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SUPPLEMENTARY INFORMATION

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Supplementary Information for: Bioavailability of zinc in marine systems through time

Compilation Requirements

In order to relate Zn enrichments in ancient black shales to temporal changes in the oceanic Zn reservoir, we have compiled Zn data from numerous literature sources (see additional data sources below) for comparison to our sample set of Precambrian black shales. In the presence of free sulphide, Zn will be removed as an insoluble phase. Based on sediment Zn enrichments in modern euxinic (anoxic and sulphidic water column) settings there is first-order scaling between sediment Zn enrichments and dissolved Zn concentrations in the overlying water column. Therefore, we have limited our compilation to samples determined to have been deposited under euxinic conditions. The logic behind this filter is that under euxinic conditions it will be possible to deposit authigenic Zn phases that, in first-order terms, track dissolved Zn levels. In non-euxinic environments (where free sulphide is restricted to the pore waters) sulphide-linked Zn enrichment will be limited by pore water processes and it is possible that the flux of biomass will control sediment Zn enrichments. Therefore, Zn enrichments in non-euxinic environments are a more indirect indicator of water column Zn availability (Fig. S1).

Although several factors such as free sulphide levels and sedimentation rate will also affect sediment Zn enrichments when there are euxinic conditions, these factors are unlikely to negate using sediment Zn enrichment to track basic, first-order trends in Zn concentrations. We selected euxinic samples using Fe-based proxies when available.

Euxinic samples are those where pyrite Fe is greater than 50% of the total reactive Fe as determined by the HCl leach[1] or 70% of total reactive Fe as determined by the sequential extraction[2]. When Fe proxies were not available for Phanerozoic samples we included samples with Mo enrichments exceeding 25 ppm—the upper limit of Mo enrichments in modern, non-euxinic sediments[3]. This builds from the fact that Mo removal in anoxic settings, similar to Zn removal, is dependent on the presence of free sulfide. For the Proterozoic, we selected euxinic samples only using Fe-based proxies. For the Archean we include all black shales containing pyrite, since these samples can be assumed to have been deposited under an anoxic water column. For the conclusions presented in this paper, this exception for Archean samples is conservative because Zn enrichments in non-euxinic environments should under represent the water column Zn inventory (Figure S1). From our Precambrian analysis and a Phanerozoic literature survey ~1000 samples passed the compilation requirements.

Lastly, given that secondary Zn mineralization is a concern, we also avoided samples with documented late stage alteration of trace metal enrichments. Additionally, we have excluded samples with large euhedral sulfide grains and sulfide veins. These basic filters do not exclude the possibility of Zn mineralization, but exclude obvious alteration. We have included samples from several formations with Re-Os ages that are consistent with independent age constraints. Since Re is a chalcophilic element (similar to Zn), it is very unlikely to have late stage Zn alteration without disrupting the Re-Os system. This approach is currently the most rigorous geochemical method of ruling out late stage sulfide mineralization. There are significant Zn enrichments in formations with Re-Os ages in 2,500 Myr old Mt McRae shale[4], the 1,400 Myr old Velkerri Formation[5], the 641

Myr old Black River Dolomite[6], and the 1,100 Myr old Taoudeni Basin[7]. In these cases trace metal and Re-Os work were done on the same samples. Despite strong evidence in these formations for authigenic Zn enrichment, future petrographic studies should test the idea that, in general, large Zn enrichments in Phanerozoic and Precambrian black shales are seawater derived.

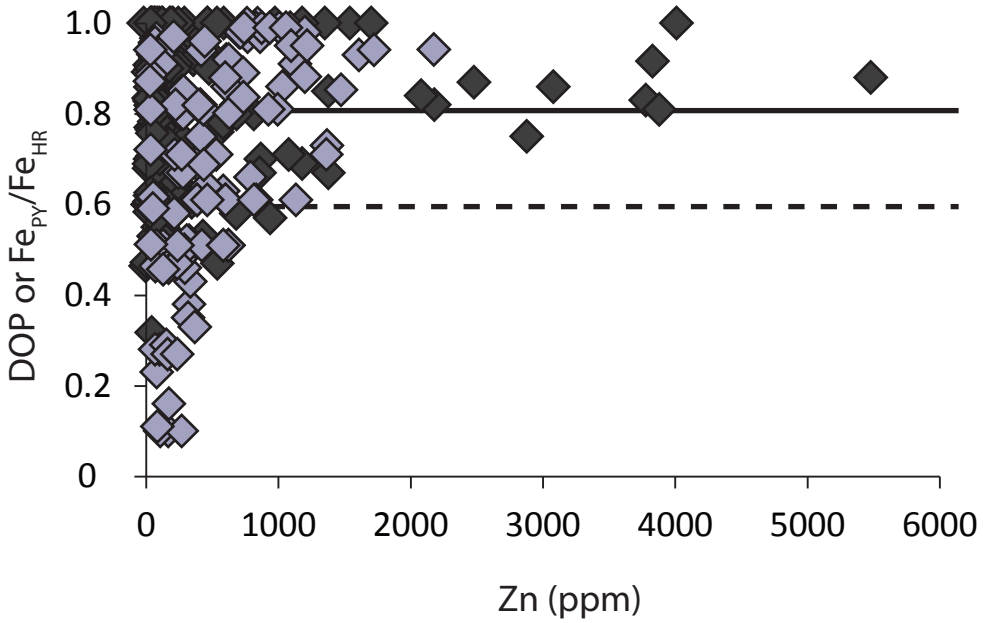

Figure S1. Zn concentrations in black shales as a function of Fe-based proxies that trace the availability of free sulfide. Data are from all samples in Tables S1 and S2 for which degree-of-pyritizaion, DOP, (black) or sequential Fe extraction (grey) data are available. Dashed line represents threshold for possible euxinia and solid line represents the threshold for probable euxinia. Samples with sequential Fe extraction data presented contain highly reactive to total iron enrichments indicative of deposition under anoxic conditions.

References:

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Table S1

Unit	Sample - Core	Depth (m)	Age	Numeric Age (Ma)	Source(s)
Cariaco Basin	39PC457		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC427		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC627		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC422		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC472		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC452		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC482		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC468		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC477		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC487		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC417		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC408		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC442		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC437		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC492		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC217		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC367		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC372		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC432		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC127		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC464		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC377		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC362		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC382		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC412		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC387		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC402		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC207		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC397		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC232		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC392		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC102		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC353		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC357		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC047		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC112		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC034		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC117		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC142		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC147		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC496		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC132		Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC157		Pleistocene-Holocene	0.02	Piper and Dean 2002

Table S1

Cariaco Basin	39PC617	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC067	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC107	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC152	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC222	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC122	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC042	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC025	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC347	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC552	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC072	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC137	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC162	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC338	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC008	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC052	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC092	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC038	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC057	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC087	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC202	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC013	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC237	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC527	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC097	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC537	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC622	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC082	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC212	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC077	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC242	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC343	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC004	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC018	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC024	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC062	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC227	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC247	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC502	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC542	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC582	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC267	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC311	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC507	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC532	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC262	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC282	Pleistocene-Holocene	0.02	Piper and Dean 2002

Table S1

Cariaco Basin	39PC287	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC332	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC522	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC257	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC277	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC322	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC512	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC297	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC302	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC327	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC517	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC557	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC567	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC587	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC602	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC252	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC272	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC292	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC307	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC317	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC547	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC562	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC578	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC597	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC612	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC572	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC606	Pleistocene-Holocene	0.02	Piper and Dean 2002
Cariaco Basin	39PC592	Pleistocene-Holocene	0.02	Piper and Dean 2002
Mediterranean Sapropels	160-967B-6H6,104-105	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-969D-5H2,141-142	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-967B-6H6,105-106	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-964C-6H3,72/73	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-967B-6H6,45-46	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-967B-6H6,95-96	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-969D-5H2,128-129	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-967B-6H6,44-45	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-967B-6H6,103-104	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-969D-5H3,40-41	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-967B-6H6,98-99	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-969D-5H2,129-130	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-969D-5H3,42-43	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-969D-5H2,138-139	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-967B-6H6,39-40	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-964C-6H3,34/35	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-969D-5H3,69-70	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-967B-6H6,32-33	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-967B-6H6,101-102	Pliocene	3.6	Arnaboldi and Meyers 2007

Table S1

Mediterranean Sapropels	160-969D-5H2,135-136	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-969D-5H3,46-47	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-969D-5H3,60-61	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-964C-6H3,29/30	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-969D-5H3,55-56	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-967B-6H6,29-30	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-964C-6H3,32/33	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-969D-5H3,48-49	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-967B-6H6,35-36	Pliocene	3.6	Arnaboldi and Meyers 2007
Mediterranean Sapropels	160-967B-6H6,30-31	Pliocene	3.6	Arnaboldi and Meyers 2007
Monterey Formation		Miocene	20	Piper and Isaacs 1995
Monterey Formation		Miocene	20	Piper and Isaacs 1995
Monterey Formation		Miocene	20	Piper and Isaacs 1995
Monterey Formation	11	Miocene	20	Leventhal 1989
Monterey Formation	19	Miocene	20	Leventhal 1989
Monterey Formation		Miocene	20	Piper and Isaacs 1995
IODP 302	200.41	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	200.54	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	208.4	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	200.33	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	200.35	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	200.17	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	200.27	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	206.7	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	200.01	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	200.06	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	200.22	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.92	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	200.12	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	200.13	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.97	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.93	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.77	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.84	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.63	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.67	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.07	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.71	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.13	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.02	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.47	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.57	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.42	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.27	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.27	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.52	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.73	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009

Table S1

IODP 302	199.15	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.53	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.2	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.32	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.03	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.37	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
IODP 302	199.33	Eocene	55.8	März et al. 2010 and Ogawa et al. 2009
DSDP 530A	10911096	Cretaceous/Coniacian	89.3	Dean and Parduhn 1984
DSDP 530A	10953038	Cretaceous/Coniacian	89.3	Dean and Parduhn 1984
La Luna Formation	LU-138	Cretaceous	93.6	Alberdi-Genolet and Tocco 1999
La Luna Formation	LU-128	Cretaceous	93.6	Alberdi-Genolet and Tocco 1999
La Luna Formation	LU-125	Cretaceous	93.6	Alberdi-Genolet and Tocco 1999
La Luna Formation	LU-153	Cretaceous	93.6	Alberdi-Genolet and Tocco 1999
La Luna Formation	LU-147	Cretaceous	93.6	Alberdi-Genolet and Tocco 1999
La Luna Formation	LU-98	Cretaceous	93.6	Alberdi-Genolet and Tocco 1999
La Luna Formation	LU-106	Cretaceous	93.6	Alberdi-Genolet and Tocco 1999
La Luna Formation	LU-115	Cretaceous	93.6	Alberdi-Genolet and Tocco 1999
La Luna Formation	LU-121	Cretaceous	93.6	Alberdi-Genolet and Tocco 1999
La Luna Formation	LU-141	Cretaceous	93.6	Alberdi-Genolet and Tocco 1999
La Luna Formation	LU-119	Cretaceous	93.6	Alberdi-Genolet and Tocco 1999
La Luna Formation	LU-151	Cretaceous	93.6	Alberdi-Genolet and Tocco 1999
La Luna Formation	LU-108	Cretaceous	93.6	Alberdi-Genolet and Tocco 1999
La Luna Formation	NT9	Cretaceous	93.6	Mongenot et al. 1996
La Luna Formation	NT8	Cretaceous	93.6	Mongenot et al. 1996
La Luna Formation	NT23	Cretaceous	93.6	Mongenot et al. 1996
La Luna Formation	NT2	Cretaceous	93.6	Mongenot et al. 1996
La Luna Formation	NT11	Cretaceous	93.6	Mongenot et al. 1996
La Luna Formation	NT5	Cretaceous	93.6	Mongenot et al. 1996
La Luna Formation	NT7	Cretaceous	93.6	Mongenot et al. 1996
La Luna Formation	NT12	Cretaceous	93.6	Mongenot et al. 1996
La Luna Formation	NT31	Cretaceous	93.6	Mongenot et al. 1996
La Luna Formation	NT24	Cretaceous	93.6	Mongenot et al. 1996
La Luna Formation	NT4	Cretaceous	93.6	Mongenot et al. 1996
La Luna Formation	NT16	Cretaceous	93.6	Mongenot et al. 1996
ODP Hole 103-641A	103-641A-6X-CC,21-24	Cretaceous	93.6	Thurow et al. 1988
ODP Hole 103-641A	103-641A-6X-7,26-29	Cretaceous	93.6	Thurow et al. 1988
ODP Hole 103-641A	103-641A-6X-CC,0-3	Cretaceous	93.6	Thurow et al. 1988
ODP Hole 103-641A	103-641A-6X-7,31-33	Cretaceous	93.6	Thurow et al. 1988
ODP Hole 103-641A	103-641A-6X-CC,8-11	Cretaceous	93.6	Thurow et al. 1988
ODP Hole 103-641A	103-641A-6X-CC,18-21	Cretaceous	93.6	Thurow et al. 1988
DSDP 530A	10983050	Cretaceous/Cenomanian	99.6	Dean and Parduhn 1984
DSDP 530A	10983128	Cretaceous/Cenomanian	99.6	Dean and Parduhn 1984
DSDP 530A	10973070	Cretaceous/Cenomanian	99.6	Dean and Parduhn 1984
Julia Creek Shale	6	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	3	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	8	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	5	Cretaceous/Albian	112	Patterson et al. 1986

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Julia Creek Shale	7	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	4	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	33	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	9	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	34	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	24	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	32	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	11	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	19	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	31	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	20	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	23	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	25	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	10	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	16	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	21	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	22	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	12	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	28	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	18	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	26	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	29	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	27	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	17	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	30	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	14	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	15	Cretaceous/Albian	112	Patterson et al. 1986
Julia Creek Shale	13	Cretaceous/Albian	112	Patterson et al. 1986
La Luna Formation	MA-42	Cretaceous/Aptian – Albian	112	Alberdi-Genolet and Tocco 1999
La Luna Formation	MA-68	Cretaceous/Aptian – Albian	112	Alberdi-Genolet and Tocco 1999
La Luna Formation	MA-24	Cretaceous/Aptian – Albian	112	Alberdi-Genolet and Tocco 1999
La Luna Formation	MA-65	Cretaceous/Aptian – Albian	112	Alberdi-Genolet and Tocco 1999
La Luna Formation	MA-26	Cretaceous/Aptian – Albian	112	Alberdi-Genolet and Tocco 1999
La Luna Formation	MA-79	Cretaceous/Aptian – Albian	112	Alberdi-Genolet and Tocco 1999
La Luna Formation	MA-72	Cretaceous/Aptian – Albian	112	Alberdi-Genolet and Tocco 1999
La Luna Formation	MA-39	Cretaceous/Aptian – Albian	112	Alberdi-Genolet and Tocco 1999
La Luna Formation	MA-32	Cretaceous/Aptian – Albian	112	Alberdi-Genolet and Tocco 1999
Norwegian Shelf	53.8	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	52	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	51.6	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.69	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.41	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	53.5	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	52.7	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	51.09	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	52.1	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.71	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003

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Norwegian Shelf	54.1	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.23	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	53.2	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.81	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	52.5	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.63	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	54.6	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	51.03	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.33	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.65	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	53.1	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.29	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	52.2	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.19	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	51.05	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	51.07	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	60.34	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.25	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	52.9	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	53.9	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.67	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.35	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.75	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	59.74	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.27	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	53.3	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.57	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.17	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.77	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.93	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.21	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.43	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	52.3	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.91	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.73	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	54	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.91	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.19	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.87	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	47.26	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.53	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.87	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.99	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.45	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	43.1	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.79	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	67.2	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003

Table S1

Norwegian Shelf	49.95	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.95	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.85	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.85	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.65	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.55	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.15	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	48.72	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.31	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.49	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.15	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	52.4	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.45	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.59	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.11	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.61	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.83	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.93	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.89	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.13	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.43	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.61	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	53.59	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.53	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.23	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.51	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.47	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.17	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.51	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.59	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.47	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.41	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.55	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.63	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.89	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.75	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.97	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.69	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.31	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	51.01	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.39	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.71	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.49	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.21	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.79	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.73	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.81	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003

Table S1

Norwegian Shelf	50.77	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.25	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.83	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.13	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.97	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.05	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.01	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.03	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.09	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.11	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	50.07	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	49.99	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	54.55	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Norwegian Shelf	54.17	Cretaceous/Volgian-Berriasian	145.5	Lipinski et al. 2003
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Kimmeridge Clay Formation		Jurassic/Kimmerigian	155.6	Tribovillard et al. 1994
Jet Rock	PM-BS-60	Jurassic/Toarcian	183	Gill unpublished
Jet Rock	PM-BS-440	Jurassic/Toarcian	183	Gill unpublished
Jet Rock	PM-BS-140	Jurassic/Toarcian	183	Gill unpublished
Jet Rock	PM-BS-220	Jurassic/Toarcian	183	Gill unpublished
Jet Rock	PM-BS-40	Jurassic/Toarcian	183	Gill unpublished
Jet Rock	PM-BS-260	Jurassic/Toarcian	183	Gill unpublished
Jet Rock	PM-BS-160	Jurassic/Toarcian	183	Gill unpublished
Jet Rock	24	Jurassic/Toarcian	183	Gill unpublished

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Jet Rock	PM-BS-360	Jurassic/Toarcian	183	Gill unpublished
Jet Rock	PM-BS-420	Jurassic/Toarcian	183	Gill unpublished
Jet Rock	9	Jurassic/Toarcian	183	Gill unpublished
Jet Rock	PM-BS-20	Jurassic/Toarcian	183	Gill unpublished
Jet Rock	PM-BS-0	Jurassic/Toarcian	183	Gill unpublished
Jet Rock	PM-BS-280	Jurassic/Toarcian	183	Gill unpublished
Jet Rock	44	Jurassic/Toarcian	183	Gill unpublished
Posidonia Shale	DO-48	Jurassic/Toarcian	183	Gill unpublished
Posidonia Shale	DO-35	Jurassic/Toarcian	183	Gill unpublished
Posidonia Shale	DO-44	Jurassic/Toarcian	183	Gill unpublished
Posidonia Shale	DO-38	Jurassic/Toarcian	183	Gill unpublished
Posidonia Shale	DO-42	Jurassic/Toarcian	183	Gill unpublished
Posidonia Shale	DO-45	Jurassic/Toarcian	183	Gill unpublished
Posidonia Shale	DO-47	Jurassic/Toarcian	183	Gill unpublished
Posidonia Shale	DO-46	Jurassic/Toarcian	183	Gill unpublished
Posidonia Shale	DO-40	Jurassic/Toarcian	183	Gill unpublished
Posidonia Shale	DO-41	Jurassic/Toarcian	183	Gill unpublished
Posidonia Shale	DO-39	Jurassic/Toarcian	183	Gill unpublished
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007

Table S1

Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Fernie Formation, Gordondale Member		Jurassic/Pliensbachian	189.6	Ross and Bustin 2007
Grenzbitumenzone		Middle Triassic/Anisian	245	Bernasconi 1991
Grenzbitumenzone		Middle Triassic/Anisian	245	Bernasconi 1991
Grenzbitumenzone		Middle Triassic/Anisian	245	Bernasconi 1991
Grenzbitumenzone		Middle Triassic/Anisian	245	Bernasconi 1991
Grenzbitumenzone		Middle Triassic/Anisian	245	Bernasconi 1991
Grenzbitumenzone		Middle Triassic/Anisian	245	Bernasconi 1991
Grenzbitumenzone		Middle Triassic/Anisian	245	Bernasconi 1991
Kupferschiefer (umminer	11a	Permian/Lopingian/Wuchiapingian	257.3	Pašava et al. 2010
Kupferschiefer (umminer	9b	Permian/Lopingian/Wuchiapingian	257.3	Pašava et al. 2010
Kupferschiefer (umminer	5a	Permian/Lopingian/Wuchiapingian	257.3	Pašava et al. 2010
Kupferschiefer (umminer	3b	Permian/Lopingian/Wuchiapingian	257.3	Pašava et al. 2010
Phosphoria Formation	189	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	213	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	73	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	70	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	225	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	202	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	199	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	187	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	201	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	61	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	178	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	192	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	48	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	179	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	601-28-1A	Permain/Guadalupian	270.6	Hein et al. 2002
Phosphoria Formation	76	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	60	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	71	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	66	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	58	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	186	Permain/Guadalupian	270.6	Piper 1999

