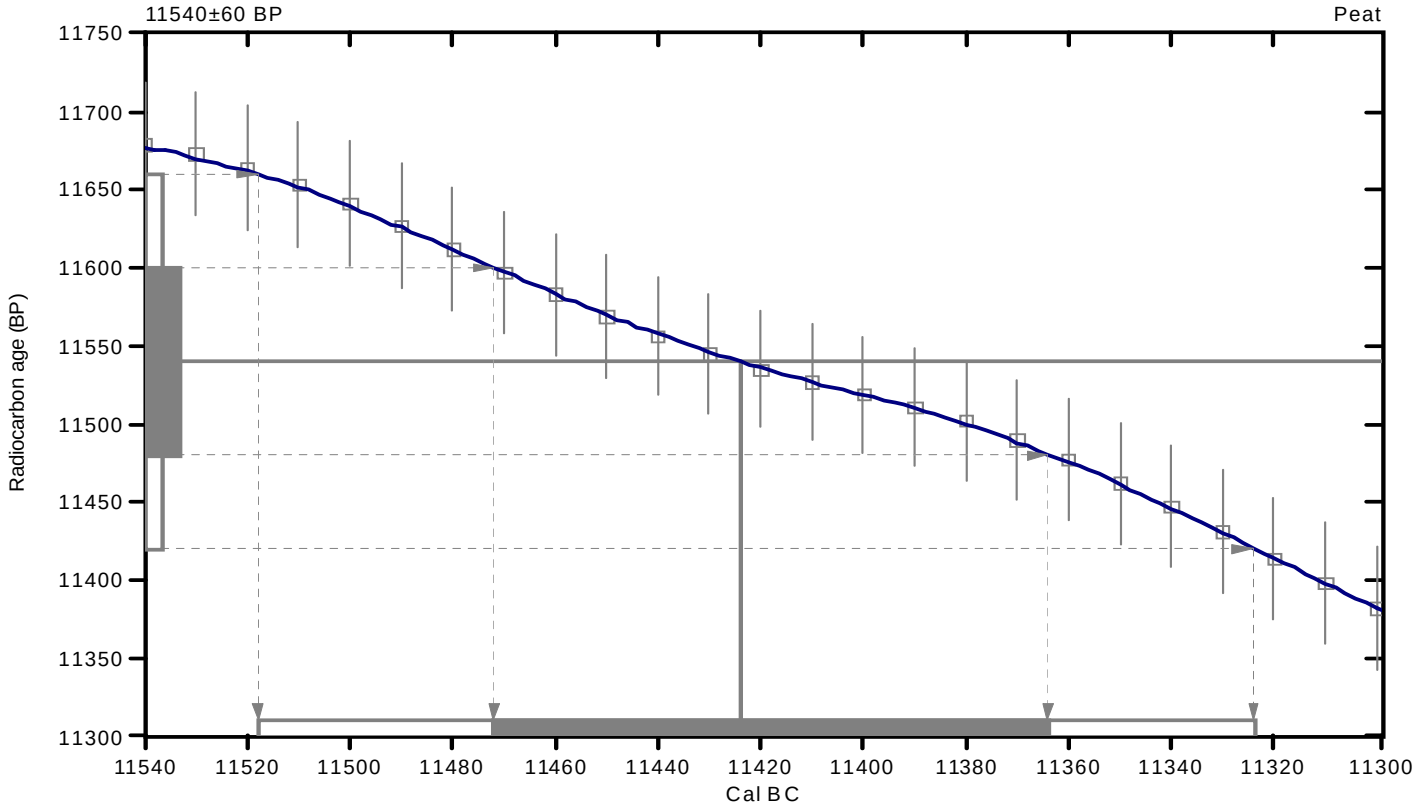
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.5:lab. mult=1)

Laboratory number:	**Beta-289959**
Conventional radiocarbon age:	**11540±60 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 11520 to 11320 (Cal BP 13470 to 13270)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 11420 (Cal BP 13370)
1 Sigma calibrated result: (68% probability)	Cal BC 11470 to 11360 (Cal BP 13420 to 13310)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

February 8, 2011

Dr. Kathy Goetz Troost
Troost Geological Consulting
17227 97th Drive SE
Snohomish, WA 98296
USA

RE: Radiocarbon Dating Results For Samples H340-10 S-1B, H343-10 S-4A, H343-10 S-5A , H349-10S-14B, H349-10 S-5C, H349-10 S-7A, H349-10S-11F, H350-10 S-5A

Dear Kathy:

Enclosed are the radiocarbon dating results for eight samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

Thank you for prepaying the analyses. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
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MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Kathy Goetz Troost — Report Date: 2/8/2011

Troost Geological Consulting — Material Received: 1/17/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 291572	10430 +/- 50 BP	-26.6 o/oo	10400 +/- 50 BP
SAMPLE : H340-10 S-1B			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid/solvent extraction			
2 SIGMA CALIBRATION : Cal BC 10640 to 10510 (Cal BP 12590 to 12460) AND Cal BC 10450 to 10130 (Cal BP 12400 to 12080)			
Beta - 291573	6900 +/- 40 BP	-26.4 o/oo	6880 +/- 40 BP
SAMPLE : H343-10 S-4A			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 5840 to 5710 (Cal BP 7790 to 7660)			
Beta - 291574	6970 +/- 40 BP	-26.1 o/oo	6950 +/- 40 BP
SAMPLE : H343-10 S-5A			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 5970 to 5950 (Cal BP 7920 to 7900) AND Cal BC 5910 to 5730 (Cal BP 7860 to 7680)			
Beta - 291575	13110 +/- 60 BP	-0.6 o/oo	13510 +/- 60 BP
SAMPLE : H349-10S-14B			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (shell): acid etch			
2 SIGMA CALIBRATION : Cal BC 13210 to 12920 (Cal BP 15160 to 14870)			

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

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PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Kathy Goetz Troost

Report Date: 2/8/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 291576	4120 +/- 40 BP	-27.5 o/oo	4080 +/- 40 BP
SAMPLE : H349-10 S-5C			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 2860 to 2800 (Cal BP 4810 to 4760) AND Cal BC 2750 to 2710 (Cal BP 4700 to 4660) Cal BC 2710 to 2550 (Cal BP 4660 to 4500) AND Cal BC 2540 to 2490 (Cal BP 4490 to 4440)			
Beta - 291577	2000 +/- 30 BP	-29.0 o/oo	1930 +/- 30 BP
SAMPLE : H349-10 S-7A			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 10 to 130 (Cal BP 1940 to 1820)			
Beta - 291578	8100 +/- 40 BP	-29.9 o/oo	8020 +/- 40 BP
SAMPLE : H349-10S-11F			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 7070 to 6810 (Cal BP 9020 to 8760)			
Beta - 291580	6910 +/- 40 BP	-24.7 o/oo	6910 +/- 40 BP
SAMPLE : H350-10 S-5A			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 5880 to 5720 (Cal BP 7830 to 7670)			

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

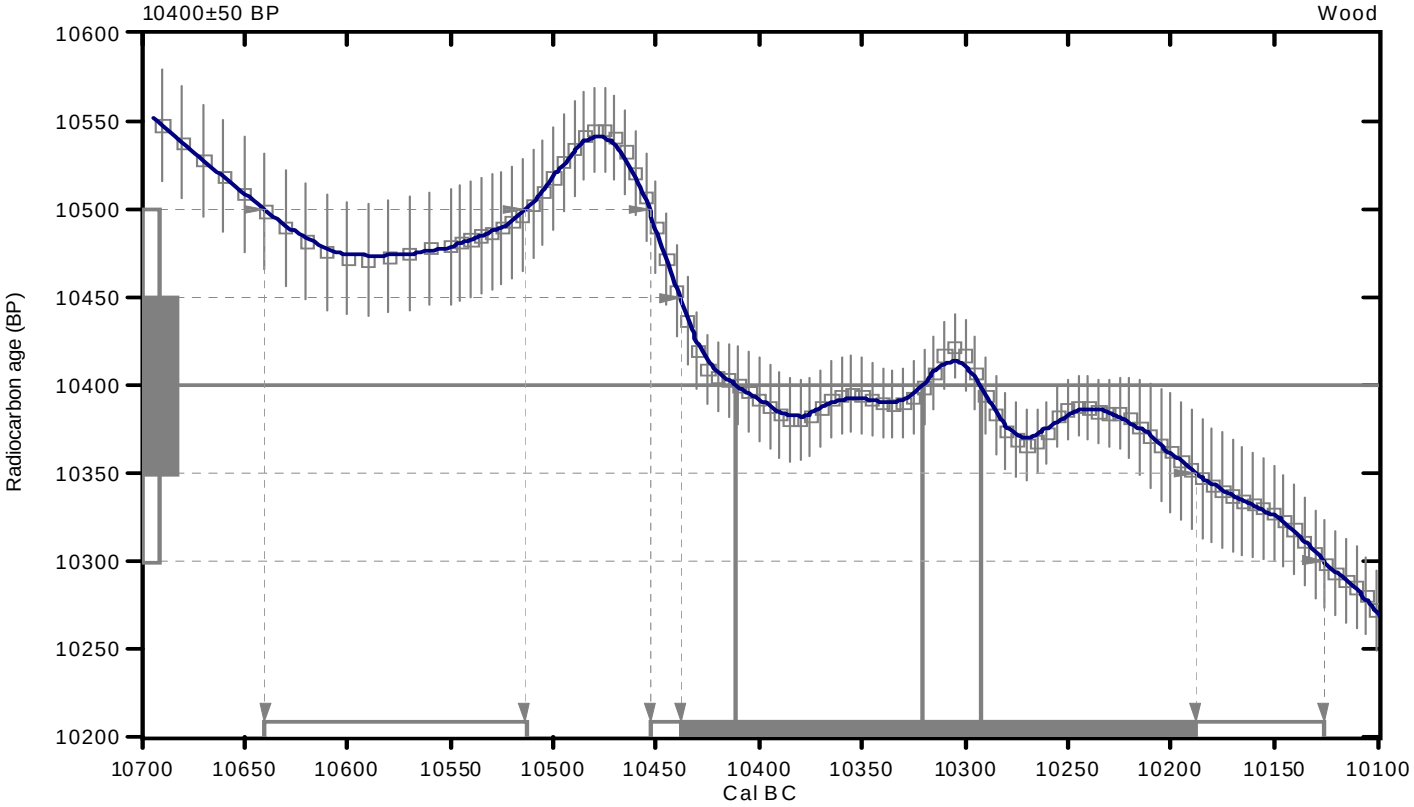
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.6:lab. mult=1)

Laboratory number:	**Beta-291572**
Conventional radiocarbon age:	**10400±50 BP**
2 Sigma calibrated results: **(95% probability)**	**Cal BC 10640 to 10510 (Cal BP 12590 to 12460) and** **Cal BC 10450 to 10130 (Cal BP 12400 to 12080)**

Intercept data

Intercepts of radiocarbon age with calibration curve:	Cal BC 10410 (Cal BP 12360) and Cal BC 10320 (Cal BP 12270) and Cal BC 10290 (Cal BP 12240)
1 Sigma calibrated result: (68% probability)	Cal BC 10440 to 10190 (Cal BP 12390 to 12140)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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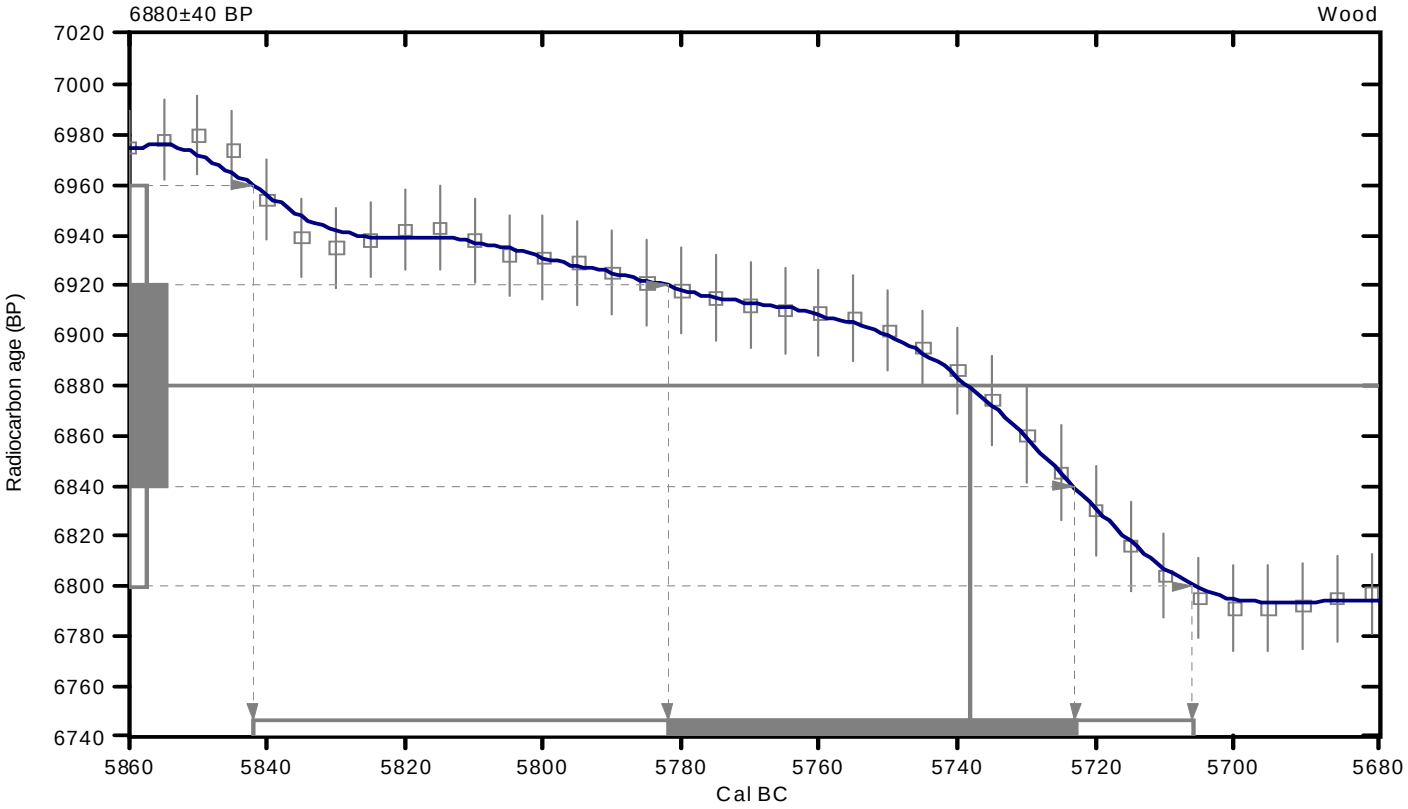
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.4:lab. mult=1)

Laboratory number:	**Beta-291573**
Conventional radiocarbon age:	**6880±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 5840 to 5710 (Cal BP 7790 to 7660)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 5740 (Cal BP 7690)
1 Sigma calibrated result: (68% probability)	Cal BC 5780 to 5720 (Cal BP 7730 to 7670)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

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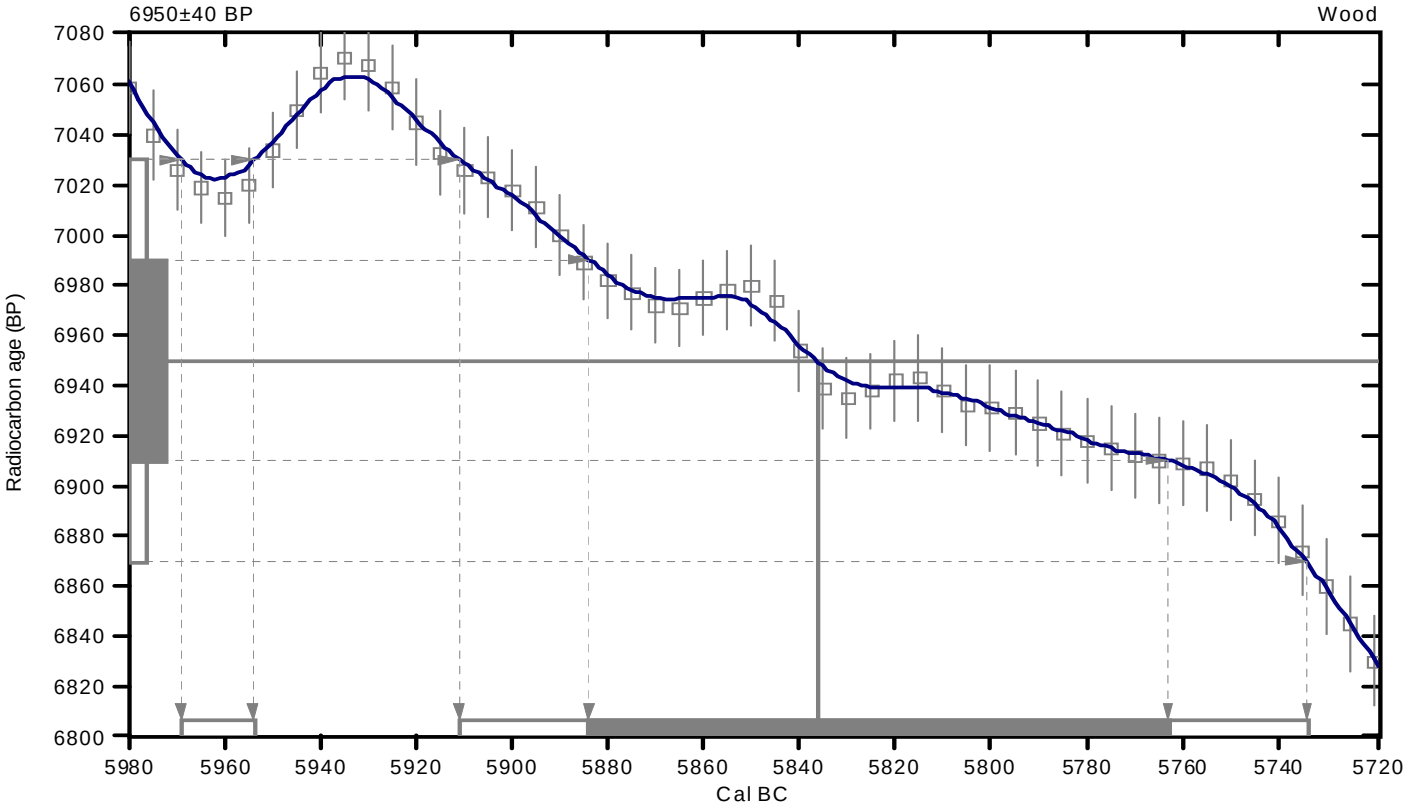
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.1:lab. mult=1)

Laboratory number:	**Beta-291574**
Conventional radiocarbon age:	**6950±40 BP**
2 Sigma calibrated results: (95% probability)	**Cal BC 5970 to 5950 (Cal BP 7920 to 7900) and Cal BC 5910 to 5730 (Cal BP 7860 to 7680)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 5840 (Cal BP 7790)
1 Sigma calibrated result: (68% probability)	Cal BC 5880 to 5760 (Cal BP 7830 to 7710)



References:

Database used

INTCAL04

Calibration Database

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Mathematics

A Simplified Approach to Calibrating C14 Dates

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-0.6:Delta-R=390±25:Glob res=-200 to 500:lab. mult=1)

Laboratory number: **Beta-291575**

Conventional radiocarbon age: **13510±60 BP**

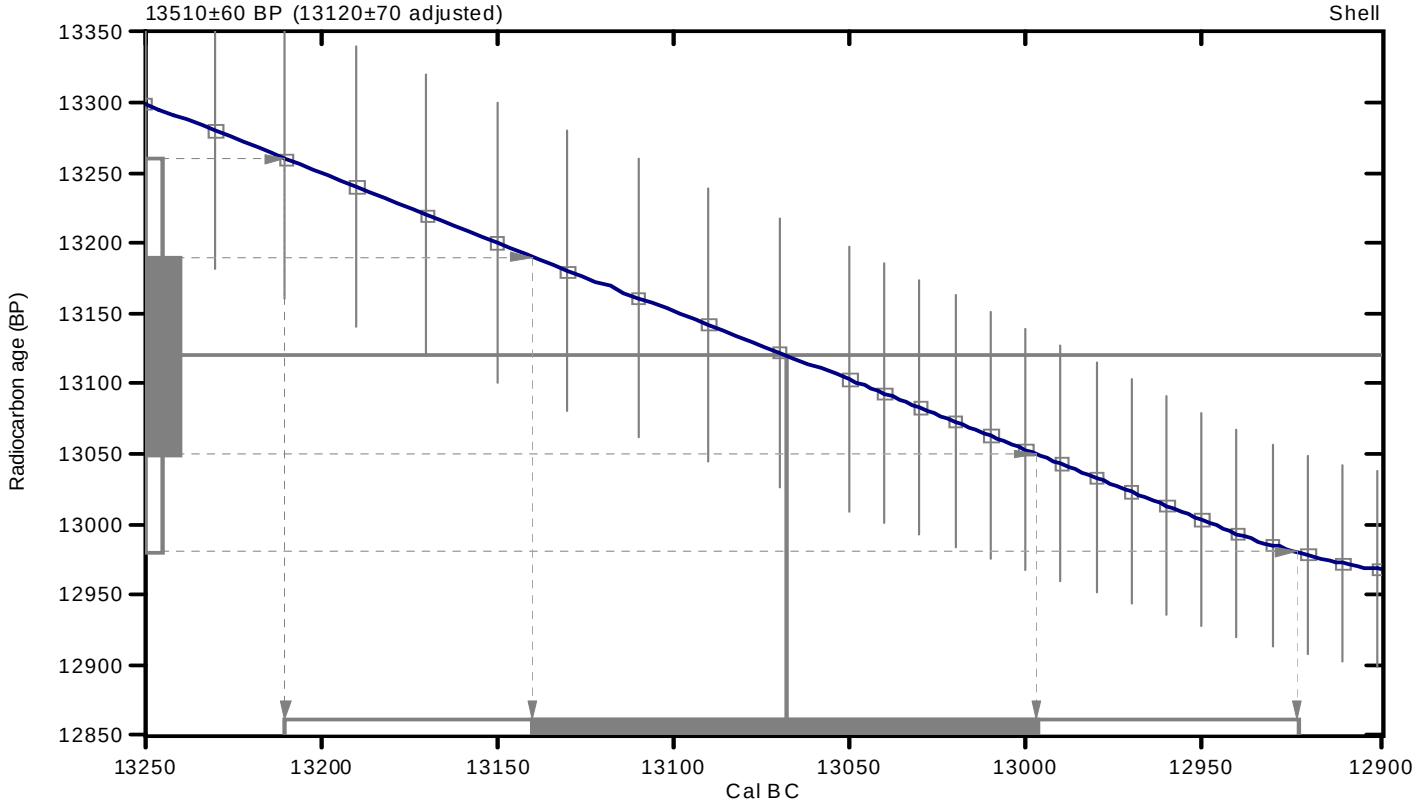
(13120±70 adjusted for local reservoir correction)

2 Sigma calibrated result: **Cal BC 13210 to 12920 (Cal BP 15160 to 14870)**
(95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 13070 (Cal BP 15020)

1 Sigma calibrated result: Cal BC 13140 to 13000 (Cal BP 15090 to 14950)
(68% probability)



References:

Database used

MARINE04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

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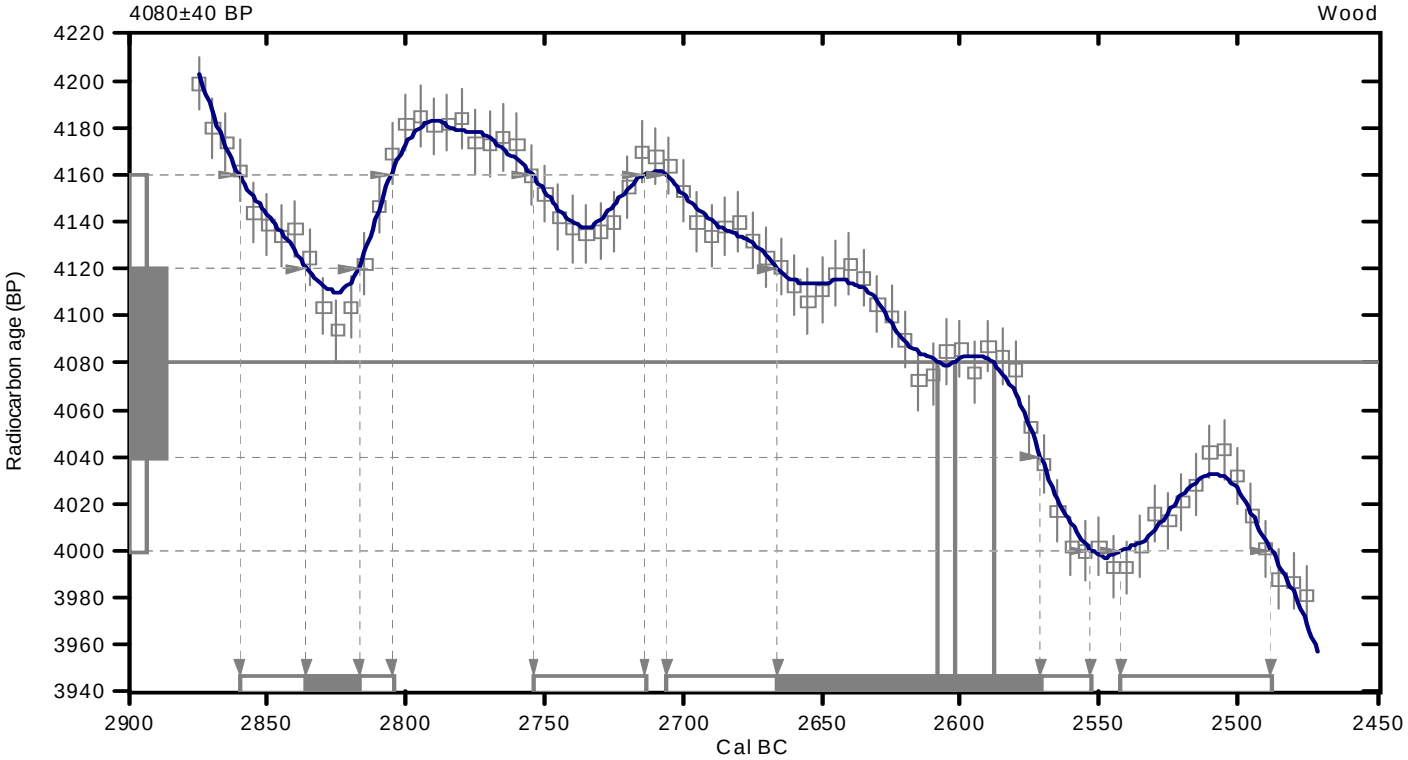
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.5:lab. mult=1)

Laboratory number:	**Beta-291576**
Conventional radiocarbon age:	**4080±40 BP**
2 Sigma calibrated results: **(95% probability)**	**Cal BC 2860 to 2800 (Cal BP 4810 to 4760) and** **Cal BC 2750 to 2710 (Cal BP 4700 to 4660) and** **Cal BC 2710 to 2550 (Cal BP 4660 to 4500) and** **Cal BC 2540 to 2490 (Cal BP 4490 to 4440)**

Intercept data

Intercepts of radiocarbon age with calibration curve:	Cal BC 2610 (Cal BP 4560) and Cal BC 2600 (Cal BP 4550) and Cal BC 2590 (Cal BP 4540)
1 Sigma calibrated results: (68% probability)	Cal BC 2840 to 2820 (Cal BP 4790 to 4770) and Cal BC 2670 to 2570 (Cal BP 4620 to 4520)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

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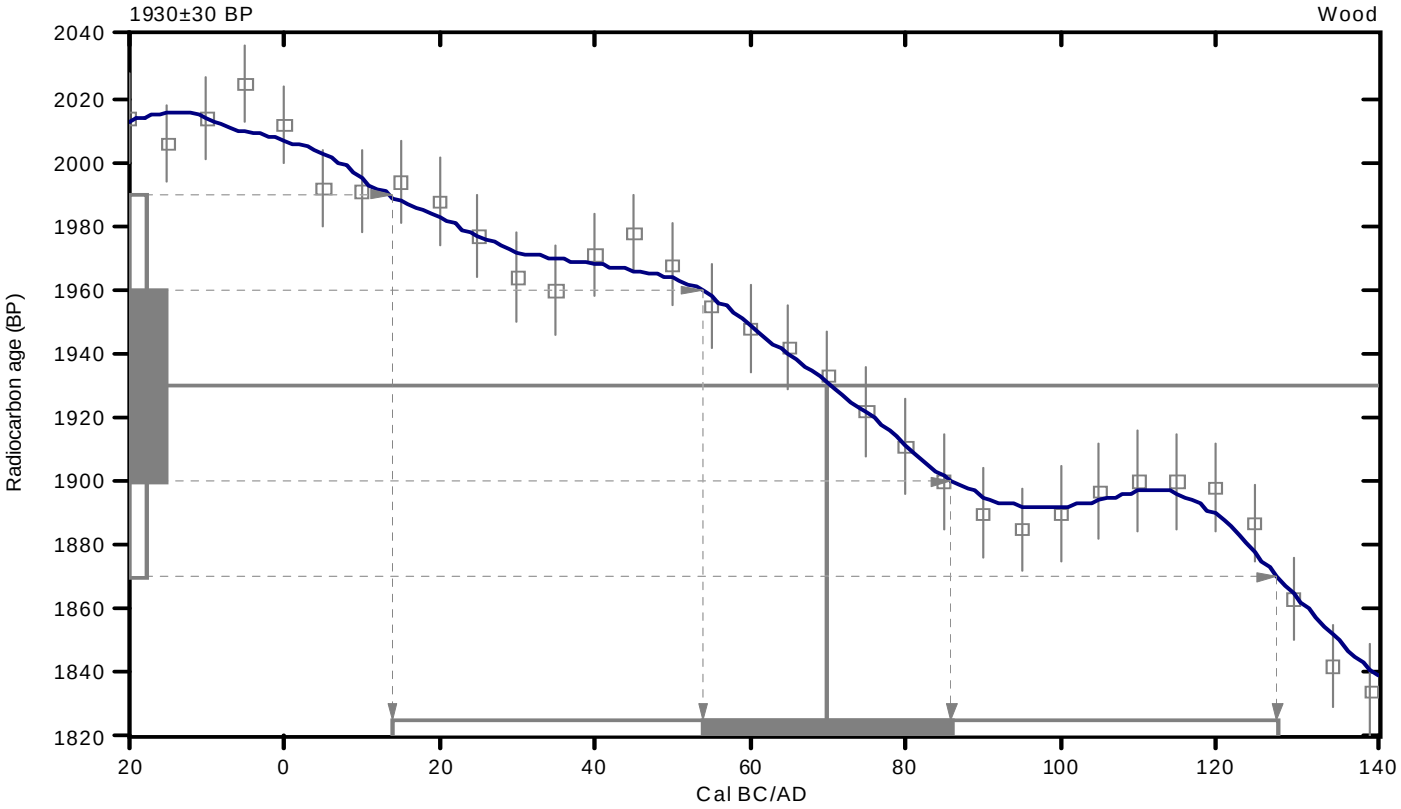
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-29:lab. mult=1)

Laboratory number:	**Beta-291577**
Conventional radiocarbon age:	**1930±30 BP**
2 Sigma calibrated result: (95% probability)	**Cal AD 10 to 130 (Cal BP 1940 to 1820)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal AD 70 (Cal BP 1880)
1 Sigma calibrated result: (68% probability)	Cal AD 50 to 90 (Cal BP 1900 to 1860)



References:

Database used

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Calibration Database

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Mathematics

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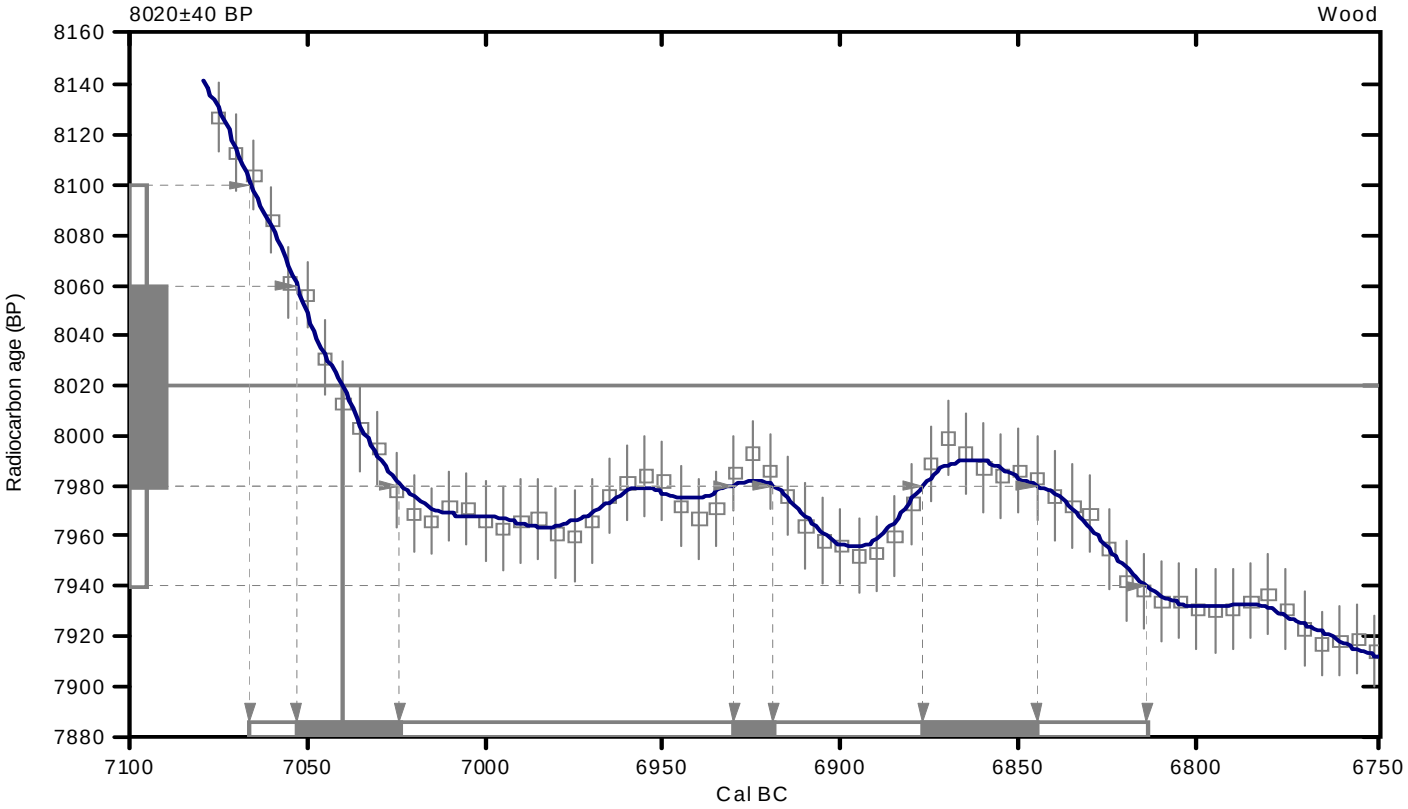
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-29.9:lab. mult=1)