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Phosphoria Formation	195	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	171	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	502-14-2A	Permain/Guadalupian	270.6	Hein et al. 2002
Phosphoria Formation	67	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	52	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	44	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	185	Permain/Guadalupian	270.6	Piper 1999
Phosphoria Formation	196	Permain/Guadalupian	270.6	Piper 1999
Hushpuckney Shale	1036.7-3GR	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Hushpuckney Shale	1036.7-7GR	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Hushpuckney Shale	1036.7-1GR	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Hushpuckney Shale	1036.7-4GR	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Hushpuckney Shale	1036.7-2B	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Hushpuckney Shale	1036.7-4B	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Hushpuckney Shale	1036.7-6GR	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Hushpuckney Shale	1036.7-5GR	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Hushpuckney Shale	1036.7-2GR	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Hushpuckney Shale	1036.7-3B	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Hushpuckney Shale	1039.2-10B	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Hushpuckney Shale	1039.2-1B	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Stark Shale	S43	Pennsylvanian/Missourian	306	Hatch and Leventhal 1992
Stark Shale	S82	Pennsylvanian/Missourian	306	Hatch and Leventhal 1992
Stark Shale	S81	Pennsylvanian/Missourian	306	Hatch and Leventhal 1992
Stark Shale	S5	Pennsylvanian/Missourian	306	Hatch and Leventhal 1992
Stark Shale	S42	Pennsylvanian/Missourian	306	Hatch and Leventhal 1992
Stark Shale	S11	Pennsylvanian/Missourian	306	Hatch and Leventhal 1992
Stark Shale	S10	Pennsylvanian/Missourian	306	Hatch and Leventhal 1992
Stark Shale	S1	Pennsylvanian/Missourian	306	Hatch and Leventhal 1992
Stark Shale	S122	Pennsylvanian/Missourian	306	Hatch and Leventhal 1992
Stark Shale	S22	Pennsylvanian/Missourian	306	Hatch and Leventhal 1992
Stark Shale	S21	Pennsylvanian/Missourian	306	Hatch and Leventhal 1992
Stark Shale	S41	Pennsylvanian/Missourian	306	Hatch and Leventhal 1992
Stark Shale	S62	Pennsylvanian/Missourian	306	Hatch and Leventhal 1992
Stark Shale	S121	Pennsylvanian/Missourian	306	Hatch and Leventhal 1992
Tackett Shale	294.0-2GT	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Tackett Shale	289.3-13B	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Tackett Shale	289.3-5B	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Tackett Shale	289.3-6B	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Tackett Shale	289.3-8B	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Tackett Shale	289.3-12B	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Tackett Shale	294.0-17B	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Tackett Shale	294.0-16B	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Tackett Shale	294.0-15B	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Tackett Shale	294.0-13B	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Tackett Shale	294.0-12B	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Tackett Shale	294.0-9B	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Tackett Shale	294.0-1GT	Pennsylvanian/Missourian	306	Cruse and Lyons 2004

Table S1

Tackett Shale	294.0-3GT	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Tackett Shale	294.0-5GT	Pennsylvanian/Missourian	306	Cruse and Lyons 2004
Anna	MC121-2	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Anna	Anna	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Anna	CP22-6D	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Excello	EDS1A-7	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Excello	1044-32	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Excello	MC86-2	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Excello	EDS1A-6	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Excello	EDS1A-5	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Excello	CP22-14	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Excello	BM5-2	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Excello	CP41-1	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Excello	CP78-13B	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Excello	1535-7	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Excello	SS-11	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Excello	SS-1	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Little Osage	1535u-25	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Little Osage	BM14-2	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Little Osage	CP78-4B	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Little Osage	CP22-11	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Little Osage	CP78-4A	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Oakley	CP41-17	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Oakley	CP22-22E	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Oakley	CP22-22C	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Unnamed	1044-47	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Unnamed	BM2-5	Pennsylvanian/Desmoinesian	308	Hatch et al. 1997
Rhinestreet Shale	1366	Mississippian/Osagean	345.3	Leventhal 1978
Rhinestreet Shale	1494	Mississippian/Osagean	345.3	Leventhal 1978
Rhinestreet Shale	1450	Mississippian/Osagean	345.3	Leventhal 1978
Rhinestreet Shale	1470	Mississippian/Osagean	345.3	Leventhal 1978
Rhinestreet Shale	1239	Mississippian/Osagean	345.3	Leventhal 1978
Rhinestreet Shale	1478	Mississippian/Osagean	345.3	Leventhal 1978
Exshaw Formation	19	Mississippian/Tournasian	359.2	Caplan and Bustin 1998
Exshaw Formation	27	Mississippian/Tournasian	359.2	Caplan and Bustin 1998
Exshaw Formation	38	Mississippian/Tournasian	359.2	Caplan and Bustin 1998
Exshaw Formation	11	Mississippian/Tournasian	359.2	Caplan and Bustin 1998
Exshaw Formation	14	Mississippian/Tournasian	359.2	Caplan and Bustin 1998
Exshaw Formation	2	Mississippian/Tournasian	359.2	Caplan and Bustin 1998
Exshaw Formation	5	Mississippian/Tournasian	359.2	Caplan and Bustin 1998
Exshaw Formation	8	Mississippian/Tournasian	359.2	Caplan and Bustin 1998
Exshaw Formation	35	Mississippian/Tournasian	359.2	Caplan and Bustin 1998
Exshaw Formation	41	Mississippian/Tournasian	359.2	Caplan and Bustin 1998
Exshaw Formation	22	Mississippian/Tournasian	359.2	Caplan and Bustin 1998
Exshaw Formation	21	Mississippian/Tournasian	359.2	Caplan and Bustin 1998
Exshaw Formation	30	Mississippian/Tournasian	359.2	Caplan and Bustin 1998
Exshaw Formation	24	Mississippian/Tournasian	359.2	Caplan and Bustin 1998

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Sunbury Shale	A19	Mississippian/Tournasian	359.2	Perkins et al.2008
Sunbury Shale	A20	Mississippian/Tournasian	359.2	Perkins et al.2008
Sunbury Shale	A6	Mississippian/Tournasian	359.2	Perkins et al.2008
Sunbury Shale	A2	Mississippian/Tournasian	359.2	Perkins et al.2008
Sunbury Shale	A12	Mississippian/Tournasian	359.2	Perkins et al.2008
Sunbury Shale	A10	Mississippian/Tournasian	359.2	Perkins et al.2008
Sunbury Shale	A5	Mississippian/Tournasian	359.2	Perkins et al.2008
Sunbury Shale	A9	Mississippian/Tournasian	359.2	Perkins et al.2008
Sunbury Shale	B23	Mississippian/Tournasian	359.2	Perkins et al.2008
Sunbury Shale	A7	Mississippian/Tournasian	359.2	Perkins et al.2008
Sunbury Shale	A8	Mississippian/Tournasian	359.2	Perkins et al.2008
Sunbury Shale	A11	Mississippian/Tournasian	359.2	Perkins et al.2008
Sunbury Shale	A15	Mississippian/Tournasian	359.2	Perkins et al.2008
Sunbury Shale	A14	Mississippian/Tournasian	359.2	Perkins et al.2008
Sunbury Shale	A13	Mississippian/Tournasian	359.2	Perkins et al.2008
Annulata Black Shales	6/K5	Devonian/Famennian	374.5	Racka et al. 2010
Chattanooga Shale	P-3	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	P-13	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	P-12	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	P-14	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	P-8	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	T-3	Devonian/Famennian	374.5	Leventhal 1979
Chattanooga Shale	P-10	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	T-11	Devonian/Famennian	374.5	Leventhal 1979
Chattanooga Shale	L-3551	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	T-8	Devonian/Famennian	374.5	Leventhal 1979
Chattanooga Shale	L-3961.6	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	T-10	Devonian/Famennian	374.5	Leventhal 1979
Chattanooga Shale	P-7	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	P-16	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	T-4	Devonian/Famennian	374.5	Leventhal 1979
Chattanooga Shale	P-2	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	P-4	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	L-3956	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	T-9	Devonian/Famennian	374.5	Leventhal 1979
Chattanooga Shale	P-18	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	T-13	Devonian/Famennian	374.5	Leventhal 1979
Chattanooga Shale	P-15	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	T-7	Devonian/Famennian	374.5	Leventhal 1979
Chattanooga Shale	L-3951	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	T-5	Devonian/Famennian	374.5	Leventhal 1979
Chattanooga Shale	P-1	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	T-6	Devonian/Famennian	374.5	Leventhal 1979
Chattanooga Shale	L-2733	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	P-17	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	P-19	Devonian/Famennian	374.5	Leventhal 1978
Chattanooga Shale	P-20	Devonian/Famennian	374.5	Leventhal 1978

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Chattanooga Shale	P-21	Devonian/Famennian	374.5	Leventhal 1978
Ohio Shale	C-4	Devonian/Famennian	374.5	Leventhal 1979
Ohio Shale	C-5	Devonian/Famennian	374.5	Leventhal 1979
Ohio Shale	M-10	Devonian/Famennian	374.5	Leventhal 1979
Ohio Shale	M-11	Devonian/Famennian	374.5	Leventhal 1979
Ohio Shale	M-12	Devonian/Famennian	374.5	Leventhal 1979
Ohio Shale	M-17	Devonian/Famennian	374.5	Leventhal 1979
Ohio Shale	M-18	Devonian/Famennian	374.5	Leventhal 1979
Ohio Shale	Wa-6	Devonian/Famennian	374.5	Leventhal 1979
Ohio Shale/Cleveland Me	A26	Devonian/Famennian	374.5	Perkins et al.2008
Ohio Shale/Cleveland Me	A24	Devonian/Famennian	374.5	Perkins et al.2008
Ohio Shale/Cleveland Me	A25	Devonian/Famennian	374.5	Perkins et al.2008
Ohio Shale/Cleveland Me	B12	Devonian/Famennian	374.5	Perkins et al.2008
Ohio Shale/Cleveland Me	B11	Devonian/Famennian	374.5	Perkins et al.2008
Ohio Shale/Huron Membe	A21	Devonian/Famennian	374.5	Perkins et al.2008
Ohio Shale/Huron Membe	D2	Devonian/Famennian	374.5	Perkins et al.2008
Ohio Shale/Huron Membe	B15	Devonian/Famennian	374.5	Perkins et al.2008
Ohio Shale/Huron Membe	B5	Devonian/Famennian	374.5	Perkins et al.2008
Ohio Shale/Huron Membe	B3	Devonian/Famennian	374.5	Perkins et al.2008
Ohio Shale/Huron Membe	B22	Devonian/Famennian	374.5	Perkins et al.2008
Ohio Shale/Huron Membe	B21	Devonian/Famennian	374.5	Perkins et al.2008
Ohio Shale/Huron Membe	D3	Devonian/Famennian	374.5	Perkins et al.2008
Ohio Shale/Huron Membe	B14	Devonian/Famennian	374.5	Perkins et al.2008
Ohio Shale/Huron Membe	B16	Devonian/Famennian	374.5	Perkins et al.2008
Ohio Shale/Three Lick Me	A22	Devonian/Famennian	374.5	Perkins et al.2008
Muskwa Formation	MU1745-3	Devonian/Frasnian	385.3	Ross and Bustin 2009
Muskwa Formation	MU1745-4	Devonian/Frasnian	391	Ross and Bustin 2009
Muskwa Formation	MU714-2	Devonian/Frasnian	391	Ross and Bustin 2009
Muskwa Formation	MU414-3	Devonian/Frasnian	391	Ross and Bustin 2009
Muskwa Formation	MU414-1	Devonian/Frasnian	391	Ross and Bustin 2009
Muskwa Formation	MU1416-7	Devonian/Frasnian	391	Ross and Bustin 2009
Muskwa Formation	MU414-2	Devonian/Frasnian	391	Ross and Bustin 2009
Lower Besa River Format	LBR25 63-7	Devonian/Givetian	391.8	Ross and Bustin 2009
Lower Besa River Format	LBR25 63-5	Devonian/Givetian	391.8	Ross and Bustin 2009
Lower Besa River Format	LBR25 63-1	Devonian/Givetian	391.8	Ross and Bustin 2009
Lower Besa River Format	LBR25 63-3	Devonian/Givetian	391.8	Ross and Bustin 2009
Oatka Creek Formation	328.36	Devonian/Givetian	391.8	Werne et al. 2002
Oatka Creek Formation	339.71	Devonian/Givetian	391.8	Werne et al. 2002
Oatka Creek Formation	337.2	Devonian/Givetian	391.8	Werne et al. 2002
Oatka Creek Formation	337.83	Devonian/Givetian	391.8	Werne et al. 2002
Oatka Creek Formation	338.73	Devonian/Givetian	391.8	Werne et al. 2002
Oatka Creek Formation	330.94	Devonian/Givetian	391.8	Werne et al. 2002
Oatka Creek Formation	328.57	Devonian/Givetian	391.8	Werne et al. 2002
Oatka Creek Formation	333.85	Devonian/Givetian	391.8	Werne et al. 2002
Oatka Creek Formation	332.05	Devonian/Givetian	391.8	Werne et al. 2002
Oatka Creek Formation	333.12	Devonian/Givetian	391.8	Werne et al. 2002
Oatka Creek Formation	335.87	Devonian/Givetian	391.8	Werne et al. 2002

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Oatka Creek Formation	335.26	Devonian/Givetian	391.8	Werne et al. 2002
Oatka Creek Formation	337.09	Devonian/Givetian	391.8	Werne et al. 2002
Oatka Creek Formation	336.27	Devonian/Givetian	391.8	Werne et al. 2002
Oatka Creek Formation	332.72	Devonian/Givetian	391.8	Werne et al. 2002
Oatka Creek Formation	334.63	Devonian/Givetian	391.8	Werne et al. 2002
Oatka Creek Formation	333.59	Devonian/Givetian	391.8	Werne et al. 2002
Oatka Creek Formation	336.69	Devonian/Givetian	391.8	Werne et al. 2002
Unterer Graptolithenschie	P4	Ordovician/Llandovery-Ludlow	443.7	Dill 1986
Unterer Graptolithenschie	P5	Ordovician/Llandovery-Ludlow	443.7	Dill 1986
Unterer Graptolithenschie	P9	Ordovician/Llandovery-Ludlow	443.7	Dill 1986
Unterer Graptolithenschie	P14	Ordovician/Llandovery-Ludlow	443.7	Dill 1986
Unterer Graptolithenschie	P8	Ordovician/Llandovery-Ludlow	443.7	Dill 1986
Unterer Graptolithenschie	P12	Ordovician/Llandovery-Ludlow	443.7	Dill 1986
Unterer Graptolithenschie	P7	Ordovician/Llandovery-Ludlow	443.7	Dill 1986
Unterer Graptolithenschie	P6	Ordovician/Llandovery-Ludlow	443.7	Dill 1986
Unterer Graptolithenschie	P3	Ordovician/Llandovery-Ludlow	443.7	Dill 1986
Unterer Graptolithenschie	P16	Ordovician/Llandovery-Ludlow	443.7	Dill 1986
Unterer Graptolithenschie	P15	Ordovician/Llandovery-Ludlow	443.7	Dill 1986
Unterer Graptolithenschie	P17	Ordovician/Llandovery-Ludlow	443.7	Dill 1986
Unterer Graptolithenschie	P10	Ordovician/Llandovery-Ludlow	443.7	Dill 1986
Unterer Graptolithenschie	P11	Ordovician/Llandovery-Ludlow	443.7	Dill 1986
Unterer Graptolithenschie	P13	Ordovician/Llandovery-Ludlow	443.7	Dill 1986
Dictyonema		Ordovician	460	Quinby-Hunt and Wilde
Dictyonema		Ordovician	460	Quinby-Hunt and Wilde
Dictyonema		Ordovician	460	Quinby-Hunt and Wilde
Dictyonema		Ordovician	460	Quinby-Hunt and Wilde
Dictyonema		Ordovician	460	Quinby-Hunt and Wilde
Dictyonema		Ordovician	460	Quinby-Hunt and Wilde
Dictyonema		Ordovician	460	Quinby-Hunt and Wilde
Dictyonema		Ordovician	460	Quinby-Hunt and Wilde
Dictyonema		Ordovician	460	Quinby-Hunt and Wilde
Dictyonema		Ordovician	460	Quinby-Hunt and Wilde
Dictyonema		Ordovician	460	Quinby-Hunt and Wilde
Dictyonema		Ordovician	460	Quinby-Hunt and Wilde
Dictyonema		Ordovician	460	Quinby-Hunt and Wilde
Dictyonema		Ordovician	460	Quinby-Hunt and Wilde
Dicellogr. Shale		Ordovician/Caradoc	460.9	Schovsbo 2003
Dicellogr. Shale		Ordovician/Caradoc	460.9	Schovsbo 2003
Dicellogr. Shale		Ordovician/Caradoc	460.9	Schovsbo 2003
Dicellogr. Shale		Ordovician/Llanvirn	471.8	Schovsbo 2003
Dicellogr. Shale		Ordovician/Llanvirn	471.8	Schovsbo 2003
Dicellogr. Shale		Ordovician/Llanvirn	471.8	Schovsbo 2003
Dicellogr. Shale		Ordovician/Llanvirn	471.8	Schovsbo 2003
Dicellogr. Shale		Ordovician/Llanvirn	471.8	Schovsbo 2003
Bright Eye Brook Formati	1	Ordovician/Areigian	478.6	Hennessy and Mossman 1996
Bright Eye Brook Formati	2	Ordovician/Areigian	478.6	Hennessy and Mossman 1996
Bright Eye Brook Formati	3	Ordovician/Areigian	478.6	Hennessy and Mossman 1996

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Bright Eye Brook Formati	4	Ordovician/Areigian	478.6	Hennessy and Mossman 1996
Bright Eye Brook Formati	5	Ordovician/Areigian	478.6	Hennessy and Mossman 1996
Bright Eye Brook Formati	6	Ordovician/Areigian	478.6	Hennessy and Mossman 1996
Bright Eye Brook Formati	7	Ordovician/Areigian	478.6	Hennessy and Mossman 1996
Bright Eye Brook Formati	8	Ordovician/Areigian	478.6	Hennessy and Mossman 1996
Bright Eye Brook Formati	9	Ordovician/Areigian	478.6	Hennessy and Mossman 1996
Bright Eye Brook Formati	10	Ordovician/Areigian	478.6	Hennessy and Mossman 1996
Bright Eye Brook Formati	11	Ordovician/Areigian	478.6	Hennessy and Mossman 1996
Bright Eye Brook Formati	12	Ordovician/Areigian	478.6	Hennessy and Mossman 1996
Bright Eye Brook Formati	13	Ordovician/Areigian	478.6	Hennessy and Mossman 1996
Alum Shale	30	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	11.1-11.2	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	13.0-13.1	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	10.5-11.5	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	3	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	14.5-15.2	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	13.0-13.7	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	14.1-14.5	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	9.2-9.9	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	7.9-8.5	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	E	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	83	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	6.0-6.1	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	F	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	G	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	4.2-4.3	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	45	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	37	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	68	Cambrian/Furgonian	499	Leventhal 1991
Alum Shale	253	Cambrian/Furgonian	499	Leventhal 1991
Guojiaba Formation	Sat512	Cambrian/Fortunian	542	Guo et al. 2007
Guojiaba Formation	Sat513	Cambrian/Fortunian	542	Guo et al. 2007
Guojiaba Formation	Sat511	Cambrian/Fortunian	542	Guo et al. 2007
Guojiaba Formation	Sat509	Cambrian/Fortunian	542	Guo et al. 2007
Guojiaba Formation	Sat505	Cambrian/Fortunian	542	Guo et al. 2007
Guojiaba Formation	Sat515	Cambrian/Fortunian	542	Guo et al. 2007
Guojiaba Formation	Sat506	Cambrian/Fortunian	542	Guo et al. 2007
Guojiaba Formation	Sat510	Cambrian/Fortunian	542	Guo et al. 2007
Jiumenchong Formation	Son581	Cambrian/Fortunian	542	Guo et al. 2007
Jiumenchong Formation	Son583	Cambrian/Fortunian	542	Guo et al. 2007
Jiumenchong Formation	Son590	Cambrian/Fortunian	542	Guo et al. 2007
Jiumenchong Formation	Son593	Cambrian/Fortunian	542	Guo et al. 2007
Jiumenchong Formation	Son584	Cambrian/Fortunian	542	Guo et al. 2007
Jiumenchong Formation	Son588	Cambrian/Fortunian	542	Guo et al. 2007
Jiumenchong Formation	Son582	Cambrian/Fortunian	542	Guo et al. 2007
Jiumenchong Formation	Son586	Cambrian/Fortunian	542	Guo et al. 2007
Jiumenchong Formation	Son591	Cambrian/Fortunian	542	Guo et al. 2007