Laboratory number:	**Beta-291578**
Conventional radiocarbon age:	**8020±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 7070 to 6810 (Cal BP 9020 to 8760)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 7040 (Cal BP 8990)
1 Sigma calibrated results: (68% probability)	Cal BC 7050 to 7020 (Cal BP 9000 to 8970) and Cal BC 6930 to 6920 (Cal BP 8880 to 8870) and Cal BC 6880 to 6840 (Cal BP 8830 to 8800)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

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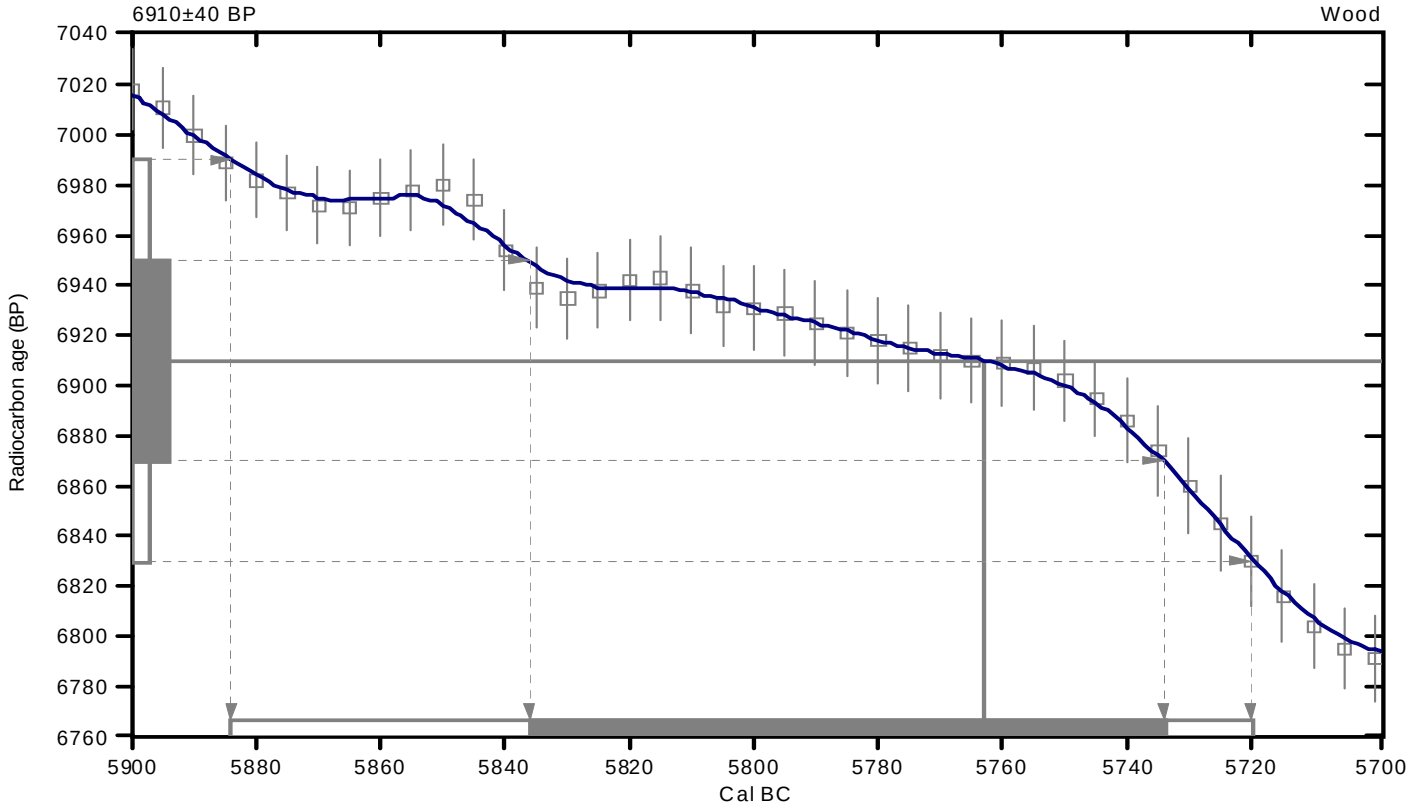
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.7:lab. mult=1)

Laboratory number:	**Beta-291580**
Conventional radiocarbon age:	**6910±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 5880 to 5720 (Cal BP 7830 to 7670)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 5760 (Cal BP 7710)
1 Sigma calibrated result: (68% probability)	Cal BC 5840 to 5730 (Cal BP 7790 to 7680)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

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President

Ronald Hatfield
Christopher Patrick
Deputy Directors

February 9, 2011

Dr. Kathy Goetz Troost
Troost Geological Consulting
17227 97th Drive SE
Snohomish, WA 98296
USA

RE: Radiocarbon Dating Result For Sample H469-11L-20D 39.35'

Dear Kathy:

Enclosed is the radiocarbon dating result for one sample recently sent to us. It provided plenty of carbon for an accurate measurement and the analysis proceeded normally. As usual, the method of analysis is listed on the report sheet and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analysis. It was analyzed with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

The cost of the analysis was charged to the VISA card provided. A receipt is enclosed with the mailed report copy. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

Digital signature on file

BETA ANALYTIC INC.
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MIAMI, FLORIDA, USA 33155
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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Kathy Goetz Troost — Report Date: 2/9/2011

Troost Geological Consulting — Material Received: 1/20/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 291935	8110 +/- 50 BP	-26.6 o/oo	8080 +/- 50 BP

SAMPLE : H469-11L-20D 39.35'
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 7170 to 7020 (Cal BP 9120 to 8970) AND Cal BC 6930 to 6920 (Cal BP 8880 to 8870)
Cal BC 6880 to 6840 (Cal BP 8830 to 8800)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

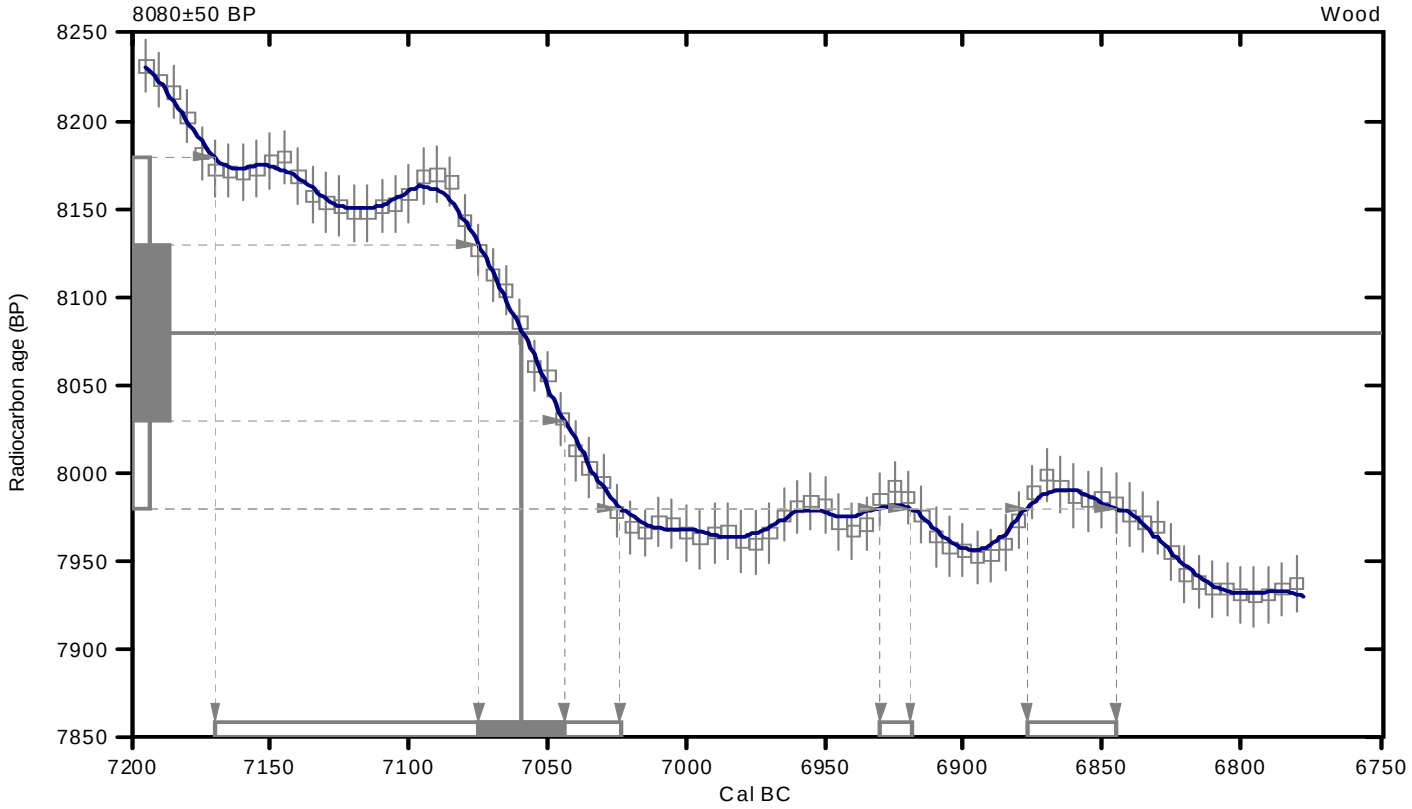
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.6:lab. mult=1)

Laboratory number:	**Beta-291935**
Conventional radiocarbon age:	**8080±50 BP**
2 Sigma calibrated results: (95% probability)	**Cal BC 7170 to 7020 (Cal BP 9120 to 8970) and Cal BC 6930 to 6920 (Cal BP 8880 to 8870) and Cal BC 6880 to 6840 (Cal BP 8830 to 8800)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 7060 (Cal BP 9010)
1 Sigma calibrated result: (68% probability)	Cal BC 7080 to 7040 (Cal BP 9020 to 8990)



References:

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Mathematics

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Ronald Hatfield
Christopher Patrick
Deputy Directors

February 18, 2011

Dr. Kathy Goetz Troost
Troost Geological Consulting
17227 97th Drive SE
Snohomish, WA 98296
USA

RE: Radiocarbon Dating Result For Sample H499-10 F-13A

Dear Kathy:

Enclosed is the radiocarbon dating result for one sample recently sent to us. It provided plenty of carbon for an accurate measurement and the analysis proceeded normally. As usual, the method of analysis is listed on the report sheet and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analysis. It was analyzed with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

The cost of the analysis was charged to the VISA card provided. A receipt is enclosed with the mailed report copy. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

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BETA ANALYTIC INC.
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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Kathy Goetz Troost — Report Date: 2/18/2011

Troost Geological Consulting — Material Received: 1/31/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 292564	5220 +/- 40 BP	-26.4 o/oo	5200 +/- 40 BP

SAMPLE : H499-10 F-13A
ANALYSIS : AMS-ADVANCE delivery
MATERIAL/PRETREATMENT : (peat): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 4050 to 3960 (Cal BP 6000 to 5900)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

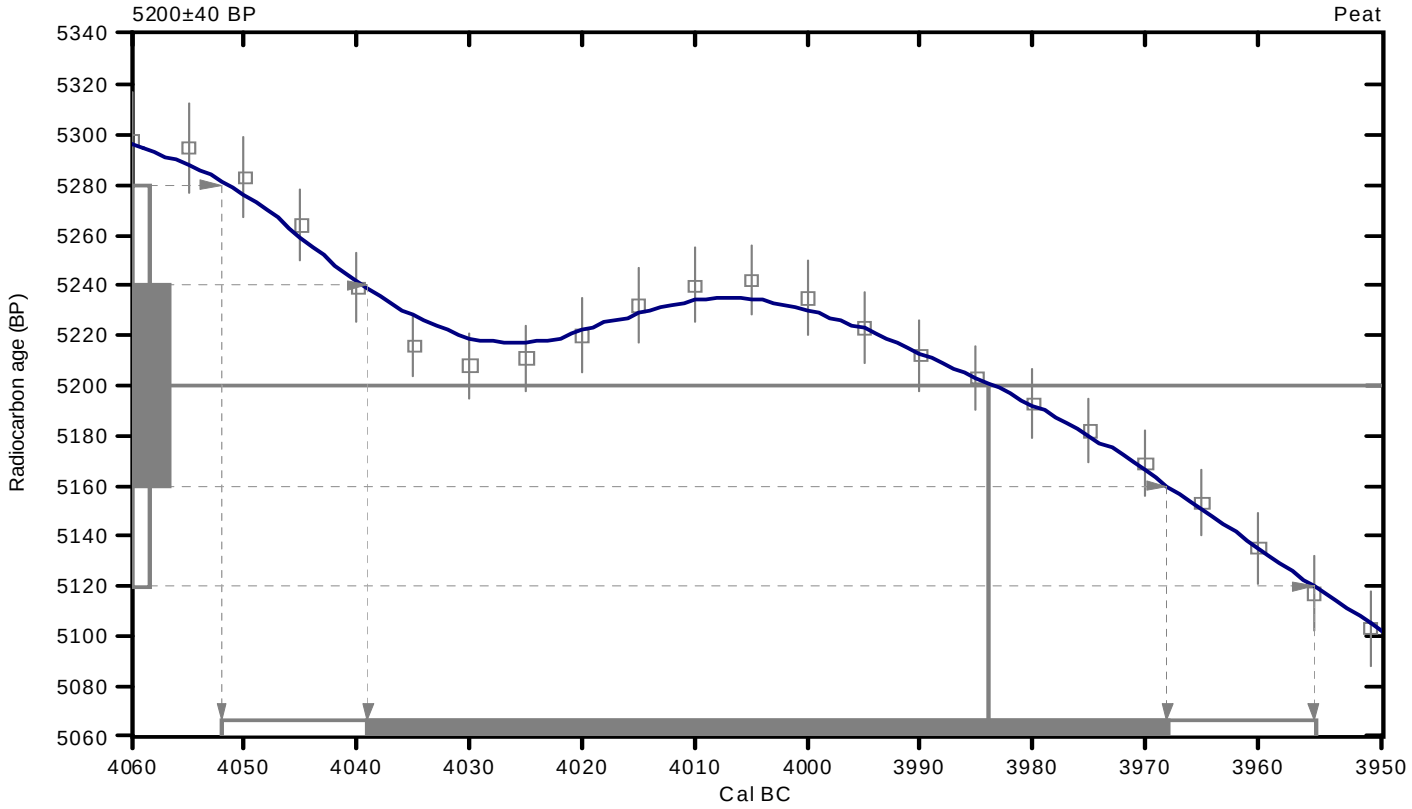
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.4:lab. mult=1)

Laboratory number:	**Beta-292564**
Conventional radiocarbon age:	**5200±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 4050 to 3960 (Cal BP 6000 to 5900)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 3980 (Cal BP 5930)
1 Sigma calibrated result: (68% probability)	Cal BC 4040 to 3970 (Cal BP 5990 to 5920)



References:

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Calibration Database

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Mathematics

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Ronald Hatfield
Christopher Patrick
Deputy Directors

March 3, 2011

Dr. Kathy Goetz Troost
Troost Geological Consulting
17227 97th Drive SE
Snohomish, WA 98296
USA

RE: Radiocarbon Dating Results For Samples H481-10 F-22B, H481-10 L-4D, H481-10 L-6A, H481-10 L-12C, H488-10 L-14B, H488-10 L-22A, H488-10 L-24ACF, H499-10 F-7B, H499-10 L-2E, H500-10 L-8C, H505-10 L-14A

Dear Kathy:

Enclosed are the radiocarbon dating results for 11 samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

The cost of the analysis was charged to the VISA card provided. A receipt is enclosed with the mailed report copy. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

BETA ANALYTIC INC.
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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Kathy Goetz Troost — Report Date: 3/3/2011

Troost Geological Consulting — Material Received: 1/31/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 292556	NA	-29.5 o/oo	> 43500 BP

SAMPLE : H481-10 F-22B
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
COMMENTS:

(1) The 14C activity was extremely low and almost identical to the background signal. In such cases, indeterminant errors associated with the background add non-measurable uncertainty to the result. Always, the result should be considered along with other lines of evidence. The most conservative interpretation of age is infinite (i.e. greater than).
(2) A Measured Radiocarbon Age is not reported for infinite dates since corrections may imply a greater level of confidence than is appropriate.

Beta - 292557	3030 +/- 40 BP	-27.7 o/oo	2990 +/- 40 BP

SAMPLE : H481-10 L-4D
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (peat): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 1380 to 1330 (Cal BP 3330 to 3280) AND Cal BC 1330 to 1120 (Cal BP 3280 to 3060)

Beta - 292558	2540 +/- 40 BP	-26.0 o/oo	2520 +/- 40 BP

SAMPLE : H481-10 L-6A
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 790 to 520 (Cal BP 2740 to 2470)

Beta - 292559	5460 +/- 40 BP	-27.4 o/oo	5420 +/- 40 BP

SAMPLE : H481-10 L-12C
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 4340 to 4230 (Cal BP 6290 to 6180)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

BETA ANALYTIC INC.
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beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Kathy Goetz Troost

Report Date: 3/3/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 292560	6310 +/- 50 BP	-27.4 o/oo	6270 +/- 50 BP
SAMPLE : H488-10 L-14B			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (peat): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 5330 to 5200 (Cal BP 7280 to 7150) AND Cal BC 5170 to 5070 (Cal BP 7120 to 7020)			
Beta - 292561	5920 +/- 40 BP	-28.7 o/oo	5860 +/- 40 BP
SAMPLE : H488-10 L-22A			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 4800 to 4670 (Cal BP 6750 to 6620) AND Cal BC 4640 to 4620 (Cal BP 6590 to 6570)			
Beta - 292562	7780 +/- 40 BP	-27.6 o/oo	7740 +/- 40 BP
SAMPLE : H488-10 L-24ACF			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 6640 to 6470 (Cal BP 8600 to 8420)			
Beta - 292563	3940 +/- 40 BP	-26.8 o/oo	3910 +/- 40 BP
SAMPLE : H499-10 F-7B			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 2480 to 2290 (Cal BP 4430 to 4240)			

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Kathy Goetz Troost

Report Date: 3/3/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 292565 SAMPLE : H499-10 L-2E ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (wood): acid/alkali/acid 2 SIGMA CALIBRATION : Cal BC 810 to 760 (Cal BP 2760 to 2720)	2620 +/- 30 BP	-27.0 o/oo	2590 +/- 30 BP
Beta - 292566 SAMPLE : H500-10 L-8C ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (wood): acid/alkali/acid 2 SIGMA CALIBRATION : Cal BC 2470 to 2200 (Cal BP 4420 to 4150)	3950 +/- 40 BP	-29.9 o/oo	3870 +/- 40 BP
Beta - 292567 SAMPLE : H505-10 L-14A ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (wood): acid/alkali/acid 2 SIGMA CALIBRATION : Cal BC 4450 to 4330 (Cal BP 6400 to 6280)	5540 +/- 40 BP	-26.3 o/oo	5520 +/- 40 BP

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

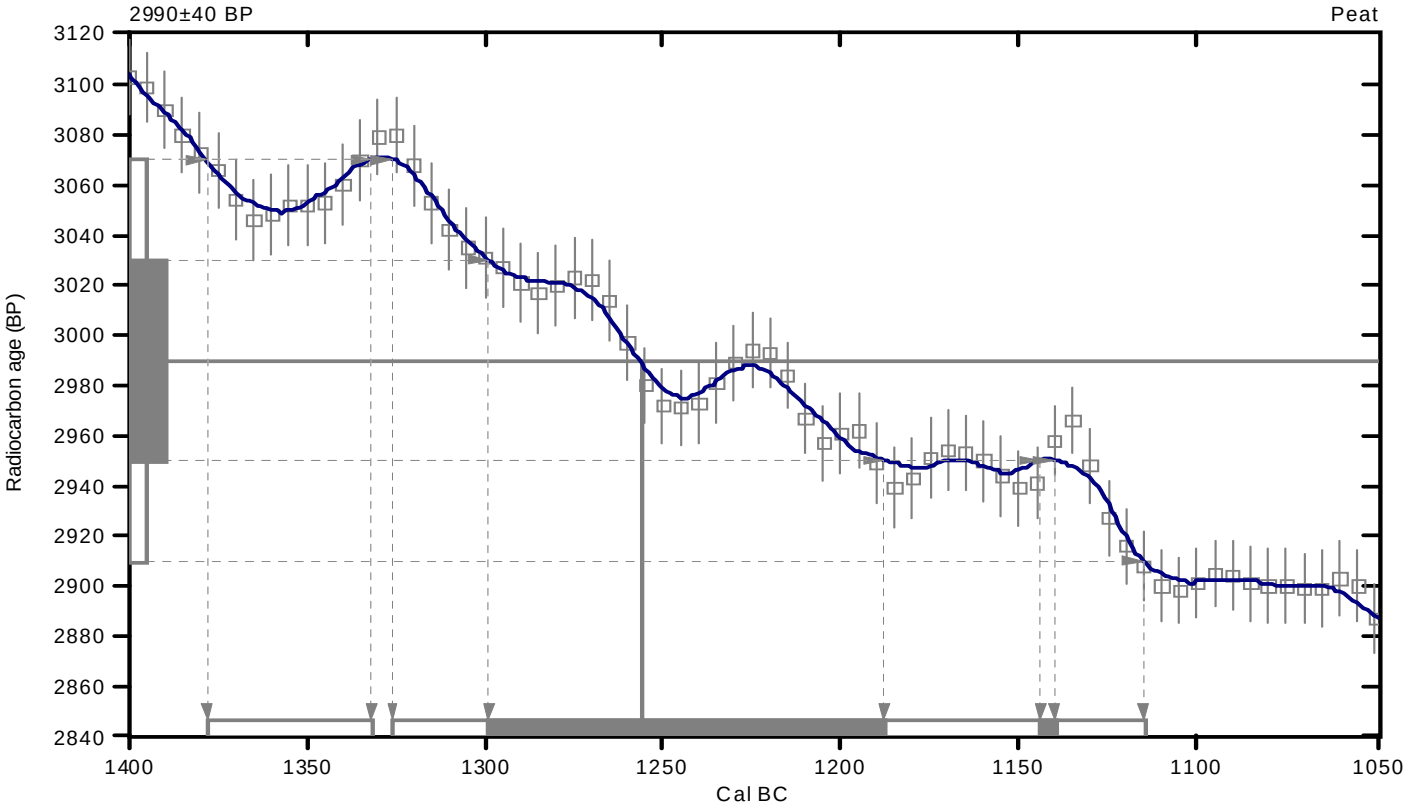
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.7:lab. mult=1)

Laboratory number:	**Beta-292557**
Conventional radiocarbon age:	**2990±40 BP**
2 Sigma calibrated results: **(95% probability)**	**Cal BC 1380 to 1330 (Cal BP 3330 to 3280) and** **Cal BC 1330 to 1120 (Cal BP 3280 to 3060)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 1260 (Cal BP 3210)
1 Sigma calibrated results: (68% probability)	Cal BC 1300 to 1190 (Cal BP 3250 to 3140) and Cal BC 1140 to 1140 (Cal BP 3090 to 3090)



References:

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Mathematics

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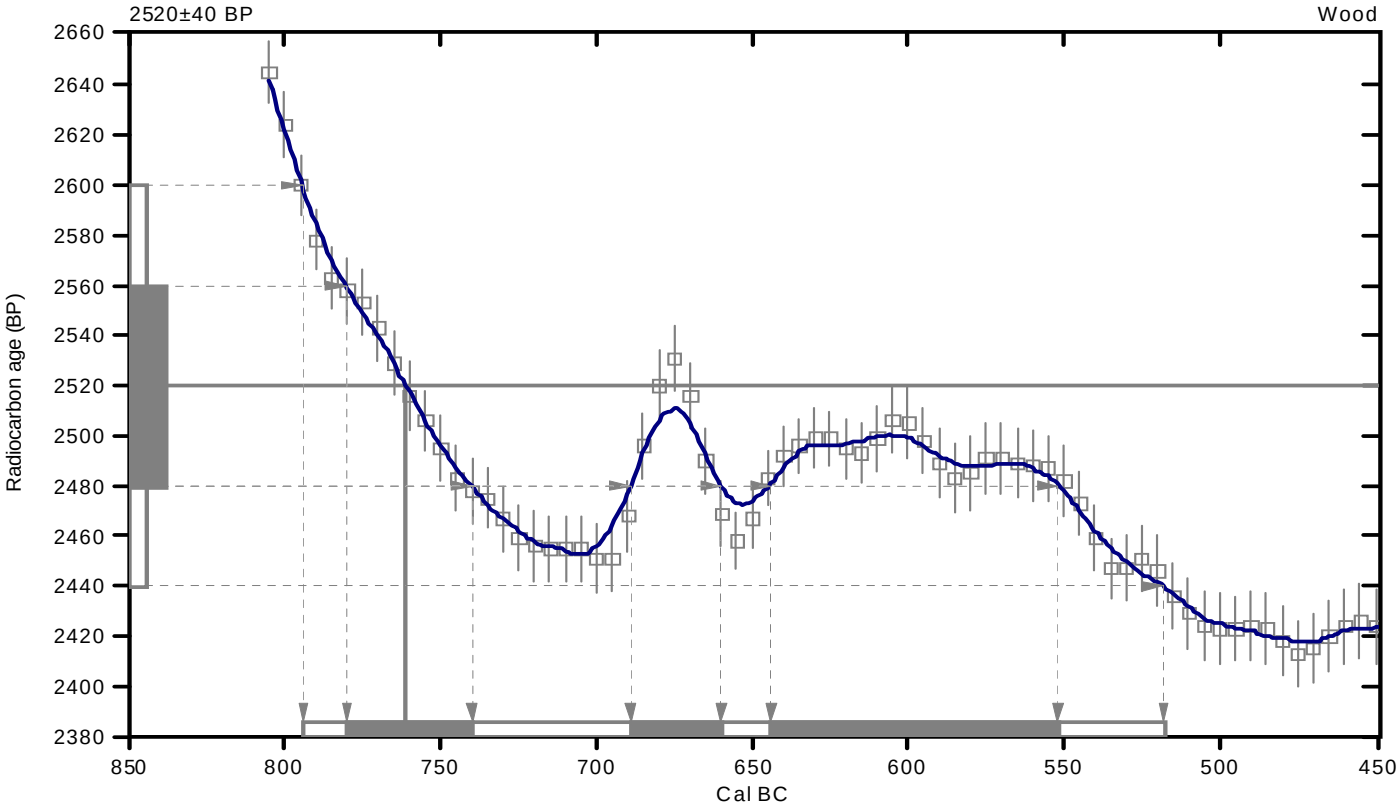
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26:lab. mult=1)

Laboratory number:	**Beta-292558**
Conventional radiocarbon age:	**2520±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 790 to 520 (Cal BP 2740 to 2470)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 760 (Cal BP 2710)
1 Sigma calibrated results: (68% probability)	Cal BC 780 to 740 (Cal BP 2730 to 2690) and Cal BC 690 to 660 (Cal BP 2640 to 2610) and Cal BC 640 to 550 (Cal BP 2590 to 2500)



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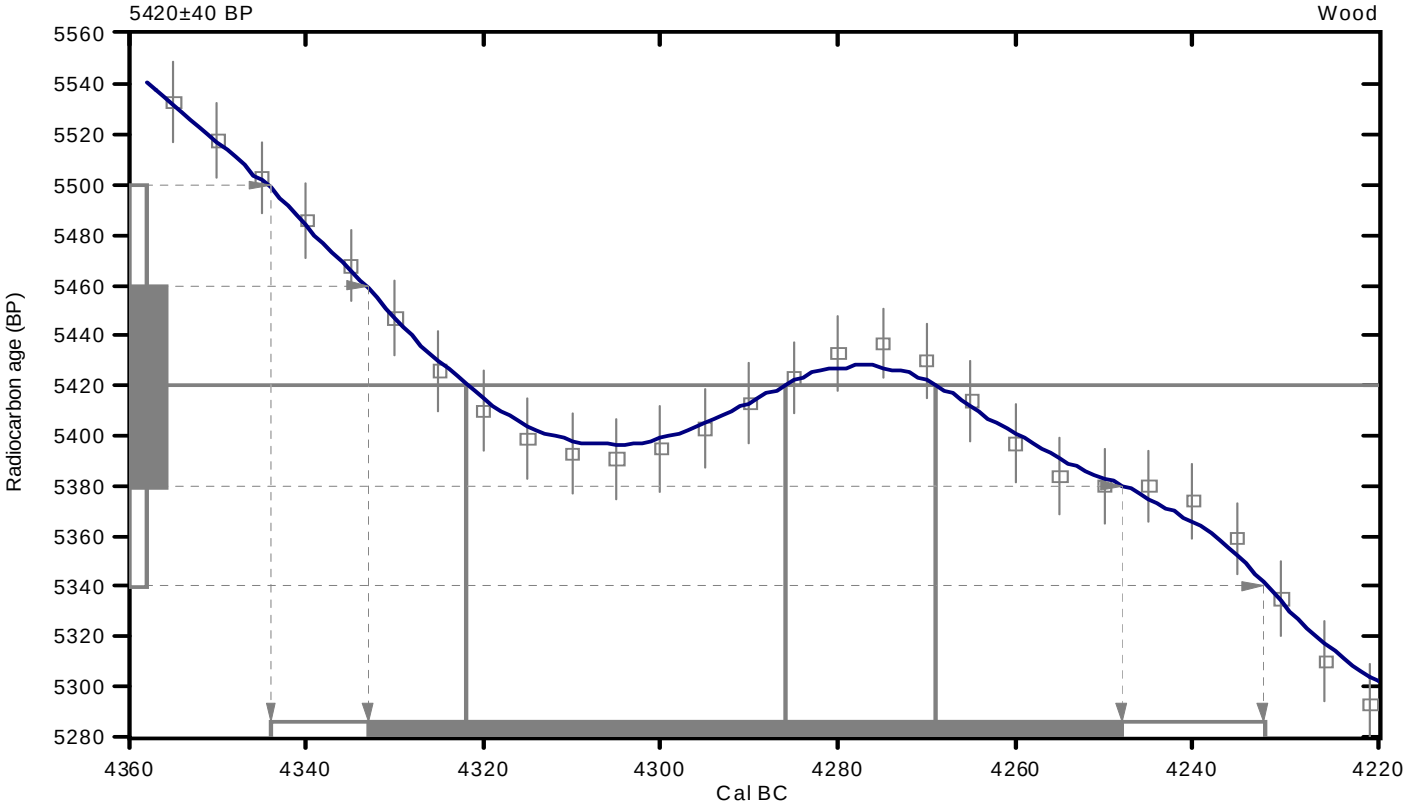
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.4:lab. mult=1)

Laboratory number:	**Beta-292559**
Conventional radiocarbon age:	**5420±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 4340 to 4230 (Cal BP 6290 to 6180)**

Intercept data

Intercepts of radiocarbon age with calibration curve:	Cal BC 4320 (Cal BP 6270) and Cal BC 4290 (Cal BP 6240) and Cal BC 4270 (Cal BP 6220)
1 Sigma calibrated result: (68% probability)	Cal BC 4330 to 4250 (Cal BP 6280 to 6200)



References:

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Mathematics

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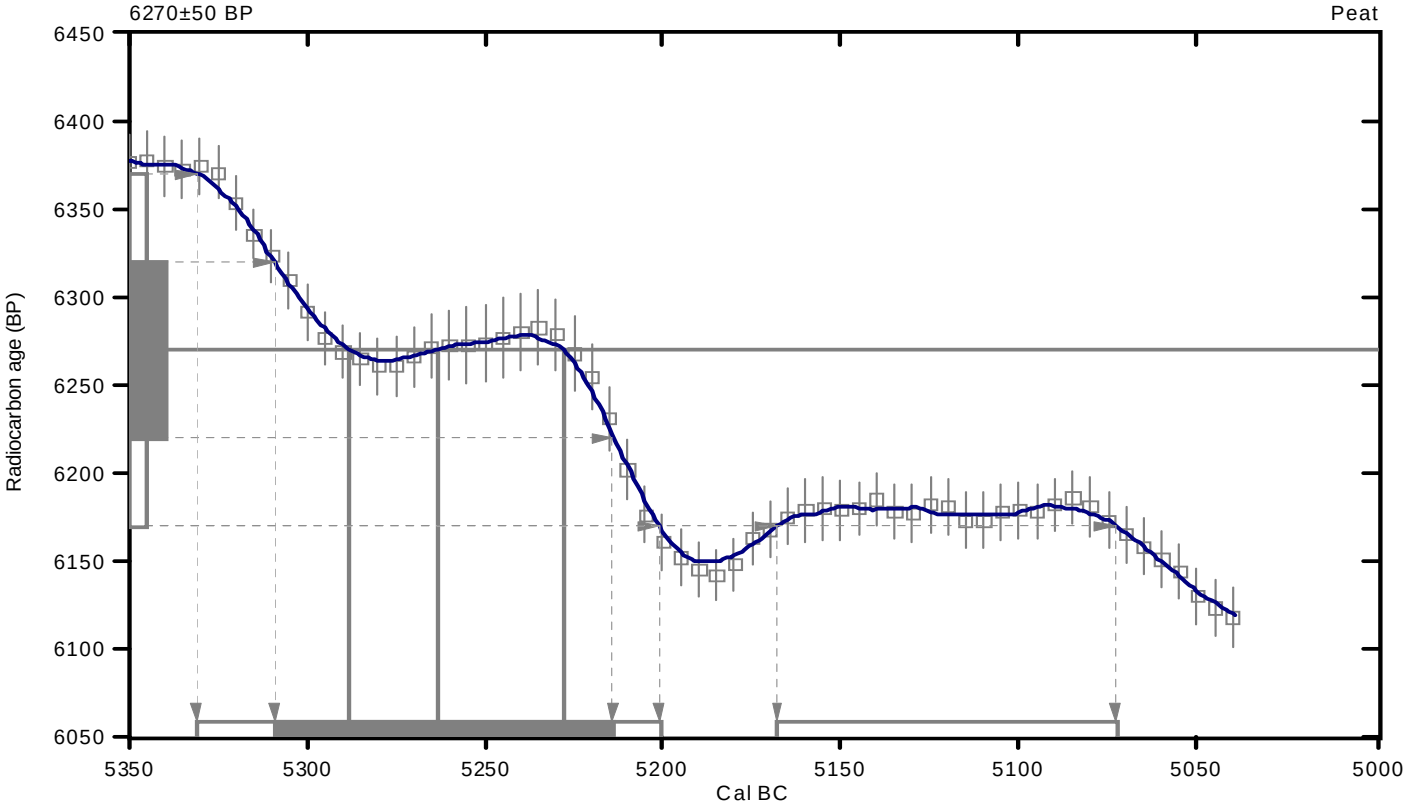
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.4:lab. mult=1)

Laboratory number:	**Beta-292560**
Conventional radiocarbon age:	**6270±50 BP**
2 Sigma calibrated results: (95% probability)	**Cal BC 5330 to 5200 (Cal BP 7280 to 7150) and Cal BC 5170 to 5070 (Cal BP 7120 to 7020)**

Intercept data

Intercepts of radiocarbon age with calibration curve:	Cal BC 5290 (Cal BP 7240) and Cal BC 5260 (Cal BP 7210) and Cal BC 5230 (Cal BP 7180)
1 Sigma calibrated result: (68% probability)	Cal BC 5310 to 5210 (Cal BP 7260 to 7160)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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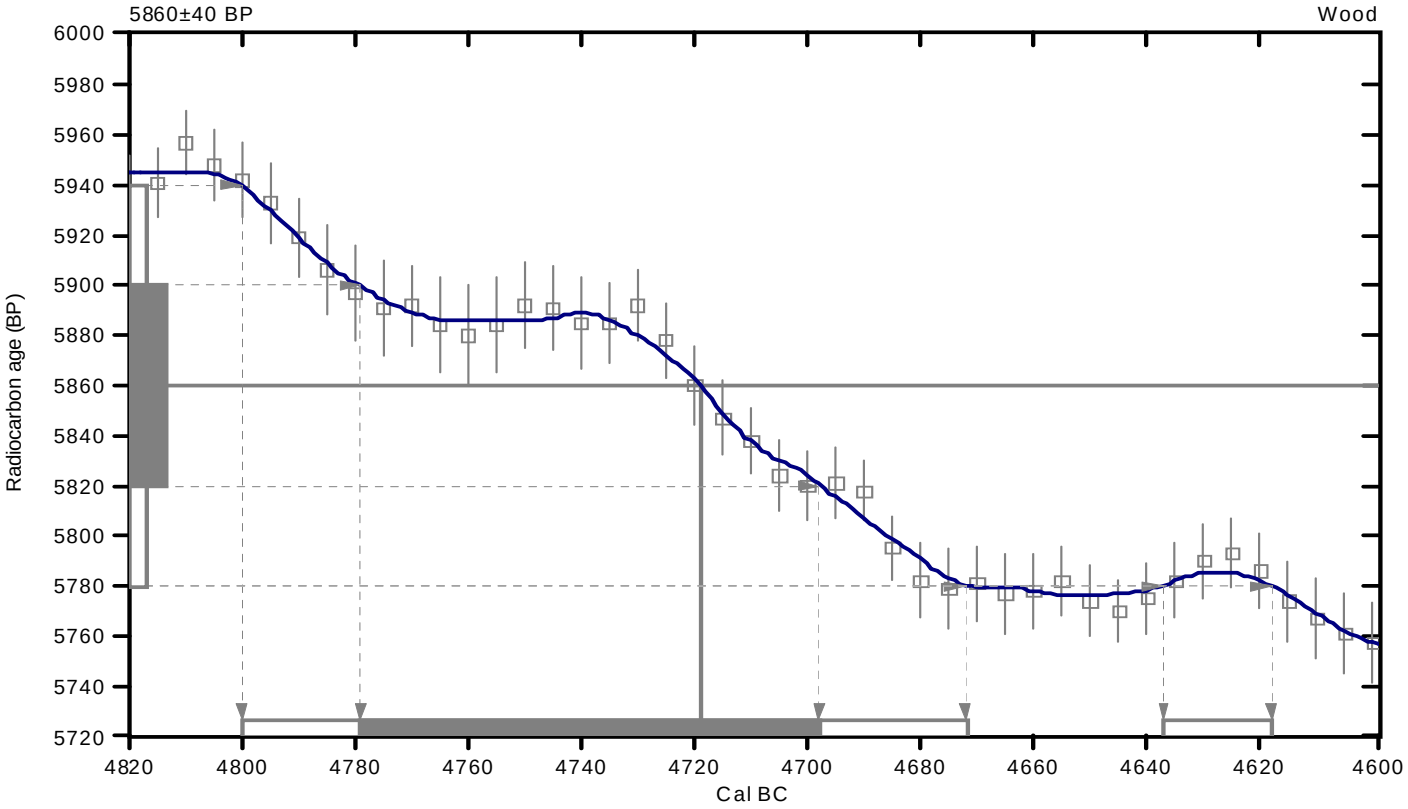
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-28.7:lab. mult=1)

Laboratory number:	**Beta-292561**
Conventional radiocarbon age:	**5860±40 BP**
2 Sigma calibrated results: (95% probability)	**Cal BC 4800 to 4670 (Cal BP 6750 to 6620) and Cal BC 4640 to 4620 (Cal BP 6590 to 6570)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 4720 (Cal BP 6670)
1 Sigma calibrated result: (68% probability)	Cal BC 4780 to 4700 (Cal BP 6730 to 6650)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

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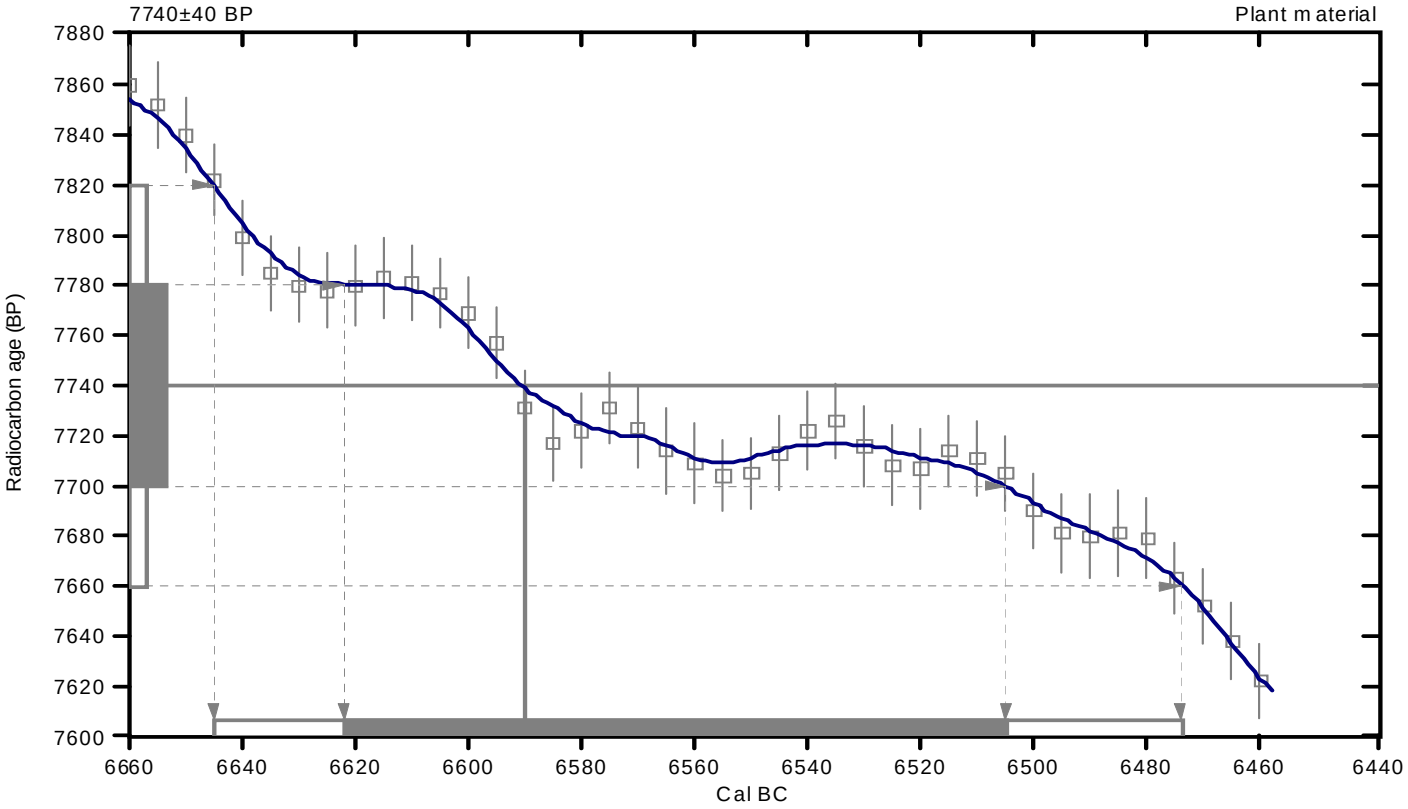
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.6:lab. mult=1)

Laboratory number:	**Beta-292562**
Conventional radiocarbon age:	**7740±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 6640 to 6470 (Cal BP 8600 to 8420)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 6590 (Cal BP 8540)
1 Sigma calibrated result: (68% probability)	Cal BC 6620 to 6500 (Cal BP 8570 to 8460)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

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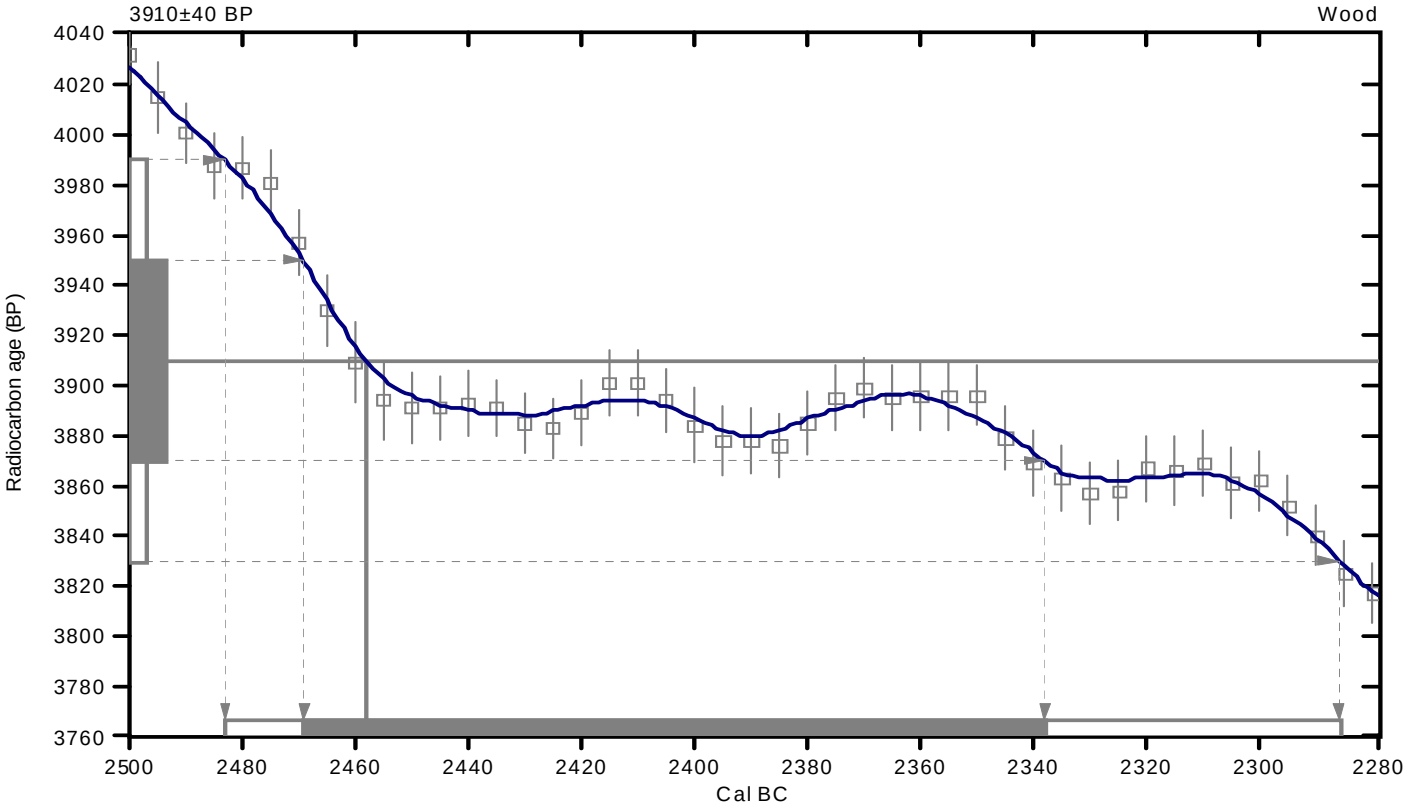
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.8:lab. mult=1)

Laboratory number:	**Beta-292563**
Conventional radiocarbon age:	**3910±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 2480 to 2290 (Cal BP 4430 to 4240)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 2460 (Cal BP 4410)
1 Sigma calibrated result: (68% probability)	Cal BC 2470 to 2340 (Cal BP 4420 to 4290)



References:

Database used

INTCAL04

Calibration Database

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IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

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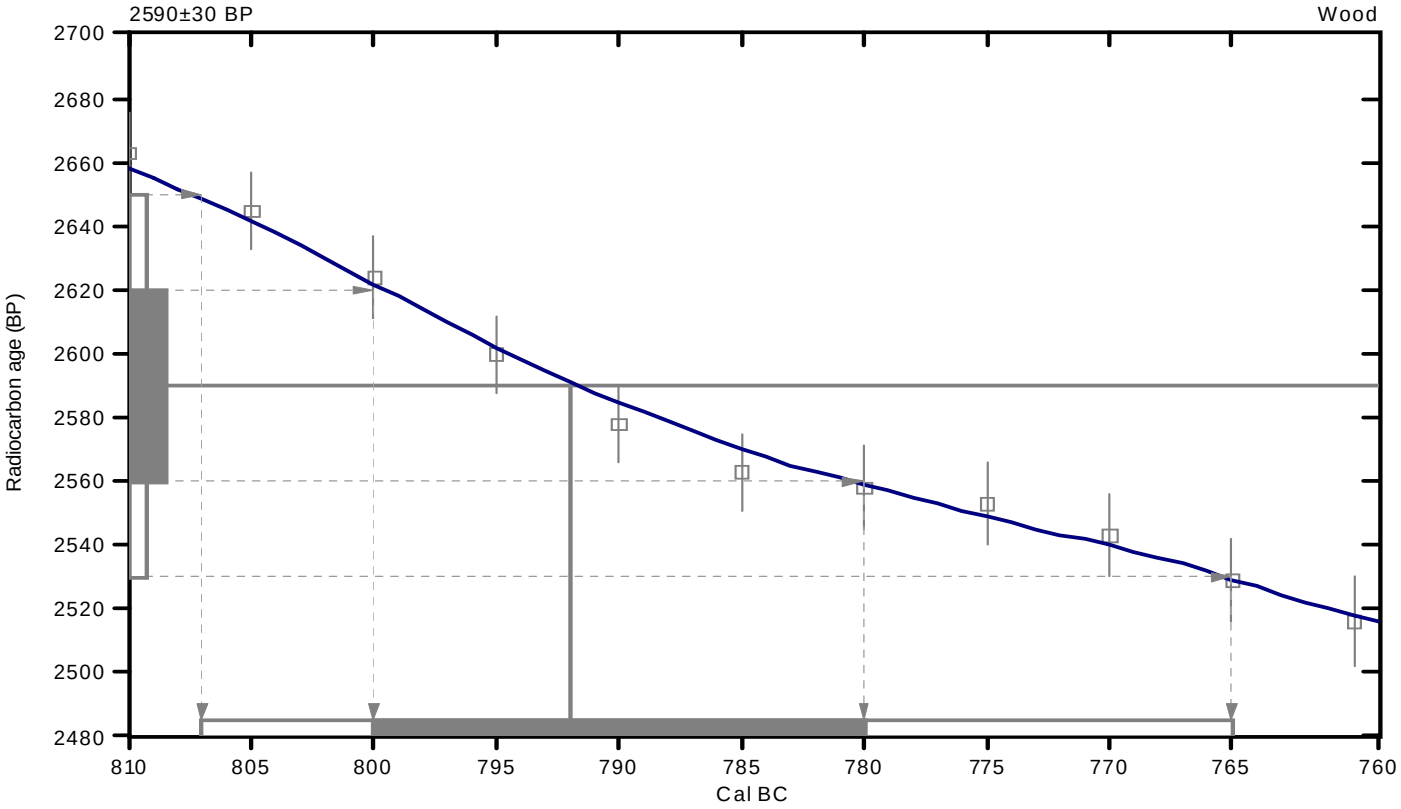
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27:lab. mult=1)

Laboratory number:	**Beta-292565**
Conventional radiocarbon age:	**2590±30 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 810 to 760 (Cal BP 2760 to 2720)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 790 (Cal BP 2740)
1 Sigma calibrated result: (68% probability)	Cal BC 800 to 780 (Cal BP 2750 to 2730)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

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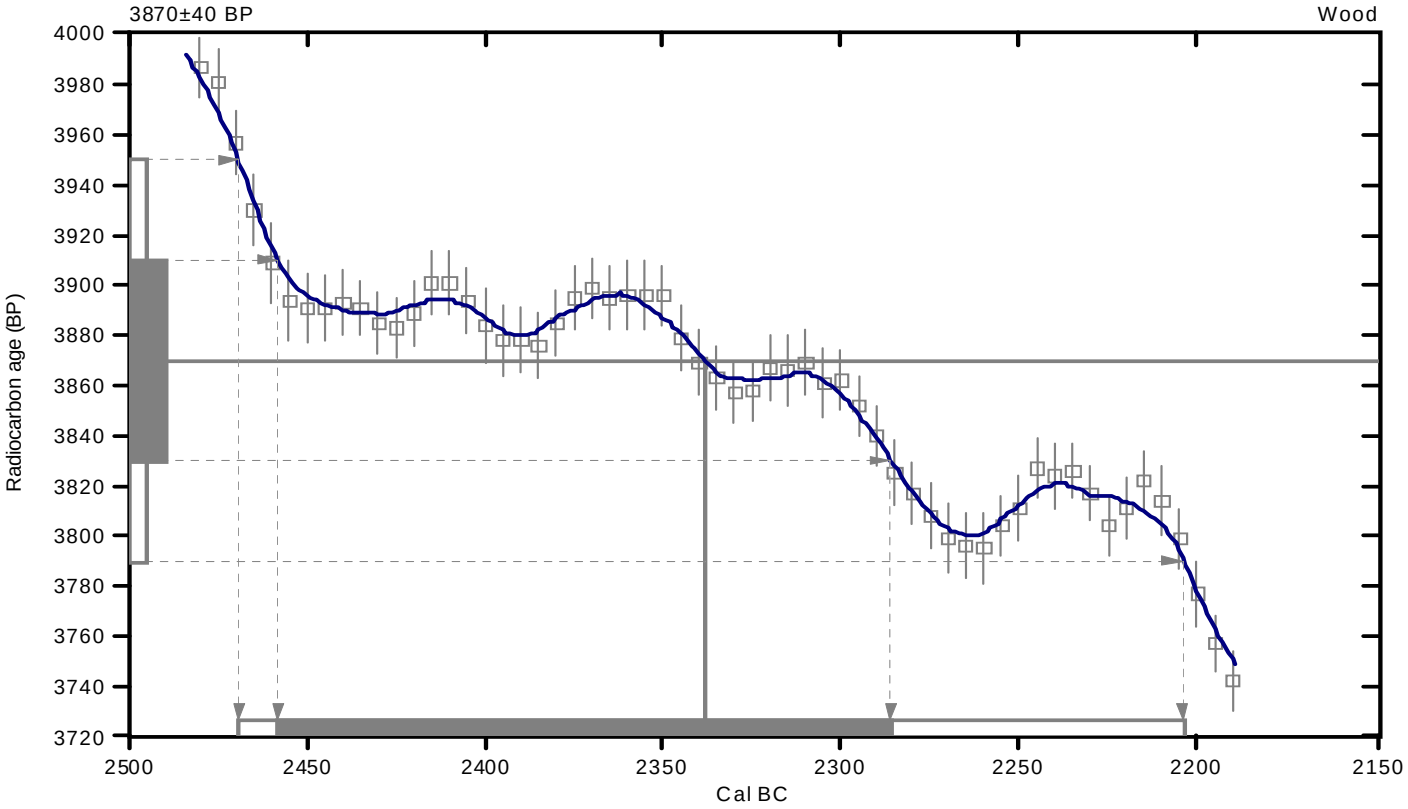
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-29.9:lab. mult=1)

Laboratory number:	**Beta-292566**
Conventional radiocarbon age:	**3870±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 2470 to 2200 (Cal BP 4420 to 4150)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 2340 (Cal BP 4290)
1 Sigma calibrated result: (68% probability)	Cal BC 2460 to 2290 (Cal BP 4410 to 4240)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

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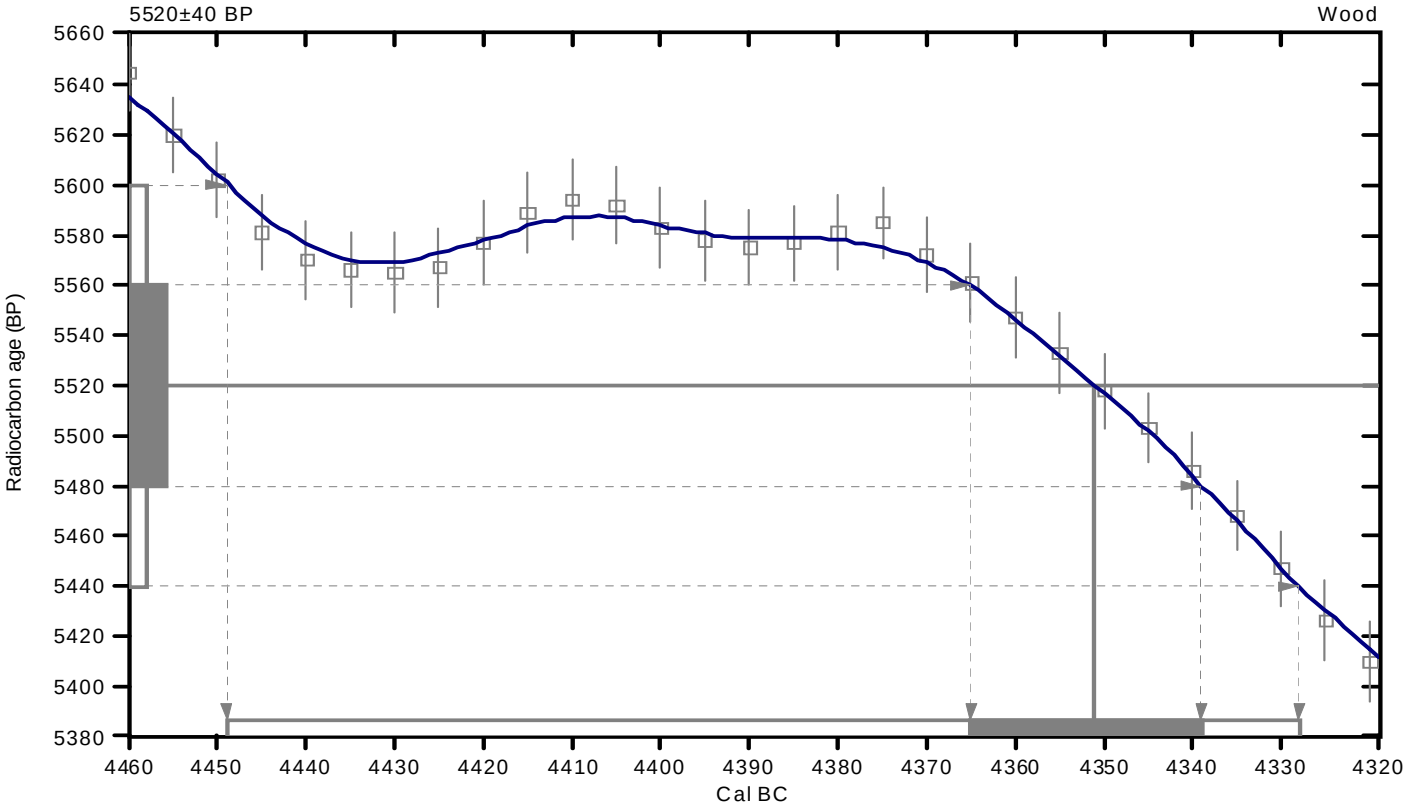
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.3:lab. mult=1)

Laboratory number:	**Beta-292567**
Conventional radiocarbon age:	**5520±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 4450 to 4330 (Cal BP 6400 to 6280)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 4350 (Cal BP 6300)
1 Sigma calibrated result: (68% probability)	Cal BC 4360 to 4340 (Cal BP 6320 to 6290)



References:

Database used

INTCAL04

Calibration Database

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Mathematics

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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

March 3, 2011

Dr. Kathy Goetz Troost
Troost Geological Consulting
17227 97th Drive SE
Snohomish, WA 98296
USA

RE: Radiocarbon Dating Result For Sample H481-10 F-13B

Dear Kathy:

Enclosed is the radiocarbon dating result for one sample recently sent to us. It provided plenty of carbon for an accurate measurement and the analysis proceeded normally. As usual, the method of analysis is listed on the report sheet and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analysis. It was analyzed with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

The cost of the analysis was charged to the VISA card provided. A receipt is enclosed with the mailed report copy. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

Digital signature on file

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Kathy Goetz Troost — Report Date: 3/3/2011

Troost Geological Consulting — Material Received: 2/1/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 292730	6220 +/- 40 BP	-23.1 o/oo	6250 +/- 40 BP

SAMPLE : H481-10 F-13B
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 5310 to 5200 (Cal BP 7260 to 7150) AND Cal BC 5170 to 5070 (Cal BP 7120 to 7020)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

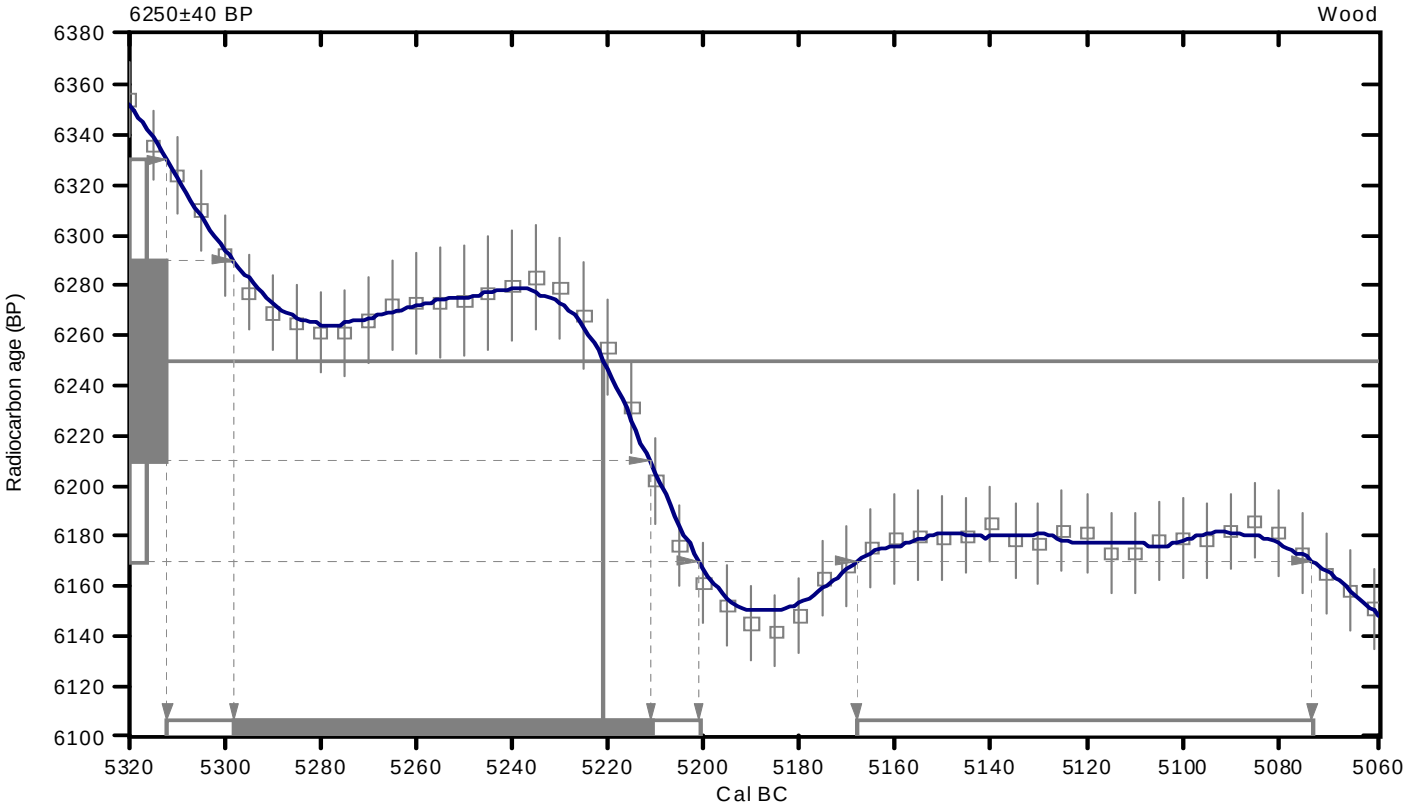
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.1:lab. mult=1)

Laboratory number:	**Beta-292730**
Conventional radiocarbon age:	**6250±40 BP**
2 Sigma calibrated results: (95% probability)	**Cal BC 5310 to 5200 (Cal BP 7260 to 7150) and Cal BC 5170 to 5070 (Cal BP 7120 to 7020)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 5220 (Cal BP 7170)
1 Sigma calibrated result: (68% probability)	Cal BC 5300 to 5210 (Cal BP 7250 to 7160)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

March 4, 2011

Dr. Kathy Goetz Troost
Troost Geological Consulting
17227 97th Drive SE
Snohomish, WA 98296
USA

RE: Radiocarbon Dating Results For Samples H447-11 L-6A, H449-10F-10A, H450-10 L-2D, H451-10 L-4E, H451-10 L-8C, H457-10 L-6B, H457-10L-10D, H457-10L-16D, H457-10L22AC, H469-11F-35B, H469-11 L-2E

Dear Kathy:

Enclosed are the radiocarbon dating results for 11 samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

Thank you for prepaying the analyses. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Kathy Goetz Troost — Report Date: 3/4/2011

Troost Geological Consulting — Material Received: 2/14/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 293494	4370 +/- 40 BP	-23.2 o/oo	4400 +/- 40 BP

SAMPLE : H447-11 L-6A
ANALYSIS : AMS-ADVANCE delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 3270 to 3240 (Cal BP 5220 to 5190) AND Cal BC 3110 to 2910 (Cal BP 5060 to 4860)

Beta - 293495	NA	-26.0 o/oo	> 43500 BP

SAMPLE : H449-10F-10A
ANALYSIS : AMS-ADVANCE delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
COMMENTS:

(1) The 14C activity was extremely low and almost identical to the background signal. In such cases, indeterminant errors associated with the background add non-measurable uncertainty to the result. Always, the result should be considered along with other lines of evidence. The most conservative interpretation of age is infinite (i.e. greater than).

(2) A Measured Radiocarbon Age is not reported for infinite dates since corrections may imply a greater level of confidence than is appropriate.