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Jiumenchong Formation	Son587		Cambrian/Fortunian	542	Guo et al. 2007
Jiumenchong Formation	Son592		Cambrian/Fortunian	542	Guo et al. 2007
Yuertushi Formation			Cambrian/Fortunian	542	Bingsong et al. 2009
Yuertushi Formation			Cambrian/Fortunian	542	Bingsong et al. 2009
Yuertushi Formation			Cambrian/Fortunian	542	Bingsong et al. 2009
Yuertushi Formation			Cambrian/Fortunian	542	Bingsong et al. 2009
Yuertushi Formation			Cambrian/Fortunian	542	Bingsong et al. 2009
Yuertushi Formation			Cambrian/Fortunian	542	Bingsong et al. 2009
Yuertushi Formation			Cambrian/Fortunian	542	Bingsong et al. 2009
Doushantuo Formation	Son512		Edicarian	551	Guo et al. 2007
Doushantuo Formation	Son514		Edicarian	551	Guo et al. 2007
Black River Dolomite	RC06-FOR01-A		Neoproterozoic/Cryogenian	641	Kendall et al. 2009
Black River Dolomite	RC06-FOR01-B		Neoproterozoic/Cryogenian	641	Kendall et al. 2009
Black River Dolomite	RC06-FOR01-C		Neoproterozoic/Cryogenian	641	Kendall et al. 2009
Black River Dolomite	RC06-FOR01-D		Neoproterozoic/Cryogenian	641	Kendall et al. 2009
Black River Dolomite	RC06-FOR01-E		Neoproterozoic/Cryogenian	641	Kendall et al. 2009
Black River Dolomite	RC06-FOR02-B		Neoproterozoic/Cryogenian	641	Kendall et al. 2009
Black River Dolomite	RC06-FOR02-D		Neoproterozoic/Cryogenian	641	Kendall et al. 2009
Black River Dolomite	RC06-FOR02-G		Neoproterozoic/Cryogenian	641	Kendall et al. 2009
Black River Dolomite	RC06-FOR02-H		Neoproterozoic/Cryogenian	641	Kendall et al. 2009
Black River Dolomite	RC06-FOR02-I		Neoproterozoic/Cryogenian	641	Kendall et al. 2009
Taoudeni Basin	S1	75.75	Mesoproterozoic	1100	
Taoudeni Basin	S1	78.5	Mesoproterozoic	1100	
Taoudeni Basin	S1	80.64	Mesoproterozoic	1100	
Taoudeni Basin	S1	82.34	Mesoproterozoic	1100	
Taoudeni Basin	S1	83.59	Mesoproterozoic	1100	
Taoudeni Basin	S1	85.05	Mesoproterozoic	1100	
Taoudeni Basin	S1	85.62	Mesoproterozoic	1100	
Taoudeni Basin	S1	122.6	Mesoproterozoic	1100	
Taoudeni Basin	S2	200.8	Mesoproterozoic	1100	
Taoudeni Basin	S2	201	Mesoproterozoic	1100	
Taoudeni Basin	S2	202.15	Mesoproterozoic	1100	
Taoudeni Basin	S4	122.66	Mesoproterozoic	1100	
Taoudeni Basin	S4	122.78	Mesoproterozoic	1100	
Taoudeni Basin	S4	122.88	Mesoproterozoic	1100	
Taoudeni Basin	S4	123.1	Mesoproterozoic	1100	
Taoudeni Basin	S4	128.95	Mesoproterozoic	1100	
Taoudeni Basin	S4	129.28	Mesoproterozoic	1100	
Taoudeni Basin	S4	129.44	Mesoproterozoic	1100	
Taoudeni Basin	S4	129.54	Mesoproterozoic	1100	
Taoudeni Basin	S4	129.63	Mesoproterozoic	1100	
	S4	129.74	Mesoproterozoic	1100	
	S4	129.94	Mesoproterozoic	1100	
	S4	130.2	Mesoproterozoic	1100	
Bordern Basin	JD-79-113-B		Mesoproterozoic	1200	Scott et al. 2008
Bordern Basin	JD-79-112 C-2		Mesoproterozoic	1200	Scott et al. 2008

Table S1

Bordern Basin	JD-79-I 112 C-2		Mesoproterozoic	1200	Scott et al. 2008
Bordern Basin	JD-79-186k		Mesoproterozoic	1200	Scott et al. 2008
Velkerri Formation	Urapunga-4	136.98–137.0	Mesoproterozoic	1400	Shen et al., 2003
Velkerri Formation	Urapunga-4	137.19–137.2	Mesoproterozoic	1400	Shen et al., 2003
Velkerri Formation	Urapunga-4	137.26–137.3	Mesoproterozoic	1400	Shen et al., 2003
Velkerri Formation	Urapunga-4	137.46–137.5	Mesoproterozoic	1400	Shen et al., 2003
Velkerri Formation	Urapunga-4	137.75–137.7	Mesoproterozoic	1400	Shen et al., 2003
Velkerri Formation	Urapunga-4	137.84–137.8	Mesoproterozoic	1400	Shen et al., 2003
Velkerri Formation	Urapunga-4	326.48-326.5	Mesoproterozoic	1400	Shen et al., 2003
Rove	R-26P		Paleoproterozoic	1820	Poulton et al. 2004
Rove	R-28		Paleoproterozoic	1820	Poulton et al. 2004
Rove	R-30		Paleoproterozoic	1820	Poulton et al. 2004
Rove	R-32		Paleoproterozoic	1820	Poulton et al. 2004
Rove	R-33		Paleoproterozoic	1820	Poulton et al. 2004
Rove	R-39		Paleoproterozoic	1820	Poulton et al. 2004
Rove	R-40		Paleoproterozoic	1820	Poulton et al. 2004
Rove	R-32		Paleoproterozoic	1820	Poulton et al. 2004
Rove	R-33		Paleoproterozoic	1820	Poulton et al. 2004
Rove	R-39		Paleoproterozoic	1820	Poulton et al. 2004
Rove	R-40		Paleoproterozoic	1820	Poulton et al. 2004
Rove	R-16		Paleoproterozoic	1840	Poulton et al. 2004
Rove	R-19		Paleoproterozoic	1840	Poulton et al. 2004
Rove	R-21		Paleoproterozoic	1840	Poulton et al. 2004
Rove	R-25		Paleoproterozoic	1840	Poulton et al. 2004
Rove	R-26A		Paleoproterozoic	1840	Poulton et al. 2004
Rove	R-26C		Paleoproterozoic	1840	Poulton et al. 2004
Rove	R-26E		Paleoproterozoic	1840	Poulton et al. 2004
Rove	R-26G		Paleoproterozoic	1840	Poulton et al. 2004
Rove	R-26I		Paleoproterozoic	1840	Poulton et al. 2004
Zaonega Formation	C-175	16.6	Paleoproterozoic	2050	
Zaonega Formation	C-175	30.2	Paleoproterozoic	2050	
Zaonega Formation	C-175	33.7	Paleoproterozoic	2050	
Zaonega Formation	C-175	36.5	Paleoproterozoic	2050	
Zaonega Formation	C-175	36.9	Paleoproterozoic	2050	
Zaonega Formation	C-175	38.4	Paleoproterozoic	2050	
Zaonega Formation	C-175	54.9	Paleoproterozoic	2050	
Zaonega Formation	C-175	57.3	Paleoproterozoic	2050	
Zaonega Formation	C-175	61.5	Paleoproterozoic	2050	
Zaonega Formation	C-175	70.6	Paleoproterozoic	2050	
Zaonega Formation	C-175	72.6	Paleoproterozoic	2050	
Zaonega Formation	C-175	75.2	Paleoproterozoic	2050	
Zaonega Formation	C-175	80.3	Paleoproterozoic	2050	
Zaonega Formation	C-175	81.8	Paleoproterozoic	2050	
Zaonega Formation	C-175	84.5	Paleoproterozoic	2050	
Zaonega Formation	C-175	86.9	Paleoproterozoic	2050	
Zaonega Formation	C-175	95.3	Paleoproterozoic	2050	
Zaonega Formation	C-175	96.9	Paleoproterozoic	2050	

Table S1

Zaonega Formation	C-175	97	Paleoproterozoic	2050
Zaonega Formation	C-175	98.8	Paleoproterozoic	2050
Zaonega Formation	C-175	101.5	Paleoproterozoic	2050
Zaonega Formation	C-175	175.2	Paleoproterozoic	2050
Zaonega Formation	C-175	176	Paleoproterozoic	2050
Zaonega Formation	C-175	179.4	Paleoproterozoic	2050
Zaonega Formation	C-175	180.7	Paleoproterozoic	2050
Zaonega Formation	C-175	194.8	Paleoproterozoic	2050
Zaonega Formation	C-175	204.3	Paleoproterozoic	2050
Zaonega Formation	C-175	206.1	Paleoproterozoic	2050
Zaonega Formation	C-175	217.2	Paleoproterozoic	2050
Zaonega Formation	C-175	218.6	Paleoproterozoic	2050
Sengoma	Strat 2	146.2	Paleoproterozoic	2150
Sengoma	Strat 2	156.78	Paleoproterozoic	2150
Sengoma	Strat 2	171.5	Paleoproterozoic	2150
Sengoma	Strat 2	173.67	Paleoproterozoic	2150
Sengoma	Strat 2	177.7	Paleoproterozoic	2150
Sengoma	Strat 2	181.25	Paleoproterozoic	2150
Sengoma	Strat 2	184.5	Paleoproterozoic	2150
Sengoma	Strat 2	200.7	Paleoproterozoic	2150
Sengoma	Strat 2	202.5	Paleoproterozoic	2150
Sengoma	Strat 2	209	Paleoproterozoic	2150
Sengoma	Strat 2	212	Paleoproterozoic	2150
Sengoma	Strat 2	216	Paleoproterozoic	2150
Sengoma	Strat 2	219	Paleoproterozoic	2150
Sengoma	Strat 2	224.87	Paleoproterozoic	2150
Sengoma	Strat 2	286.6	Paleoproterozoic	2150
Mt. McRae Shale	ABDP-9	105.2	Neoarchean	2501
Mt. McRae Shale	ABDP-9	107.25	Neoarchean	2501
Mt. McRae Shale	ABDP-9	108.27	Neoarchean	2501
Mt. McRae Shale	ABDP-9	108.54	Neoarchean	2501
Mt. McRae Shale	ABDP-9	109	Neoarchean	2501
Mt. McRae Shale	ABDP-9	110.7	Neoarchean	2501
Mt. McRae Shale	ABDP-9	111	Neoarchean	2501
Mt. McRae Shale	ABDP-9	112.52	Neoarchean	2501
Mt. McRae Shale	ABDP-9	113.46	Neoarchean	2501
Mt. McRae Shale	ABDP-9	114.50	Neoarchean	2501
Mt. McRae Shale	ABDP-9	115.49	Neoarchean	2501
Mt. McRae Shale	ABDP-9	116.49	Neoarchean	2501
Mt. McRae Shale	ABDP-9	117.31	Neoarchean	2501
Mt. McRae Shale	ABDP-9	118.13	Neoarchean	2501
Mt. McRae Shale	ABDP-9	119.24	Neoarchean	2501
Mt. McRae Shale	ABDP-9	120.42	Neoarchean	2501
Mt. McRae Shale	ABDP-9	121.20	Neoarchean	2501
Mt. McRae Shale	ABDP-9	121.39	Neoarchean	2501
Mt. McRae Shale	ABDP-9	122.32	Neoarchean	2501
Mt. McRae Shale	ABDP-9	123.22	Neoarchean	2501

Table S1

Mt. McRae Shale	ABDP-9	124.22	Neoarchean	2501	
Mt. McRae Shale	ABDP-9	125.25	Neoarchean	2501	
Mt. McRae Shale	ABDP-9	126.15	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	127.25	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	128.17	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	129.01	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	129.55	Neoarchean	2501	
Mt. McRae Shale	ABDP-9	130.06	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	130.71	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	130.76	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	131.60	Neoarchean	2501	
Mt. McRae Shale	ABDP-9	131.60	Neoarchean	2501	
Mt. McRae Shale	ABDP-9	132.13	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	133.97	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	135.58	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	136.15	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	136.67	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	136.94	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	137.31	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	137.68	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	137.96	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	138.38	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	138.74	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	139.01	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	139.65	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	139.71	Neoarchean	2501	
Mt. McRae Shale	ABDP-9	139.97	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	140.25	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	140.50	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	140.95	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	141.17	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	141.47	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	141.72	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	142.08	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	142.60	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	143.45	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	144.36	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	145.61	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	146.45	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	147.30	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	148.27	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	149.30	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	150.24	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	152.65	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	153.18	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	154.43	Neoarchean	2501	
Mt. McRae Shale	ABDP-9	156.05	Neoarchean	2501	

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Mt. McRae Shale	ABDP-9	157.80	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	158.91	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	161.32	Neoarchean	2501	
Mt. McRae Shale	ABDP-9	162.80	Neoarchean	2501	
Mt. McRae Shale	ABDP-9	163.95	Neoarchean	2501	
Mt. McRae Shale	ABDP-9	165.56	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	167.76	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	168.36	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	168.90	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	169.28	Neoarchean	2501	
Mt. McRae Shale	ABDP-9	169.47	Neoarchean	2501	
Mt. McRae Shale	ABDP-9	169.68	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	169.94	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	170.17	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	170.39	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	170.55	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	170.86	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	170.94	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	171.22	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	173.09	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	173.50	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	173.73	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	174.67	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	175.51	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	177.10	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	178.61	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	178.83	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	179.05	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	180.33	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	181.20	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	182.50	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	183.65	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	185.43	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	187.46	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	188.01	Neoarchean	2501	
Mt. McRae Shale	ABDP-9	188.87	Neoarchean	2501	Reinhard et al. 2009
Mt. McRae Shale	ABDP-9	189.39	Neoarchean	2501	Reinhard et al. 2009
Jerinah	FVG-1	748.30	Neoarchean	2650	Scott et al. 2010
Jerinah	FVG-1	749.65	Neoarchean	2650	Scott et al. 2010
Jerinah	FVG-1	750.56	Neoarchean	2650	Scott et al. 2010
Jerinah	FVG-1	752.65	Neoarchean	2650	Scott et al. 2010
Jerinah	FVG-1	753.95	Neoarchean	2650	Scott et al. 2010
Jerinah	FVG-1	760.70	Neoarchean	2650	Scott et al. 2010
Jerinah	FVG-1	761.80	Neoarchean	2650	Scott et al. 2010
Jerinah	FVG-1	765.00	Neoarchean	2650	Scott et al. 2010
Jerinah	FVG-1	767.6	Neoarchean	2650	Scott et al. 2010
Jerinah	FVG-1	774	Neoarchean	2650	Scott et al. 2010

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Jerinah	FVG-1	775.55	Neoarchean	2650	Scott et al. 2010
Jerinah	FVG-1	776.4	Neoarchean	2650	Scott et al. 2010
Jerinah	FVG-1	777.8	Neoarchean	2650	Scott et al. 2010
Jerinah	FVG-1	779.45	Neoarchean	2650	Scott et al. 2010
Jerinah	FVG-1	780.95	Neoarchean	2650	Scott et al. 2010
Jerinah	FVG-1	787.4	Neoarchean	2650	Scott et al. 2010
Jerinah	FVG-1	791	Neoarchean	2650	Scott et al. 2010
Jerinah	FVG-1	794.1	Neoarchean	2650	Scott et al. 2010
Roy Hill Shale	RHDH-2A		Neoarchean	2700	
Roy Hill Shale	RHDH-2A		Neoarchean	2700	
Roy Hill Shale	RHDH-2A		Neoarchean	2700	
Roy Hill Shale	RHDH-2A		Neoarchean	2700	
Roy Hill Shale	RHDH-2A		Neoarchean	2700	
Roy Hill Shale	RHDH-2A		Neoarchean	2700	
Roy Hill Shale	RHDH-2A		Neoarchean	2700	

Table S2

Unit	Sample - Core	Depth (m)	Numeric Age (Ma)	Zn (ppm)	Zn/Al	TOC (wt%)	S (wt%)	Fe (wt%)	Al (wt%)	Mo (ppm)	Fe(HR)/ Fe(T)	Fe(Py)/ Fe(HR)	DOP
Cariaco Basin	39PC004		0.02	97	17	---	---	2.60	5.80	84	---	---	---
Cariaco Basin	39PC008		0.02	98	17	---	---	2.60	5.80	74	---	---	---
Cariaco Basin	39PC013		0.02	92	16	---	---	2.50	5.70	76	---	---	---
Cariaco Basin	39PC018		0.02	96	16	---	---	2.70	5.90	84	---	---	---
Cariaco Basin	39PC024		0.02	93	16	---	---	2.60	6.00	84	---	---	---
Cariaco Basin	39PC025		0.02	96	16	---	---	2.70	6.00	71	---	---	---
Cariaco Basin	39PC034		0.02	92	16	---	---	2.60	5.80	62	---	---	---
Cariaco Basin	39PC038		0.02	95	16	---	---	2.60	5.80	75	---	---	---
Cariaco Basin	39PC042		0.02	94	16	---	---	2.60	5.80	70	---	---	---
Cariaco Basin	39PC047		0.02	99	16	---	---	2.70	6.10	59	---	---	---
Cariaco Basin	39PC052		0.02	98	17	---	---	2.80	5.80	74	---	---	---
Cariaco Basin	39PC057		0.02	94	16	---	---	2.60	5.90	75	---	---	---
Cariaco Basin	39PC062		0.02	94	16	---	---	2.60	5.80	86	---	---	---
Cariaco Basin	39PC067		0.02	96	16	---	---	2.60	5.90	68	---	---	---
Cariaco Basin	39PC072		0.02	100	17	---	---	2.80	5.90	73	---	---	---
Cariaco Basin	39PC077		0.02	95	16	---	---	2.70	5.90	81	---	---	---
Cariaco Basin	39PC082		0.02	94	16	---	---	2.70	5.80	78	---	---	---
Cariaco Basin	39PC087		0.02	96	16	---	---	2.80	6.00	75	---	---	---
Cariaco Basin	39PC092		0.02	100	16	---	---	2.80	6.10	74	---	---	---
Cariaco Basin	39PC097		0.02	100	17	---	---	2.70	5.90	77	---	---	---
Cariaco Basin	39PC102		0.02	98	16	---	---	2.70	6.10	58	---	---	---
Cariaco Basin	39PC107		0.02	100	16	---	---	2.90	6.20	68	---	---	---
Cariaco Basin	39PC112		0.02	100	16	---	---	3.00	6.30	61	---	---	---
Cariaco Basin	39PC117		0.02	100	16	---	---	3.00	6.30	62	---	---	---
Cariaco Basin	39PC122		0.02	100	16	---	---	2.80	6.20	69	---	---	---
Cariaco Basin	39PC127		0.02	100	16	---	---	2.90	6.20	48	---	---	---
Cariaco Basin	39PC132		0.02	100	16	---	---	2.90	6.40	65	---	---	---
Cariaco Basin	39PC137		0.02	100	17	---	---	2.70	5.90	73	---	---	---
Cariaco Basin	39PC142		0.02	100	16	---	---	2.90	6.20	62	---	---	---
Cariaco Basin	39PC147		0.02	100	16	---	---	2.90	6.40	62	---	---	---
Cariaco Basin	39PC152		0.02	110	18	---	---	2.90	6.20	68	---	---	---
Cariaco Basin	39PC157		0.02	110	17	---	---	2.90	6.30	66	---	---	---
Cariaco Basin	39PC162		0.02	110	18	---	---	2.80	6.10	73	---	---	---
Cariaco Basin	39PC202		0.02	110	17	---	---	3.10	6.50	75	---	---	---
Cariaco Basin	39PC207		0.02	110	17	---	---	3.10	6.60	54	---	---	---

Table S2

Cariaco Basin	39PC212	0.02	120	17	---	---	3.20	6.90	79	---	---	---
Cariaco Basin	39PC217	0.02	110	17	---	---	3.10	6.60	46	---	---	---
Cariaco Basin	39PC222	0.02	110	16	---	---	3.20	6.90	68	---	---	---
Cariaco Basin	39PC227	0.02	110	16	---	---	3.20	6.80	88	---	---	---
Cariaco Basin	39PC232	0.02	110	17	---	---	3.10	6.50	56	---	---	---
Cariaco Basin	39PC237	0.02	110	15	---	---	3.30	7.20	76	---	---	---
Cariaco Basin	39PC242	0.02	110	17	---	---	3.20	6.60	82	---	---	---
Cariaco Basin	39PC247	0.02	110	15	---	---	3.30	7.20	90	---	---	---
Cariaco Basin	39PC252	0.02	120	17	---	---	3.50	7.20	130	---	---	---
Cariaco Basin	39PC257	0.02	110	16	---	---	3.30	6.80	110	---	---	---
Cariaco Basin	39PC262	0.02	110	16	---	---	3.20	6.70	100	---	---	---
Cariaco Basin	39PC267	0.02	110	17	---	---	3.00	6.30	97	---	---	---
Cariaco Basin	39PC272	0.02	100	16	---	---	3.00	6.40	130	---	---	---
Cariaco Basin	39PC277	0.02	100	16	---	---	2.90	6.10	110	---	---	---
Cariaco Basin	39PC282	0.02	110	18	---	---	3.00	6.20	100	---	---	---
Cariaco Basin	39PC287	0.02	100	16	---	---	2.90	6.10	100	---	---	---
Cariaco Basin	39PC292	0.02	96	17	---	---	2.60	5.50	130	---	---	---
Cariaco Basin	39PC297	0.02	93	17	---	---	2.60	5.40	120	---	---	---
Cariaco Basin	39PC302	0.02	87	19	---	---	2.20	4.60	120	---	---	---
Cariaco Basin	39PC307	0.02	97	23	---	---	2.10	4.30	130	---	---	---
Cariaco Basin	39PC311	0.02	84	17	---	---	2.40	4.90	98	---	---	---
Cariaco Basin	39PC317	0.02	72	16	---	---	2.10	4.40	130	---	---	---
Cariaco Basin	39PC322	0.02	74	17	---	---	2.10	4.40	110	---	---	---
Cariaco Basin	39PC327	0.02	77	18	---	---	2.10	4.40	120	---	---	---
Cariaco Basin	39PC332	0.02	66	16	---	---	1.90	4.00	100	---	---	---
Cariaco Basin	39PC338	0.02	67	16	---	---	1.90	4.10	73	---	---	---
Cariaco Basin	39PC343	0.02	57	17	---	---	1.60	3.30	82	---	---	---
Cariaco Basin	39PC347	0.02	71	18	---	---	2.00	4.00	72	---	---	---
Cariaco Basin	39PC353	0.02	57	18	---	---	1.60	3.20	58	---	---	---
Cariaco Basin	39PC357	0.02	62	17	---	---	1.80	3.60	58	---	---	---
Cariaco Basin	39PC362	0.02	59	16	---	---	1.80	3.80	50	---	---	---
Cariaco Basin	39PC367	0.02	57	17	---	---	1.60	3.30	46	---	---	---
Cariaco Basin	39PC372	0.02	48	16	---	---	1.40	3.00	47	---	---	---
Cariaco Basin	39PC377	0.02	51	18	---	---	1.40	2.90	49	---	---	---
Cariaco Basin	39PC382	0.02	55	17	---	---	1.50	3.20	50	---	---	---
Cariaco Basin	39PC387	0.02	48	17	---	---	1.40	2.80	51	---	---	---
Cariaco Basin	39PC392	0.02	44	16	---	---	1.30	2.70	56	---	---	---
Cariaco Basin	39PC397	0.02	57	17	---	---	1.60	3.30	54	---	---	---

Table S2

Cariaco Basin	39PC402	0.02	56	17	---	---	1.60	3.30	53	---	---	---
Cariaco Basin	39PC408	0.02	56	17	---	---	1.60	3.30	43	---	---	---
Cariaco Basin	39PC412	0.02	48	17	---	---	1.30	2.80	50	---	---	---
Cariaco Basin	39PC417	0.02	50	18	---	---	1.30	2.80	42	---	---	---
Cariaco Basin	39PC422	0.02	52	17	---	---	1.40	3.10	37	---	---	---
Cariaco Basin	39PC427	0.02	62	15	---	---	1.80	4.00	36	---	---	---
Cariaco Basin	39PC432	0.02	51	15	---	---	1.50	3.30	47	---	---	---
Cariaco Basin	39PC437	0.02	57	16	---	---	1.70	3.50	44	---	---	---
Cariaco Basin	39PC442	0.02	61	17	---	---	1.60	3.60	43	---	---	---
Cariaco Basin	39PC452	0.02	62	16	---	---	1.70	3.80	39	---	---	---
Cariaco Basin	39PC457	0.02	69	16	---	---	2.00	4.30	35	---	---	---
Cariaco Basin	39PC464	0.02	71	16	---	---	2.10	4.50	48	---	---	---
Cariaco Basin	39PC468	0.02	57	16	---	---	1.70	3.60	40	---	---	---
Cariaco Basin	39PC472	0.02	61	15	---	---	1.80	4.00	38	---	---	---
Cariaco Basin	39PC477	0.02	69	16	---	---	2.00	4.30	41	---	---	---
Cariaco Basin	39PC482	0.02	71	15	---	---	2.20	4.80	39	---	---	---
Cariaco Basin	39PC487	0.02	67	15	---	---	2.00	4.40	41	---	---	---
Cariaco Basin	39PC492	0.02	62	15	---	---	1.80	4.10	44	---	---	---
Cariaco Basin	39PC496	0.02	60	15	---	---	1.90	4.10	63	---	---	---
Cariaco Basin	39PC502	0.02	69	15	---	---	2.10	4.60	90	---	---	---
Cariaco Basin	39PC507	0.02	64	16	---	---	1.90	3.90	99	---	---	---
Cariaco Basin	39PC512	0.02	65	16	---	---	2.00	4.00	110	---	---	---
Cariaco Basin	39PC517	0.02	55	16	---	---	1.70	3.40	120	---	---	---
Cariaco Basin	39PC522	0.02	68	17	---	---	1.90	4.00	100	---	---	---
Cariaco Basin	39PC527	0.02	71	16	---	---	2.20	4.50	76	---	---	---
Cariaco Basin	39PC532	0.02	56	16	---	---	1.70	3.60	99	---	---	---
Cariaco Basin	39PC537	0.02	54	15	---	---	1.70	3.60	77	---	---	---
Cariaco Basin	39PC542	0.02	45	16	---	---	1.40	2.90	91	---	---	---
Cariaco Basin	39PC547	0.02	62	18	---	---	1.70	3.40	130	---	---	---
Cariaco Basin	39PC552	0.02	59	17	---	---	1.70	3.40	72	---	---	---
Cariaco Basin	39PC557	0.02	36	18	---	---	1.00	2.00	120	---	---	---
Cariaco Basin	39PC562	0.02	77	23	---	---	1.70	3.40	130	---	---	---
Cariaco Basin	39PC567	0.02	63	18	---	---	1.80	3.50	120	---	---	---
Cariaco Basin	39PC572	0.02	56	18	---	---	1.60	3.10	150	---	---	---
Cariaco Basin	39PC578	0.02	76	19	---	---	2.10	4.10	140	---	---	---
Cariaco Basin	39PC582	0.02	75	19	---	---	1.90	3.90	94	---	---	---
Cariaco Basin	39PC587	0.02	61	20	---	---	1.40	3.10	120	---	---	---
Cariaco Basin	39PC592	0.02	83	19	---	---	2.10	4.30	160	---	---	---

Table S2

Cariaco Basin	39PC597	0.02	90	19	---	---	2.30	4.70	140	---	---	---
Cariaco Basin	39PC602	0.02	77	20	---	---	2.00	3.90	120	---	---	---
Cariaco Basin	39PC606	0.02	77	21	---	---	1.80	3.60	150	---	---	---
Cariaco Basin	39PC612	0.02	87	20	---	---	2.10	4.30	140	---	---	---
Cariaco Basin	39PC617	0.02	80	21	---	---	2.00	3.80	66	---	---	---
Cariaco Basin	39PC622	0.02	44	22	---	---	1.10	2.00	77	---	---	---
Cariaco Basin	39PC627	0.02	85	20	---	---	2.00	4.20	36	---	---	---
Mediterranean Sapropels	160-964C-6H3,29/30	3.6	134.73	45	---	---	---	3.02	177	---	---	---
Mediterranean Sapropels	160-964C-6H3,32/33	3.6	161.92	37	---	---	---	4.37	199	---	---	---
Mediterranean Sapropels	160-964C-6H3,34/35	3.6	118.16	36	---	---	---	3.26	106	---	---	---
Mediterranean Sapropels	160-964C-6H3,72/73	3.6	198.03	31	---	---	---	6.42	51	---	---	---
Mediterranean Sapropels	160-967B-6H6,101-102	3.6	50	13	---	---	---	3.9	135	---	---	---
Mediterranean Sapropels	160-967B-6H6,103-104	3.6	52	14	---	---	---	3.8	63	---	---	---
Mediterranean Sapropels	160-967B-6H6,104-105	3.6	54	10	---	---	---	5.6	42	---	---	---
Mediterranean Sapropels	160-967B-6H6,105-106	3.6	56	13	---	---	---	4.2	50	---	---	---
Mediterranean Sapropels	160-967B-6H6,29-30	3.6	53	10	---	---	---	5.1	195	---	---	---
Mediterranean Sapropels	160-967B-6H6,30-31	3.6	59	17	---	---	---	3.4	329	---	---	---
Mediterranean Sapropels	160-967B-6H6,32-33	3.6	33	11	---	---	---	3.1	124	---	---	---
Mediterranean Sapropels	160-967B-6H6,35-36	3.6	47	10	---	---	---	4.5	277	---	---	---
Mediterranean Sapropels	160-967B-6H6,39-40	3.6	43	8	---	---	---	5.5	102	---	---	---
Mediterranean Sapropels	160-967B-6H6,44-45	3.6	47	9	---	---	---	5	61	---	---	---
Mediterranean Sapropels	160-967B-6H6,45-46	3.6	44	7	---	---	---	6	52	---	---	---
Mediterranean Sapropels	160-967B-6H6,95-96	3.6	56	22	---	---	---	2.6	54	---	---	---
Mediterranean Sapropels	160-967B-6H6,98-99	3.6	53	14	---	---	---	3.8	87	---	---	---
Mediterranean Sapropels	160-969D-5H2,128-129	3.6	45	17	---	---	---	2.6	59	---	---	---
Mediterranean Sapropels	160-969D-5H2,129-130	3.6	51	20	---	---	---	2.6	89	---	---	---
Mediterranean Sapropels	160-969D-5H2,135-136	3.6	49	18	---	---	---	2.7	147	---	---	---
Mediterranean Sapropels	160-969D-5H2,138-139	3.6	49	13	---	---	---	3.9	96	---	---	---
Mediterranean Sapropels	160-969D-5H2,141-142	3.6	43	11	---	---	---	3.9	43	---	---	---
Mediterranean Sapropels	160-969D-5H3,40-41	3.6	44	11	---	---	---	4.1	74	---	---	---
Mediterranean Sapropels	160-969D-5H3,42-43	3.6	44	9	---	---	---	5.1	91	---	---	---
Mediterranean Sapropels	160-969D-5H3,46-47	3.6	52	14	---	---	---	3.6	169	---	---	---
Mediterranean Sapropels	160-969D-5H3,48-49	3.6	54	13	---	---	---	4.2	220	---	---	---
Mediterranean Sapropels	160-969D-5H3,55-56	3.6	61	14	---	---	---	4.5	190	---	---	---
Mediterranean Sapropels	160-969D-5H3,60-61	3.6	55	13	---	---	---	4.1	174	---	---	---
Mediterranean Sapropels	160-969D-5H3,69-70	3.6	50	14	---	---	---	3.7	110	---	---	---
Monterey Formation		20	313	60	16.4	3.06	2.34	5.24	36	---	---	---
Monterey Formation		20	181	53	10.02	2.47	1.63	3.41	30	---	---	---

Table S2

Monterey Formation		20	237	36	6.51	1.86	3.66	6.51	49	---	---	---
Monterey Formation	11	20	70	21	12.7	3.80	1.6	3.3	62	---	---	---
Monterey Formation	19	20	26.3	10	2.13	1.50	1.2	2.7	66	---	---	---
Monterey Formation		20	451	107	14.8	7.52	2.51	4.23	24	---	---	---
IODP 302	199.02	55.8	281	48	---	---	12.39	5.83	86	---	---	---
IODP 302	199.03	55.8	295	63	---	---	16.99	4.67	118	---	---	---
IODP 302	199.07	55.8	281	60	---	---	15.42	4.71	80	---	---	---
IODP 302	199.13	55.8	253	49	---	---	15.01	5.21	85	---	---	---
IODP 302	199.15	55.8	275	56	---	---	14.47	4.94	99	---	---	---
IODP 302	199.2	55.8	273	57	---	---	15.34	4.76	102	---	---	---
IODP 302	199.27	55.8	271	50	---	---	13.40	5.46	95	---	---	---
IODP 302	199.27	55.8	278	53	---	---	13.23	5.26	97	---	---	---
IODP 302	199.32	55.8	226	49	---	---	15.94	4.59	113	---	---	---
IODP 302	199.33	55.8	286	56	---	---	14.92	5.14	127	---	---	---
IODP 302	199.37	55.8	261	54	---	---	14.09	4.87	126	---	---	---
IODP 302	199.42	55.8	229	47	---	---	14.68	4.90	94	---	---	---
IODP 302	199.47	55.8	256	52	---	---	13.86	4.90	87	---	---	---
IODP 302	199.52	55.8	223	47	---	---	15.33	4.75	97	---	---	---
IODP 302	199.53	55.8	239	50	---	---	16.89	4.81	100	---	---	---
IODP 302	199.57	55.8	389	78	---	---	15.78	4.96	90	---	---	---
IODP 302	199.63	55.8	354	65	4.1	14.2	12.01	5.44	76	---	---	---
IODP 302	199.67	55.8	453	73	---	---	8.87	6.19	77	---	---	---
IODP 302	199.71	55.8	441	82	---	---	14.30	5.37	80	---	---	---
IODP 302	199.73	55.8	293	55	---	---	15.77	5.29	97	---	---	---
IODP 302	199.77	55.8	260	53	---	---	15.62	4.87	70	---	---	---
IODP 302	199.84	55.8	393	66	---	---	12.23	5.95	72	---	---	---
IODP 302	199.92	55.8	245	46	---	---	12.57	5.34	48	---	---	---
IODP 302	199.93	55.8	253	47	---	---	13.56	5.33	55	---	---	---
IODP 302	199.97	55.8	286	53	---	---	12.44	5.38	53	---	---	---
IODP 302	200.01	55.8	300	53	---	---	11.34	5.71	45	---	---	---
IODP 302	200.06	55.8	243	45	---	---	12.37	5.41	46	---	---	---
IODP 302	200.12	55.8	314	54	---	---	12.16	5.79	49	---	---	---
IODP 302	200.13	55.8	239	41	---	---	13.43	5.78	50	---	---	---
IODP 302	200.17	55.8	243	43	---	---	12.60	5.66	41	---	---	---
IODP 302	200.22	55.8	240	45	---	---	14.43	5.36	47	---	---	---
IODP 302	200.27	55.8	197	34	---	---	12.05	5.83	42	---	---	---
IODP 302	200.33	55.8	242	40	---	---	13.25	5.98	38	---	---	---
IODP 302	200.35	55.8	192	34	---	---	13.24	5.58	38	---	---	---

Table S2

IODP 302	200.41	55.8	259	41	---	---	11.51	6.30	35	---	---	---
IODP 302	200.54	55.8	186	32	---	---	13.02	5.79	35	---	---	---
IODP 302	206.7	55.8	187	35	---	---	16.91	5.40	44	---	---	---
IODP 302	208.4	55.8	171	29	---	---	15.00	5.86	35	---	---	---
DSDP 530A	10911096	89.3	1,100	165	---	---	5.99	6.67	77	---	---	---
DSDP 530A	10953038	89.3	1,300	192	---	---	5.72	6.76	91	---	---	---
La Luna Formation	LU-106	93.6	880	677	5.2	---	1.7	1.3	82	---	---	---
La Luna Formation	LU-108	93.6	1176	336	5.3	0.93	1.12	3.5	218	---	---	---
La Luna Formation	LU-115	93.6	1313	1076	5	0.54	0.35	1.22	89	---	---	---
La Luna Formation	LU-119	93.6	1454	1287	6.5	---	0.43	1.13	177	---	---	---
La Luna Formation	LU-121	93.6	1573	414	4.5	0.82	1.22	3.8	126	---	---	---
La Luna Formation	LU-125	93.6	1115	360	3.4	1.04	0.84	3.1	45	---	---	---
La Luna Formation	LU-128	93.6	83	64	1.3	---	0.66	1.3	44	---	---	---
La Luna Formation	LU-138	93.6	312	503	3.6	0.46	0.3	0.62	42	---	---	---
La Luna Formation	LU-141	93.6	1400	824	5.1	1.17	0.65	1.7	126	---	---	---
La Luna Formation	LU-147	93.6	1910	1000	7.2	0.53	0.65	1.91	62	---	---	---
La Luna Formation	LU-151	93.6	974	317	5.6	---	1.07	3.07	192	---	---	---
La Luna Formation	LU-153	93.6	590	226	3.1	0.89	0.97	2.61	56	---	---	---
La Luna Formation	LU-98	93.6	327	207	3.8	1.07	0.83	1.58	73	---	---	---
La Luna Formation	NT2	93.6	995	440	3.43	0.74	0.71	2.26	54	---	---	1.00
La Luna Formation	NT4	93.6	1723	1689	10.2	1.19	0.46	1.02	135	---	---	1.00
La Luna Formation	NT5	93.6	1372	1153	6.2	0.99	0.43	1.19	74	---	---	1.00
La Luna Formation	NT8	93.6	293	575	1.79	0.51	0.48	0.51	40	---	---	---
La Luna Formation	NT9	93.6	607	528	4.47	0.64	0.38	1.15	36	---	---	1.00
La Luna Formation	NT11	93.6	1561	685	2.44	1.4	0.82	2.28	62	---	---	1.00
La Luna Formation	NT12	93.6	561	143	3.76	1.65	1.55	3.91	108	---	---	0.76
La Luna Formation	NT16	93.6	201	314	0.21	0.28	0.43	0.64	228	---	---	---
La Luna Formation	NT23	93.6	402	820	1.02	0.53	0.27	0.49	47	---	---	---
La Luna Formation	NT24	93.6	336	49	4.29	3.22	2.57	6.84	129	---	---	---
La Luna Formation	NT31	93.6	107	19	2.27	1.75	1.78	5.73	108	---	---	---
ODP Hole 103-641A	103-641A-6X-7,26-29	93.6	1150	141	3.25	1.13	3.78	8.17	195	---	---	---
ODP Hole 103-641A	103-641A-6X-7,31-33	93.6	6500	1011	9.78	3.53	3.54	6.43	1040	---	---	---
ODP Hole 103-641A	103-641A-6X-CC,0-3	93.6	8175	1246	9.44	3.04	3.39	6.56	970	---	---	---
ODP Hole 103-641A	103-641A-6X-CC,18-21	93.6	1335	219	11.04	4.29	4.32	6.09	5050	---	---	---
ODP Hole 103-641A	103-641A-6X-CC,21-24	93.6	108	14	0.23	0.12	3.24	7.92	45	---	---	---
ODP Hole 103-641A	103-641A-6X-CC,8-11	93.6	17170	2594	9.14	3.77	3.38	6.62	2500	---	---	---
DSDP 530A	10973070	99.6	5,200	1175	---	---	4.81	4.42	170	---	---	---
DSDP 530A	10983050	99.6	4,100	731	---	---	5.77	5.61	53	---	---	---