Beta - 293496	2980 +/- 40 BP	-27.3 o/oo	2940 +/- 40 BP

SAMPLE : H450-10 L-2D
ANALYSIS : AMS-ADVANCE delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 1280 to 1010 (Cal BP 3230 to 2960)

Beta - 293497	3670 +/- 40 BP	-26.8 o/oo	3640 +/- 40 BP

SAMPLE : H451-10 L-4E
ANALYSIS : AMS-ADVANCE delivery
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 2130 to 1900 (Cal BP 4080 to 3850)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Kathy Goetz Troost

Report Date: 3/4/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 293498	4590 +/- 50 BP	-27.8 o/oo	4540 +/- 50 BP
SAMPLE : H451-10 L-8C			
ANALYSIS : AMS-ADVANCE delivery			
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 3490 to 3470 (Cal BP 5440 to 5420) AND Cal BC 3370 to 3090 (Cal BP 5320 to 5040)			
Beta - 293499	2760 +/- 40 BP	-28.1 o/oo	2710 +/- 40 BP
SAMPLE : H457-10 L-6B			
ANALYSIS : AMS-ADVANCE delivery			
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 920 to 800 (Cal BP 2870 to 2750)			
Beta - 293500	3910 +/- 40 BP	-30.1 o/oo	3830 +/- 40 BP
SAMPLE : H457-10L-10D			
ANALYSIS : AMS-ADVANCE delivery			
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 2460 to 2190 (Cal BP 4410 to 4140) AND Cal BC 2180 to 2140 (Cal BP 4120 to 4100)			
Beta - 293501	5830 +/- 40 BP	-25.9 o/oo	5820 +/- 40 BP
SAMPLE : H457-10L-16D			
ANALYSIS : AMS-ADVANCE delivery			
MATERIAL/PRETREATMENT : (peat): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 4780 to 4560 (Cal BP 6730 to 6500)			

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Kathy Goetz Troost

Report Date: 3/4/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 293502	7620 +/- 50 BP	-27.8 o/oo	7570 +/- 50 BP

SAMPLE : H457-10L22AC
ANALYSIS : AMS-ADVANCE delivery
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 6480 to 6380 (Cal BP 8430 to 8330)

Beta - 293503	NA	-27.8 o/oo	> 43500 BP

SAMPLE : H469-11F-35B
ANALYSIS : AMS-ADVANCE delivery
MATERIAL/PRETREATMENT : (organic sediment): acid washes
COMMENTS:

(1) The 14C activity was extremely low and almost identical to the background signal. In such cases, indeterminant errors associated with the background add non-measurable uncertainty to the result. Always, the result should be considered along with other lines of evidence. The most conservative interpretation of age is infinite (i.e. greater than).
(2) A Measured Radiocarbon Age is not reported for infinite dates since corrections may imply a greater level of confidence than is appropriate.

Beta - 293504	1750 +/- 40 BP	-26.4 o/oo	1730 +/- 40 BP

SAMPLE : H469-11 L-2E
ANALYSIS : AMS-ADVANCE delivery
MATERIAL/PRETREATMENT : (peat): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 230 to 410 (Cal BP 1720 to 1540)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

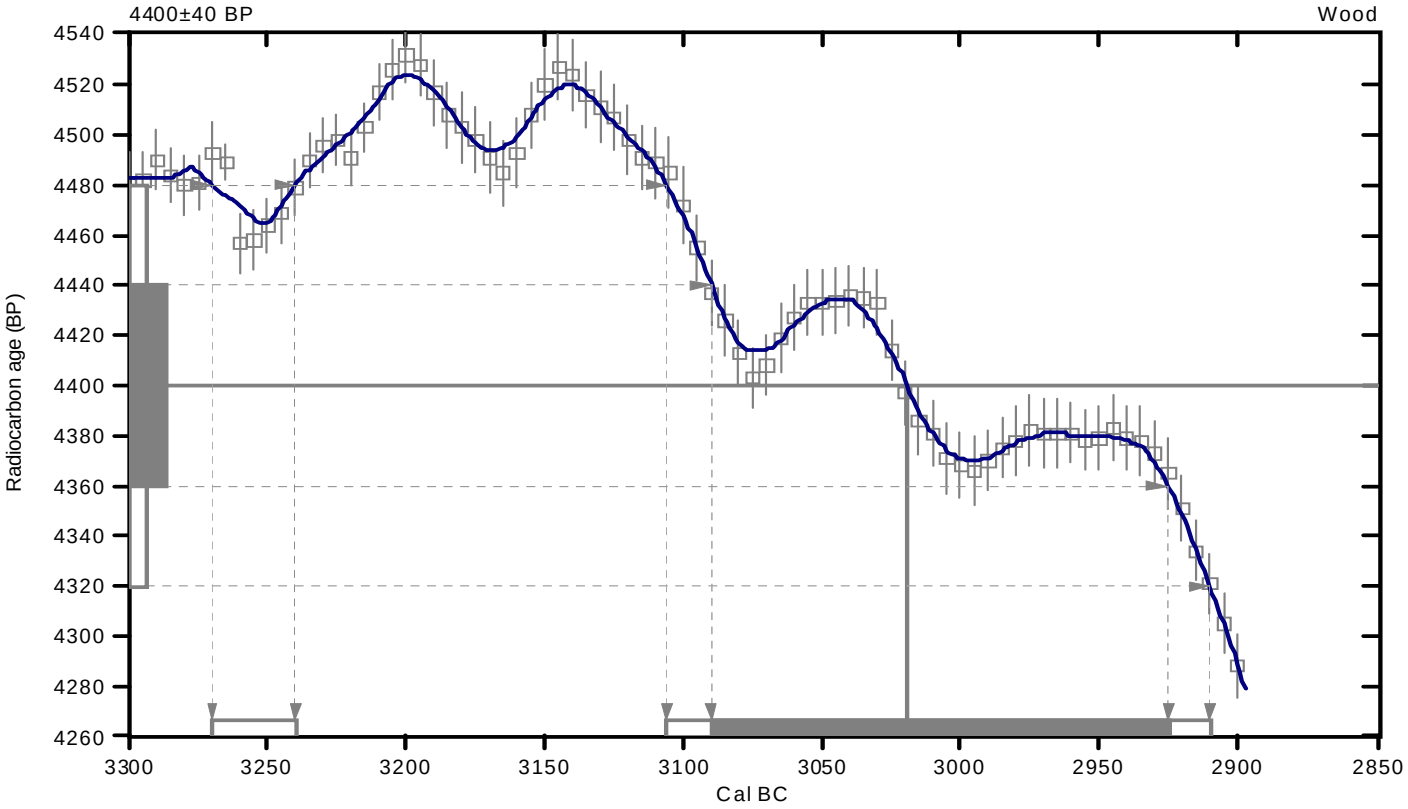
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.2:lab. mult=1)

Laboratory number:	**Beta-293494**
Conventional radiocarbon age:	**4400±40 BP**
2 Sigma calibrated results: (95% probability)	**Cal BC 3270 to 3240 (Cal BP 5220 to 5190) and Cal BC 3110 to 2910 (Cal BP 5060 to 4860)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 3020 (Cal BP 4970)
1 Sigma calibrated result: (68% probability)	Cal BC 3090 to 2920 (Cal BP 5040 to 4880)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

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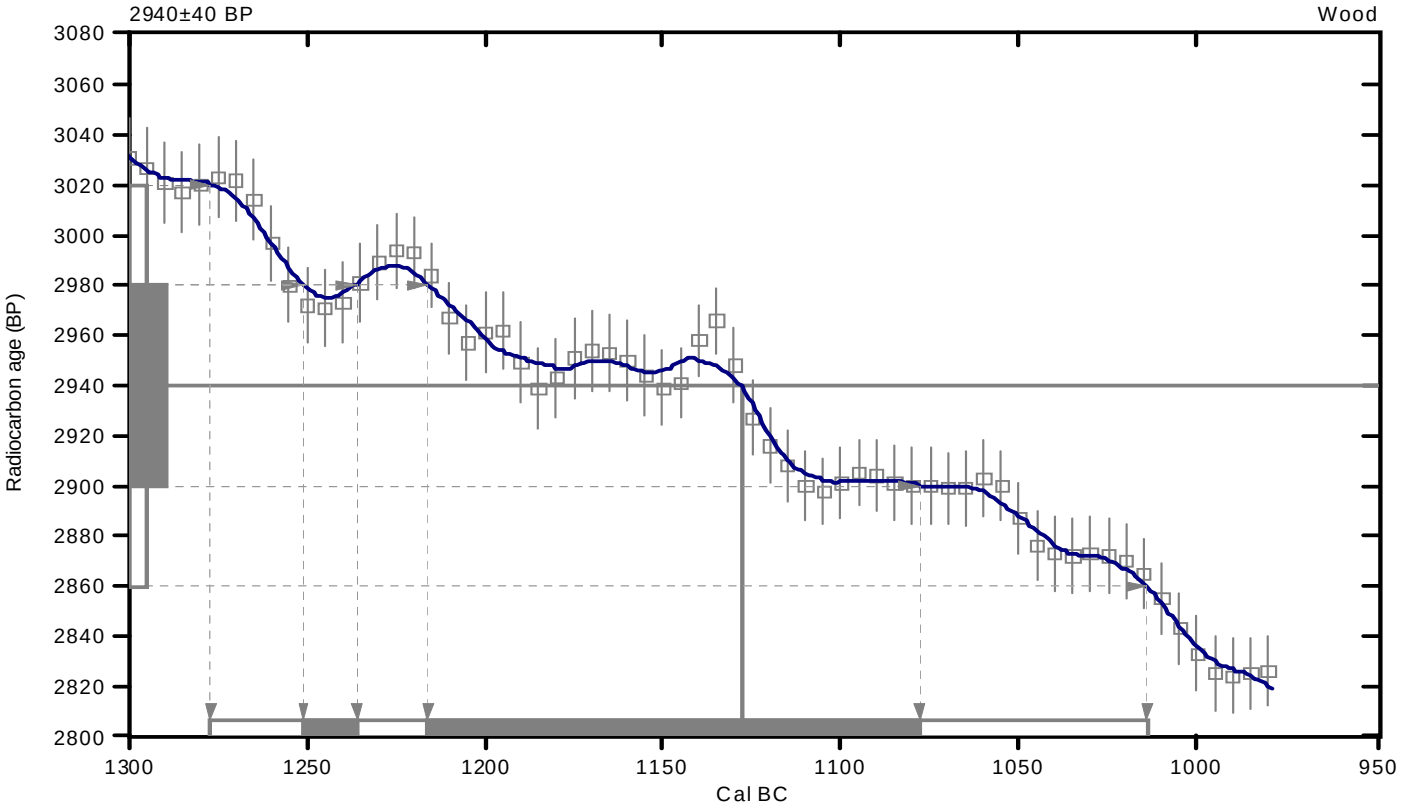
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.3:lab. mult=1)

Laboratory number:	**Beta-293496**
Conventional radiocarbon age:	**2940±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 1280 to 1010 (Cal BP 3230 to 2960)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 1130 (Cal BP 3080)
1 Sigma calibrated results: (68% probability)	Cal BC 1250 to 1240 (Cal BP 3200 to 3190) and Cal BC 1220 to 1080 (Cal BP 3170 to 3030)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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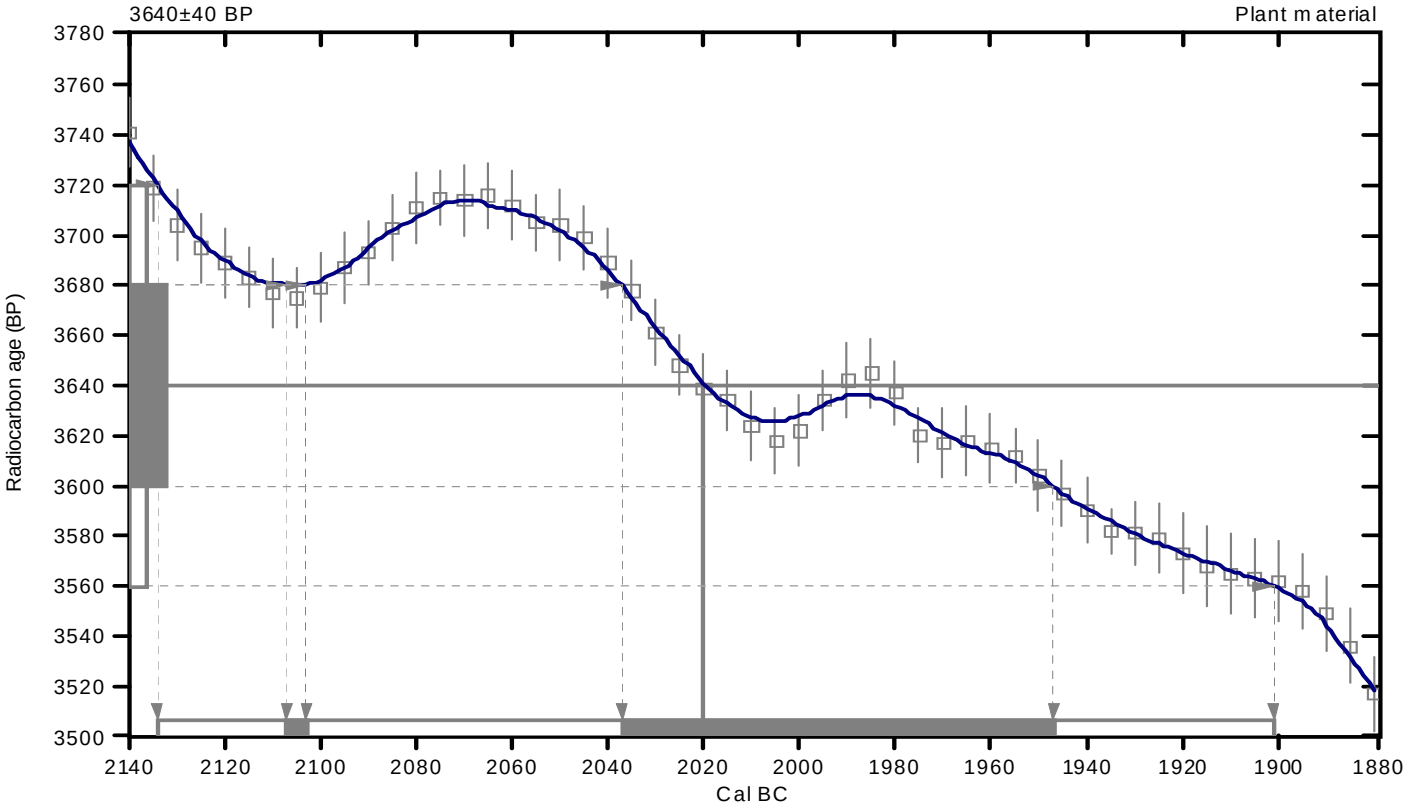
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.8:lab. mult=1)

Laboratory number:	**Beta-293497**
Conventional radiocarbon age:	**3640±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 2130 to 1900 (Cal BP 4080 to 3850)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 2020 (Cal BP 3970)
1 Sigma calibrated results: (68% probability)	Cal BC 2110 to 2100 (Cal BP 4060 to 4050) and Cal BC 2040 to 1950 (Cal BP 3990 to 3900)



References:

Database used

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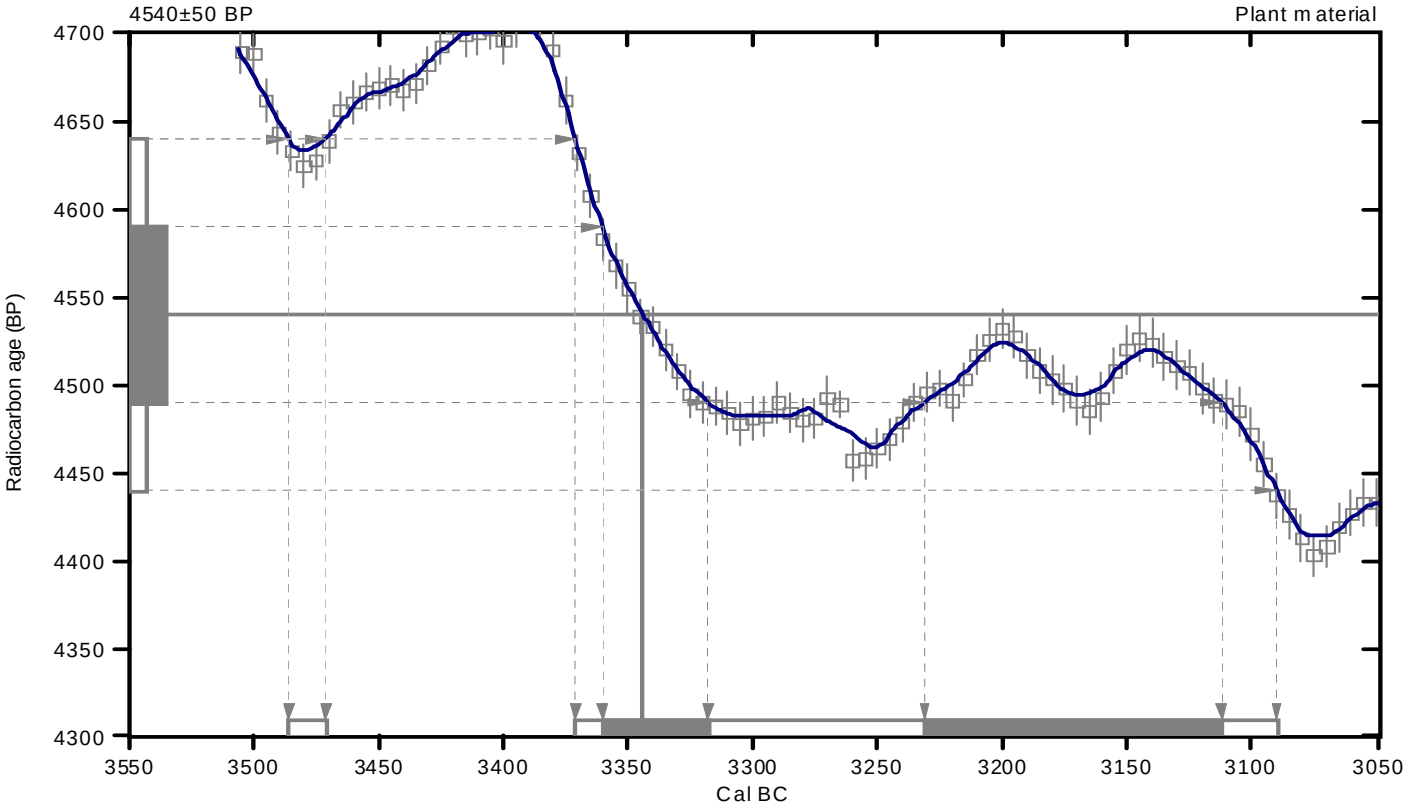
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.8:lab. mult=1)

Laboratory number:	**Beta-293498**
Conventional radiocarbon age:	**4540±50 BP**
2 Sigma calibrated results: **(95% probability)**	**Cal BC 3490 to 3470 (Cal BP 5440 to 5420) and Cal BC 3370 to 3090 (Cal BP 5320 to 5040)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 3340 (Cal BP 5290)
1 Sigma calibrated results: (68% probability)	Cal BC 3360 to 3320 (Cal BP 5310 to 5270) and Cal BC 3230 to 3110 (Cal BP 5180 to 5060)



References:

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Mathematics

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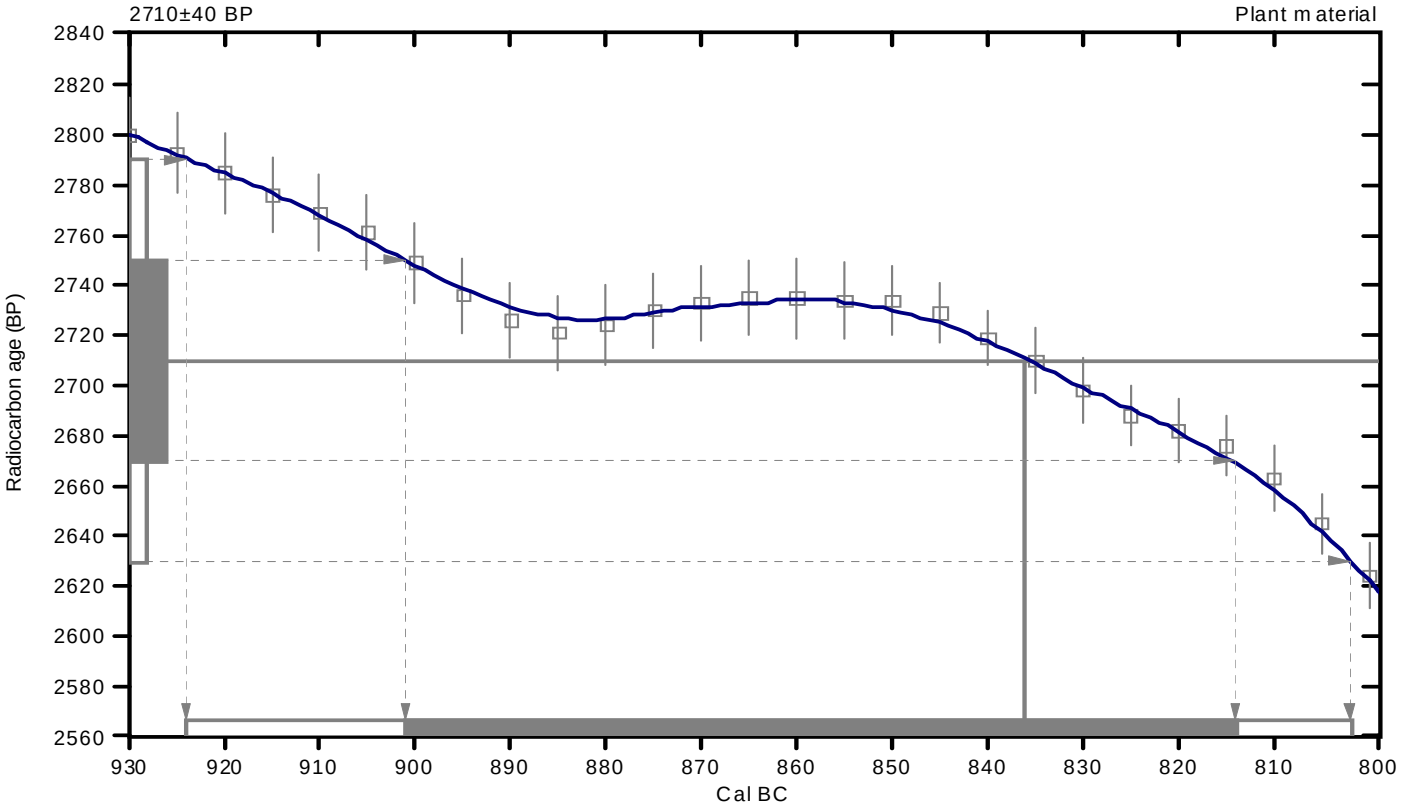
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-28.1:lab. mult=1)

Laboratory number:	**Beta-293499**
Conventional radiocarbon age:	**2710±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 920 to 800 (Cal BP 2870 to 2750)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 840 (Cal BP 2790)
1 Sigma calibrated result: (68% probability)	Cal BC 900 to 810 (Cal BP 2850 to 2760)



References:

Database used

INTCAL04

Calibration Database

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Mathematics

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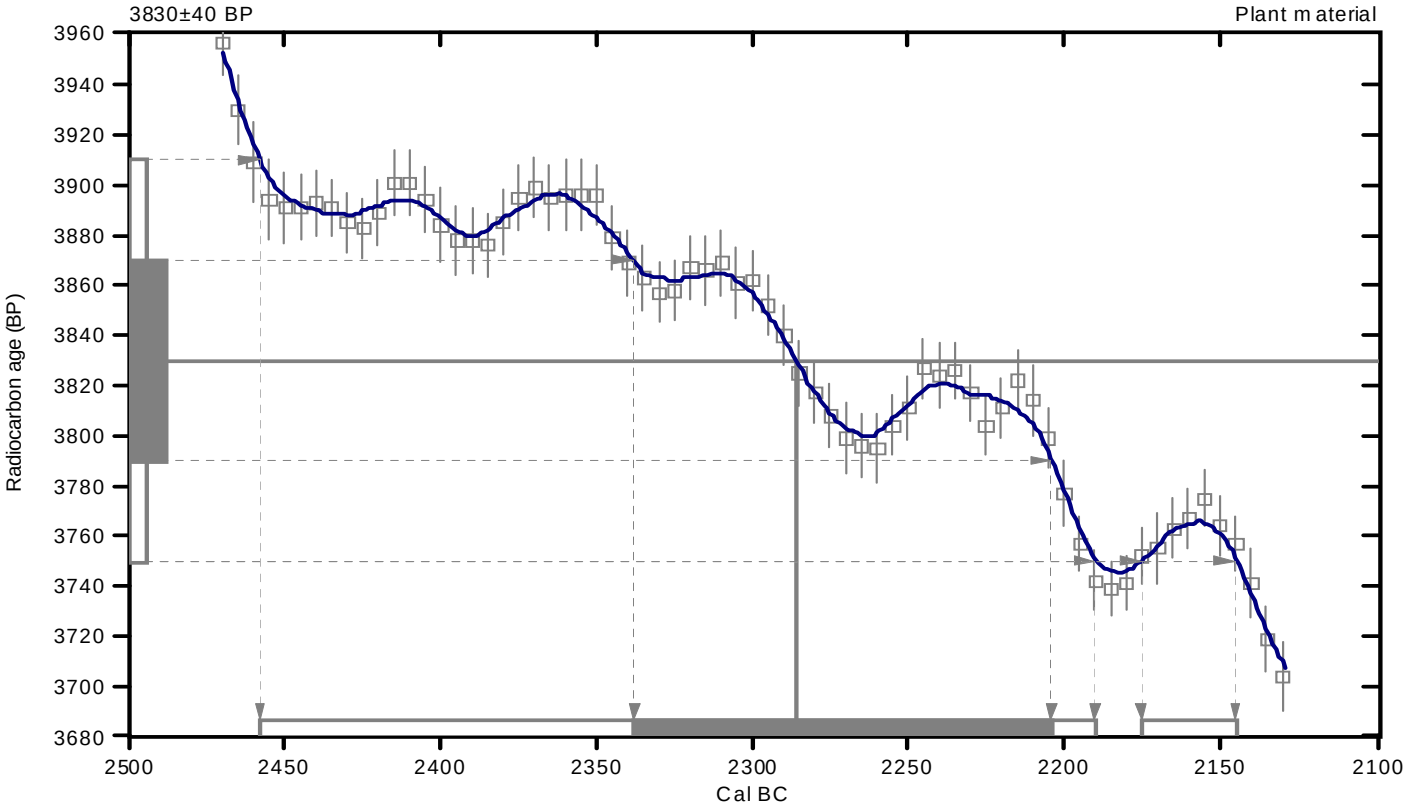
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-30.1:lab. mult=1)

Laboratory number:	**Beta-293500**
Conventional radiocarbon age:	**3830±40 BP**
2 Sigma calibrated results: (95% probability)	**Cal BC 2460 to 2190 (Cal BP 4410 to 4140) and Cal BC 2180 to 2140 (Cal BP 4120 to 4100)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 2290 (Cal BP 4240)
1 Sigma calibrated result: (68% probability)	Cal BC 2340 to 2200 (Cal BP 4290 to 4150)



References:

Database used

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Calibration Database

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Mathematics

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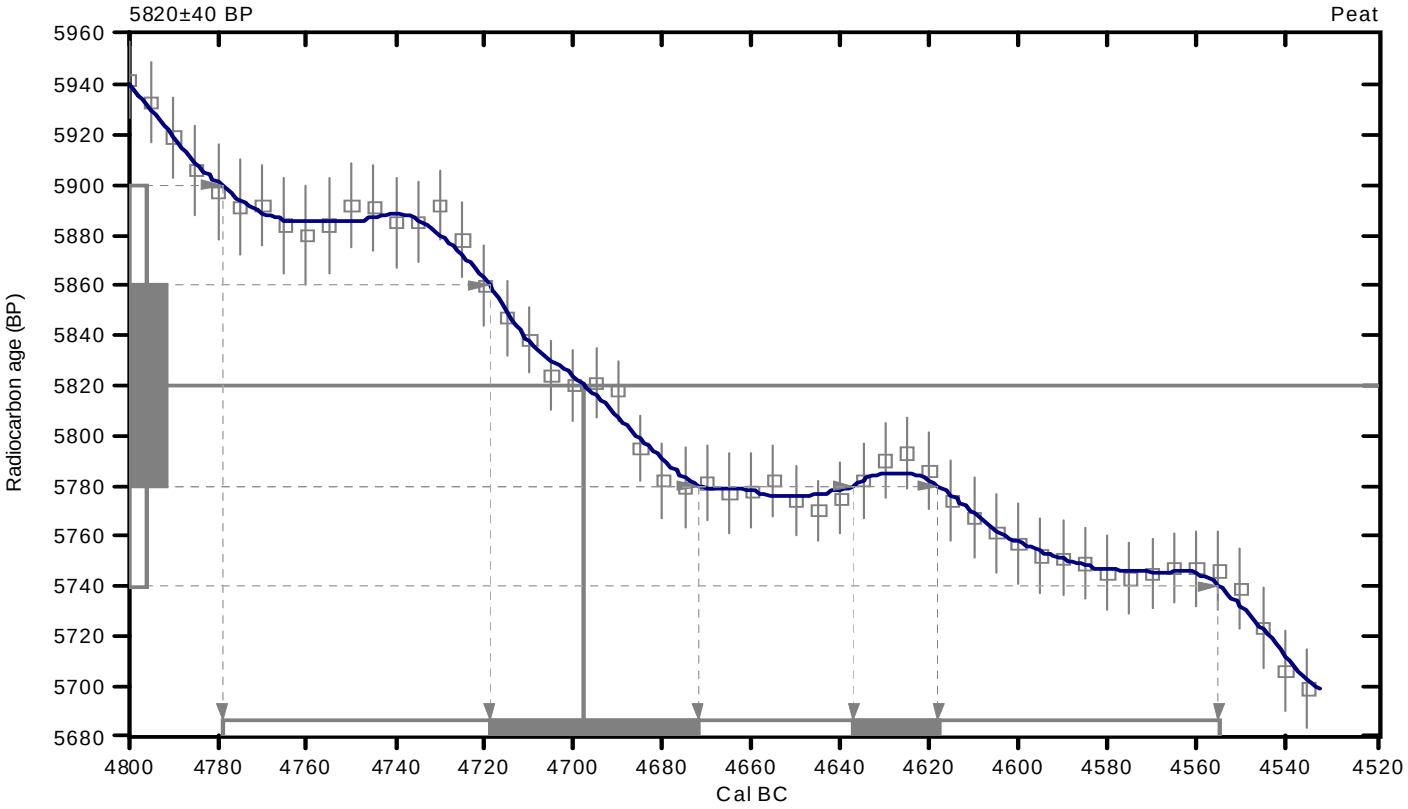
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.9:lab. mult=1)

Laboratory number:	**Beta-293501**
Conventional radiocarbon age:	**5820±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 4780 to 4560 (Cal BP 6730 to 6500)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 4700 (Cal BP 6650)
1 Sigma calibrated results: (68% probability)	Cal BC 4720 to 4670 (Cal BP 6670 to 6620) and Cal BC 4640 to 4620 (Cal BP 6590 to 6570)



References:

Database used

INTCAL04

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Mathematics

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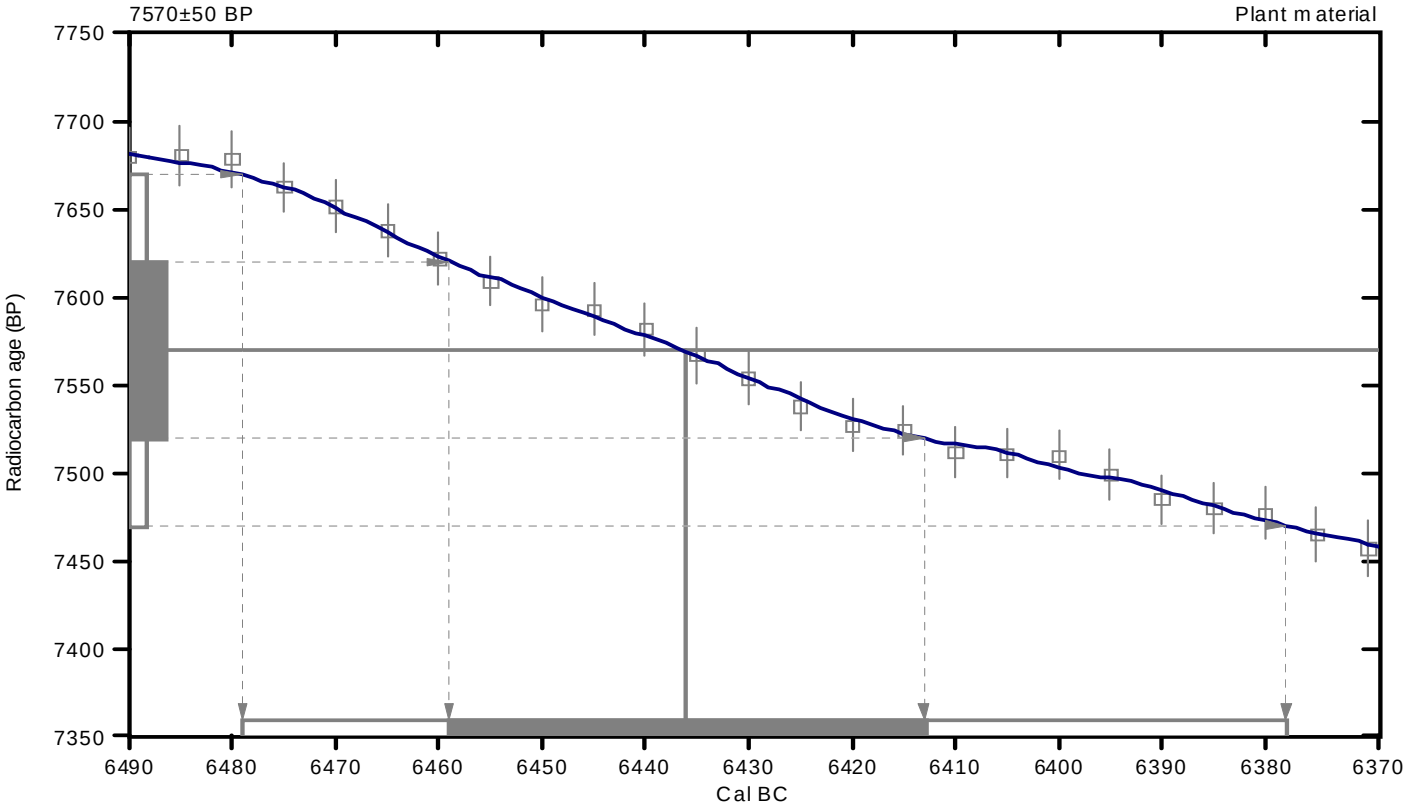
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.8:lab. mult=1)