Table S2

DSDP 530A	10983128	99.6	2,000	320	---	---	6.07	6.25	65	---	---	---
Julia Creek Shale	3	112	200	151	1.9	0.52	0.63	1.32	45	---	---	---
Julia Creek Shale	4	112	300	283	2.5	0.59	0.38	1.06	69	---	---	---
Julia Creek Shale	12	112	1450	783	19	1.71	1.38	1.85	240	---	---	---
Julia Creek Shale	13	112	400	302	12.9	1.39	1.13	1.32	490	---	---	---
Julia Creek Shale	14	112	600	349	15.1	1.58	1.38	1.72	325	---	---	---
Julia Creek Shale	15	112	650	378	15.3	1.39	1.13	1.72	330	---	---	---
Julia Creek Shale	16	112	450	283	12.5	1.20	1.00	1.59	225	---	---	---
Julia Creek Shale	17	112	850	535	16.4	1.13	0.88	1.59	310	---	---	---
Julia Creek Shale	18	112	600	378	15.5	1.72	1.38	1.59	285	---	---	---
Julia Creek Shale	19	112	525	331	12.9	0.92	0.88	1.59	200	---	---	---
Julia Creek Shale	20	112	500	344	11.2	0.83	0.75	1.46	210	---	---	---
Julia Creek Shale	21	112	650	447	14.7	1.14	1.00	1.46	230	---	---	---
Julia Creek Shale	22	112	700	441	15.5	1.82	1.38	1.59	230	---	---	---
Julia Creek Shale	23	112	750	472	14.6	1.49	0.88	1.59	210	---	---	---
Julia Creek Shale	24	112	650	491	12.1	0.88	0.75	1.32	170	---	---	---
Julia Creek Shale	25	112	850	494	15.6	1.12	1.00	1.72	215	---	---	---
Julia Creek Shale	26	112	750	378	18.3	1.37	1.13	1.98	285	---	---	---
Julia Creek Shale	27	112	700	353	17.4	1.87	1.38	1.98	300	---	---	---
Julia Creek Shale	28	112	850	268	15.5	1.98	1.63	3.18	280	---	---	---
Julia Creek Shale	29	112	825	297	15.75	2.45	1.88	2.78	285	---	---	---
Julia Creek Shale	30	112	900	283	16.2	2.20	1.88	3.18	310	---	---	---
Julia Creek Shale	31	112	800	195	16.5	2.45	2.25	4.10	205	---	---	---
Julia Creek Shale	32	112	900	206	16.2	4.28	3.38	4.37	170	---	---	---
Julia Creek Shale	33	112	750	153	16	1.59	1.63	4.90	80	---	---	---
Julia Creek Shale	34	112	850	161	14.6	3.55	2.13	5.29	145	---	---	---
La Luna Formation	MA-24	112	1400	203	6.1	1.95	3	6.9	95	---	---	---
La Luna Formation	MA-26	112	909	317	5.7	1.52	1.28	2.87	186	---	---	---
La Luna Formation	MA-32	112	3300	892	10	2.88	1.9	3.7	828	---	---	---
La Luna Formation	MA-39	112	870	137	3.8	2.89	3.04	6.34	240	---	---	---
La Luna Formation	MA-42	112	392	106	2.6	1.01	0.9	3.7	47	---	---	---
La Luna Formation	MA-65	112	816	138	5.4	1.86	0.31	5.9	136	---	---	---
La Luna Formation	MA-68	112	730	155	3.6	1.81	1.8	4.7	72	---	---	---
La Luna Formation	MA-72	112	1586	415	4.2	1.24	1.06	3.82	224	---	---	---
La Luna Formation	MA-79	112	835	89	2.9	3.21	493	9.4	194	---	---	---
Norwegian Shelf	43.1	145.5	1557	191	8.16	2.79	3.84	8.14	114	---	---	---
Norwegian Shelf	47.26	145.5	675	93	6.75	4.25	4.29	7.28	104	---	---	---
Norwegian Shelf	48.72	145.5	3615	876	25.69	4.71	2.37	4.13	131	---	---	---

Table S2

Norwegian Shelf	49.11	145.5	2757	516	17.84	3.57	2.20	5.35	144	---	---	---
Norwegian Shelf	49.13	145.5	2689	518	17.77	4.79	3.14	5.19	151	---	---	---
Norwegian Shelf	49.15	145.5	2682	497	16.84	3.41	2.27	5.39	132	---	---	---
Norwegian Shelf	49.17	145.5	1493	238	11.8	3.08	2.62	6.27	83	---	---	---
Norwegian Shelf	49.19	145.5	1243	190	9.96	2.68	2.52	6.56	65	---	---	---
Norwegian Shelf	49.21	145.5	1042	157	13.74	3.46	2.93	6.63	88	---	---	---
Norwegian Shelf	49.23	145.5	130	31	2.95	23.4	23.00	4.24	51	---	---	---
Norwegian Shelf	49.25	145.5	1266	194	11.36	3.43	3.13	6.53	67	---	---	---
Norwegian Shelf	49.27	145.5	1518	244	17.24	3.06	2.15	6.22	77	---	---	---
Norwegian Shelf	49.29	145.5	704	102	11.04	2.59	2.48	6.89	63	---	---	---
Norwegian Shelf	49.31	145.5	3475	617	6.68	2.29	2.15	5.63	132	---	---	---
Norwegian Shelf	49.33	145.5	186	26	4.8	3.5	3.99	7.03	58	---	---	---
Norwegian Shelf	49.35	145.5	1385	212	10.19	2.09	2.11	6.53	70	---	---	---
Norwegian Shelf	49.39	145.5	3786	732	20.3	4.08	2.43	5.17	220	---	---	---
Norwegian Shelf	49.41	145.5	328	47	20.25	3.69	2.76	7.00	39	---	---	---
Norwegian Shelf	49.43	145.5	3316	596	18.06	3.8	2.41	5.57	157	---	---	---
Norwegian Shelf	49.45	145.5	2426	432	15.82	3.71	2.62	5.62	139	---	---	---
Norwegian Shelf	49.47	145.5	3787	823	19.68	3.54	2.01	4.60	176	---	---	---
Norwegian Shelf	49.49	145.5	2701	464	15.22	3.92	2.88	5.82	132	---	---	---
Norwegian Shelf	49.51	145.5	3441	605	17.75	4	2.60	5.69	176	---	---	---
Norwegian Shelf	49.53	145.5	1777	297	15.26	2.98	2.15	5.99	105	---	---	---
Norwegian Shelf	49.55	145.5	1918	331	16.43	3.32	2.23	5.80	123	---	---	---
Norwegian Shelf	49.57	145.5	1109	171	13.04	2.83	2.40	6.50	81	---	---	---
Norwegian Shelf	49.59	145.5	3080	580	20.62	3.24	1.87	5.31	139	---	---	---
Norwegian Shelf	49.61	145.5	2409	491	17.35	3.04	1.94	4.91	158	---	---	---
Norwegian Shelf	49.63	145.5	2635	634	18.67	3.29	1.93	4.15	196	---	---	---
Norwegian Shelf	49.65	145.5	1402	256	13.44	2.96	2.35	5.47	123	---	---	---
Norwegian Shelf	49.67	145.5	988	140	7.72	2.88	3.12	7.04	69	---	---	---
Norwegian Shelf	49.69	145.5	81	12	2.7	5.6	5.64	6.88	39	---	---	---
Norwegian Shelf	49.71	145.5	175	25	4.93	3.15	3.54	6.99	49	---	---	---
Norwegian Shelf	49.73	145.5	1730	266	12.4	2.91	2.36	6.51	97	---	---	---
Norwegian Shelf	49.75	145.5	1130	165	9.66	2.68	2.53	6.85	72	---	---	---
Norwegian Shelf	49.77	145.5	1115	181	12.92	3.23	2.74	6.18	84	---	---	---
Norwegian Shelf	49.79	145.5	2586	434	16.49	3.7	2.65	5.96	114	---	---	---
Norwegian Shelf	49.81	145.5	5980	1294	25.25	4.73	2.25	4.62	248	---	---	---
Norwegian Shelf	49.83	145.5	5294	1091	21.64	4.16	2.22	4.85	278	---	---	---
Norwegian Shelf	49.85	145.5	2038	345	14.24	2.99	2.24	5.91	121	---	---	---
Norwegian Shelf	49.87	145.5	2889	481	14.97	3.07	2.15	6.00	106	---	---	---

Table S2

Norwegian Shelf	49.89	145.5	3238	574	16.13	3.11	2.32	5.64	151	---	---	---
Norwegian Shelf	49.91	145.5	1105	161	13.63	2.94	2.36	6.85	99	---	---	---
Norwegian Shelf	49.93	145.5	1516	225	13.45	3.19	2.56	6.73	147	---	---	---
Norwegian Shelf	49.95	145.5	2214	352	16.42	3.41	2.34	6.28	119	---	---	---
Norwegian Shelf	49.97	145.5	6326	1836	36.01	6.09	2.01	3.45	322	---	---	---
Norwegian Shelf	49.99	145.5	7061	1920	31.56	5.93	2.32	3.68	403	---	---	---
Norwegian Shelf	50.01	145.5	7036	2074	37.16	6.47	2.08	3.39	341	---	---	---
Norwegian Shelf	50.03	145.5	6629	1574	28.14	5.81	2.70	4.21	345	---	---	---
Norwegian Shelf	50.05	145.5	5534	1195	25.31	5.26	2.57	4.63	324	---	---	---
Norwegian Shelf	50.07	145.5	6485	1524	25.55	6.09	3.22	4.26	386	---	---	---
Norwegian Shelf	50.09	145.5	4911	1125	24.09	5.22	2.59	4.37	361	---	---	---
Norwegian Shelf	50.11	145.5	5122	1273	28.6	5.81	2.62	4.02	377	---	---	---
Norwegian Shelf	50.13	145.5	4224	956	22.65	4.81	2.61	4.42	298	---	---	---
Norwegian Shelf	50.15	145.5	1675	283	15.03	3.79	2.78	5.92	126	---	---	---
Norwegian Shelf	50.17	145.5	3034	569	18.26	3.99	2.51	5.33	187	---	---	---
Norwegian Shelf	50.19	145.5	1172	185	12.88	4.68	3.87	6.34	100	---	---	---
Norwegian Shelf	50.21	145.5	3861	761	16.78	4.82	3.60	5.08	243	---	---	---
Norwegian Shelf	50.23	145.5	2492	428	15.77	3.8	2.73	5.83	163	---	---	---
Norwegian Shelf	50.25	145.5	4759	967	19.57	4.24	2.55	4.92	278	---	---	---
Norwegian Shelf	50.31	145.5	2955	518	17.94	4.18	2.90	5.70	213	---	---	---
Norwegian Shelf	50.41	145.5	3443	625	17.19	3.81	2.53	5.51	193	---	---	---
Norwegian Shelf	50.43	145.5	1522	252	17.57	3.81	2.70	6.05	91	---	---	---
Norwegian Shelf	50.45	145.5	1988	364	21.34	3.58	2.07	5.46	107	---	---	---
Norwegian Shelf	50.47	145.5	4604	974	24.68	4.18	1.98	4.73	192	---	---	---
Norwegian Shelf	50.49	145.5	4397	941	20.45	3.97	2.15	4.67	236	---	---	---
Norwegian Shelf	50.51	145.5	3024	528	15.44	3.27	2.43	5.73	189	---	---	---
Norwegian Shelf	50.53	145.5	2173	364	13.4	3.95	4.35	5.98	161	---	---	---
Norwegian Shelf	50.55	145.5	3597	721	21	4.04	2.33	4.99	195	---	---	---
Norwegian Shelf	50.59	145.5	2523	445	15.53	4.33	3.12	5.67	189	---	---	---
Norwegian Shelf	50.61	145.5	2196	355	13.37	4.28	3.45	6.19	146	---	---	---
Norwegian Shelf	50.63	145.5	659	91	7.95	2.65	3.02	7.23	55	---	---	---
Norwegian Shelf	50.65	145.5	250	36	7.72	5.91	5.70	6.90	58	---	---	---
Norwegian Shelf	50.69	145.5	4090	726	16.09	3.64	2.39	5.63	208	---	---	---
Norwegian Shelf	50.71	145.5	4137	742	14.95	3.93	2.65	5.57	235	---	---	---
Norwegian Shelf	50.73	145.5	4173	765	17.13	3.97	2.49	5.46	246	---	---	---
Norwegian Shelf	50.75	145.5	3181	534	14.33	3.41	2.40	5.96	204	---	---	---
Norwegian Shelf	50.77	145.5	3986	713	15.48	3.88	2.57	5.59	270	---	---	---
Norwegian Shelf	50.79	145.5	3294	567	14.8	3.69	2.60	5.81	245	---	---	---

Table S2

Norwegian Shelf	50.81	145.5	112	19	3.6	11.47	10.47	5.96	54	---	---	---
Norwegian Shelf	50.83	145.5	2360	385	16.5	3.84	2.70	6.13	146	---	---	---
Norwegian Shelf	50.85	145.5	2267	362	13.55	3.44	2.77	6.26	122	---	---	---
Norwegian Shelf	50.87	145.5	1775	278	12.91	3.6	2.86	6.39	100	---	---	---
Norwegian Shelf	50.89	145.5	3446	619	16.5	3.82	2.53	5.57	201	---	---	---
Norwegian Shelf	50.91	145.5	1564	251	15.2	2.81	2.18	6.22	95	---	---	---
Norwegian Shelf	50.93	145.5	1640	280	15.22	3.18	2.31	5.86	87	---	---	---
Norwegian Shelf	50.95	145.5	2723	438	18.89	3.31	2.06	6.22	120	---	---	---
Norwegian Shelf	50.97	145.5	4174	758	21.53	3.83	2.11	5.51	205	---	---	---
Norwegian Shelf	50.99	145.5	2873	474	20.17	3.43	2.07	6.07	106	---	---	---
Norwegian Shelf	51.01	145.5	3946	731	20.73	4.83	2.95	5.40	214	---	---	---
Norwegian Shelf	51.03	145.5	801	115	13.54	2.93	2.54	6.94	57	---	---	---
Norwegian Shelf	51.05	145.5	1264	190	18.19	2.85	1.92	6.65	65	---	---	---
Norwegian Shelf	51.07	145.5	2029	317	17.9	3.02	2.02	6.40	66	---	---	---
Norwegian Shelf	51.09	145.5	601	84	11.56	2.54	2.54	7.16	44	---	---	---
Norwegian Shelf	51.6	145.5	311	42	7.3	2.35	2.78	7.38	37	---	---	---
Norwegian Shelf	52	145.5	803	122	13.27	2.54	2.28	6.60	36	---	---	---
Norwegian Shelf	52.1	145.5	535	80	11.49	4.64	4.23	6.69	48	---	---	---
Norwegian Shelf	52.2	145.5	457	63	8.77	4.09	4.12	7.22	65	---	---	---
Norwegian Shelf	52.3	145.5	1579	262	15.88	3.36	2.56	6.03	93	---	---	---
Norwegian Shelf	52.4	145.5	3180	431	14.5	3.98	2.80	7.37	136	---	---	---
Norwegian Shelf	52.5	145.5	1108	158	17.56	2.8	2.00	7.02	54	---	---	---
Norwegian Shelf	52.7	145.5	1056	149	15.1	2.49	2.01	7.07	41	---	---	---
Norwegian Shelf	52.9	145.5	1120	162	12.56	3.07	2.65	6.92	67	---	---	---
Norwegian Shelf	53.1	145.5	2388	424	13.49	2.63	2.22	5.64	59	---	---	---
Norwegian Shelf	53.2	145.5	138	22	4.55	7.56	7.25	6.28	52	---	---	---
Norwegian Shelf	53.3	145.5	1138	177	12.58	2.66	2.39	6.45	79	---	---	---
Norwegian Shelf	53.5	145.5	419	59	10.19	2.26	2.43	7.16	40	---	---	---
Norwegian Shelf	53.59	145.5	4976	944	19.11	3.95	2.55	5.27	160	---	---	---
Norwegian Shelf	53.8	145.5	366	50	9.79	2.36	2.52	7.34	35	---	---	---
Norwegian Shelf	53.9	145.5	153	34	6.01	18.05	16.26	4.47	69	---	---	---
Norwegian Shelf	54	145.5	484	74	8.33	3.06	3.06	6.58	98	---	---	---
Norwegian Shelf	54.1	145.5	373	51	8.39	2.36	2.39	7.31	50	---	---	---
Norwegian Shelf	54.17	145.5	1891	686	3.62	25.8	23.54	2.76	1233	---	---	---
Norwegian Shelf	54.55	145.5	1583	428	4.75	19.37	18.00	3.70	833	---	---	---
Norwegian Shelf	54.6	145.5	970	135	8.78	2.26	2.54	7.21	55	---	---	---
Norwegian Shelf	59.74	145.5	1640	232	9.12	7.34	6.90	7.08	77	---	---	---
Norwegian Shelf	60.34	145.5	1847	267	10.58	2.99	3.05	6.91	67	---	---	---

Table S2

Norwegian Shelf	67.2	145.5	1206	180	11.81	3.74	3.65	6.69	116	---	---	---
Kimmeridge Clay Formation		155.6	63	5	4.55	1.07	2.96	13.40	38	---	---	---
Kimmeridge Clay Formation		155.6	86	10	8.13	1.44	2.88	8.34	40	---	---	0.86
Kimmeridge Clay Formation		155.6	128	16	11.51	2.05	3.43	8.11	60	---	---	0.91
Kimmeridge Clay Formation		155.6	105	10	9.07	2.17	3.38	10.27	60	---	---	0.93
Kimmeridge Clay Formation		155.6	189	20	5.39	6.87	8.39	9.36	70	---	---	0.97
Kimmeridge Clay Formation		155.6	200	28	15.62	2.49	3.79	7.08	110	---	---	0.92
Kimmeridge Clay Formation		155.6	219	31	13.81	2.58	3.96	7.03	120	---	---	0.90
Kimmeridge Clay Formation		155.6	263	34	17.5	3.12	3.96	7.74	130	---	---	0.94
Kimmeridge Clay Formation		155.6	288	43	13.66	2.91	4.39	6.71	140	---	---	0.92
Kimmeridge Clay Formation		155.6	628	77	12.3	2.36	3.68	8.17	160	---	---	0.92
Kimmeridge Clay Formation		155.6	247	43	9.18	2.82	5.39	5.70	160	---	---	0.69
Kimmeridge Clay Formation		155.6	327	87	28.94	3.64	6.07	3.77	200	---	---	0.97
Kimmeridge Clay Formation		155.6	204	52	31.37	3.75	5.83	3.89	200	---	---	0.97
Kimmeridge Clay Formation		155.6	410	53	14.19	3.1	4.23	7.72	200	---	---	0.96
Kimmeridge Clay Formation		155.6	408	65	20.04	3.59	5.34	6.26	220	---	---	0.96
Kimmeridge Clay Formation		155.6	108	9	7.46	2.9	4.1	12.12	---	---	---	0.79
Kimmeridge Clay Formation		155.6	171	15	8.84	4.06	4.8	11.35	---	---	---	0.76
Kimmeridge Clay Formation		155.6	431	41	9.51	4.59	4.92	10.45	---	---	---	0.82
Kimmeridge Clay Formation		155.6	114	10	7.99	2.53	3.6	11.47	---	---	---	0.68
Kimmeridge Clay Formation		155.6	61	5	5.28	1.43	3.25	11.30	---	---	---	0.60
Kimmeridge Clay Formation		155.6	79	7	8.59	1.51	2.71	10.70	---	---	---	0.53
Kimmeridge Clay Formation		155.6	233	23	5.76	2.75	4.1	10.31	---	---	---	0.58
Kimmeridge Clay Formation		155.6	161	14	6.46	1.61	3.07	11.83	---	---	---	0.50
Kimmeridge Clay Formation		155.6	243	23	6.91	3.28	4.09	10.62	---	---	---	0.63
Kimmeridge Clay Formation		155.6	196	16	7	2.65	4.18	12.35	---	---	---	0.58
Jet Rock	PM-BS-60	183	67	9	3.61	3.73	4.18	7.18	35	---	---	0.81
Jet Rock	PM-BS-440	183	148	14	3.16	2.95	5.40	10.48	37	---	---	0.74
Jet Rock	PM-BS-140	183	189	20	4.31	2.84	5.68	9.68	37	---	---	0.85
Jet Rock	PM-BS-220	183	182	19	4.36	3.81	5.92	9.78	38	---	---	0.79
Jet Rock	PM-BS-40	183	129	14	3.16	3.03	5.87	9.37	137	---	---	0.78
Jet Rock	PM-BS-260	183	105	11	4.12	3.58	5.68	9.60	41	---	---	0.79
Jet Rock	PM-BS-160	183	112	11	3.52	3.45	5.97	9.75	47	---	---	0.89
Jet Rock	24	183	219	29	5.25	2.67	5.45	7.65	53	---	---	0.60
Jet Rock	PM-BS-360	183	135	19	3.51	3.32	4.26	7.05	53	---	---	0.75
Jet Rock	PM-BS-420	183	114	11	3.60	2.52	5.23	9.99	59	---	---	0.66
Jet Rock	9	183	71	15	3.75	4.50	7.27	4.62	61	---	---	0.60
Jet Rock	PM-BS-20	183	97	10	3.16	3.80	5.66	9.63	74	---	---	0.81

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Jet Rock	PM-BS-0	183	86	9	4.23	3.53	5.46	9.15	111	---	---	0.80
Jet Rock	PM-BS-280	183	129	13	4.20	3.51	5.86	9.83	40	---	---	0.77
Jet Rock	44	183	88	14	7.76	3.11	5.77	6.10	197	---	---	0.59
Posidonia Shale	DO-48	183	65	21	8.90	2.33	2.06	3.11	35	---	---	0.89
Posidonia Shale	DO-35	183	136	45	9.44	4.06	3.41	3.05	43	---	---	0.91
Posidonia Shale	DO-44	183	102	35	6.15	2.49	2.03	2.88	43	---	---	0.84
Posidonia Shale	DO-38	183	117	37	8.66	2.66	2.36	3.19	44	---	---	0.88
Posidonia Shale	DO-42	183	50	19	6.68	2.55	2.02	2.64	53	---	---	0.91
Posidonia Shale	DO-45	183	76	22	9.19	2.83	2.85	3.38	57	---	---	0.81
Posidonia Shale	DO-47	183	79	29	11.28	3.54	2.61	2.73	66	---	---	0.90
Posidonia Shale	DO-46	183	137	38	9.81	2.93	2.67	3.63	70	---	---	0.89
Posidonia Shale	DO-40	183	76	29	5.54	2.58	2.12	2.62	70	---	---	0.93
Posidonia Shale	DO-41	183	92	31	7.25	2.50	2.43	2.98	73	---	---	0.90
Posidonia Shale	DO-39	183	83	30	7.89	2.67	2.24	2.75	84	---	---	0.93
Fernie Formation, Gordondale Mbr		189.6	175.3	31	6.4	1.7	2.66	5.61	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	215.0	34	6.1	2.2	2.45	6.30	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	215.8	36	5.2	2	2.24	6.03	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	140.3	24	6.1	1.5	2.31	5.77	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	231.1	47	8.7	2.7	1.96	4.92	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	167.7	29	6.4	2.6	2.59	5.72	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	152.8	27	6.8	2.5	2.59	5.72	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	299.1	45	5.4	2	2.73	6.62	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	277.8	36	4	2.5	3.29	7.78	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	254.0	67	6.8	0.5	1.89	3.81	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	121.0	79	5.2	0.2	1.19	1.53	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	214.3	119	8.8	5	4.48	1.80	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	57.8	84	20.3	1.5	0.35	0.69	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	387.1	106	7.7	1.5	1.54	3.65	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	513.2	173	8	1.7	1.33	2.96	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	109.2	90	14.5	1.5	0.49	1.22	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	41.1	37	10	0.5	0.56	1.11	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	99.5	54	10.8	0.6	0.49	1.85	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	268.5	98	6	0.9	1.12	2.75	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	20.6	10	12.6	1.8	0.63	2.06	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	28.4	17	13.2	2	0.84	1.69	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	36.5	17	8.8	0.9	0.91	2.17	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	54.2	26	7.5	1.4	0.91	2.12	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	40.8	26	10.4	1.4	0.77	1.59	---	---	---	---

Table S2

Fernie Formation, Gordondale Mbr		189.6	51.0	24	8.8	1.1	0.91	2.12	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	92.6	34	8.6	1.5	1.33	2.75	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	232.9	96	8.9	1.4	0.84	2.43	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	344.2	163	4.7	0.8	0.98	2.12	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	570.5	299	10.8	2	0.77	1.91	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	475.9	187	12.8	2.7	1.40	2.54	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	512.3	225	8.7	2.1	1.40	2.28	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	512.3	173	7.4	2.1	1.54	2.96	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	121.9	38	4.1	1.4	1.96	3.18	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	99.7	171	1.8	0.4	0.21	0.58	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	52.3	14	6	2.5	1.82	3.76	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	99.0	15	6.1	7.4	6.51	6.72	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	563.2	242	6.4	1.8	1.47	2.33	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	594.3	255	7.1	1.6	0.98	2.33	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	1464.5	710	5.9	0.9	0.84	2.06	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	2437.8	1535	7.9	0.2	0.70	1.59	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	4254.8	228	5	1.8	1.26	18.63	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	2409.8	711	6	2	1.54	3.39	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	4868.2	1769	5.1	2	1.33	2.75	---	---	---	---
Fernie Formation, Gordondale Mbr		189.6	2049.7	731	6.2	1.6	1.19	2.80	---	---	---	---
Grenzbitumenzone		245	999	208	28.35	2.46	2.97	4.81	---	---	---	---
Grenzbitumenzone		245	181	96	18.98	2.23	1.38	1.88	---	---	---	---
Grenzbitumenzone		245	124	73	18.67	3.85	2.77	1.70	---	---	---	---
Grenzbitumenzone		245	190	64	27.43	3.1	1.80	2.95	---	---	---	---
Grenzbitumenzone		245	140	36	24.33	7.18	6.70	3.87	---	---	---	---
Grenzbitumenzone		245	118	29	29.04	4.2	2.43	4.05	---	---	---	---
Grenzbitumenzone		245	98	21	16.44	10.23	10.76	4.74	---	---	---	---
Kupferschiefer (ummineralized)	11a	257.3	32	---	2.4	0.78	---	---	60	---	---	---
Kupferschiefer (ummineralized)	3b	257.3	106	---	10.32	2.25	---	---	340	---	---	---
Kupferschiefer (ummineralized)	5a	257.3	144	---	9.41	1.71	---	---	260	---	---	---
Kupferschiefer (ummineralized)	9b	257.3	64	---	4.94	1.71	---	---	110	---	---	---
Phosphoria Formation	44	270.6	4100	833	2.1	0.28	2.09	4.92	130	---	---	---
Phosphoria Formation	48	270.6	2600	1755	2.3	0.76	2.71	1.48	61	---	---	---
Phosphoria Formation	52	270.6	3400	630	3.2	0.38	1.88	5.40	130	---	---	---
Phosphoria Formation	58	270.6	2300	604	2.5	0.34	1.67	3.81	82	---	---	---
Phosphoria Formation	60	270.6	2700	521	1.7	0.17	2.16	5.19	70	---	---	---
Phosphoria Formation	61	270.6	2700	1275	4	0.57	0.97	2.12	46	---	---	---
Phosphoria Formation	66	270.6	2100	810	4.3	0.55	0.90	2.59	77	---	---	---

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Phosphoria Formation	67	270.6	2800	853	5.5	0.7	1.39	3.28	120	---	---	---
Phosphoria Formation	70	270.6	1300	219	3.4	0.35	2.99	5.93	37	---	---	---
Phosphoria Formation	71	270.6	1100	245	4.3	0.53	2.02	4.50	73	---	---	---
Phosphoria Formation	73	270.6	1200	160	8.4	0.92	2.02	7.52	37	---	---	---
Phosphoria Formation	76	270.6	1300	241	6.4	0.8	2.37	5.40	67	---	---	---
Phosphoria Formation	171	270.6	1500	278	7.8	0.89	2.23	5.40	100	---	---	---
Phosphoria Formation	178	270.6	1500	278	3.4	0.4	2.71	5.40	51	---	---	---
Phosphoria Formation	179	270.6	1300	210	2.9	0.32	2.51	6.19	62	---	---	---
Phosphoria Formation	185	270.6	140	41	1.9	2.7	2.02	3.39	150	---	---	---
Phosphoria Formation	186	270.6	280	76	18.1	2	2.23	3.70	83	---	---	---
Phosphoria Formation	187	270.6	280	51	3.1	0.34	2.58	5.50	42	---	---	---
Phosphoria Formation	189	270.6	2100	389	1.1	0.1	2.51	5.40	35	---	---	---
Phosphoria Formation	192	270.6	1200	298	4.3	0.65	1.67	4.02	52	---	---	---
Phosphoria Formation	195	270.6	1300	261	4.2	0.54	2.23	4.97	96	---	---	---
Phosphoria Formation	196	270.6	3800	1596	1.56	0.3	15.94	2.38	340	---	---	---
Phosphoria Formation	199	270.6	620	111	4.5	0.5	2.37	5.61	40	---	---	---
Phosphoria Formation	201	270.6	910	181	4.8	0.59	2.09	5.03	45	---	---	---
Phosphoria Formation	202	270.6	810	180	4.1	0.47	1.81	4.50	39	---	---	---
Phosphoria Formation	213	270.6	1500	251	2.4	0.21	3.20	5.98	37	---	---	---
Phosphoria Formation	225	270.6	2700	500	0.74	0.05	3.41	5.40	38	---	---	---
Phosphoria Formation	502-14-2A	270.6	3060	1494	2.42	2.52	0.91	2.05	117	---	---	---
Phosphoria Formation	601-28-1A	270.6	1460	378	1.79	2.97	1.66	3.86	65	---	---	---
Hushpuckney Shale	1036.7-1GR	306	149	20	9.31	1.24	3.7	7.45	52	---	---	0.47
Hushpuckney Shale	1036.7-2B	306	559	90	11.31	1.28	3.53	6.24	71	---	---	0.47
Hushpuckney Shale	1036.7-2GR	306	109	15	3.79	1.8	4.06	7.33	---	---	---	0.55
Hushpuckney Shale	1036.7-3B	306	452	70	9.19	1.31	3.44	6.49	---	---	---	0.53
Hushpuckney Shale	1036.7-3GR	306	56	7	1.31	2.2	4.29	7.48	---	---	---	0.6
Hushpuckney Shale	1036.7-4B	306	960	151	9.62	1.54	3.53	6.37	90	---	---	0.57
Hushpuckney Shale	1036.7-4GR	306	56	8	0.71	3.27	5.33	7.39	58	---	---	0.77
Hushpuckney Shale	1036.7-5GR	306	56	7	0.58	2.87	4.85	7.74	39	---	---	0.7
Hushpuckney Shale	1036.7-6GR	306	44	6	0.46	2.09	3.91	7.02	---	---	---	0.68
Hushpuckney Shale	1036.7-7GR	306	34	8	0.29	1.67	3.35	4.27	47	---	---	0.6
Hushpuckney Shale	1039.2-10B	306	346	54	6.65	1.36	3.25	6.45	---	---	---	0.52
Hushpuckney Shale	1039.2-1B	306	702	115	15.25	1.52	3.57	6.08	---	---	---	0.58
Stark Shale	S1	306	3100	525	21.7	4.1	4.7	5.9	320	---	---	0.86
Stark Shale	S10	306	2200	361	17.8	3.8	4.5	6.1	180	---	---	0.82
Stark Shale	S11	306	1400	184	13.5	2.2	3.4	7.6	170	---	---	0.85
Stark Shale	S121	306	3900	709	23.6	3.8	4.1	5.5	850	---	---	0.81

Table S2

Stark Shale	S122	306	2100	280	12	3.6	4.7	7.5	440	---	---	0.84
Stark Shale	S21	306	5500	1146	29.5	3.3	3.8	4.8	670	---	---	0.88
Stark Shale	S22	306	3800	655	24.4	2.7	3.5	5.8	520	---	---	0.83
Stark Shale	S41	306	2900	475	21.4	2.6	3.3	6.1	760	---	---	0.75
Stark Shale	S42	306	890	159	10.8	2.2	2.9	5.6	150	---	---	0.7
Stark Shale	S43	306	310	41	7.5	2.5	3.5	7.6	67	---	---	0.74
Stark Shale	S5	306	1100	138	14.4	2.1	3.4	8	93	---	---	0.71
Stark Shale	S62	306	2500	373	19.2	3.8	4.5	6.7	820	---	---	0.87
Stark Shale	S81	306	1200	197	23.4	1.7	2.5	6.1	91	---	---	0.69
Stark Shale	S82	306	1400	250	17.9	1.9	2.4	5.6	67	---	---	0.67
Tackett Shale	289.3-12B	306	111	18	13.71	2.36	4.24	6.28	---	---	---	0.68
Tackett Shale	289.3-13B	306	123	23	7.42	12.91	14.9	5.3	---	---	---	0.86
Tackett Shale	289.3-5B	306	240	41	11.95	6.11	7.47	5.89	---	---	---	0.82
Tackett Shale	289.3-6B	306	256	41	11.7	6.73	8.28	6.18	---	---	---	0.83
Tackett Shale	289.3-8B	306	299	46	10.04	6.06	7.43	6.49	---	---	---	0.81
Tackett Shale	294.0-12B	306	175	21	6.17	1.22	3.24	8.19	---	---	---	0.54
Tackett Shale	294.0-13B	306	180	24	4.64	1.56	3.69	7.5	---	---	---	0.6
Tackett Shale	294.0-15B	306	275	33	5.18	1.77	3.94	8.34	---	---	---	0.61
Tackett Shale	294.0-16B	306	836	119	5.92	4.37	6.07	7.05	---	---	---	0.8
Tackett Shale	294.0-17B	306	603	92	10.45	3.77	5.91	6.52	---	---	---	0.78
Tackett Shale	294.0-1GT	306	878	137	6.08	2.9	4.81	6.42	---	---	---	0.67
Tackett Shale	294.0-2GT	306	247	37	5.51	2.47	4.29	6.63	---	---	---	0.65
Tackett Shale	294.0-3GT	306	148	20	4.77	1.58	3.76	7.26	---	---	---	0.55
Tackett Shale	294.0-5GT	306	172	24	1.97	1.45	3.6	7.18	---	---	---	0.52
Tackett Shale	294.0-9B	306	195	26	5.43	1.29	3.59	7.42	---	---	---	0.51
Anna	MC121-2	308	1200	190	19.7	1.2	2.6	6.3	40	---	---	---
Anna	Anna	308	1600	364	26.3	1.4	2.4	4.4	76	---	---	---
Anna	CP22-6D	308	50	9	16.4	3.8	4.5	5.3	80	---	---	---
Excello	EDS1A-7	308	930	133	2.4	0.7	2.7	7	36	---	---	---
Excello	1044-32	308	1090	188	9.9	2.2	3.4	5.8	40	---	---	---
Excello	MC86-2	308	2000	286	9.2	1.1	2.9	7	50	---	---	---
Excello	EDS1A-6	308	940	294	1.6	0.5	1.3	3.2	51	---	---	---
Excello	EDS1A-5	308	590	113	3.1	0.5	1.9	5.2	56	---	---	---
Excello	CP22-14	308	465	68	4.3	0.1	2.4	6.8	60	---	---	---
Excello	BM5-2	308	1800	290	13.9	---	2.4	6.2	60	---	---	---
Excello	CP41-1	308	1140	181	4	0.1	2.6	6.3	70	---	---	---
Excello	CP78-13B	308	430	54	6.5	0.5	3.1	7.9	80	---	---	---
Excello	1535-7	308	1280	210	14.8	2.1	2.7	6.1	110	---	---	---

Table S2

Excello	SS-11	308	1100	159	16	0.7	2.7	6.9	150	---	---	---
Excello	SS-1	308	1100	190	13.7	3.3	4.5	5.8	199	---	---	---
Little Osage	1535u-25	308	600	72	11	2.1	3.4	8.3	40	---	---	---
Little Osage	BM14-2	308	2300	523	23.1	1.2	2.4	4.4	50	---	---	---
Little Osage	CP78-4B	308	7120	1582	27.6	1.8	2.5	4.5	103	---	---	---
Little Osage	CP22-11	308	1770	316	18.7	1.3	3.1	5.6	170	---	---	---
Little Osage	CP78-4A	308	510	80	18.7	1.4	3.2	6.4	260	---	---	---
Oakley	CP41-17	308	4510	752	24.8	2	2.9	6	420	---	---	---
Oakley	CP22-22E	308	15400	2333	25.1	2.5	3.6	6.6	450	---	---	---
Oakley	CP22-22C	308	330	36	---	1.8	4.7	9.1	---	---	---	---
Unnamed	1044-47	308	810	113	15.2	2.1	3.5	7.2	40	---	---	---
Unnamed	BM2-5	308	1500	231	21.2	3.3	3.2	6.5	90	---	---	---
Rhinestreet Shale	1239	345.3	57	7	4.3	1.4	4.27	7.94	57	---	---	---
Rhinestreet Shale	1366	345.3	111	13	3	2	4.76	8.47	37	---	---	---
Rhinestreet Shale	1450	345.3	47	1	---	1.3	3.71	60.86	40	---	---	---
Rhinestreet Shale	1470	345.3	144	16	2.4	---	4.62	9.00	46	---	---	---
Rhinestreet Shale	1478	345.3	568	63	3.6	1.4	3.99	9.00	64	---	---	---
Rhinestreet Shale	1494	345.3	50	6	---	1.3	3.92	7.94	37	---	---	---
Exshaw Formation	2	359.2	357	28	3.29	2.9	4.6	12.6	44	---	---	---
Exshaw Formation	5	359.2	332	25	3.47	2.6	4.4	13.3	44	---	---	---
Exshaw Formation	8	359.2	318	24	3.39	2.3	4	13.3	45	---	---	---
Exshaw Formation	11	359.2	333	24	3.19	3.3	3.9	13.8	41	---	---	---
Exshaw Formation	14	359.2	341	25	2.92	2.3	4.3	13.7	43	---	---	---
Exshaw Formation	19	359.2	633	54	2.98	1.3	3	11.7	36	---	---	---
Exshaw Formation	21	359.2	63	11	10.56	1.6	2.1	5.7	101	---	---	---
Exshaw Formation	22	359.2	195	41	2.92	1.4	2	4.7	87	---	---	---
Exshaw Formation	24	359.2	27	4	11.23	2.9	4.2	7.2	138	---	---	---
Exshaw Formation	27	359.2	18	3	9.69	1.8	2.2	5.4	40	---	---	---
Exshaw Formation	30	359.2	26	3	10.56	2.3	2.9	7.6	116	---	---	---
Exshaw Formation	35	359.2	22	3	10.93	1.8	2	6.8	60	---	---	---
Exshaw Formation	38	359.2	670	96	16.43	5.3	2.9	7	40	---	---	---
Exshaw Formation	41	359.2	100	10	10.69	4.3	6.4	10.3	68	---	---	---
Sunbury Shale	A10	359.2	1040	152	11.7	2.64	3.67	6.83	215	---	---	---
Sunbury Shale	A11	359.2	1880	264	10.7	3.19	4.32	7.13	287	---	---	---
Sunbury Shale	A12	359.2	39	10	4.59	25.3	15.04	4.01	212	---	---	---
Sunbury Shale	A13	359.2	372	51	10.7	3.09	4.12	7.23	395	---	---	---
Sunbury Shale	A14	359.2	1500	242	13.7	2.39	2.75	6.21	378	---	---	---
Sunbury Shale	A15	359.2	1900	269	10.5	1.52	2.95	7.06	310	---	---	---

Table S2

Sunbury Shale	A19	359.2	249	42	12.8	2.19	2.77	5.89	134	---	---	---
Sunbury Shale	A2	359.2	9120	1835	9.68	10.2	9.44	4.97	169	---	---	---
Sunbury Shale	A20	359.2	69	9	6.61	1.89	4.01	7.72	150	---	---	---
Sunbury Shale	A5	359.2	1260	208	16.6	1.75	2.78	6.06	221	---	---	---
Sunbury Shale	A6	359.2	668	106	11.5	1.67	2.84	6.28	159	---	---	---
Sunbury Shale	A7	359.2	509	93	12.8	2.11	2.92	5.45	264	---	---	---
Sunbury Shale	A8	359.2	841	140	10.2	2.1	3.00	6.00	277	---	---	---
Sunbury Shale	A9	359.2	336	55	11.3	3.08	3.88	6.11	255	---	---	---
Sunbury Shale	B23	359.2	1990	311	15.2	1.82	2.55	6.40	263	---	---	---
Annulata Black Shales	6/K5	374.5	54	17	23.26	3.01	2.87	3.13	61	---	---	---
Chattanooga Shale	L-2733	374.5	108	11	---	0.37	4.48	10.06	---	---	---	---
Chattanooga Shale	L-3551	374.5	116	14	4.2	2.4	5.18	8.47	55	---	---	---
Chattanooga Shale	L-3951	374.5	249	36	8	3.3	5.74	6.88	179	---	---	---
Chattanooga Shale	L-3956	374.5	90	11	6.4	2.5	4.90	7.94	93	---	---	---
Chattanooga Shale	L-3961.6	374.5	55	6	3.4	1.2	4.27	8.47	70	---	---	---
Chattanooga Shale	P-1	374.5	1310	146	---	---	3.78	9.00	202	---	---	---
Chattanooga Shale	P-10	374.5	135	15	---	---	4.69	9.00	47	---	---	---
Chattanooga Shale	P-12	374.5	71	8	---	---	5.60	9.00	42	---	---	---
Chattanooga Shale	P-13	374.5	89	10	---	---	6.02	9.00	39	---	---	---
Chattanooga Shale	P-14	374.5	78	9	---	---	6.30	9.00	42	---	---	---
Chattanooga Shale	P-15	374.5	53	8	---	---	9.79	6.88	109	---	---	---
Chattanooga Shale	P-16	374.5	106	13	---	---	5.88	8.47	78	---	---	---
Chattanooga Shale	P-17	374.5	47	5	---	---	3.36	9.53	---	---	---	---
Chattanooga Shale	P-18	374.5	66	7	---	---	5.04	9.00	105	---	---	---
Chattanooga Shale	P-19	374.5	56	6	---	---	3.92	9.53	---	---	---	---
Chattanooga Shale	P-2	374.5	414	56	---	---	3.01	7.41	91	---	---	---
Chattanooga Shale	P-20	374.5	69	7	---	---	4.41	9.53	---	---	---	---
Chattanooga Shale	P-21	374.5	68	6	---	---	4.34	10.58	---	---	---	---
Chattanooga Shale	P-3	374.5	1430	225	---	---	6.85	6.35	39	---	---	---
Chattanooga Shale	P-4	374.5	326	36	---	---	3.22	9.00	92	---	---	---
Chattanooga Shale	P-7	374.5	150	16	---	---	4.55	9.53	75	---	---	---
Chattanooga Shale	P-8	374.5	95	11	---	---	4.55	9.00	44	---	---	---
Chattanooga Shale	T-10	374.5	253	32	7.09	3.41	3.64	7.94	75	---	---	---
Chattanooga Shale	T-11	374.5	173	23	6.83	3.96	3.01	7.41	55	---	---	---
Chattanooga Shale	T-13	374.5	309	42	8.76	3.46	3.71	7.41	108	---	---	---
Chattanooga Shale	T-3	374.5	428	81	7.74	4.00	3.08	5.29	47	---	---	---
Chattanooga Shale	T-4	374.5	736	107	12.45	3.53	3.08	6.88	86	---	---	---
Chattanooga Shale	T-5	374.5	388	67	11.13	6.61	5.18	5.82	181	---	---	---