Laboratory number:	**Beta-293502**
Conventional radiocarbon age:	**7570±50 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 6480 to 6380 (Cal BP 8430 to 8330)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 6440 (Cal BP 8390)
1 Sigma calibrated result: (68% probability)	Cal BC 6460 to 6410 (Cal BP 8410 to 8360)



References:

Database used

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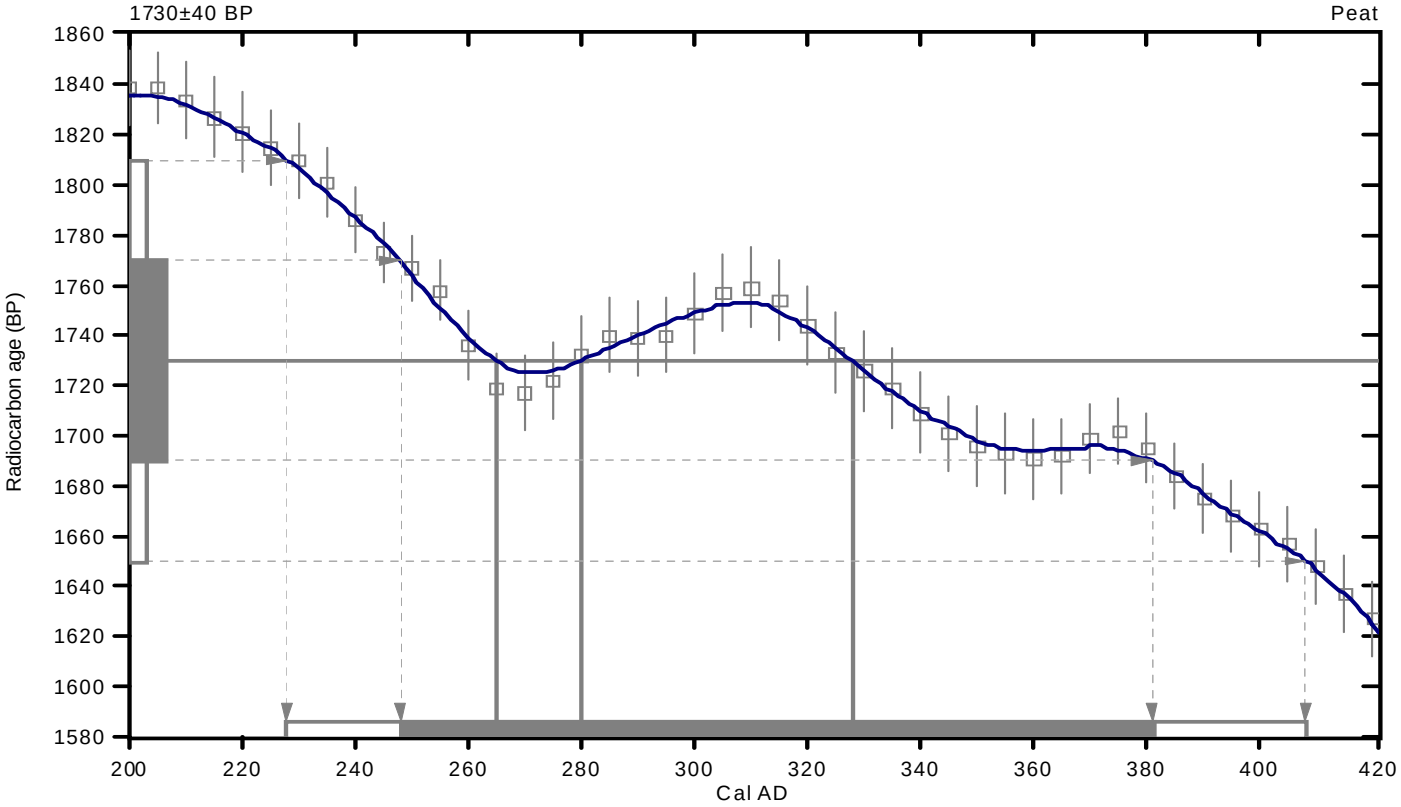
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.4:lab. mult=1)

Laboratory number:	**Beta-293504**
Conventional radiocarbon age:	**1730±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal AD 230 to 410 (Cal BP 1720 to 1540)**

Intercept data

Intercepts of radiocarbon age with calibration curve:	Cal AD 260 (Cal BP 1680) and Cal AD 280 (Cal BP 1670) and Cal AD 330 (Cal BP 1620)
1 Sigma calibrated result: (68% probability)	Cal AD 250 to 380 (Cal BP 1700 to 1570)



References:

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Mathematics

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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

March 22, 2011

Dr. Kathy Goetz Troost
Troost Geological Consulting
17227 97th Drive SE
Snohomish, WA 98296
USA

RE: Radiocarbon Dating Results For Samples H-448-10 S-3A, H-452-11 S-11A, H-455-11 S-13

Dear Kathy:

Enclosed are the radiocarbon dating results for three samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

The cost of the analysis was charged to the VISA card provided. A receipt is enclosed. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

Digital signature on file

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Kathy Goetz Troost — Report Date: 3/22/2011

Troost Geological Consulting — Material Received: 3/4/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 295050	3680 +/- 40 BP	-24.2 o/oo	3690 +/- 40 BP
SAMPLE : H-448-10 S-3A			
ANALYSIS : AMS-ADVANCE delivery			
MATERIAL/PRETREATMENT : (peat): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 2200 to 1960 (Cal BP 4150 to 3910)			
Beta - 295051	5390 +/- 40 BP	-26.1 o/oo	5370 +/- 40 BP
SAMPLE : H-452-11 S-11A			
ANALYSIS : AMS-ADVANCE delivery			
MATERIAL/PRETREATMENT : (peat): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 4330 to 4140 (Cal BP 6280 to 6100) AND Cal BC 4140 to 4060 (Cal BP 6090 to 6010)			
Beta - 295052	7260 +/- 40 BP	-26.0 o/oo	7240 +/- 40 BP
SAMPLE : H-455-11 S-13			
ANALYSIS : AMS-ADVANCE delivery			
MATERIAL/PRETREATMENT : (peat): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 6220 to 6020 (Cal BP 8170 to 7970)			

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

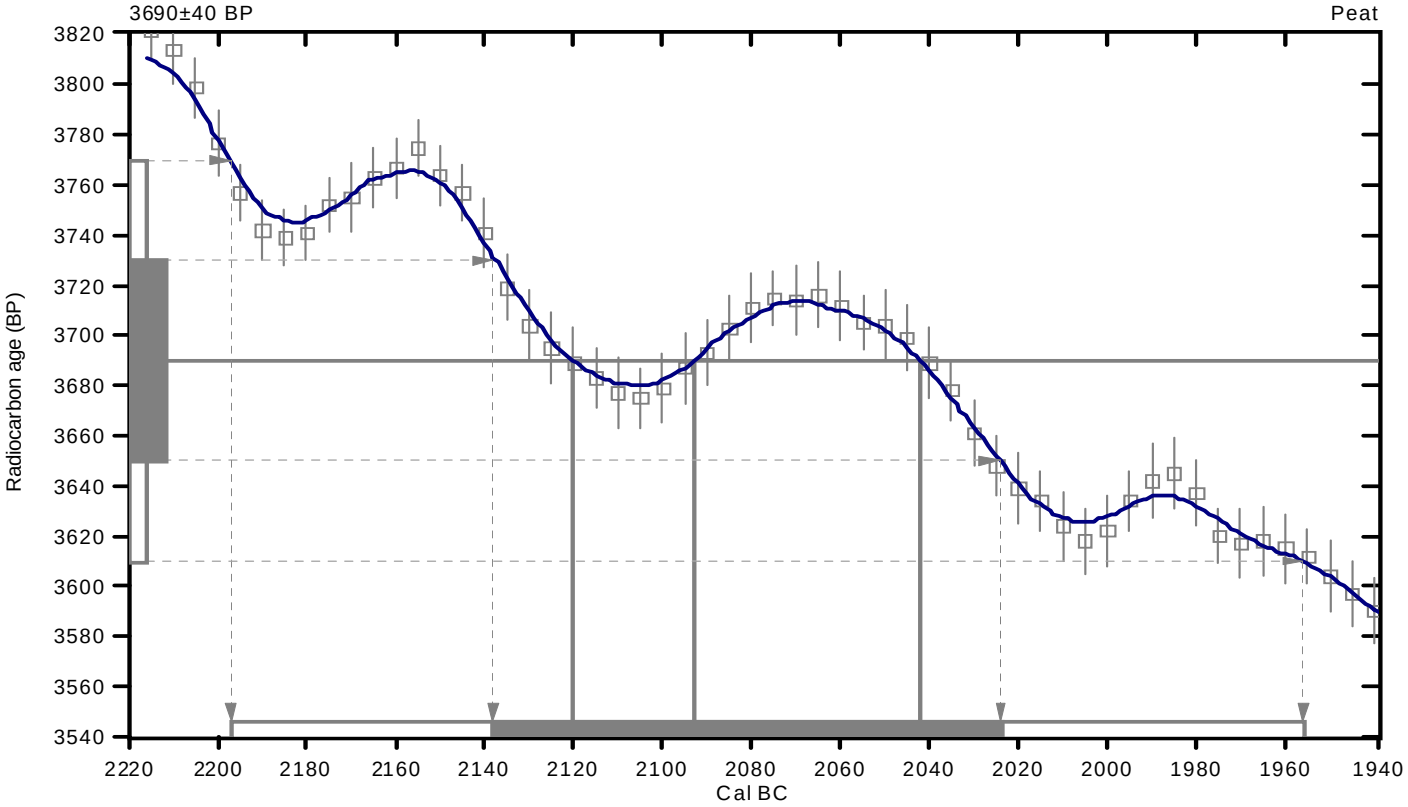
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.2:lab. mult=1)

Laboratory number:	**Beta-295050**
Conventional radiocarbon age:	**3690±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 2200 to 1960 (Cal BP 4150 to 3910)**

Intercept data

Intercepts of radiocarbon age with calibration curve:	Cal BC 2120 (Cal BP 4070) and Cal BC 2090 (Cal BP 4040) and Cal BC 2040 (Cal BP 3990)
1 Sigma calibrated result: (68% probability)	Cal BC 2140 to 2020 (Cal BP 4090 to 3970)



References:

Database used

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Mathematics

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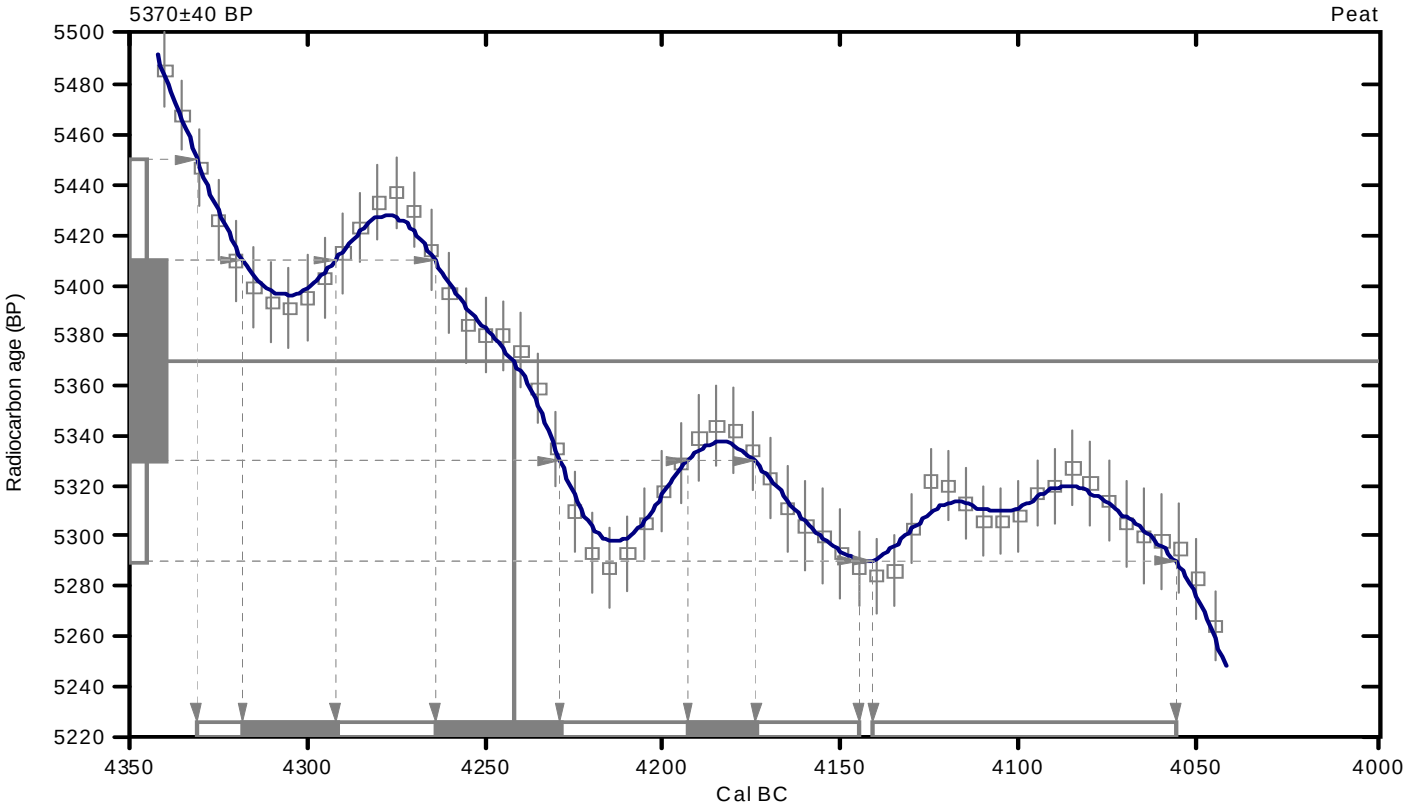
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.1:lab. mult=1)

Laboratory number:	**Beta-295051**
Conventional radiocarbon age:	**5370±40 BP**
2 Sigma calibrated results: **(95% probability)**	**Cal BC 4330 to 4140 (Cal BP 6280 to 6100) and Cal BC 4140 to 4060 (Cal BP 6090 to 6010)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 4240 (Cal BP 6190)
1 Sigma calibrated results: (68% probability)	Cal BC 4320 to 4290 (Cal BP 6270 to 6240) and Cal BC 4260 to 4230 (Cal BP 6210 to 6180) and Cal BC 4190 to 4170 (Cal BP 6140 to 6120)



References:

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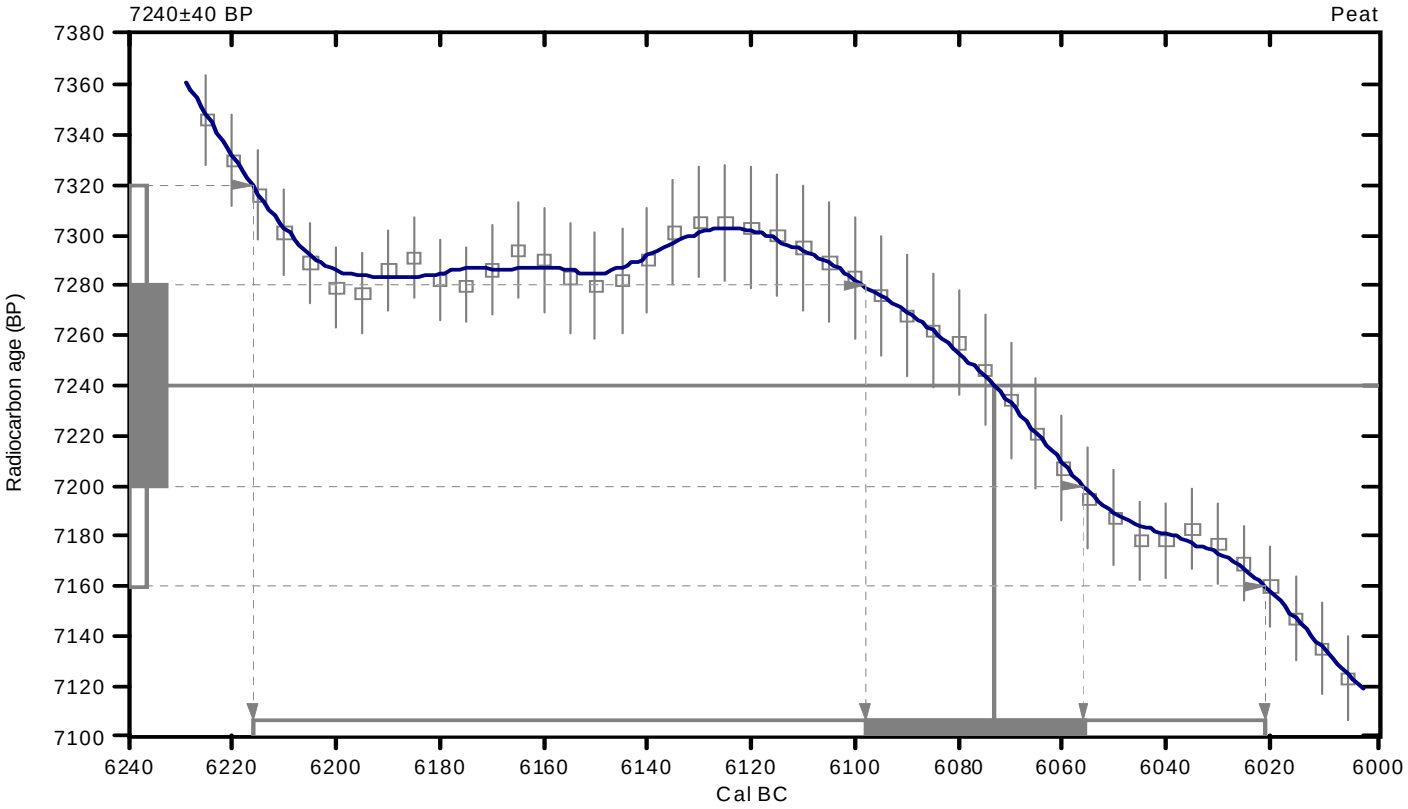
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26:lab. mult=1)

Laboratory number:	**Beta-295052**
Conventional radiocarbon age:	**7240±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 6220 to 6020 (Cal BP 8170 to 7970)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 6070 (Cal BP 8020)
1 Sigma calibrated result: (68% probability)	Cal BC 6100 to 6060 (Cal BP 8050 to 8010)



References:

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Geomorphology and Shoreline History

of Lake Washington, Union Bay and Portage Bay

Appendix E

Reports of Tephra Analyses

Reports of Tephra Analyses
Appendix E

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Report from Microbeam Lab at WSU dated 10/26/2010

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Report from Microlabs Northwest dated 4/12/2011

Report from Microbeam Lab at WSU dated 4/26/2011

Microlab Northwest
7609 140th PL NE
Redmond, WA 98052
(425) 885-9419

Report #: 260-10
Date: October 18, 2010

LABORATORY REPORT

TO: Kathy Troost
Troost Geological Consulting
17227 97th Drive SE
Snohomish, WA 98296

PHONE: (360) 668-8253 **FAX:** () **E-MAIL:** troostgeology@comcast.net
SUBJECT: Refractive Index Determination
SPECIMEN: Ash Lenses from Lake Washington Core Samples
REFERENCE: P.O.

INTRODUCTION

Four samples of suspected ash lenses were submitted for refractive index determinations. The samples were wrapped individually in aluminum foil and then placed in separate Ziploc-type plastic bags. The samples were marked as follows:

H-337-10, S-6A, 28'-30'
H-338-10, S-6A, 26'-28'
H-349-10, S-3A, 4.5'
H-349-10, S-3A, 20.1'

A portion of each sample was removed and mounted after drying in a synthetic resin that had a refractive index of approximately 1.515 when cured. Another portion of each resin was mounted in Cargille High Dispersion, Series E, refractive index liquids. The liquids found to me useful for these samples were 1.505, 1.510, and 1.515. Dispersion staining was used to determine the D-line refractive index match. A standard optical glass was mounted in the matching liquids to verify the refractive index. The optical glass selected was Cargille 1.51 with the following optical properties:

nF = 1.51568, ne = 1.51203, nD = 1.51004, nC = 1.50765

Phase contrast and darkfield dispersion staining were used to measure and document the refractive indices. Photographs* 1 through 6 document the refractive indices of the standard liquids at the time of use. As can be seen from the photographs the effective refractive index of the 1.510 liquid was approximately 1.5112+/-0.0005 at the time of testing. All samples were mounted at the same time and tested within the same hour. The dispersion curve for the ash was assumed to be near that of the optical glass standard in deriving the D-line refractive index from the closest matching dispersion color. By using the closest matching dispersion color the error introduced by a difference in slope was minimized. The value reported was determined graphically to the fourth place but the confidence interval is based on the accuracy of the method. As a result, the relative ranking of the different samples is correct though the reported value may change on repeated measurements of the same sample using this technique by 0.0005 units.

Microlab Northwest
7609 140th PL NE
Redmond, WA 98052
(425) 885-9419

Report #: 260-10
Date: October 18, 2010

RESULTS

The refractive index of the ash from H-337-10, S-6A, 28'-30' at the sodium D-line is approximately 1.5128+/-0.0005 (see Photographs* 7through 12). The refractive index of the ash from H-338-10, S-6A, 26'-28' at the sodium D-line is approximately 1.5127+/-0.0005 (see Photographs* 13 through 18). The refractive index of the ash from H-349-10, S-3A, 4.5' at the sodium D-line is approximately 1.5110+/-0.0005 (see Photographs* 19 through 24). The refractive index of the ash from H-349-10, S-3A, 20.1' at the sodium D-line is approximately 1.5125+/-0.0005 (see Photographs* 25 through 30). The difference in the dispersion curves for the ash samples compared to the optical glass standard was negligible because the dispersion curve reference points were within about 30 nanometers wavelength.

CONCLUSION

Three of the ash samples are nearly the same: H-337-10, S-6A, 28'-30'; H-338-10, S-6A, 26'-28'; and H-349-10, S-3A, 20.1'. These ash samples range from 1.5128 to 1.5125. The other ash sample; H-349-10, S-3A, 4.5'; had a refractive index of 1.5110.

Thank you for this opportunity to be of service. If I can provide any further assistance please contact me.

Signed: _____
E. R. Crutcher, Consultant

* Photographs are in the electronic version of the report.

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Redmond, WA 98052
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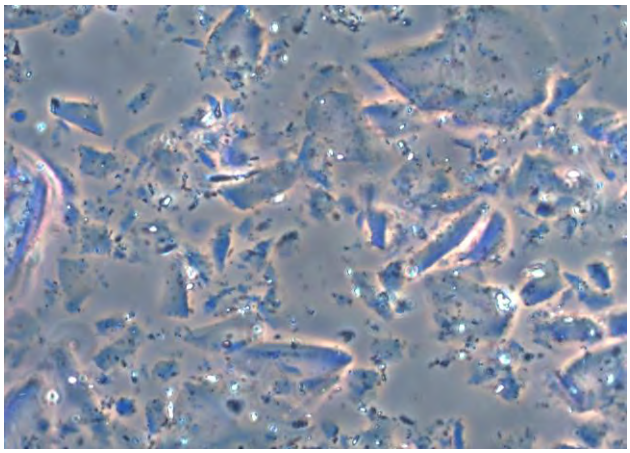
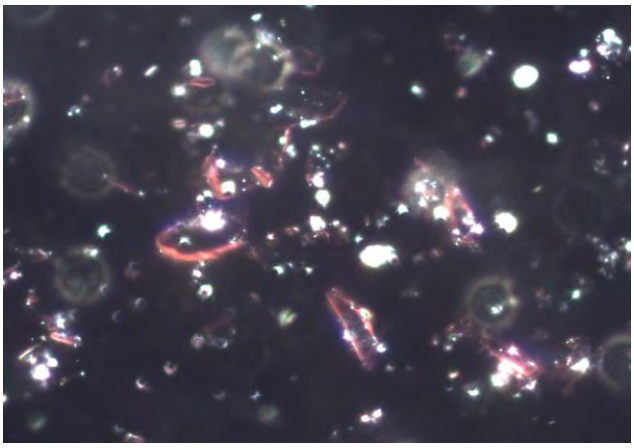
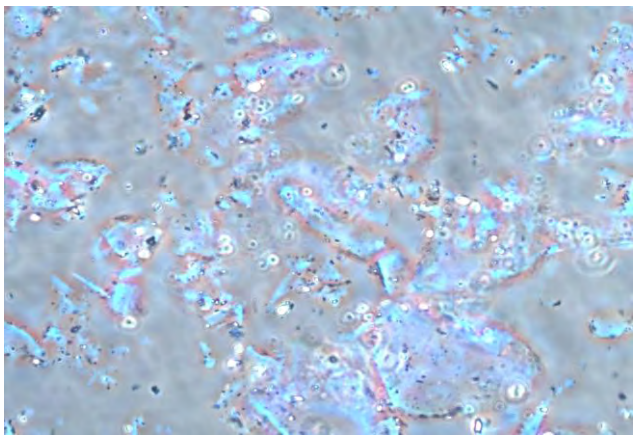
Report #: 260-10
Date: October 18, 2010



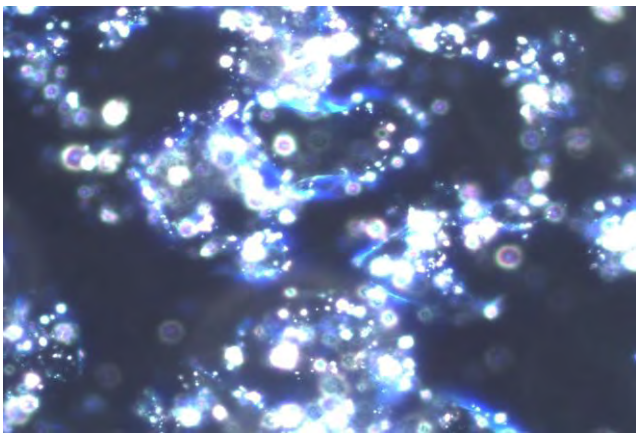
Photograph 1: Optical Glass Standard , nD = 1.51004, In 1.505 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



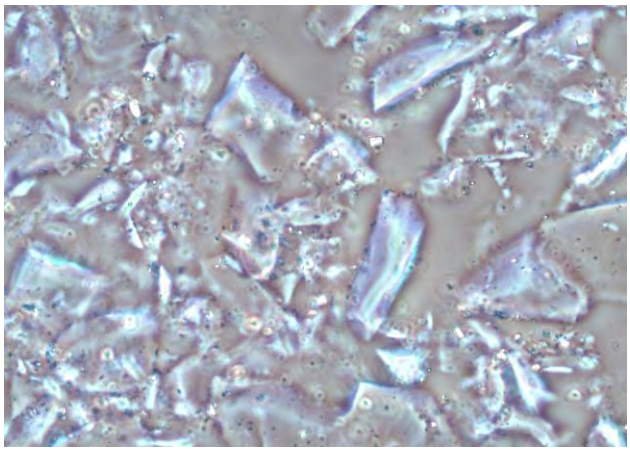
Photograph 2: Optical Glass Standard , nD = 1.51004, In 1.505 Standard Refractive Index Liquid, Darkfield Dispersion Staining



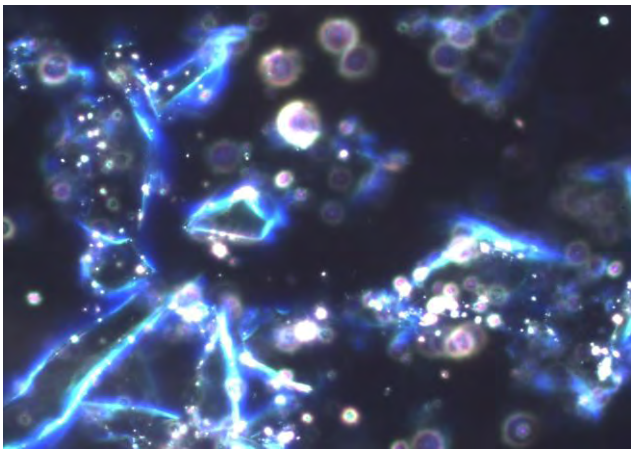
Photograph 3: Optical Glass Standard , nD = 1.51004, In 1.510 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



Photograph 4: Optical Glass Standard , nD = 1.51004, In 1.510 Standard Refractive Index Liquid, Darkfield Dispersion Staining



Photograph 5: Optical Glass Standard , nD = 1.51004, In 1.515 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



Photograph 6: Optical Glass Standard , nD = 1.51004, In 1.515 Standard Refractive Index Liquid, Darkfield Dispersion Staining

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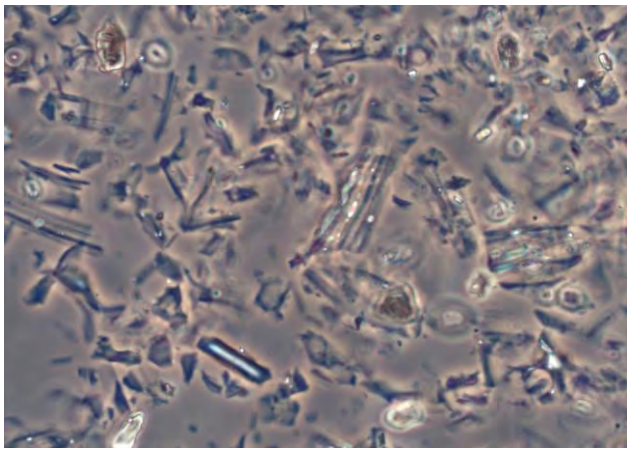
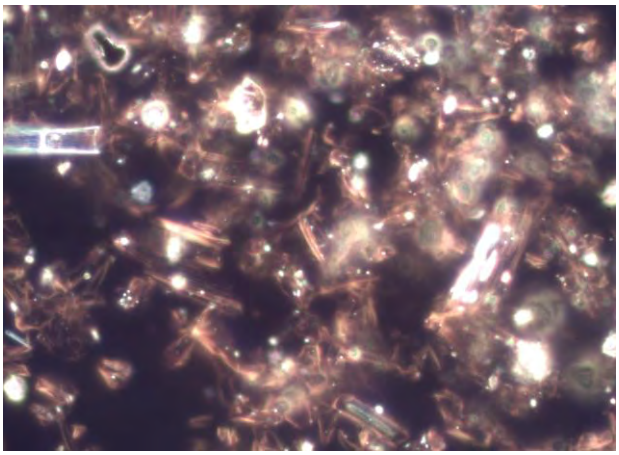
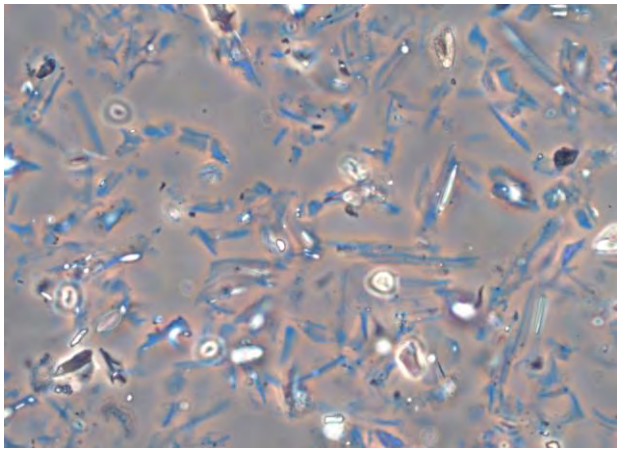


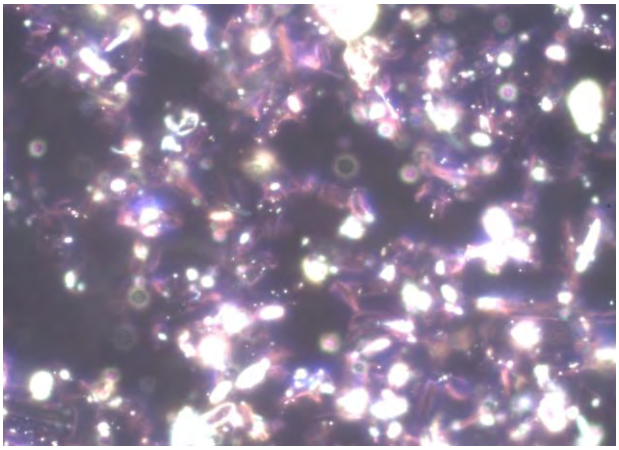
Photograph 7: Core H-337-10, S-6A, 28'-30', In 1.505 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