Table S2

Chattanooga Shale	T-6	374.5	390	67	13.54	7.02	5.67	5.82	207	---	---	---
Chattanooga Shale	T-7	374.5	262	45	10.77	2.77	4.76	5.82	141	---	---	---
Chattanooga Shale	T-8	374.5	195	26	4.76	6.03	3.15	7.41	59	---	---	---
Chattanooga Shale	T-9	374.5	267	42	10.22	5.50	4.55	6.35	101	---	---	---
Ohio Shale	C-4	374.5	52	35	4.36	1.51	2.80	1.48	73	---	---	---
Ohio Shale	C-5	374.5	326	315	7.06	1.42	1.96	1.04	144	---	---	---
Ohio Shale	M-10	374.5	136	20	4.25	2.44	3.64	6.88	57	---	---	---
Ohio Shale	M-11	374.5	152	21	5.28	2.40	4.27	7.41	57	---	---	---
Ohio Shale	M-12	374.5	176	22	7.19	2.40	4.48	7.94	145	---	---	---
Ohio Shale	M-17	374.5	4360	687	3.28	9.89	11.19	6.35	140	---	---	---
Ohio Shale	M-18	374.5	63	8	3.45	1.92	3.29	7.94	40	---	---	---
Ohio Shale	Wa-6	374.5	122	14	2.59	2.10	3.29	8.47	39	---	---	---
Ohio Shale/Huron Member	A21	374.5	97	11	2.8	2.63	4.57	8.50	44	---	---	---
Ohio Shale/Three Lick Member	A22	374.5	103	14	6	1.29	2.34	7.49	87	---	---	---
Ohio Shale/Cleveland Member	A24	374.5	56	7	5.67	2.98	3.62	7.73	53	---	---	---
Ohio Shale/Cleveland Member	A25	374.5	111	18	18.2	1.17	2.52	6.15	55	---	---	---
Ohio Shale/Cleveland Member	A26	374.5	109	14	15.8	1.05	2.28	7.53	42	---	---	---
Ohio Shale/Cleveland Member	B11	374.5	230	32	7.05	1.7	2.73	7.23	128	---	---	---
Ohio Shale/Cleveland Member	B12	374.5	295	52	13.3	1.4	2.01	5.66	61	---	---	---
Ohio Shale/Huron Member	B14	374.5	68	11	9.62	5.35	5.08	6.33	125	---	---	---
Ohio Shale/Huron Member	B15	374.5	253	39	11.5	5.2	5.47	6.56	78	---	---	---
Ohio Shale/Huron Member	B16	374.5	269	42	9.18	6.64	6.22	6.33	160	---	---	---
Ohio Shale/Huron Member	B21	374.5	279	37	7.27	3.35	3.51	7.59	104	---	---	---
Ohio Shale/Huron Member	B22	374.5	205	27	5.46	3.92	4.13	7.55	93	---	---	---
Ohio Shale/Huron Member	B3	374.5	282	40	11	2.86	3.13	7.05	89	---	---	---
Ohio Shale/Huron Member	B5	374.5	170	21	5.9	2.07	3.20	8.15	86	---	---	---
Ohio Shale/Huron Member	D2	374.5	84	10	5.52	2.57	3.68	8.16	76	---	---	---
Ohio Shale/Huron Member	D3	374.5	173	25	6.66	4.38	4.95	6.88	106	---	---	---
Muskwa Formation	MU1416-7	391	120	18	2	2.4	2.59	6.72	64	---	---	---
Muskwa Formation	MU1745-3	385.3	223	31	2.3	4.5	4.34	7.14	49	---	---	---
Muskwa Formation	MU1745-4	391	252	36	2	4.3	3.85	7.09	39	---	---	---
Muskwa Formation	MU414-1	391	167	32	3.7	1.4	1.89	5.24	64	---	---	---
Muskwa Formation	MU414-2	391	370	64	3.6	1.8	1.96	5.82	97	---	---	---
Muskwa Formation	MU414-3	391	276	38	2.5	4.4	4.97	7.36	47	---	---	---
Muskwa Formation	MU714-2	391	81	25	2.8	1.7	1.54	3.23	42	---	---	---
Lower Besa River Formation	LBR25 63-1	391.8	242	78	4.8	1.2	1.11	3.12	92	---	---	---
Lower Besa River Formation	LBR25 63-3	391.8	224	67	4.4	1.7	1.40	3.33	129	---	---	---
Lower Besa River Formation	LBR25 63-5	391.8	412	118	2.8	1.7	1.38	3.49	87	---	---	---

Table S2

Lower Besa River Formation	LBR25 63-7	391.8	177	43	2.5	1.4	1.50	4.13	77	---	---	---
Oatka Creek Formation	328.36	391.8	52.3	6	3.24	1.62	3.84	8.85	47	---	---	0.62
Oatka Creek Formation	328.57	391.8	66.1	8	5.84	4.19	6.29	8.17	79	---	---	0.765
Oatka Creek Formation	330.94	391.8	83	9	5.19	2.92	4.8	8.8	68	---	---	0.783
Oatka Creek Formation	332.05	391.8	48.3	6	8.21	3.89	5.56	7.84	169	---	---	0.828
Oatka Creek Formation	332.72	391.8	55.3	7	8.61	4.18	5.62	7.89	236	---	---	0.859
Oatka Creek Formation	333.12	391.8	56.3	7	8.68	3.97	5.19	7.61	173	---	---	0.872
Oatka Creek Formation	333.59	391.8	494	80	14.18	5.17	6.28	6.15	279	---	---	0.934
Oatka Creek Formation	333.85	391.8	38.3	5	6.68	4.39	5.14	7.79	93	---	---	0.892
Oatka Creek Formation	334.63	391.8	99	16	11.19	6.59	6.48	6.29	251	---	---	0.954
Oatka Creek Formation	335.26	391.8	1200	197	9.86	4.49	5.11	6.09	206	---	---	1
Oatka Creek Formation	335.87	391.8	135	21	9.51	4.72	5.91	6.32	192	---	---	0.915
Oatka Creek Formation	336.27	391.8	147	24	11.17	4.4	5.8	6.02	234	---	---	0.935
Oatka Creek Formation	336.69	391.8	3850	594	17.3	5.54	6.51	6.48	394	---	---	0.916
Oatka Creek Formation	337.09	391.8	463	71	11.7	5.42	6.29	6.5	229	---	---	0.924
Oatka Creek Formation	337.2	391.8	52.2	8	8.4		3.73	6.34	53	---	---	---
Oatka Creek Formation	337.83	391.8	177	34	4.89	1.13	2.36	5.21	56	---	---	0.739
Oatka Creek Formation	338.73	391.8	56.2	6	7.95	1.63	3.68	8.67	60	---	---	0.819
Oatka Creek Formation	339.71	391.8	42.3	5	3.77	2.22	3.5	8.47	51	---	---	0.835
Unterer Graptolithenschiefer	P3	443.7	1540	---	12.53	2.18	---	---	177	---	---	---
Unterer Graptolithenschiefer	P4	443.7	1297	---	13.31	3.51	---	---	91	---	---	---
Unterer Graptolithenschiefer	P5	443.7	5985	---	14.75	2.55	---	---	92	---	---	---
Unterer Graptolithenschiefer	P6	443.7	5672	---	14.27	2.73	---	---	177	---	---	---
Unterer Graptolithenschiefer	P7	443.7	5486	---	12.29	1.59	---	---	170	---	---	---
Unterer Graptolithenschiefer	P8	443.7	3181	---	11.03	1.77	---	---	140	---	---	---
Unterer Graptolithenschiefer	P9	443.7	2891	---	24.98	5.56	---	---	94	---	---	---
Unterer Graptolithenschiefer	P10	443.7	2176	---	18.78	6.34	---	---	209	---	---	---
Unterer Graptolithenschiefer	P11	443.7	970	---	14.70	10.91	---	---	213	---	---	---
Unterer Graptolithenschiefer	P12	443.7	857	---	10.13	5.14	---	---	163	---	---	---
Unterer Graptolithenschiefer	P13	443.7	798	---	10.97	2.79	---	---	242	---	---	---
Unterer Graptolithenschiefer	P14	443.7	497	---	11.93	4.84	---	---	102	---	---	---
Unterer Graptolithenschiefer	P15	443.7	57	---	17.11	6.46	---	---	194	---	---	---
Unterer Graptolithenschiefer	P16	443.7	111	---	16.27	4.66	---	---	177	---	---	---
Unterer Graptolithenschiefer	P17	443.7	33	---	4.12	2.13	---	---	198	---	---	---
Dictyonema		460	84	11	---	---	2.44	7.7	45	---	---	---
Dictyonema		460	95	13	---	---	3.52	7.22	59	---	---	---
Dictyonema		460	1500	183	---	---	2.57	8.19	74	---	---	---
Dictyonema		460	649	88	---	---	3.92	7.39	81	---	---	---

Table S2

Dictyonema		460	760	101	---	---	2.69	7.53	109	---	---	---
Dictyonema		460	149	17	---	---	2.47	9	111	---	---	---
Dictyonema		460	149	18	---	---	2.58	8.5	130	---	---	---
Dictyonema		460	494	57	---	---	2.89	8.72	142	---	---	---
Dictyonema		460	3780	550	---	---	2.25	6.87	153	---	---	---
Dictyonema		460	1720	196	---	---	1.796	8.79	174	---	---	---
Dictyonema		460	163	20	---	---	2.79	8.2	318	---	---	---
Dictyonema		460	1350	167	---	---	2.07	8.1	328	---	---	---
Dictyonema		460	371	45	---	---	3.19	8.2	395	---	---	---
Dictyonema		460	2480	334	---	---	2.61	7.43	603	---	---	---
Dicellogr. Shale		460.9	111	15	---	---	3.2	7.4	---	---	---	---
Dicellogr. Shale		460.9	73	12	---	---	2.7	5.9	---	---	---	---
Dicellogr. Shale		460.9	127	17	---	---	5.2	7.3	---	---	---	---
Dicellogr. Shale		471.8	100	11	---	---	3.1	9.1	---	---	---	---
Dicellogr. Shale		471.8	132	14	---	---	3.1	9.2	---	---	---	---
Dicellogr. Shale		471.8	126	15	---	---	2.6	8.2	---	---	---	---
Dicellogr. Shale		471.8	428	47	---	---	3.0	9.1	---	---	---	---
Dicellogr. Shale		471.8	106	12	---	---	3.3	9.1	---	---	---	---
Bright Eye Brook Formation	1	478.6	96	11	0.05	0.02	6.43	8.61	---	---	---	---
Bright Eye Brook Formation	2	478.6	128	16	0.16	0.01	9.70	7.77	---	---	---	---
Bright Eye Brook Formation	3	478.6	144	20	---	---	12.09	7.19	---	---	---	---
Bright Eye Brook Formation	4	478.6	114	19	---	---	11.87	6.00	---	---	---	---
Bright Eye Brook Formation	5	478.6	49	6	1.76	0.15	2.20	8.35	---	---	---	---
Bright Eye Brook Formation	6	478.6	64	8	---	---	1.80	7.59	---	---	---	---
Bright Eye Brook Formation	7	478.6	26	3	---	---	1.18	7.66	---	---	---	---
Bright Eye Brook Formation	8	478.6	34	5	---	---	1.45	7.32	---	---	---	---
Bright Eye Brook Formation	9	478.6	106	12	2.28	0.21	2.78	8.67	---	---	---	---
Bright Eye Brook Formation	10	478.6	103	14	---	---	2.59	7.40	---	---	---	---
Bright Eye Brook Formation	11	478.6	106	16	---	---	4.15	6.57	---	---	---	---
Bright Eye Brook Formation	12	478.6	138	20	---	---	16.23	7.04	---	---	---	---
Bright Eye Brook Formation	13	478.6	133	19	---	---	11.94	6.85	---	---	---	---
Alum Shale	3	499	60	9	7.2	5.3	6	6.7	150	---	---	---
Alum Shale	30	499	85	10	2.7	7.1	9.3	8.4	47	---	---	---
Alum Shale	37	499	410	62	12.8	4.3	3.9	6.6	340	---	---	---
Alum Shale	45	499	565	90	12.3	6.3	5.6	6.3	280	---	---	---
Alum Shale	68	499	360	57	13.6	4.4	4	6.3	340	---	---	---
Alum Shale	83	499	545	75	11.8	3.6	3.4	7.3	250	---	---	---
Alum Shale	253	499	320	50	13.8	4.9	4.4	6.4	350	---	---	---

Table S2

Alum Shale	10.5-11.5	499	75	14	16.3	5.6	5.3	5.3	150	---	---	---
Alum Shale	11.1-11.2	499	135	17	10.3	7.5	7.1	7.8	120	---	---	---
Alum Shale	13.0-13.1	499	290	35	9.2	6.1	6.7	8.3	125	---	---	---
Alum Shale	13.0-13.7	499	28	5	14.4	7.4	6.6	5.8	180	---	---	---
Alum Shale	14.1-14.5	499	49	9	15.6	6.2	5.5	5.5	180	---	---	---
Alum Shale	14.5-15.2	499	600	105	17.3	6.9	6.2	5.7	160	---	---	---
Alum Shale	4.2-4.3	499	60	9	19.6	5.8	5.1	6.4	280	---	---	---
Alum Shale	6.0-6.1	499	90	14	11.9	9.2	8.2	6.4	260	---	---	---
Alum Shale	7.9-8.5	499	31	6	15.4	5.9	5.7	5.4	220	---	---	---
Alum Shale	9.2-9.9	499	150	28	17.2	5.4	5.1	5.3	210	---	---	---
Alum Shale	E	499	40	7	15.1	7	6.2	5.4	235	---	---	---
Alum Shale	F	499	335	53	16.9	6.3	5.9	6.3	260	---	---	---
Alum Shale	G	499	70	12	20.6	6.5	5.5	5.8	275	---	---	---
Guojiaba Formation	Sat505	542	184.29	---	4.18	0.94	---	---	43	---	---	---
Guojiaba Formation	Sat506	542	107.34	---	4.9	0.75	---	---	70	---	---	---
Guojiaba Formation	Sat509	542	159.76	---	3.11	1.6	---	---	39	---	---	---
Guojiaba Formation	Sat510	542	130.42	---	4.08	0.91	---	---	71	---	---	---
Guojiaba Formation	Sat511	542	85.33	---	3.15	1.3	---	---	39	---	---	---
Guojiaba Formation	Sat512	542	124.34	---	3.88	0.63	---	---	36	---	---	---
Guojiaba Formation	Sat513	542	134.8	---	3.17	0.22	---	---	37	---	---	---
Guojiaba Formation	Sat515	542	156.13	---	1.88	1.43	---	---	44	---	---	---
Jiumenchong Formation	Son581	542	231.5	---	3.25	---	---	---	37	---	---	---
Jiumenchong Formation	Son582	542	1382.91	---	---	---	---	---	133	---	---	---
Jiumenchong Formation	Son583	542	4501.44	---	---	---	---	---	75	---	---	---
Jiumenchong Formation	Son584	542	108.71	---	---	---	---	---	112	---	---	---
Jiumenchong Formation	Son586	542	180.93	---	---	---	---	---	144	---	---	---
Jiumenchong Formation	Son587	542	255.48	---	---	---	---	---	248	---	---	---
Jiumenchong Formation	Son588	542	246.94	---	---	---	---	---	112	---	---	---
Jiumenchong Formation	Son590	542	94.5	---	---	---	---	---	90	---	---	---
Jiumenchong Formation	Son591	542	48.78	---	---	---	---	---	217	---	---	---
Jiumenchong Formation	Son592	542	10.16	---	---	---	---	---	295	---	---	---
Jiumenchong Formation	Son593	542	13.63	---	---	---	---	---	112	---	---	---
Yuertushi Formation		542	419	---	8.56	---	---	---	35	---	---	---
Yuertushi Formation		542	332	---	6.6	---	---	---	41	---	---	---
Yuertushi Formation		542	164	---	5.89	---	---	---	43	---	---	---
Yuertushi Formation		542	213	38	9.8	---	1.74	5.62	48	---	---	---
Yuertushi Formation		542	503	---	---	---	---	---	55	---	---	---
Yuertushi Formation		542	955	---	3.39	---	---	---	57	---	---	---

Table S2

Yuertushi Formation			542	553	56	7.5	---	2.18	9.85	79	---	---	---
Doushantuo Formation	Son512		551	13.81	---	13.06	---	---	---	38	---	---	---
Doushantuo Formation	Son514		551	79.5	---	4.54	---	---	---	45	---	---	---
Black River Dolomite	RC06-FOR01-A		641	51.0	11	5.1	---	---	4.8		1.03	0.94	---
Black River Dolomite	RC06-FOR01-B		641	54.3	12	5.6	---	---	4.7		0.99	0.95	---
Black River Dolomite	RC06-FOR01-C		641	57.1	11	5.3	---	---	5.4		1.11	0.96	---
Black River Dolomite	RC06-FOR01-D		641	48.5	10	5.6	---	---	5.1		0.98	0.95	---
Black River Dolomite	RC06-FOR01-E		641	46.5	9	5.3	---	---	5.1		1.02	0.95	---
Black River Dolomite	RC06-FOR02-B		641	98.5	14	6.5	---	---	7.0		0.79	0.93	---
Black River Dolomite	RC06-FOR02-D		641	99.8	18	6.6	---	---	5.7		0.80	0.93	---
Black River Dolomite	RC06-FOR02-G		641	101.0	14	6.5	---	---	7.4		0.80	0.93	---
Black River Dolomite	RC06-FOR02-H		641	92.7	17	6.4	---	---	5.6		0.90	0.93	---
Black River Dolomite	RC06-FOR02-I		641	100.0	14	6.8	---	---	7.3		0.81	0.90	---
Taoudeni Basin	S1	75.75	1100	86.2	8	---	---	---	11.1		1.1	0.79	---
Taoudeni Basin	S1	78.5	1100	1047	129	---	---	---	8.1		0.9	0.71	---
Taoudeni Basin	S1	80.64	1100	534.7	232	---	---	---	2.3		1.08	0.85	---
Taoudeni Basin	S1	82.34	1100	158.0	20	---	---	---	8.0		0.98	0.72	---
Taoudeni Basin	S1	83.59	1100	368.6	47	---	---	---	7.9		---	---	---
Taoudeni Basin	S1	85.05	1100	447.0	56	---	---	---	8.0		---	---	---
Taoudeni Basin	S1	85.62	1100	224.9	30	---	---	---	7.4		---	---	---
Taoudeni Basin	S1	122.6	1100	16.6	4	---	---	---	4.7		0.78	0.85	---
Taoudeni Basin	S2	200.8	1100	104.0	10	---	---	---	10.2		0.54	0.77	---
Taoudeni Basin	S2	201	1100	99.0	10	---	---	---	9.5		0.49	0.73	---
Taoudeni Basin	S2	202.15	1100	99.0	11	---	---	---	9.1		0.61	0.85	---
Taoudeni Basin	S4	122.66	1100	86.0	9	---	---	---	9.5		0.74	0.85	---
Taoudeni Basin	S4	122.78	1100	813.0	88	---	---	---	9.2		0.78	0.83	---
Taoudeni Basin	S4	122.88	1100	95.0	10	---	---	---	9.7		0.81	0.84	---
Taoudeni Basin	S4	123.1	1100	37.0	4	---	---	---	8.7		0.80	0.85	---
Taoudeni Basin	S4	128.95	1100	41.0	4	---	---	---	10.9		0.71	0.81	---
Taoudeni Basin	S4	129.28	1100	28.0	2	---	---	---	11.5		0.45	0.71	---
Taoudeni Basin	S4	129.44	1100	32.0	3	---	---	---	11.9		0.48	0.75	---
Taoudeni Basin	S4	129.54	1100	46.0	4	---	---	---	11.2		0.56	0.84	---
Taoudeni Basin	S4	129.63	1100	40.0	3	---	---	---	11.9		0.58	0.81	---
Taoudeni Basin	S4	129.74	1100	75.0	6	---	---	---	12.5		0.54	0.84	---
Taoudeni Basin	S4	129.94	1100	184.0	17	---	---	---	10.8		0.70	0.87	---
Taoudeni Basin	S4	130.2	1100	33.0	3	---	---	---	11.6		0.65	0.79	---
Borden Basin	JD-79-113-B		1200	17.03	9	1.0179	0.6	1.30	1.89		---	---	0.5
Borden Basin	JD-79-112 C-2		1200	27.98	11	3.4984	1.5	1.76	2.51		---	---	0.5