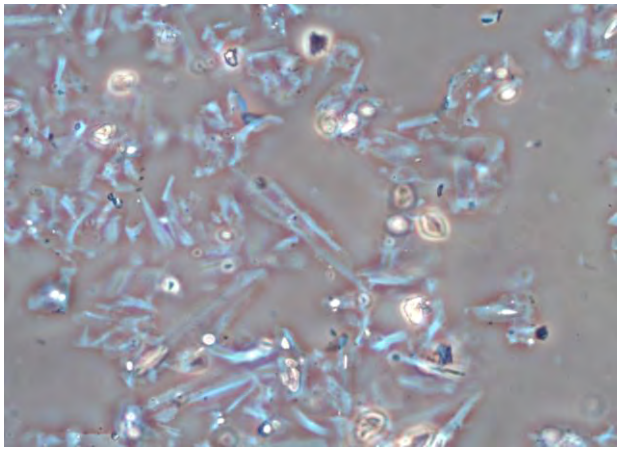
Photograph 8: Core H-337-10, S-6A, 28'-30', In 1.505 Standard Refractive Index Liquid, Darkfield Dispersion Staining



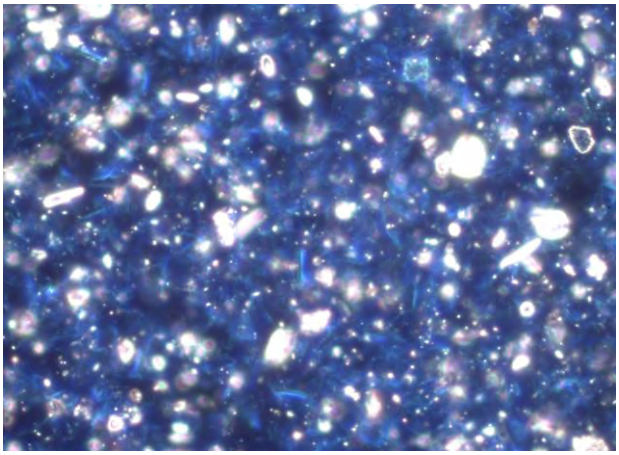
Photograph 9: Core H-337-10, S-6A, 28'-30', In 1.510 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



Photograph 10: Core H-337-10, S-6A, 28'-30', In 1.510 Standard Refractive Index Liquid, Darkfield Dispersion Staining



Photograph 11: Core H-337-10, S-6A, 28'-30', In 1.515 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



Photograph 12: Core H-337-10, S-6A, 28'-30', In 1.515 Standard Refractive Index Liquid, Darkfield Dispersion Staining

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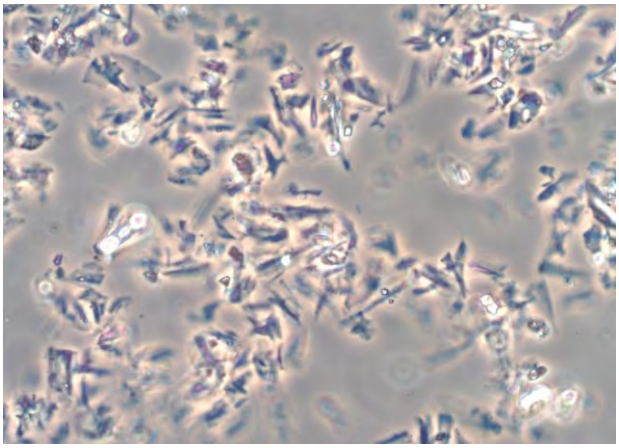
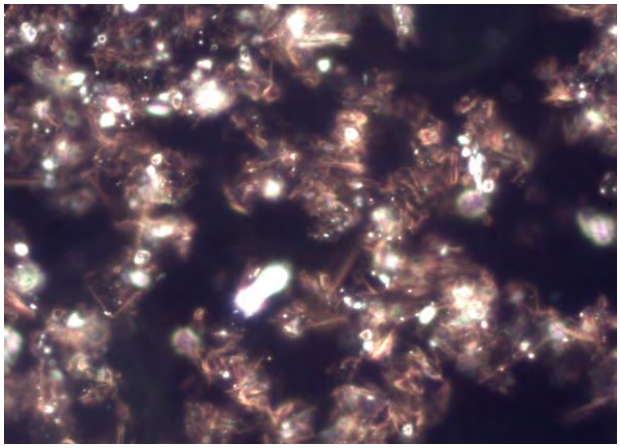
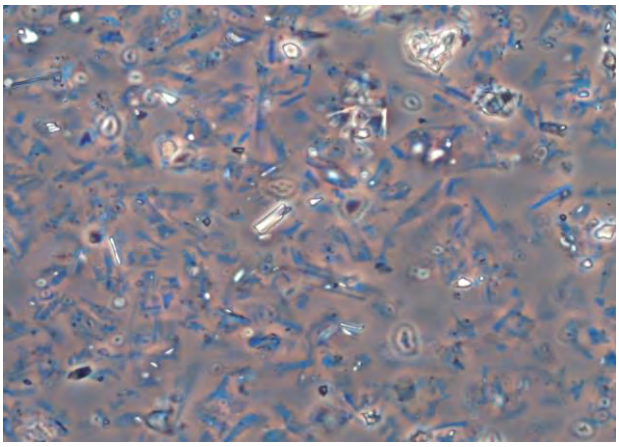


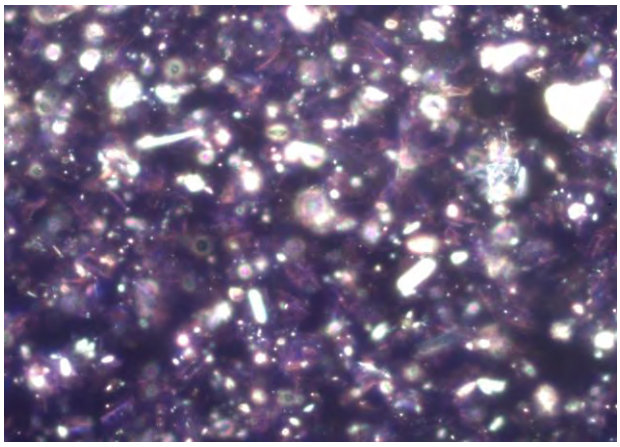
Photograph 13: Core H-338-10, S-6A, 26'-28', In 1.505 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



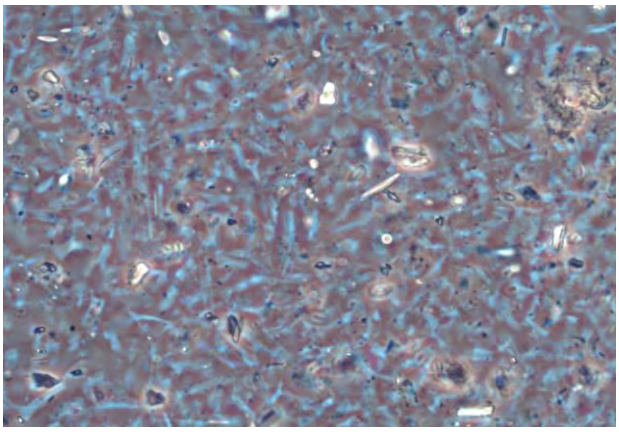
Photograph 14: Core H-338-10, S-6A, 26'-28', In 1.505 Standard Refractive Index Liquid, Darkfield Dispersion Staining



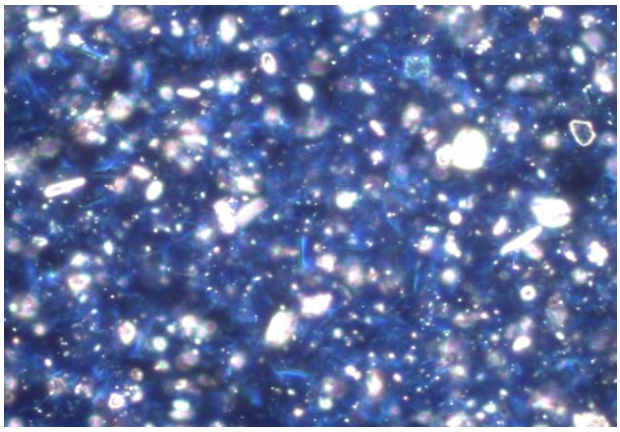
Photograph 15: Core H-338-10, S-6A, 26'-28', In 1.510 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



Photograph 16: Core H-338-10, S-6A, 26'-28', In 1.510 Standard Refractive Index Liquid, Darkfield Dispersion Staining



Photograph 17: Core H-338-10, S-6A, 26'-28', In 1.515 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



Photograph 18: Core H-338-10, S-6A, 26'-28', In 1.515 Standard Refractive Index Liquid, Darkfield Dispersion Staining

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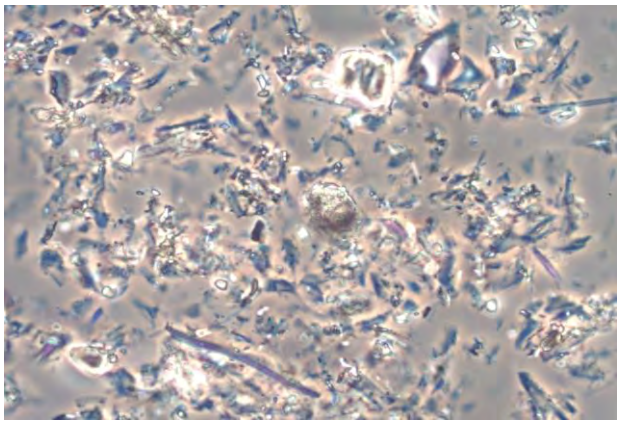
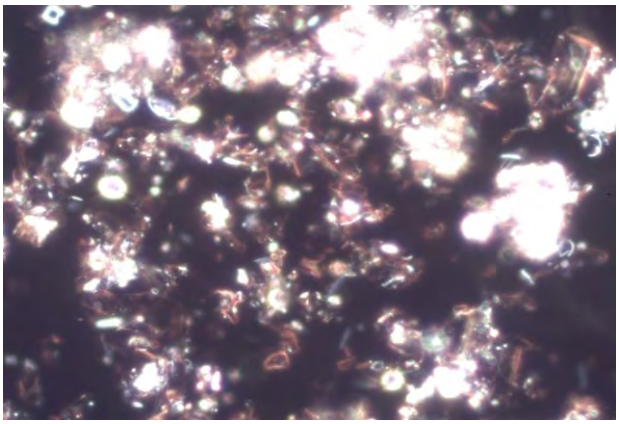
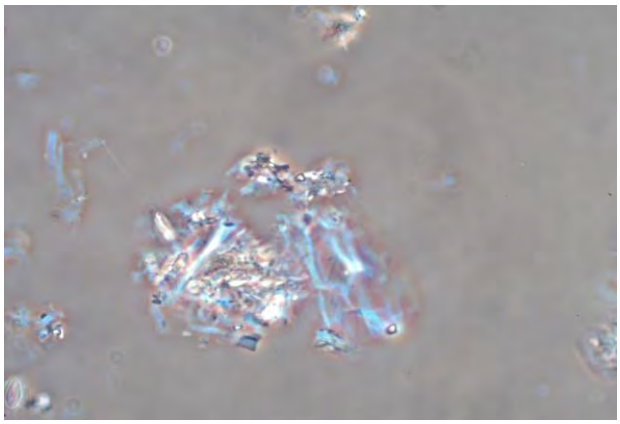


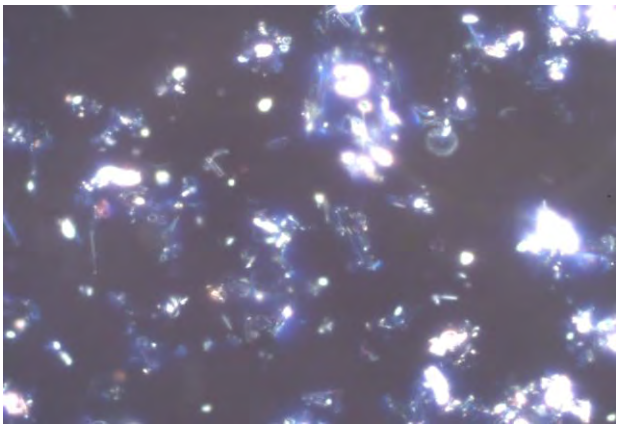
Photograph 19: Core H-349-10, S-3A, 4.5', In 1.505 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



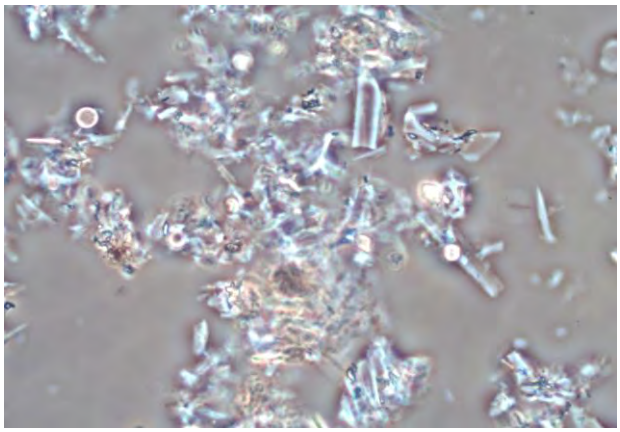
Photograph 20: Core H-349-10, S-3A, 4.5', In 1.505 Standard Refractive Index Liquid, Darkfield Dispersion Staining



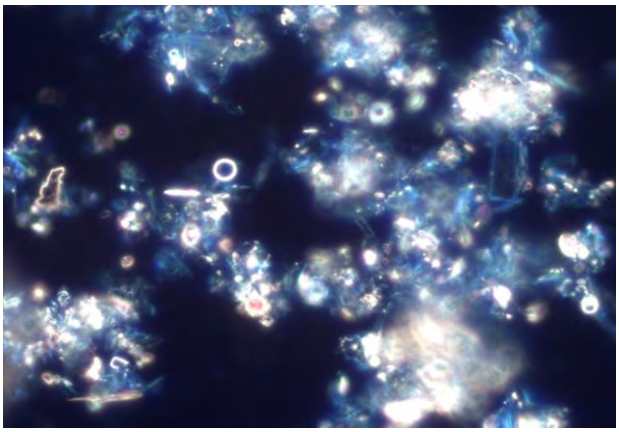
Photograph 21: Core H-349-10, S-3A, 4.5', In 1.510 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



Photograph 22: Core H-349-10, S-3A, 4.5', In 1.510 Standard Refractive Index Liquid, Darkfield Dispersion Staining



Photograph 23: Core H-349-10, S-3A, 4.5', In 1.515 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



Photograph 24: Core H-349-10, S-3A, 4.5', In 1.515 Standard Refractive Index Liquid, Darkfield Dispersion Staining

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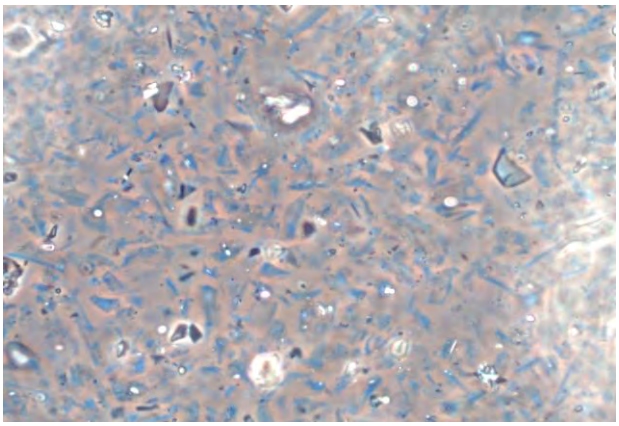
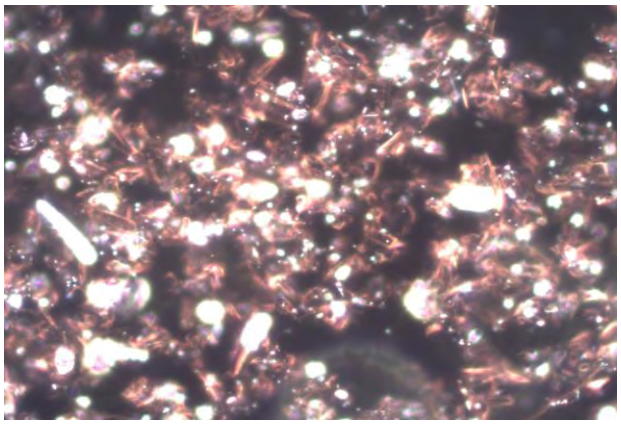
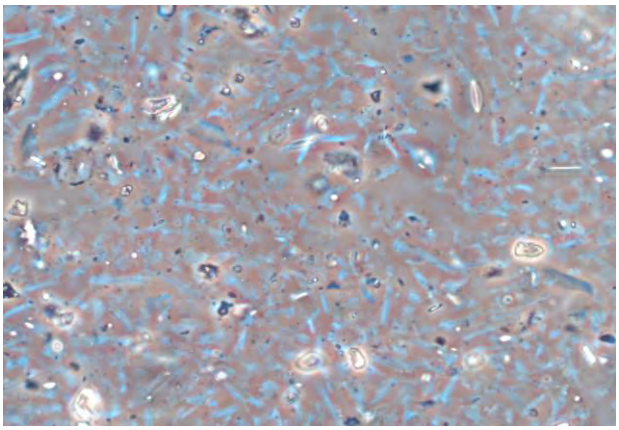


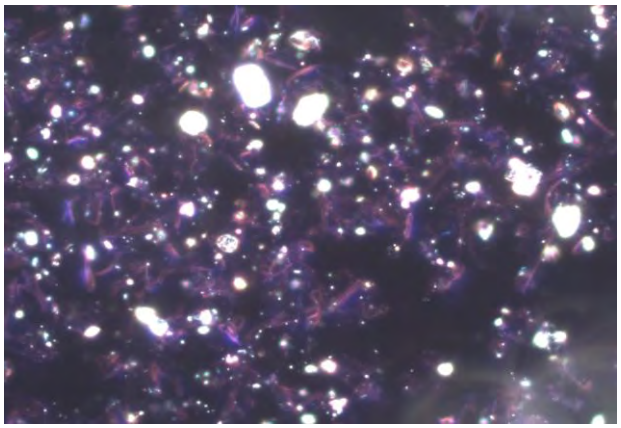
Photograph 25: Core H-349-10, S-3A, 20.1', In 1.505 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



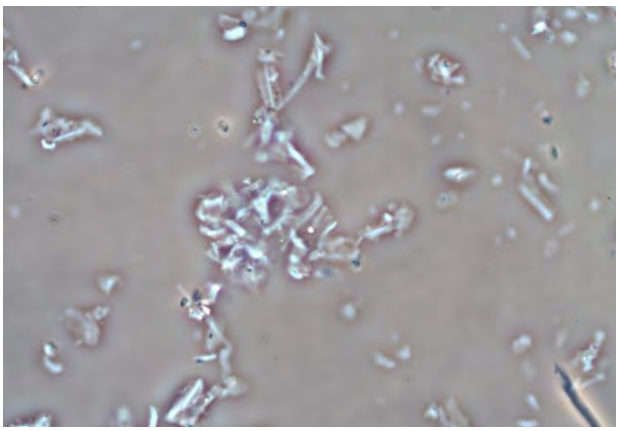
Photograph 26: Core H-349-10, S-3A, 20.1', In 1.505 Standard Refractive Index Liquid, Darkfield Dispersion Staining



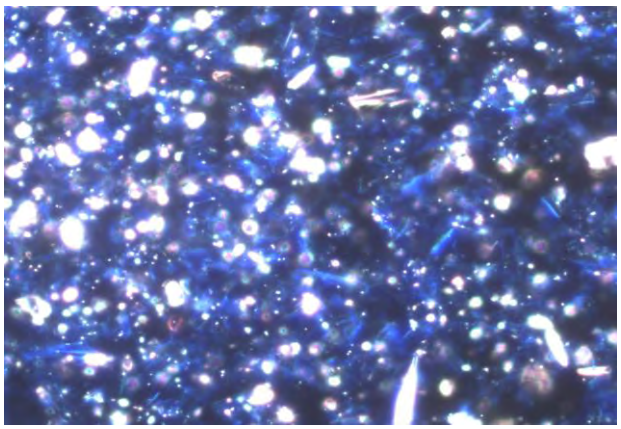
Photograph 27: Core H-349-10, S-3A, 20.1', In 1.510 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



Photograph 28: Core H-349-10, S-3A, 20.1', In 1.510 Standard Refractive Index Liquid, Darkfield Dispersion Staining



Photograph 29: Core H-349-10, S-3A, 20.1', In 1.515 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



Photograph 30: Core H-349-10, S-3A, 20.1', In 1.515 Standard Refractive Index Liquid, Darkfield Dispersion Staining

WASHINGTON STATE UNIVERSITY
School of Earth and Environmental Sciences

October 26, 2010

Kathy Troost
Troost Geological Consulting
17227 97th Drive SE
Snohomish, WA 98296

Dear Kathy,

I've enclosed the results on the sample from Lake Washington. Despite the very fine-grained nature of the tephra I was able to find (with a lot of searching) 16 glass shards of a size minimally suitable for analysis. The composition of the glass in sample H-349-10a is an excellent match (similarity coefficient = 0.98, with 1.0 indicating a perfect compositional match) to that in our Mazama O standard as well as to many other tephra samples thought to be from the Mazama climactic eruption of 6850 BP.

I trust this data will prove useful in your work and thank you for using our service.

Sincerely,

Nick

Franklin F. (Nick) Foit, Jr.
Professor Emeritus and Director of the Microbeam Lab

PO Box 642812, Pullman, WA 99164-2812
509-335-3009 • Fax: 509-335-7816 • sees@wsu.edu • www.sees.wsu.edu

TABLE 1. GLASS COMPOSITION AND SOURCE OF THE LAKE WASHINGTON TEPHRA

Oxide	**Troost H-349-10a**
SiO_2	72.95(0.28)*
Al_2O_3	14.58(0.24)
Fe_2O_3	2.42(0.06)
TiO_2	0.42(0.04)
Na_2O	4.62(0.19)
K_2O	2.77(0.07)
MgO	0.45(0.03)
CaO	1.58(0.11)
Cl	0.22(0.05)
Total**	100
Number of shards analyzed	16
Probable Source	Mazama O 6850 BP
Similarity Coefficient***	0.98+

* Standard deviations of the analyses given in parentheses
** Analyses normalized to 100 weight percent
*** Borchardt et al. (1972) J. Sed. Petrol., 42, 301-306

Sample: Troost Sample H-349-10a

number of records searched: 1716

Glass composition of sample:

SiO2	TiO2	Al2O3	MgO	CaO	BaO	MnO	Fe2O3	Na2O	K2O	Cl	Total
72.94	0.42	14.58	0.45	1.58	0.00	0.00	2.42	4.82	2.77	0.22	100.00

weighting factor (only for oxides in bold type)

1	0.25	1	0.25	1			1	1	1		

Similiarity Coefficients for 15 closet matches

SiO2	TiO2	Al2O3	MgO	CaO	Fe2O3	Na2O	K2O	sim coef weighted avg	rec#	Std	Date	State	Source/Age	Notes
0.999	1.000	0.999	0.978	1.000	0.996	0.977	0.982	0.992	276			MT	Mazama/6850	45PO144-1, Calispell Valley, MT, A. Thoms, Center for NW Anthropology
0.995	0.976	0.988	0.978	0.988	0.988	0.978	0.982	0.986	672			OR		Sample LHF2-11-1B, Glass 1, below Sand Hollow camel bones, Milepost 299.35, NWNW13, 2N, 26E, Alan Busacca, Dept. of Crop & Soil Science, Wash.
0.996	0.977	0.994	0.978	0.994	0.950	0.998	0.975	0.984	282			MT	Mazama/6850	#90, Calispell Valley, R. Mierendorf, Center for NW Anthropology
0.997	1.000	0.978	1.000	0.981	0.992	0.994	0.945	0.983	627			OR	Mazama, 6850 BP ?	Sample 335-1, bulk composition, Oregon Archaeological Site 35-UM-154, just SW of Bucks Corners, Hermiston 7.5' Quad, OR, Infotec, Craig Skinner
0.997	0.976	0.978	1.000	0.981	0.992	0.994	0.945	0.982	621			OR	Mazama, 6850 BP ?	Sample 333-1, bulk composition, Oregon Archaeological Site 35-UM-154, just SW of Bucks Corners, Hermiston 7.5' Quad, OR, Infotec, Craig Skinner
0.999	1.000	0.988	0.978	0.988	0.983	0.953	0.975	0.981	663			WA		Sample EG4-7-1, Dodd Road vertebrate site, Pipeline Milepost 247.0, SW/SE24, 8N, 32E, Alan Busacca, Dept. of Crop & Soil Science, Wash. State Univ.
0.998	0.990	0.992	0.945	0.978	0.984	0.953	0.972	0.980	596			WA		Sample CON-1C, Connell, WA, Burr Canyon 7.5 Quad, Busacca et al. (1992) Quat. Res., 37, 261-303
0.995	0.929	1.000	0.933	0.988	0.950	0.981	0.989	0.980	41			OR	Mazama	52cm Craddock Meadows, OR, P. Mehringer
0.997	1.000	0.996	1.000	0.975	0.996	0.930	0.975	0.980	277			MT	Mazama/6850	45PO144-2, Calispell Valley, MT, A. Thoms, Center for NW Anthropology
0.994	1.000	0.992	0.978	0.994	0.917	0.998	0.978	0.980	1359			WA	Mazama Climactic	Sample Tephra 1 (150-160 cm depth) from L1 loess north of Juniper Dunes along Blackman-Ridge Road (11T 356821SE 5146518 N); Mark Sweeney, D
0.994	0.977	0.988	1.000	0.988	0.938	0.994	0.971	0.979	211			WA	Mazama/6850	POR-7-29-87, Tephra A, location unknown, E. Kiver, EWU
0.999	1.000	0.989	1.000	0.994	0.992	0.928	0.960	0.979	334			OR	Mazama/6850	35WS120, TEU-1-395-1, INFOTEC, Central OR, SW of Shaniko
0.999	0.976	0.994	1.000	0.994	0.942	0.955	0.982	0.978	685			WA	Mazama Climactic, 6850 BP ?	Sample SE6/45YA305-5 (sample 2), depth 2.2m, Selah Creek drainage, Yakima Training Center, K. Borcson, Archaeological & Historical Services, EWU
0.999	0.952	0.988	1.000	0.988	0.996	0.924	0.971	0.977	336			OR	Mazama/6850	35GM25, TEU-2-286-1, INFOTEC, North Central OR, 10 mi SW of Condon
0.998	0.976	0.987	1.000	0.994	0.992	0.911	0.975	0.977	321			OR	Mazama/6850	35JE51B, TEX-4-259-1, Ash #1, INFOTEC, North Central OR south of Willowdale

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Redmond, WA 98052
(425) 885-9419

Report #: 322-10
Date: December 27, 2010

LABORATORY REPORT

TO: Kathy Troost
Troost Geological Consulting
17227 97th Drive SE
Snohomish, WA 98296

PHONE: (360) 668-8253 **FAX:** () **E-MAIL:** troostgeology@comcast.net
SUBJECT: Refractive Index Determination
SPECIMEN: Ash Lenses from Lake Washington Core Samples
REFERENCE: Microlab Northwest Report 260-10

INTRODUCTION

Three samples of suspected ash lenses were submitted for refractive index determinations. The samples were wrapped individually in aluminum foil and then placed in separate Ziploc-type plastic bags. The samples were marked as follows:

H-453-10, L-17-D1
H-488-10, L-16-A1
H-540-10, L-6-B1

A portion of each sample was removed and mounted after drying in a synthetic resin that had a refractive index of approximately 1.515 when cured. Another portion of each resin was mounted in Cargille High Dispersion, Series E, 1.510 refractive index liquid. Dispersion staining was used to determine the D-line refractive index match. A standard optical glass was mounted in the matching liquid to verify the refractive index. The optical glass selected was Cargille 1.51 with the following optical properties:

nF = 1.51568, ne = 1.51203, nD = 1.51004, nC = 1.50765

Phase contrast and darkfield dispersion staining were used to measure and document the refractive indices. Photographs* 1 through 6 document the refractive indices of the samples submitted. This is the same 1.510 liquid used for the results reported in Microlab Northwest report 260-10 and has a refractive index of approximately 1.5112+/-0.0005 at the time of testing. All samples were mounted at the same time and tested within the same hour. The dispersion curve for the ash was assumed to be near that of the optical glass standard in deriving the D-line refractive index from the closest matching dispersion color. By using the closest matching dispersion color the error introduced by a difference in slope was minimized. The value reported was determined graphically to the fourth place but the confidence interval is based on the accuracy of the method. As a result, the relative ranking of the different samples is correct though the reported value may change on repeated measurements of the same sample using this technique by 0.0005 units.

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Report #: 322-10
Date: December 27, 2010

RESULTS

The three samples all had about the same refractive index, as can be seen by the similarity of the dispersion staining colors, approximately 1.5110 +/- 0.0005. This is the same refractive index as the sample designated as H-349-10, S-3A, 4.5' of Microlab Northwest Report 260-10.

The ash in these samples tended to consist of slightly larger particles and more crystalline material that was seen in most of the earlier samples of ash shown in report 260-10.

CONCLUSION

The refractive index of all three of these samples was 1.5110 +/- 0.0005. They have the same refractive index as sample H-349-10, S-3A, 4.5' of Microlab Northwest Report 260-10.

Thank you for this opportunity to be of service. If I can provide any further assistance please contact me.

Signed: _____
E. R. Crutcher, Consultant

Microlab Northwest
7609 140th PL NE
Redmond, WA 98052
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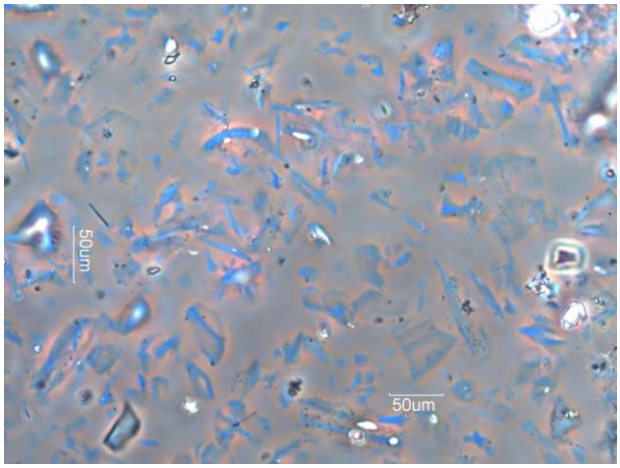
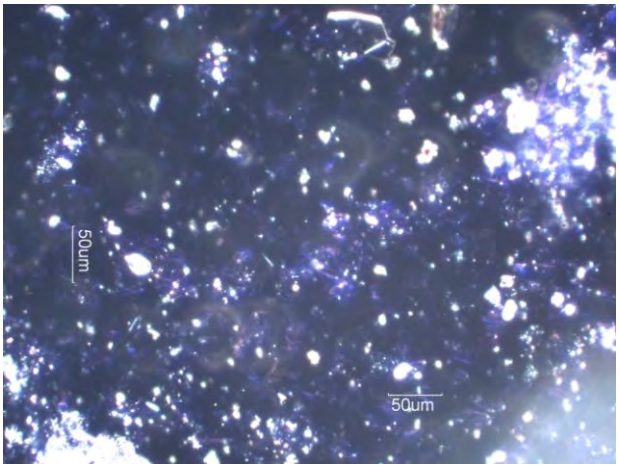
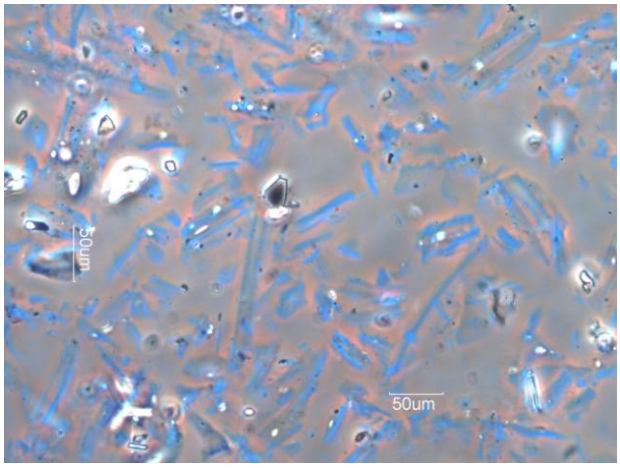
Report #: 322-10
Date: December 27, 2010



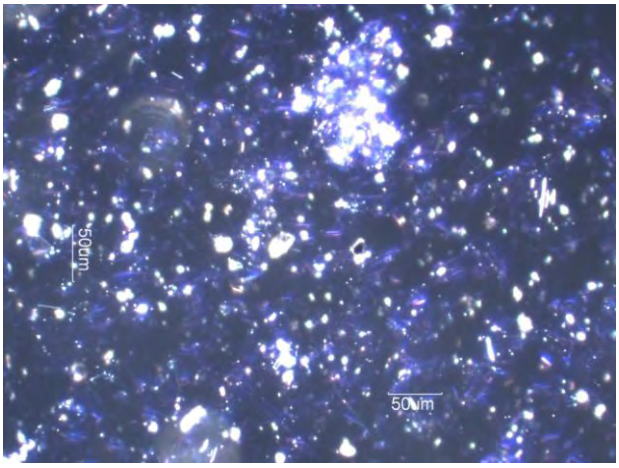
Photograph 1: Core H-453-10, L-17D In 1.510 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



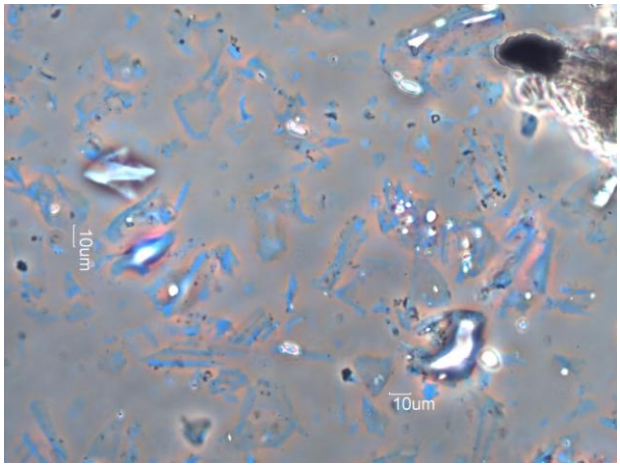
Photograph 2: Core H-453-10, L-17D In 1.510 Standard Refractive Index Liquid, Darkfield Dispersion Staining



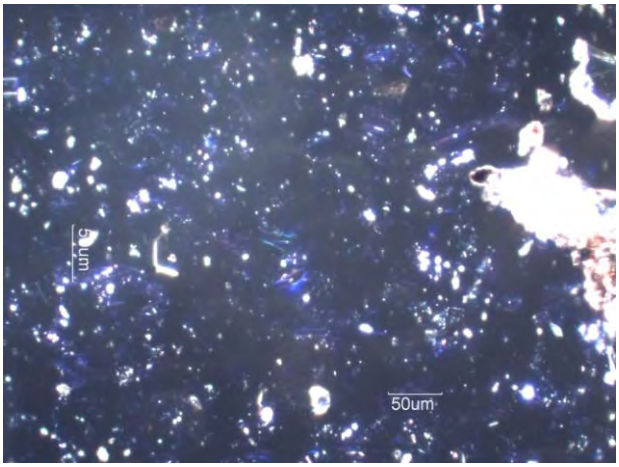
Photograph 3: Core H-488-10-L-16-A 1, In 1.510 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



Photograph 4: Core H-488-10-L-16-A 1, In 1.510 Standard Refractive Index Liquid, Darkfield Dispersion Staining



Photograph 5: Core H-540-10-L-6-B 1, In 1.510 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



Photograph 6: Core H-540-10-L-6-B 1, In 1.510 Standard Refractive Index Liquid, Darkfield Dispersion Staining

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Report #: 259-10
Date: February 4, ~~2010~~ 2011

LABORATORY REPORT

TO: Kathy Troost
Troost Geological Consulting
17227 97th Drive SE
Snohomish, WA 98296

PHONE: (360) 668-8253 FAX: () E-MAIL: troostgeology@comcast.net
SUBJECT: Particle Identification
SPECIMEN: Lake Washington Core Samples
REFERENCE: P.O.

INTRODUCTION

Four samples from cores collected in Lake Washington were received for evaluation. The purpose of the study was to assess the amount of information present in the samples and conduct some preliminary analyses as a proof-of-concept. The samples received were designated as follows:

H-338-10, S-3A, 11'-13'
H-338-10, S-10A, 46'-48'
H-338-10, S-17, 81'-83'
H-349-10, S-5E, 9.1'-9.6'

A portion of each sample was dried at 110° Celsius to constant weight and then placed in a muffle furnace at 500° Celsius to constant weight. The weight loss from 110° to 500° was recorded for each sample as a measure of the organic content. Another portion of each sample was mounted directly for analysis using analytical light microscopy. Materials were identified by petrographic analysis and morphological analysis.

Petrographic analysis indicates the types of minerals present in the sample, their size distribution, degree of roundness, and mineral associations. Size distribution helps assess the erosional environment and relative location in the body of water with respect to the source of sediment. The degree of roundness indicates the proximity to the source of the eroding rock mass. Mineral associations can be compared with the local geography to determine the type of rock being eroded.

Morphological analysis, as applied here, refers to particles of an organic source or nature. These include diatoms, sponge spicules, plant parts, insect parts, Cladocera parts, pollens, hyphae, testate ameba and other organic debris. All of these have diagnostic potential. Diatoms provide information on the mean temperature, peak temperature, low temperature, dissolved ion content, and insolation. The sponge spicules indicate depth of the water at that location and additional information on salt content, dissolved silica, and temperature of the environment. Plant parts provide information on the climate and conditions near the lake. Insect parts provide additional information about the biodiversity of the area. Cladocera parts can provide data on the uniformity of water temperature and the amount sediment introduced into the body of water. Pollens indicate the types of plants in the

area and can show the post-glacial sequence of species. The testate ameba are another indicator of salt content and temperature. Hyphae and other forms of debris are useful in that there may be changes in the local area that affect the amount of this material in the body of water. Some of these indicators are universal in that they indicate the same conditions anywhere in the world. Others are location specific and indicate local changes in the environment. The specific method for concentrating each of these types of materials is different. A complete analysis of any of these materials is outside the scope of this analysis but proof-of-concept examples are provided.

A portion of the darker samples, H-338-10, S-3A, 11'-13' and H-349-10, 9.1'-9.6', was extracted with acetone and with methanol. These extracts were analyzed by thin-layer chromatography to assess the pigment residue still present in the samples from soft-bodied algae.

RESULTS

Each of the deposits was unique. Photographs 1-4 show an overview at 100X of each sample.

IGNITION TEST

Two of the samples were dark in color; H-338-10, S-3A, 11'-13' and H-349-10, 9.1'-9.6'; and the other two were light gray; H-338-10, S-10A, 46'-48' and H-338-10, 81'-83'. The loss on ignition for the two dark deposits was 9.2% for H-338-10, S-3A, 11'-13' and 14.4% for H-349-10, 9.1'-9.6'. This loss was primarily due to the organic content of these two samples. There were essentially no hydrated minerals in these two samples. The other two samples had ignitions losses of 0.5% and 0.3% for H-338-10, S-10A, 46'-48' and H-338-10, 81'-83' respectively. Sample H-338-10, S-10A contained some organic material but the major loss in each of these two samples was from water loss in clays and other hydrated minerals. Table 1 shows the percent loss on ignition for each of the samples.

SAMPLE	H-338-10, 11'-13'	H-338-10, 46'-48'	H-338-10, 81'-83'	H-349-10, 9.1-9.6
PERCENT LOSS	9.2%	0.5%	0.3%	14.4%

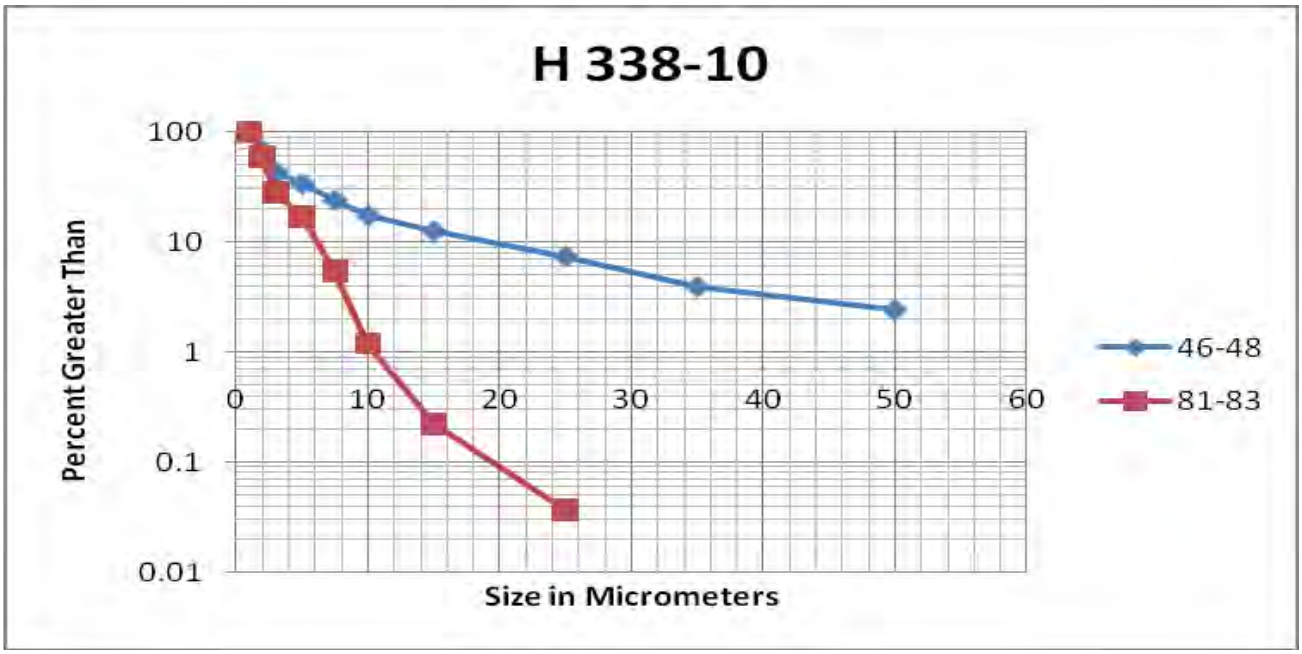
TABLE 1: Percent Loss on Ignition

PETROGRAPHIC ANALYSIS

The sample designated as H-338-10, S-3A, 11'-13' contained minerals primarily in the range of 5 to 15 micrometers. Most of the particles were very angular and ranged from acicular to equant. Quartz was the predominant mineral but hornblend, biotite, rutile, magnetite, feldspar, and pumice were also present. The magnetite, feldspar, and pumice were presumably from local volcanic ash deposits. There were over 25 diatoms per mineral grain in this sample (see Photograph 1). The diatoms and sponge spicules dominated the silica content of this sample.

The sample designated as H-338-10, S-10A, 46'-48' was dominated by minerals ranging in size from sub-micrometer to over fifty micrometers (see Figure 1 and Photograph 2). These minerals included those seen above, quartz, hornblend, biotite, rutile, magnetite, feldspar, and pumice as well various amphiboles, serpentines, clays, etc. The larger mineral grains tended to be quartz, hornblend, rutile, and magnetite.

The sample designated as H-338-10, S-17, 81'-83' was dominated by minerals ranging in size from sub-micrometer to about ten micrometers (see Figure 1 and Photograph 3).



The sample designated as H-349-10, S-5E, 9.1'-9.6' contained minerals in a broad range from sub-micrometer to over 50 micrometers. Most of the particles were very angular and ranged from acicular to equant. Quartz was the predominant mineral but hornblend, biotite, rutile, magnetite, feldspar, and pumice were also present. The magnetite, feldspar, and pumice were presumably from local volcanic ash deposits. There were over 5 diatoms per mineral grain in this sample (see Photograph 4). That would suggest a much more rapid sediment accumulation rate due to erosion and an influx of minerals at this location as compared to the H-338-10 site.

MORPHLOGICAL ANALYSIS

Over 50 different diatoms, at least 6 different freshwater sponges, 5 different pollens, 3 different testate ameba, 2 different plant phytoliths, 4 different mosses, insect parts, 3 different types of insect mandibles, 2 different rotifer lorica, plant parts, fungal hyphae, and daphnia fragments were seen in these samples. This is far from a comprehensive list. This list is the result of examining the raw material with no attempt to concentrate any of the individual types of materials. Only the most rudimentary analysis was done on these materials as part of this report. A few photographs of these materials are included with this report (Diatoms, Photographs 5-10; Sponge Spicules, Photographs 11-17; Moss, Photograph 18; Plant Parts, Photographs 19 and 23; Daphnia Fragments, Photograph 20; Insect Parts, Photographs 21 and 25 right; Testate Ameba, Photograph 22; Pollen, Photograph 24; and Phytoliths, Photograph 25 left).

The sample designated as H-338-10, S-3A, 11'-13' was dominated by diatoms with some sponge spicules, plant parts, insect parts, Cladocera parts, pollens, hyphae, and testate ameba. The diatom population was dominated by Centrales. Centrales constituted 68% of the diatom population. This

domination of Centrales generally indicates a colder climate. The most common Centrales were Aulacoseira (Melosira in earlier papers) granulate, Aulacoseira italic, Stephanodiscus niagrae and Cyclotella. The most common Peneles were Fragilaria crotonensis, and Fragilaria construens.

There were relatively few sponge spicules but those that were present were thick with a very narrow interior tube. This indicates a high dissolved silica content in the water at the time of the spicules formation. The rarity of the sponge spicules suggests that the depth of the water at this location was near or slightly over three meters. The sample had a number of megasclera consistent with Spongilla lacustris and some gemmule spicules consistent with Eunapius fragilis, both found today in the Cedar River and Lake Washington. A more detailed examination would be needed to confirm these sponges. There were also sclera and identify others.

The pollens that were present included Alder, Western Hemlock, Cedar, and Douglas Fir. The pollens in the sample would have to be concentrated to provide a more detailed analysis.

The sample contained a number of fragments of female Daphnia. It is normal for a sediment sample to contain a disproportionate population of females. The relative abundance of males would provide more information on the climate at the time of this deposition but that would require more concentration of the insect and Cladocera parts.

The other two samples of H-338-10, the one at 46'-48' and the one at 81' to 83', were dominated by minerals though "46'-48'" contained some plant parts.

The sample designated as H-349-10, S-17, 9.1'-9.6' was dominated by diatoms with some sponge spicules, plant parts, insect parts, Cladocera parts, pollens, hyphae, and testate ameba. There was also some charred wood in this sample. The diatom population was dominated by Peneles. Centrales constituted only 24% of the diatom population. The most common Peneles were Fragilaria construens, Asterionella formosa, and Fragilaria crotonensis. The most common Centrales were Melosira species. The domination of Peneles indicates warmer water than was the case at the time of deposition for H-338-10, 11'-13'.

There were numerous sponge spicules in this sample. The spicules types were consistent with Eunapius ingloviformis, Eunapius fragilis, Spongilla aspinosa, Spongilla lacustris, and Heteromeyenia latitenta. Many of the spicules showed signs of stress consistent with lower dissolved silica values in the lake water. This can be seen in part by the large diameter of the central canal and less total silica per length in the megascleres.

This sample contained the two different rotifer lorica and most of the insect parts, daphnia fragments, plant parts, etc. There was significantly more organic material in this sample than in any of the other core sections.

Pigment Analysis

A number of organic materials were extracted with both acetone and methanol (see Photographs 26 and 27). The acetone extraction drew out the less polar pigments and organic compounds. These can be seen in the upper trace of pigments in each of the two Photographs, 26 and 27. The

compounds fluoresced white, yellow, or blue with 365 nanometer wavelength ultraviolet light. The more polar compounds extracted with methanol are shown in the lower trace in each of the two Photographs. These tended to fluoresce red, pink or violet, though two strong bands did fluoresce white. The individual band on the chromatogram could be analyzed using micro-Fourier transform infrared spectroscopy but that was not in the scope of this report.

CONCLUSION

The samples contain a vast amount of information regarding the condition of the lake, climate, erosional processes, sediment deposition rates, water life diversity, and local plant life diversity as a function of time, depth along the core. This preliminary examination detected differences in water temperature, deposition rates, water depth, water chemistry in the lake, and other aspects of the environment. There were no obvious indications of marine influence in these samples though a more detailed analysis of the diatom and ameba populations could provide more specific information on changes in the salt content of the water over time. Lake Washington is a large body of water and short term intrusions of salt water that might be the result of tidal wave events would be diluted by that volume. Many questions in regard to past events, earthquakes, tidal waves, volcanic eruptions, lahares, human habitation and exploitation, forest fires, and climate change could be answered by a more detailed analysis of these core samples.

Thank you for this opportunity to be of service. If I can provide any further assistance please contact me.

Signed: _____
E. R. Crutcher, Consultant

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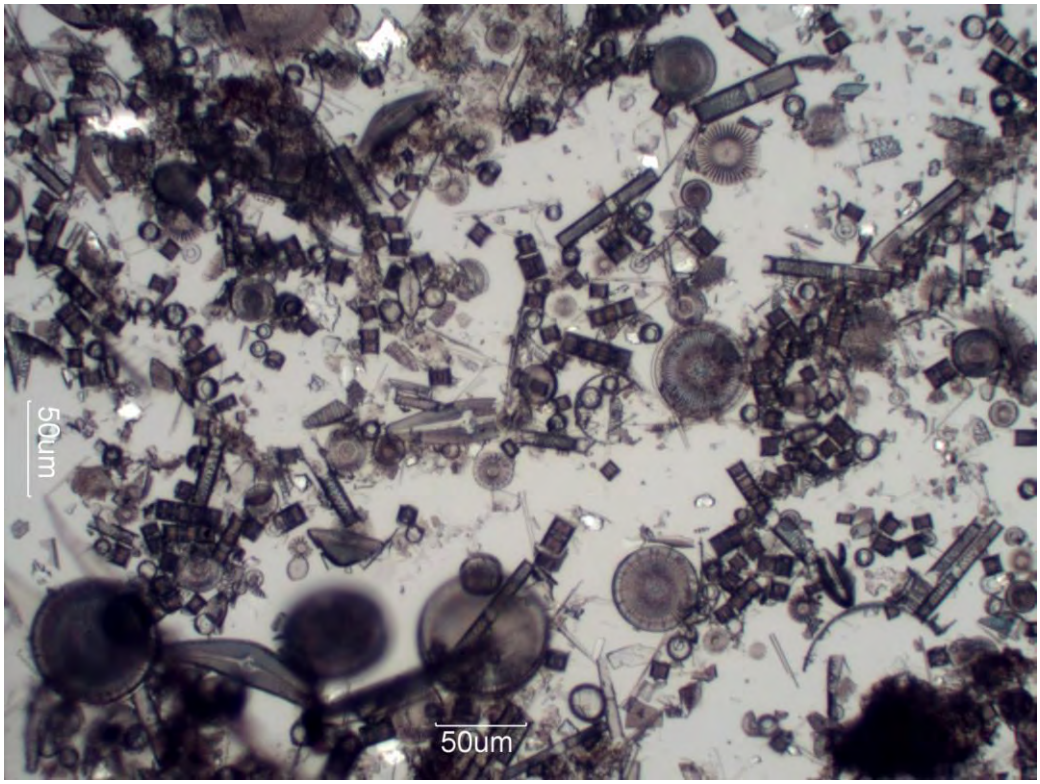
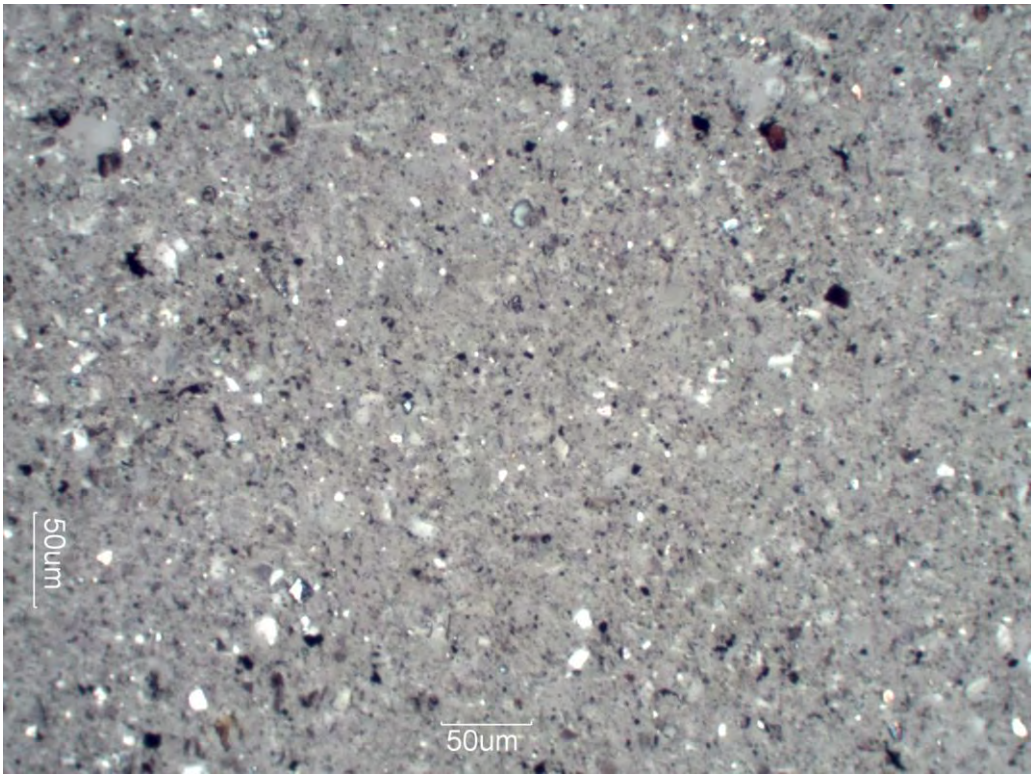


Photograph 1: Core Sample H-338-10, S-3A, 11'-13'



Photograph 2: Core Sample H-338-10, S-10A, 46'-48'

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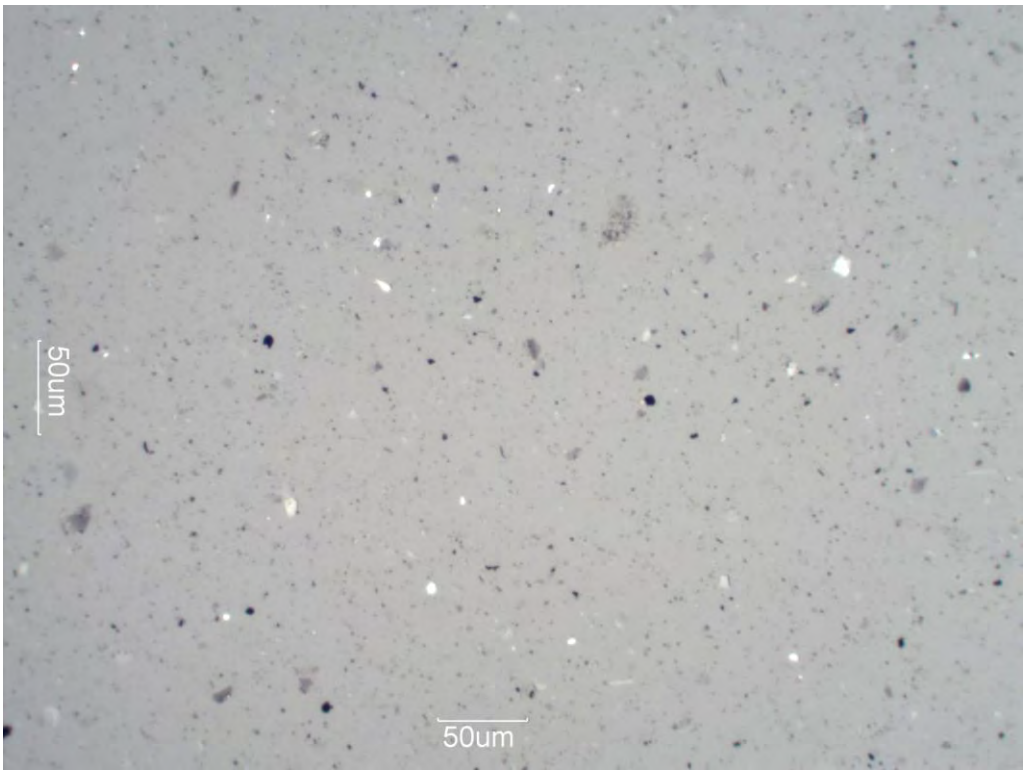

Photograph 3: Core Sample H-338-10, S-17, 81'-83'

Photograph 4: Core Sample H-349-10, S-5E, 9.1'-9.6'

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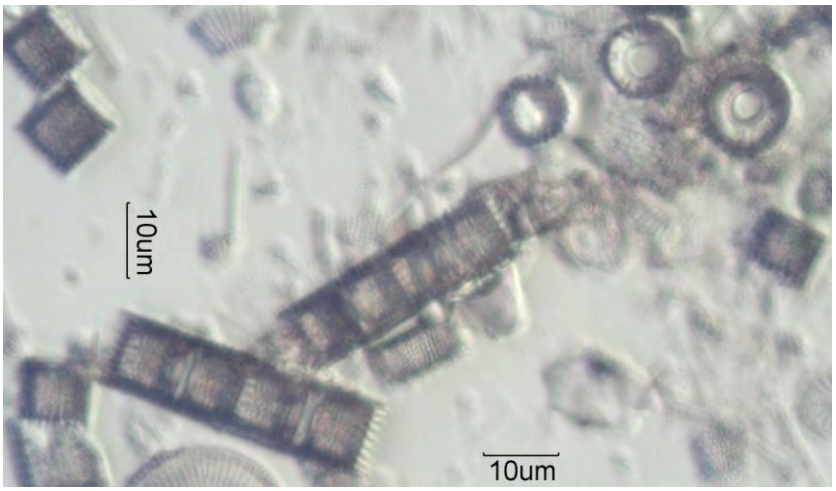
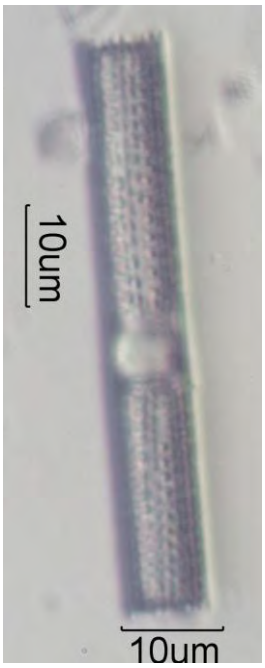
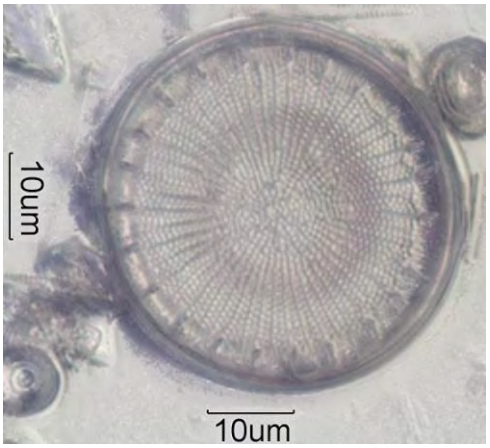


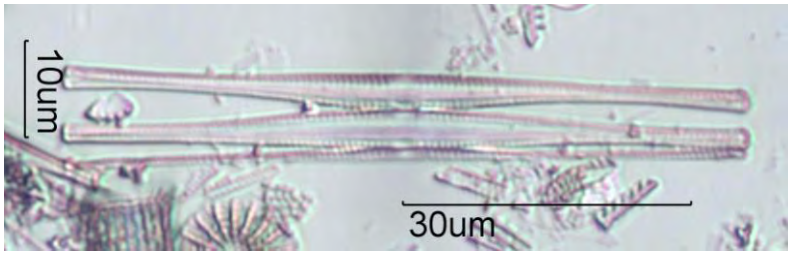
Photograph 5: Aulacoseira granulate



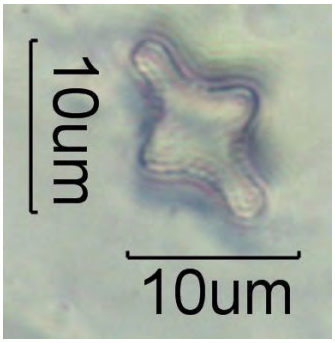
Photograph 6: Aulacoseira italica



Photograph 7: Stephanodiscus niagrae



Photograph 8: Fragilaria crotonensis



Photograph 9: Fragilaria construens

Photograph 10: Asterionella formosa

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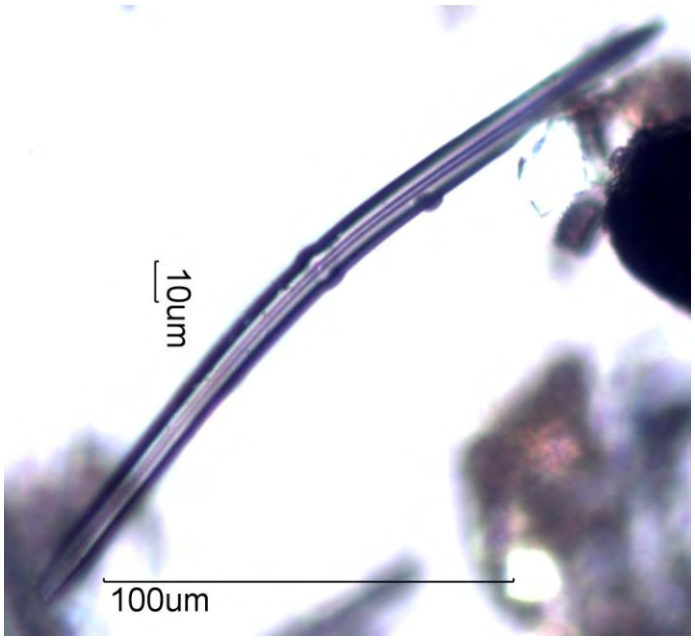
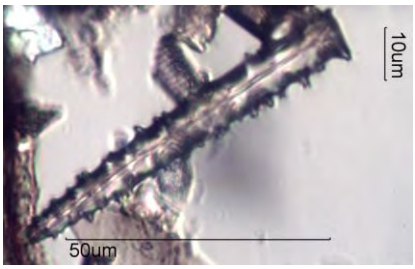
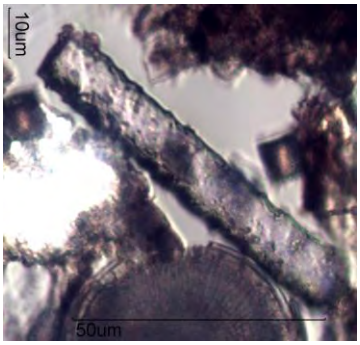


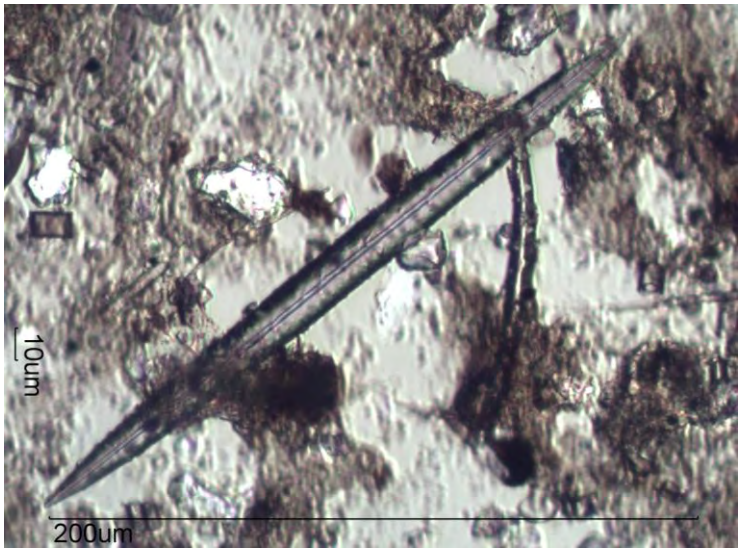
Photograph 11: Core 338-10, 11'-13', Microsclere, Spongilla aspinosa Type



Photograph 12: Core 338-10, 11'-13', Microsclere, Spongilla lacustris Type

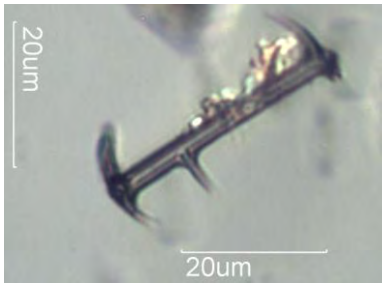


Photograph 13: Core 338-10, 11'-13', Gemmule Spicule, Eunapius fragilis Type

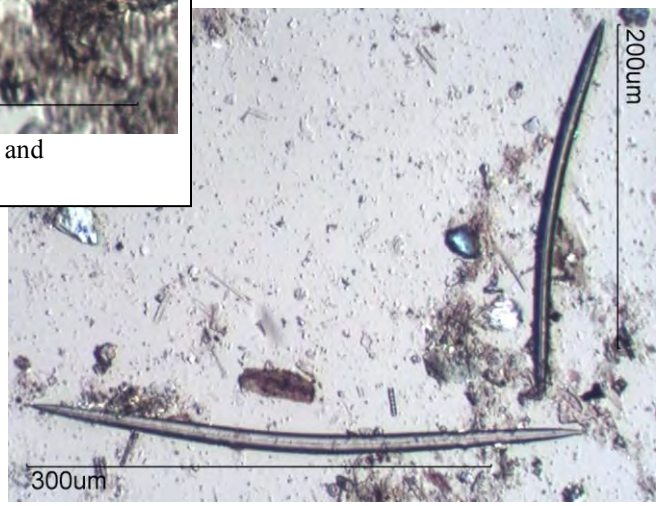


Photograph 14: Core 349-10, 9.1'-9.3', Megasclere and Microsclere, Trochospongilla horrid Type

Photograph 15: Core 349-10, 9.1'-9.3'



Photograph 16: Core 349-10, 9.1'-9.3', Gemmule Spicule



Photograph 17: Core 349-10, 9.1'-9.3', Microsclere, Spongilla aspinosa Type

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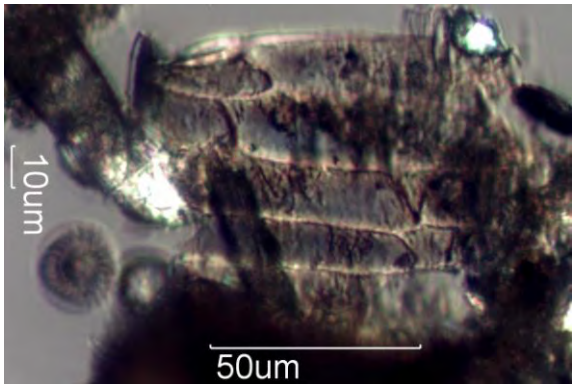
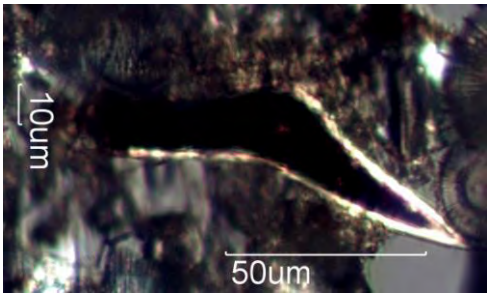
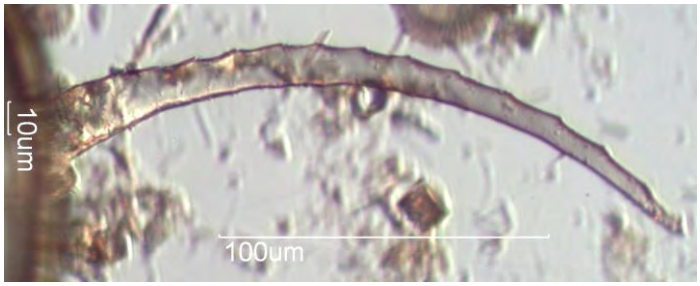


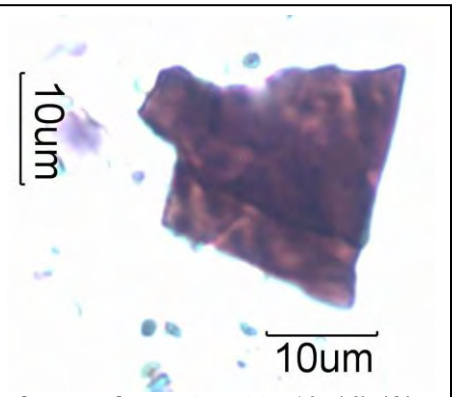
Photograph 18: Core 338-10, 11'-13', Moss Leaf Fragment



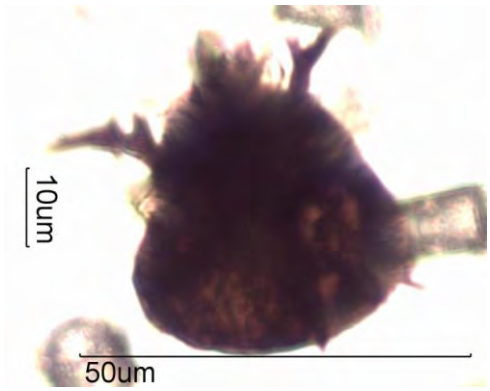
Photograph 19: Core 338-10, 11'-13', Sclerenchyma Cell (Stone Cell)



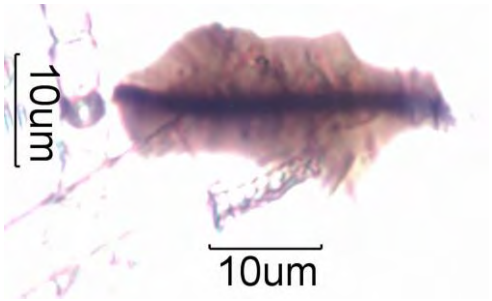
Photograph 20: Core 338-10, 11'-13', Daphnia Fragment



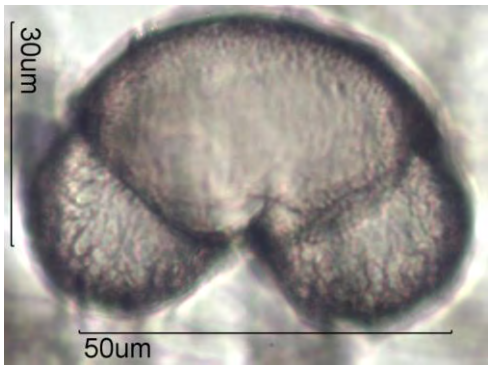
Photograph 21: Core 338-10, 46'-48', Insect Fragment



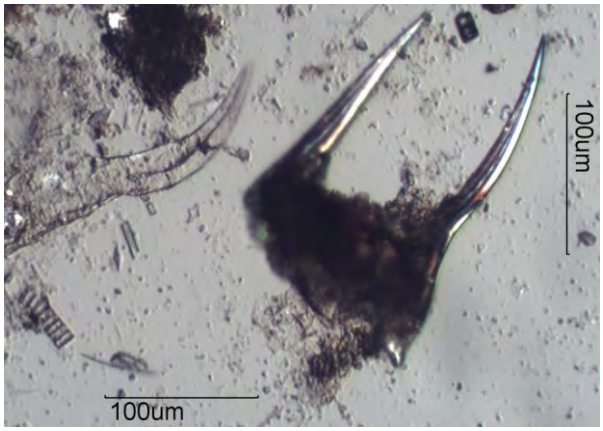
Photograph 22: Core 338-10, 11'-13', Testate Ameba



Photograph 23: Core 338-10, 11'-13', Deciduous Leaf Fragment



Photograph 24: Core 349-10, 9.1'-9.6', Pinus Pollen



Photograph 25: Core 349-10, 9.1'-9.6', Phytolith (left) and Insect Fragment

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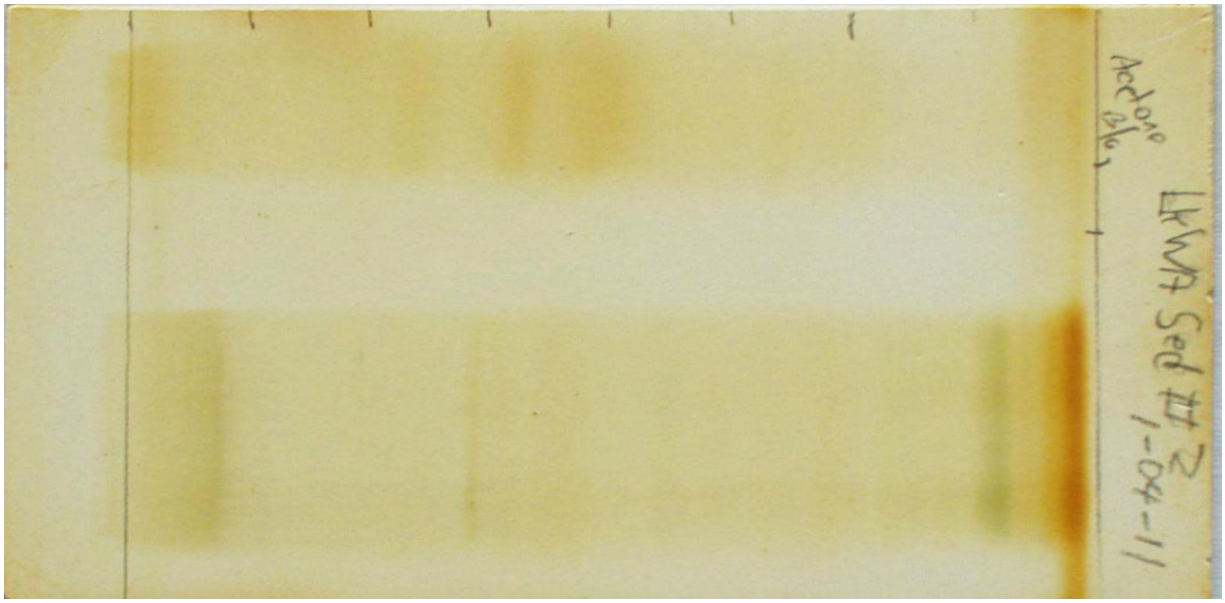
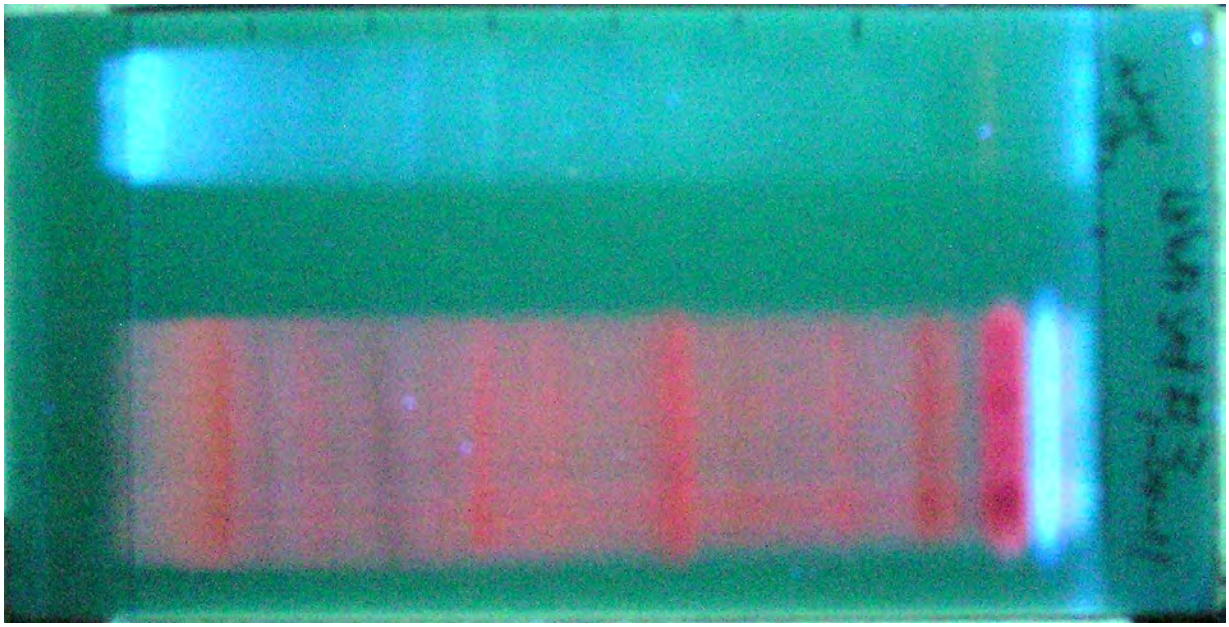


Photograph 26: Visible Pigments on Thin-Layer Plate, Sample



Photograph 27: Organic Compounds Fluorescing with UV of 365 Nanometers Wavelength.

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Report #: 414-11
Date: April 12, 2011

LABORATORY REPORT

TO: Kathy Troost
Troost Geological Consulting
17227 97th Drive SE
Snohomish, WA 98296

PHONE: (360) 668-8253 **FAX:** () **E-MAIL:** troostgeology@comcast.net
SUBJECT: Refractive Index Determination
SPECIMEN: Ash Lenses from Lake Washington Core Samples
REFERENCE: Microlab Northwest Reports 260-10, 322-10

INTRODUCTION

Five samples of suspected ash lenses were submitted for refractive index determinations. The samples were wrapped individually in aluminum foil and then placed in separate Ziploc-type plastic bags. The samples were marked as follows:

H-453-10, L-17-D, 32.8' to 33.0'
H-453-10, F-18-C, 34.6'
H-457-10, L-21-A, 38.0'
H-473-10, F-19-C, 37.0'
H-489-10, L-26-B, 50.4'

A portion of each sample was removed and mounted after drying in a synthetic resin that had a refractive index of approximately 1.515 when cured. Another portion of each resin was mounted in Cargille High Dispersion, Series E, 1.510 refractive index liquid. Sample "H-489-10, L-26-B, 50.4'" was also mounted in Series E 1.500 refractive index liquid. Dispersion staining was used to determine the D-line refractive index match. A standard optical glass was mounted in the matching liquid to verify the refractive index. The optical glass selected was Cargille 1.50 and Cargille 1.51 with the following optical properties:

nF = 1.50604, ne = 1.50263, nD = 1.50072, nC = 1.49845
nF = 1.51568, ne = 1.51203, nD = 1.51004, nC = 1.50765

Phase contrast dispersion staining was used to measure and document the refractive indices. Photographs* 1 through 6 document the refractive indices of the samples submitted. This is the same 1.510 liquid used for the results reported in Microlab Northwest report 260-10 and has a refractive index of approximately 1.5118+/-0.0005 at the time of testing. The refractive index of the 1.500 liquid at the time of testing was 1.5012+/-0.0005. The change in refractive index is largely due to the temperature in the laboratory at the time of testing. For that reason the true refractive index of the liquid is always based on the standard glass mounted and tested at the same time as the samples. All samples were mounted at the same time and tested within the same hour. The dispersion curve for the

ash was assumed to be near that of the optical glass standard in deriving the D-line refractive index from the closest matching dispersion color. By using the closest matching dispersion color the error introduced by a difference in slope was minimized. The value reported was determined graphically to the fourth place but the confidence interval is based on the accuracy of the method. As a result, the relative ranking of the different samples is correct though the reported value may change on repeated measurements of the same sample using this technique by 0.0005 units.

RESULTS

The samples designated as "H 453-10, L-17D"; "H 453-10, F-18C"; "H 457-10, L-21A"; and "H 473-10, F-19C" all had about the same refractive index, as can be seen by the similarity of the dispersion staining colors (Photographs 1 through 4), approximately 1.5110 +/- 0.0005. This is the same refractive index as the sample designated as H-349-10, S-3A, 4.5' of Microlab Northwest Report 260-10 and the ash samples of Report 322-10. Sample "H 453-10, L-17D" is a duplicate ash sample from Report 322-10. The dispersion colors are slightly different than those in the earlier report because the temperature in the laboratory was a few degrees cooler than it was for the earlier report.

The sample designated as "H 489-10, L-26B" had a lower refractive index, approximately 1.4912 +/- 0.0005, as can be seen by the poor match in the 1.510 liquid (black halo in Photograph 5) and the much closer match in the 1.500 liquid (red halo and blue body in Photograph 6). The ash particles were much larger in this sample than the ash particles in the other four samples. That would suggest a much closer source.

CONCLUSION

The refractive index of "H 453-10, L-17D"; "H 453-10, F-18C"; "H 457-10, L-21A"; and "H 473-10, F-19C" was 1.5110 +/- 0.0005. They have the same refractive index as sample H-349-10, S-3A, 4.5' of Microlab Northwest Report 260-10. The refractive index of "H 489-10, L-26B" was 1.4942 +/- 0.0005. The source of the ash in sample "H 489-10, L-26B" was much closer than the source of the other samples.

Thank you for this opportunity to be of service. If I can provide any further assistance please contact me.

Signed: _____
E. R. Crutcher, Consultant

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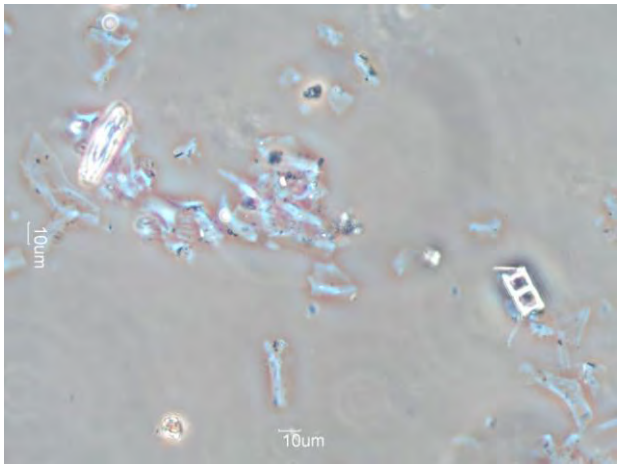
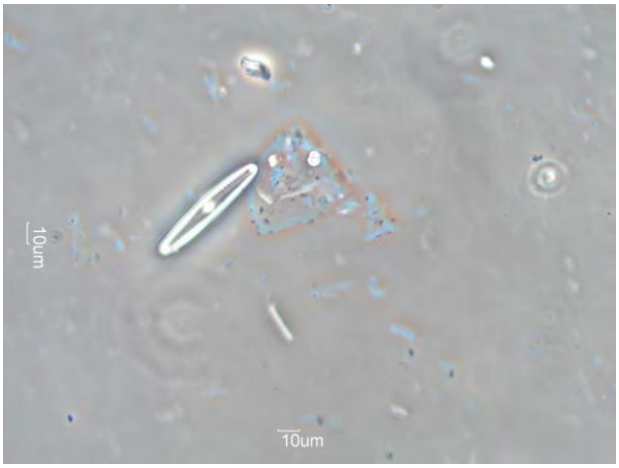
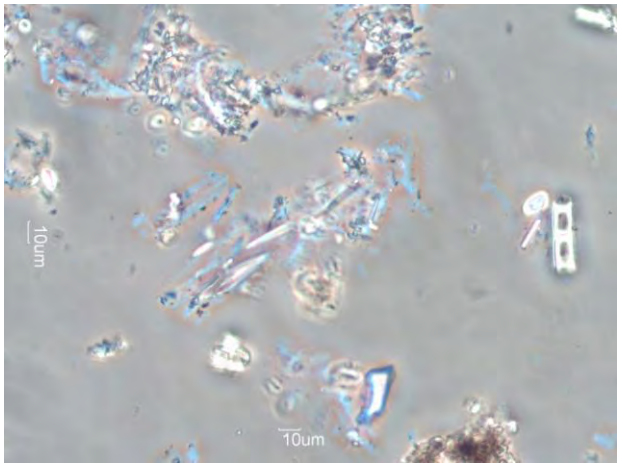
Report #: 414-11
Date: April 12, 2011



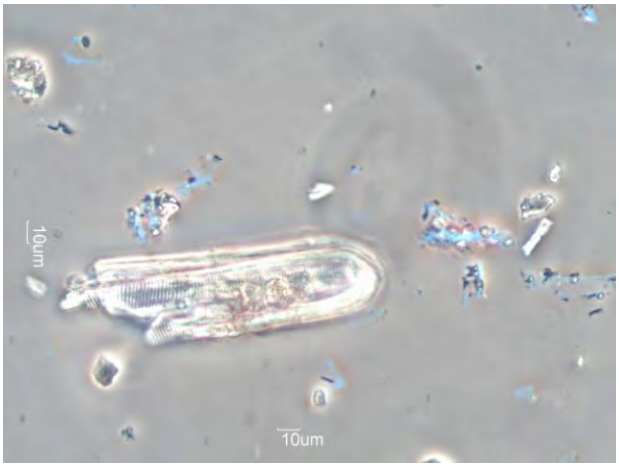
Photograph 1: Core H-453-10, L-17D In 1.510 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



Photograph 2: Core H-453-10, F-18C In 1.510 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining

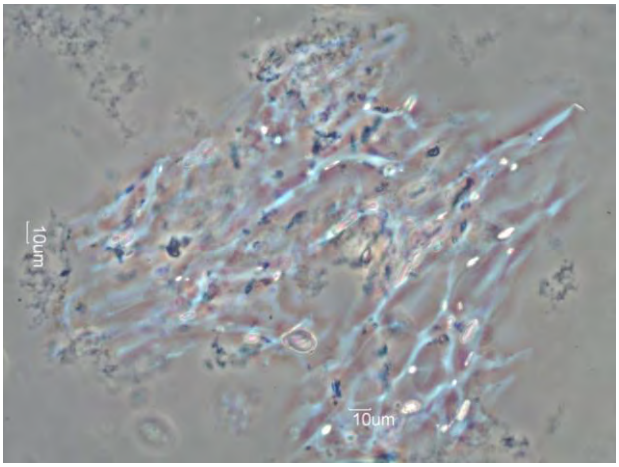


Photograph 3: Core H-457-10, L21-A, In 1.510 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining

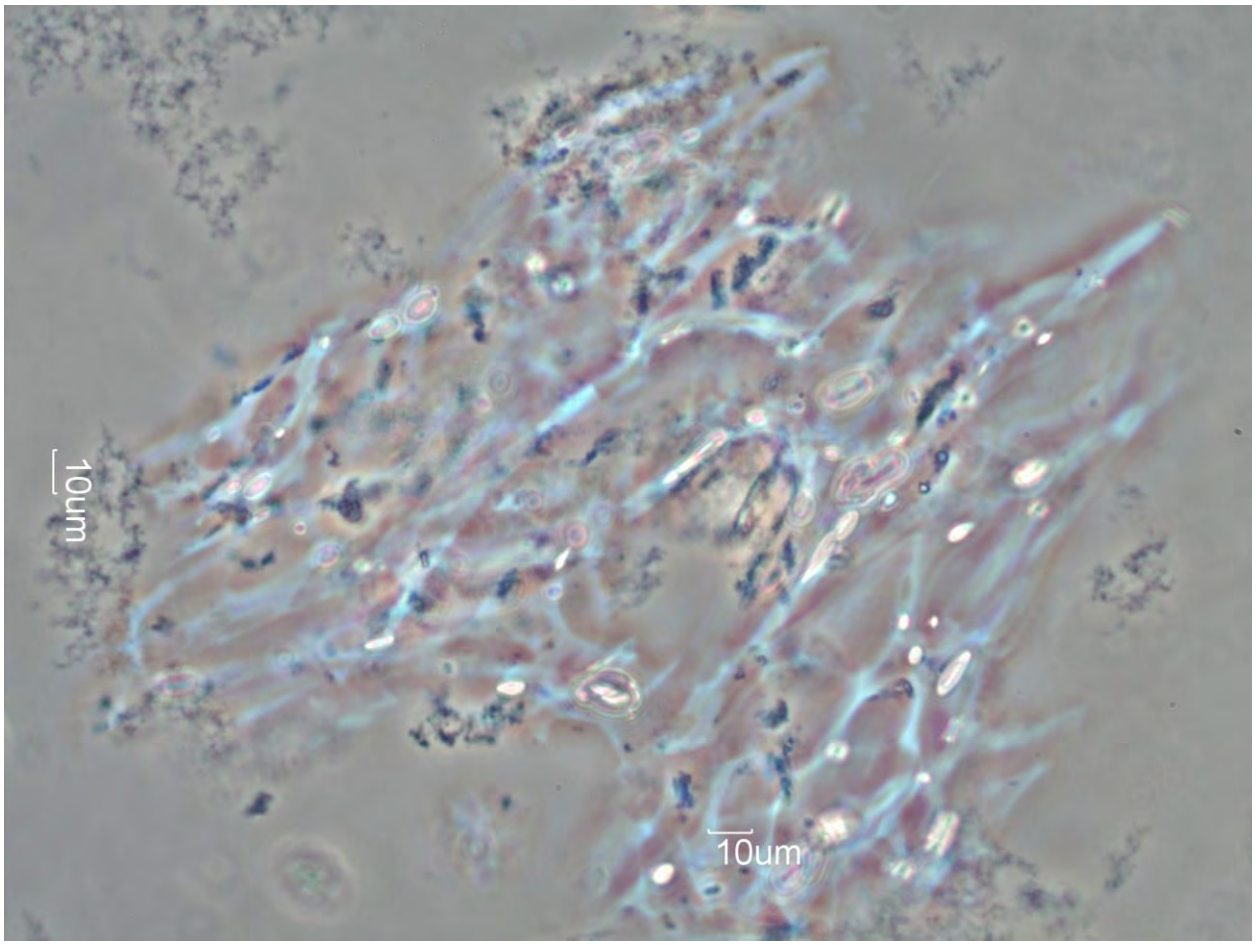


Photograph 4: Core H-473-10, F-19C, In 1.510 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining

Photograph 5: Core H-489-10, L-26B, In 1.510 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining



Photograph 6: Core H-489-10, L-26B, In 1.500 Standard Refractive Index Liquid, Phase Contrast Dispersion Staining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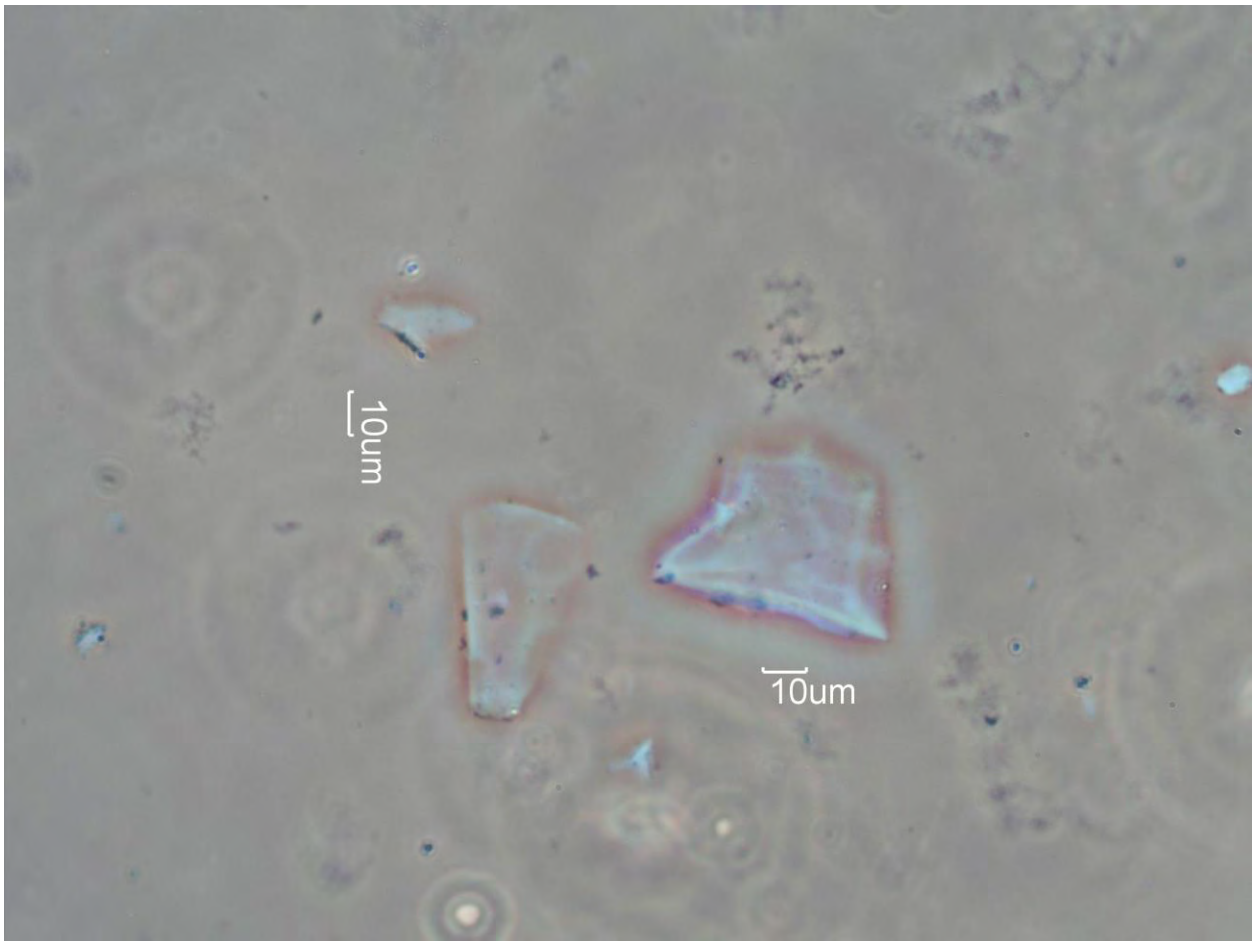
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WASHINGTON STATE UNIVERSITY
School of Earth and Environmental Sciences

April 26, 2011

Kathy Troost
Troost Geological Consulting
17227 97th Drive SE
Snohomish, WA 98296

Dear Kathy,

I've enclosed the results on the sample from Lake Washington. Despite the extremely fine-particle size of the tephra I was able to analyse 17 glass shards. The composition of the glass in sample H-540-10 (L-6B) is an excellent match (similarity coefficient = 0.98+, with 1.0 indicating a perfect compositional match) to our Mazama O standard as well as to many other tephra samples thought to be from the Mazama climactic eruption of 6850 ^{14}C BP.

Thanks again for using our service and if you have any question do not hesitate to give me a call (509-335-3093) or email (fffoit@gmail.com).

Sincerely,

Nick

Franklin F. (Nick) Foit, Jr.
Professor Emeritus and Director of the Microbeam Lab

PO Box 642812, Pullman, WA 99164-2812
509-335-3009 • Fax: 509-335-7816 • sees@wsu.edu • www.sees.wsu.edu

TABLE 1. GLASS COMPOSITION AND SOURCE OF THE LAKE WASHINGTON TEPHRA

Oxide	**Troost H-540-10 L-6B**
SiO_2	73.21(0.32)*
Al_2O_3	14.74(0.24)
Fe_2O_3	2.03(0.08)
TiO_2	0.44(0.02)
Na_2O	4.50(0.38)
K_2O	2.76(0.08)
MgO	0.44(0.02)
CaO	1.59(0.08)
Cl	0.29(0.16)
Total**	100
Number of shards analyzed	17
Probable Source	Mazama O 6850 ^{14}C BP
Similarity Coefficient***	0.98+

* Standard deviations of the analyses given in parentheses

** Analyses normalized to 100 weight percent

*** Borchardt et al. (1972) J. Sed. Petrol., 42, 301-306

Sample: Troost L-6B H-540-10

number of records searched: 1716

Glass composition of sample:

SiO2	TiO2	Al2O3	MgO	CaO	BaO	MnO	Fe2O3	Na2O	K2O	Cl	Total
73.21	0.44	14.74	0.44	1.59	0.00	0.00	2.03	4.50	2.76	0.29	100.00
weighting factor (only for oxides in bold type)											
1	0.25	1	0.25	1			1	1	1		

Similiarity Coefficients for 15 closet matches

SiO2	TiO2	Al2O3	MgO	CaO	Fe2O3	Na2O	K2O	sim coef weighted avg	rec#	Std	Date	State	Source/Age	Notes
0.997	0.886	0.987	1.000	0.988	0.981	1.000	0.989	0.987	1289			MT	Mazama	Sample FL-03 16K II, depth 138 cm Flathead Lake, Montana, Michael Hofmann (Marc Hendricks), Department of Geology, University of montana, Missoul
0.994	0.909	0.983	0.977	1.000	0.985	0.996	0.978	0.986	1172			OR	Mazama Climactic 6850 BP	Sample 5-16-99-3, from flood deposit on lower Deschutes River near Dant, OR; Robin Beebee, Dept. Geol. Sciences, Univ. of Oregon, Eugene, OR 9740
0.997	0.977	0.989	0.957	0.987	0.962	0.998	0.989	0.986	1193			WA	Mazama O 6850 BP	Sample Little Twin Lake, 76.3-76.7cm (Core B, Drive 3) near Winthrop, WA; Jon Riedel, North Cascades Natl. Park, 7280 Ranger Station Road, Marbler
0.997	0.977	0.999	1.000	0.970	0.981	0.982	0.978	0.985	1349			WA	Mazama Climactic	Sample SRASH-2 from Rattlesnake Mountain portion of the Hanford Reach National Monument; Steve Reidel, Pacific Northwest National Laboratory, 902
0.995	1.000	0.984	0.957	0.994	0.976	0.998	0.960	0.984	1019			OR	Mazama Pumice Castle 72,000 BP ???	MC-1B, depth=several meters, Meyers Canyon near Mitchell, OR; 120 degrees and 8' and 44 degrees and 38'; Dan Levish, Bur of Reclamation, Denver F
0.998	0.955	0.988	0.936	0.970	0.967	0.998	0.996	0.983	225			WA	Mazama	Rola 89 229-2, Tephra C, North Cascades National Park, D. Mierendorf
0.996	0.955	0.984	0.978	0.994	0.949	0.987	0.996	0.983	1353			ID	Mazama Climactic	Sample 2001-2 from 87 cm b.s. near Latah Mammoth Site approximately 1 mile nw of Latah, WA in Section 30, T21N, R45E; Charles Luttrell, Archaeologi
0.996	1.000	0.982	0.957	0.975	0.967	1.000	0.975	0.982	1510			WA	Mazama Climactic	Sample NWAA T-1, 220 cm bs, left bank of Sammamish River near outlet of Lake Sammamish, Redmond, WA; Charlie Hodges, Norewest Archaeologica
0.997	0.898	0.981	0.979	0.998	0.983	0.958	0.964	0.982	1630			OR	Newberry - Mazama climactic ashfall	Unit average
0.998	0.977	0.993	1.000	0.994	0.923	0.978	0.996	0.981	1354			ID	Mazama Climactic	Sample Trout Creek Site 2 from a 1 cm layer 3.5 m b.s. in alluvial deposits of Trout Creek near San Jacinto Ranch in Elko City, Nevada just south of Idaho
0.997	0.977	0.984	0.957	0.964	0.962	0.998	0.986	0.980	1339			WA	Mazama Climactic	Sample C11D from a core (51-53.5 cm b.s.) in a forest hollow in Moran State Park on Orcas Island, WA, Shelly Causbay, College of Forest Resources, Ur
0.996	0.977	0.982	0.978	0.970	0.958	0.993	0.982	0.980	1338			WA	Mazama Climactic	Sample MW1B from a core (45-46.5 cm b.s.) in a forest hollow in Mardiworth Experimental Forest at ~500 m elevation near Carnation, WA Shelly Causb
0.998	0.955	0.981	0.898	0.975	0.967	0.983	1.000	0.980	1237			OR	Mazama O 6850 BP	BRE Corral #2; tephra buried in colluvial fan deposit of small basin, exposed by arroyo cutting; 117 deg 01' 33", 44 deg 44'21", Sturgill Creek 7.5 Quad.; R
0.999	0.957	0.998	0.936	0.994	0.985	0.953	0.964	0.980	1189			ID	Mazama O 6850 BP	Sample 119, Site 10IH39 along the Salmon River near Riggins, ID; Leslie Norman, NW Archaeological Assoc., Inc, 5418 1/2 20th Ave NW, Seattle, WA. S
0.999	0.955	0.987	0.957	0.994	0.976	0.957	0.975	0.979	1198			BC	Mazama O 6850 BP	Sample Eagle Lake from 35-36cm bs; Sandra Rosenbery, Dept. of Biological Sciences, Simon Fraser univ., 8888 University Drive, Burnaby, BC, Canada