Table S2

Borden Basin	JD-79-I 112 C-2		1200	48.12	12	3.8493	1.5	2.84	3.86	---	---	0.6
Borden Basin	JD-79-186k		1200	366.39	118	1.0223	0.5	2.52	3.10	---	---	0.6
Velkerri Formation	Urapunga-4	136.98–137.	1400	379	123.7	---	---	5.64	3.1	---	---	0.92
Velkerri Formation	Urapunga-4	137.19–137.	1400	576	183.1	---	---	5.06	3.2	---	---	0.9
Velkerri Formation	Urapunga-4	137.26–137.	1400	485	173.0	---	---	5.29	2.9	---	---	0.92
Velkerri Formation	Urapunga-4	137.46–137.	1400	379	101.5	---	---	5.44	3.8	---	---	0.92
Velkerri Formation	Urapunga-4	137.75–137.	1400	253	77.0	---	---	5.57	3.3	---	---	0.91
Velkerri Formation	Urapunga-4	137.84–137.	1400	497	144.8	---	---	5.22	3.5	---	---	0.9
Velkerri Formation	Urapunga-4	326.48-326.!	1400	226	64.2	---	---	3.50	3.6	---	---	0.5
Rove	R-26P		1820	973.1	136	3.18	2.2	4.92	7.14	---	---	0.8
Rove	R-28		1820	56.6	6	2.5	0.8	2.91	8.83	---	---	0.5
Rove	R-30		1820	399.7	54	2.7	2.9	5.46	7.47	---	---	0.5
Rove	R-32		1820	599.8	75	3.22	4.4	8.58	7.98	---	---	0.5
Rove	R-33		1820	579.8	76	3.14	6.4	10.04	7.63	---	---	0.6
Rove	R-39		1820	563.3	64	1.7	7.2	8.77	8.83	---	---	0.5
Rove	R-40		1820	362.7	46	2.22		11.41	7.81	---	---	0.6
Rove	R-32		1820	599.8	---	4.4	8.58	7.98	---	---	---	0.5
Rove	R-33		1820	579.8	---	6.4	10.04	7.63	---	---	---	0.6
Rove	R-39		1820	563.3	---	7.2	8.77	8.83	---	---	---	0.5
Rove	R-40		1820	362.7	---		11.41	7.81	---	---	---	0.6
Rove	R-16		1840	793.5	104	2.09	0.8	4.43	7.6	---	---	0.6
Rove	R-19		1840	216.4	26	1.39	0.6	3.87	8.33	---	---	0.5
Rove	R-21		1840	1340.8	176	1.47	1.4	4.98	7.6	---	---	0.7
Rove	R-25		1840	903.3	132	4.68	1.9	5.33	6.84	---	---	0.8
Rove	R-26A		1840	38.2	5	0.94	3.7	4.08	7.21	---	---	0.6
Rove	R-26C		1840	195.6	34	4.21		5.74	5.69	---	---	0.7
Rove	R-26E		1840	1111.8	477	3.1	1.7	3.9	2.33	---	---	0.6
Rove	R-26G		1840	246.9	120	2.96	1.1	4.41	2.06	---	---	0.7
Rove	R-26I		1840	442.3	210	2.45	1	3.14	2.11	---	---	0.6
Zaonega Formation	C-175	16.6	2050	34	6	2.88	1.8	3.35	5.74	---	---	0.6
Zaonega Formation	C-175	30.2	2050	74	13	2.44	1.7	3.53	5.69	---	---	1.0
Zaonega Formation	C-175	33.7	2050	109	23	7.97	4.8	5	4.76	---	---	1.0
Zaonega Formation	C-175	36.5	2050	86	18	6.91	2.7	2.58	4.87	---	---	1.0
Zaonega Formation	C-175	36.9	2050	200	45	14.60	3.4	3.18	4.41	---	---	1.0
Zaonega Formation	C-175	38.4	2050	147	23	7.94	6.9	5.83	6.47	---	---	1.0
Zaonega Formation	C-175	54.9	2050	484	119	16.73	8.5	7.94	4.06	---	---	1.0
Zaonega Formation	C-175	57.3	2050	311	84	14.20	7.4	6.44	3.71	---	---	1.0
Zaonega Formation	C-175	61.5	2050	63	53	6.59	1.9	3.33	1.2	---	---	1.0

Table S2

Zaonega Formation	C-175	70.6	2050	63	23	5.40	0.6	2.58	2.77	---	---	1.0
Zaonega Formation	C-175	72.6	2050	224	54	9.52	1.8	1.55	4.13	---	---	1.0
Zaonega Formation	C-175	75.2	2050	124	49	6.61	1.1	1.05	2.54	---	---	1.0
Zaonega Formation	C-175	80.3	2050	95	32	12.43	0.8	0.87	2.96	---	---	1.0
Zaonega Formation	C-175	81.8	2050	11590	4599	11.01	0.7	0.73	2.52	---	---	1.0
Zaonega Formation	C-175	84.5	2050	141	55	18.62	0.8	1.69	2.55	---	---	1.0
Zaonega Formation	C-175	86.9	2050	486	144	21.27	0.9	1.38	3.37	---	---	1.0
Zaonega Formation	C-175	95.3	2050	4032	1920	22.22	1.1	1.07	2.1	---	---	1.0
Zaonega Formation	C-175	96.9	2050	265	92	27.77	1.8	1.57	2.87	---	---	1.0
Zaonega Formation	C-175	97	2050	558	146	16.96	2.4	2.47	3.81	---	---	1.0
Zaonega Formation	C-175	98.8	2050	208	49	16.30	1.4	1.27	4.26	---	---	1.0
Zaonega Formation	C-175	101.5	2050	55	14	17.14	1.3	1.35	4	---	---	1.0
Zaonega Formation	C-175	175.2	2050	145	30	10.32	1.1	4.63	4.91	---	---	0.8
Zaonega Formation	C-175	176	2050	287	73	9.90	1.0	3.39	3.93	---	---	0.8
Zaonega Formation	C-175	179.4	2050	91	17	8.02	1.4	3.99	5.36	---	---	0.9
Zaonega Formation	C-175	180.7	2050	124	18	4.73	1.8	5.03	6.94	---	---	0.7
Zaonega Formation	C-175	194.8	2050	76	10	1.64	1.9	3.25	7.48	---	---	0.8
Zaonega Formation	C-175	204.3	2050	240	41	8.56	2.0	2.98	5.82	---	---	0.9
Zaonega Formation	C-175	206.1	2050	160	38	12.42	1.1	1.86	4.23	---	---	0.9
Zaonega Formation	C-175	217.2	2050	179	31	8.20	1.7	3.74	5.81	---	---	0.9
Zaonega Formation	C-175	218.6	2050	706	193	19.12	1.1	1.09	3.66	---	---	0.8
Sengoma	Strat 2	146.2	2150	111	11	4.7	0.4	1.91	9.88	---	---	0.5
Sengoma	Strat 2	156.78	2150	64	9	7.1	0.9	2.85	6.88	---	---	0.3
Sengoma	Strat 2	171.5	2150	95	15	10	2.3	2.68	6.26	---	---	0.8
Sengoma	Strat 2	173.67	2150	71	10	4.2	2.9	3.08	7.33	---	---	0.9
Sengoma	Strat 2	177.7	2150	45	8	8.9	2.2	2.66	6	---	---	0.8
Sengoma	Strat 2	181.25	2150	94	16	7.8	3.5	3.6	6.06	---	---	0.9
Sengoma	Strat 2	184.5	2150	69	11	11	3.1	3.72	6.22	---	---	0.7
Sengoma	Strat 2	200.7	2150	70	12	14.4	3.6	3.49	5.9	---	---	0.9
Sengoma	Strat 2	202.5	2150	59	10	15.3	3.0	3.24	5.99	---	---	0.9
Sengoma	Strat 2	209	2150	76	13	16.6	2.3	3.04	5.76	---	---	0.8
Sengoma	Strat 2	212	2150	52	9	14.10	2.4	2.71	5.6	---	---	0.7
Sengoma	Strat 2	216	2150	68	12	10.70	2.3	2.3	5.76	---	---	0.8
Sengoma	Strat 2	219	2150	47	8	11.20	1.3	2.46	5.58	---	---	0.6
Sengoma	Strat 2	224.87	2150	44	8	9.30	1.0	1.73	5.7	---	---	0.7
Sengoma	Strat 2	286.6	2150	56	6	15.30	0.7	3.43	9.89	---	---	0.6
Mt. McRae Shale	ABDP-9	105.20	2501	26.1	90	---	---	---	0.3	---	---	---
Mt. McRae Shale	ABDP-9	107.25	2501	27.5	33	---	---	---	0.8	---	---	---

Table S2

Mt. McRae Shale	ABDP-9	108.27	2501	18.9	40	---	---	---	0.5	---	---	---
Mt. McRae Shale	ABDP-9	108.54	2501	20.5	59	---	---	---	0.3	---	---	---
Mt. McRae Shale	ABDP-9	109.00	2501	289.3	38	3.1	---	---	7.5	---	---	---
Mt. McRae Shale	ABDP-9	110.70	2501	185.0	31	3.5	---	---	5.9	---	---	---
Mt. McRae Shale	ABDP-9	111.00	2501	186.4	38	2.7	---	---	4.8	---	---	---
Mt. McRae Shale	ABDP-9	112.52	2501	212.1	38	3.7	---	---	5.6	---	---	---
Mt. McRae Shale	ABDP-9	113.46	2501	482.6	65	5.8	---	---	7.5	---	---	---
Mt. McRae Shale	ABDP-9	114.50	2501	79.9	32	2.2	---	---	2.5	---	---	---
Mt. McRae Shale	ABDP-9	115.49	2501	85.8	45	1.9	---	---	1.9	---	---	---
Mt. McRae Shale	ABDP-9	116.49	2501	823.6	198	3.6	---	---	4.2	---	---	---
Mt. McRae Shale	ABDP-9	117.31	2501	202.2	83	2.6	---	---	2.4	---	---	---
Mt. McRae Shale	ABDP-9	118.13	2501	193.3	61	---	---	---	3.2	---	---	---
Mt. McRae Shale	ABDP-9	119.24	2501	139.4	58	2.9	---	---	2.4	---	---	---
Mt. McRae Shale	ABDP-9	120.42	2501	70.0	45	1.9	---	---	1.6	---	---	---
Mt. McRae Shale	ABDP-9	121.20	2501	211.7	74	2.9	---	---	2.9	---	---	---
Mt. McRae Shale	ABDP-9	121.39	2501	152.5	52	2.4	---	---	2.9	---	---	---
Mt. McRae Shale	ABDP-9	122.32	2501	273.5	69	3.7	---	---	3.9	---	---	---
Mt. McRae Shale	ABDP-9	123.22	2501	98.0	34	2.3	---	---	2.9	---	---	---
Mt. McRae Shale	ABDP-9	124.22	2501	575.6	104	3.5	---	---	5.5	---	---	---
Mt. McRae Shale	ABDP-9	125.25	2501	297.4	83	---	---	---	3.6	---	---	---
Mt. McRae Shale	ABDP-9	126.15	2501	304.4	44	4.1	---	---	6.9	0.22	0.37	---
Mt. McRae Shale	ABDP-9	127.25	2501	261.0	35	6.9	---	---	7.4	0.24	0.79	---
Mt. McRae Shale	ABDP-9	128.17	2501	396.3	50	6.5	---	---	7.9	0.26	0.93	---
Mt. McRae Shale	ABDP-9	129.01	2501	248.4	31	6.1	---	---	8.1	0.34	0.84	---
Mt. McRae Shale	ABDP-9	129.55	2501	289.6	43	5.6	---	---	6.8	---	---	---
Mt. McRae Shale	ABDP-9	130.06	2501	401.3	51	---	---	---	7.8	0.22	0.80	---
Mt. McRae Shale	ABDP-9	130.71	2501	188.3	33	5.5	---	---	5.7	0.61	0.96	---
Mt. McRae Shale	ABDP-9	130.76	2501	147.9	23	6.2	---	---	6.3	0.30	0.45	---
Mt. McRae Shale	ABDP-9	131.60	2501	111.9	14	---	---	---	8.0	---	---	---
Mt. McRae Shale	ABDP-9	131.60	2501	128.6	20	3.9	---	---	6.3	---	---	---
Mt. McRae Shale	ABDP-9	132.13	2501	358.3	53	6.8	---	---	6.8	0.24	0.68	---
Mt. McRae Shale	ABDP-9	133.97	2501	563.4	72	7.7	---	---	7.8	0.16	0.62	---
Mt. McRae Shale	ABDP-9	135.58	2501	421.7	101	7.2	---	---	4.2	0.75	0.95	---
Mt. McRae Shale	ABDP-9	136.15	2501	821.8	126	8.2	---	---	6.5	0.70	0.97	---
Mt. McRae Shale	ABDP-9	136.67	2501	821.8	121	7.7	---	---	6.8	0.62	0.99	---
Mt. McRae Shale	ABDP-9	136.94	2501	809.9	151	9.0	---	---	5.3	0.74	0.98	---
Mt. McRae Shale	ABDP-9	137.31	2501	985.2	183	---	---	---	5.4	0.64	0.98	---
Mt. McRae Shale	ABDP-9	137.68	2501	741.4	161	9.4	---	---	4.6	0.79	0.99	---

Table S2

Mt. McRae Shale	ABDP-9	137.96	2501	745.7	130	10.8	---	---	5.7	0.73	0.96	---
Mt. McRae Shale	ABDP-9	138.38	2501	840.2	139	10.9	---	---	6.0	0.73	0.96	---
Mt. McRae Shale	ABDP-9	138.74	2501	684.4	115	---	---	---	5.9	0.68	0.97	---
Mt. McRae Shale	ABDP-9	139.01	2501	693.3	139	11.0	---	---	5.0	0.81	0.97	---
Mt. McRae Shale	ABDP-9	139.65	2501	852.9	144	9.9	---	---	5.9	0.80	0.98	---
Mt. McRae Shale	ABDP-9	139.71	2501	297.3	58	5.5	---	---	5.1	---	---	---
Mt. McRae Shale	ABDP-9	139.97	2501	1010.0	152	12.1	---	---	6.6	0.90	0.85	---
Mt. McRae Shale	ABDP-9	140.25	2501	719.8	119	12.4	---	---	6.0	0.85	0.98	---
Mt. McRae Shale	ABDP-9	140.50	2501	604.1	98	15.3	---	---	6.2	0.92	0.91	---
Mt. McRae Shale	ABDP-9	140.95	2501	711.6	119	16.1	---	---	6.0	0.95	0.88	---
Mt. McRae Shale	ABDP-9	141.17	2501	1068.0	169	12.6	---	---	6.3	0.84	0.98	---
Mt. McRae Shale	ABDP-9	141.47	2501	1180.0	184	13.0	---	---	6.4	0.82	0.97	---
Mt. McRae Shale	ABDP-9	141.72	2501	914.0	136	---	---	---	6.7	0.83	0.98	---
Mt. McRae Shale	ABDP-9	142.08	2501	1036.0	160	11.6	---	---	6.5	0.80	0.98	---
Mt. McRae Shale	ABDP-9	142.60	2501	662.2	147	---	---	---	4.5	0.74	0.81	---
Mt. McRae Shale	ABDP-9	143.45	2501	1589.0	426	13.1	---	---	3.7	0.74	0.92	---
Mt. McRae Shale	ABDP-9	144.36	2501	1104.0	250	8.7	---	---	4.4	0.36	0.90	---
Mt. McRae Shale	ABDP-9	145.61	2501	1345.0	221	13.4	---	---	6.1	0.28	0.72	---
Mt. McRae Shale	ABDP-9	146.45	2501	1076.0	212	15.2	---	---	5.1	0.61	0.94	---
Mt. McRae Shale	ABDP-9	147.30	2501	767.5	132	12.6	---	---	5.8	0.46	0.65	---
Mt. McRae Shale	ABDP-9	148.27	2501	594.4	108	10.4	---	---	5.5	0.35	0.85	---
Mt. McRae Shale	ABDP-9	149.30	2501	1195.0	168	12.1	---	---	7.1	0.64	0.94	---
Mt. McRae Shale	ABDP-9	150.24	2501	576.0	94	7.7	---	---	6.1	0.41	0.87	---
Mt. McRae Shale	ABDP-9	152.65	2501	509.7	95	5.1	---	---	5.4	0.23	0.70	---
Mt. McRae Shale	ABDP-9	153.18	2501	390.9	61	4.0	---	---	6.4	0.19	0.74	---
Mt. McRae Shale	ABDP-9	154.43	2501	175.7	25	4.1	---	---	7.1	---	---	---
Mt. McRae Shale	ABDP-9	156.05	2501	135.1	18	4.8	---	---	7.4	---	---	---
Mt. McRae Shale	ABDP-9	157.80	2501	285.7	40	4.3	---	---	7.2	0.42	0.51	---
Mt. McRae Shale	ABDP-9	158.91	2501	312.9	43	4.8	---	---	7.3	0.43	0.42	---
Mt. McRae Shale	ABDP-9	161.32	2501	183.0	26	5.8	---	---	7.0	---	---	---
Mt. McRae Shale	ABDP-9	162.80	2501	159.0	30	3.3	---	---	5.4	---	---	---
Mt. McRae Shale	ABDP-9	163.95	2501	40.9	7	3.2	---	---	5.6	---	---	---
Mt. McRae Shale	ABDP-9	165.56	2501	146.8	41	2.9	---	---	3.6	0.34	0.09	---
Mt. McRae Shale	ABDP-9	167.76	2501	86.7	33	1.8	---	---	2.6	0.30	0.09	---
Mt. McRae Shale	ABDP-9	168.36	2501	248.1	79	1.9	---	---	3.1	0.44	0.09	---
Mt. McRae Shale	ABDP-9	168.90	2501	59.0	27	1.9	---	---	2.2	0.42	0.22	---
Mt. McRae Shale	ABDP-9	169.28	2501	74.0	17	2.7	---	---	4.5	---	---	---
Mt. McRae Shale	ABDP-9	169.47	2501	56.6	20	2.0	---	---	2.8	---	---	---

Table S2

Mt. McRae Shale	ABDP-9	169.68	2501	81.4	23	2.0	---	---	3.5	0.34	0.27	---
Mt. McRae Shale	ABDP-9	169.94	2501	47.0	30	2.5	---	---	1.6	0.42	0.27	---
Mt. McRae Shale	ABDP-9	170.17	2501	294.9	77	2.1	---	---	3.8	0.30	0.34	---
Mt. McRae Shale	ABDP-9	170.39	2501	130.9	47	2.4	---	---	2.8	0.45	0.28	---
Mt. McRae Shale	ABDP-9	170.55	2501	64.3	18	3.1	---	---	3.6	0.32	0.10	---
Mt. McRae Shale	ABDP-9	170.86	2501	141.9	32	2.2	---	---	4.4	0.40	0.26	---
Mt. McRae Shale	ABDP-9	170.94	2501	192.2	55	3.0	---	---	3.5	0.48	0.47	---
Mt. McRae Shale	ABDP-9	171.22	2501	271.4	61	2.8	---	---	4.4	0.47	0.45	---
Mt. McRae Shale	ABDP-9	173.09	2501	348.0	63	3.1	---	---	5.5	0.31	0.32	---
Mt. McRae Shale	ABDP-9	173.50	2501	224.2	40	2.7	---	---	5.6	0.31	0.66	---
Mt. McRae Shale	ABDP-9	173.73	2501	213.7	54	2.8	---	---	4.0	0.33	0.26	---
Mt. McRae Shale	ABDP-9	174.67	2501	107.8	56	2.9	---	---	1.9	1.01	0.50	---
Mt. McRae Shale	ABDP-9	175.51	2501	239.4	41	3.8	---	---	5.9	0.35	0.47	---
Mt. McRae Shale	ABDP-9	177.10	2501	811.3	125	5.0	---	---	6.5	0.37	0.60	---
Mt. McRae Shale	ABDP-9	178.61	2501	263.2	41	4.9	---	---	6.3	0.33	0.84	---
Mt. McRae Shale	ABDP-9	178.83	2501	279.2	45	6.3	---	---	6.2	---	---	---
Mt. McRae Shale	ABDP-9	179.05	2501	412.9	67	4.7	---	---	6.2	0.34	0.80	---
Mt. McRae Shale	ABDP-9	180.33	2501	433.0	84	5.0	---	---	5.2	0.32	0.63	---
Mt. McRae Shale	ABDP-9	181.20	2501	268.2	56	4.2	---	---	4.8	0.35	0.49	---
Mt. McRae Shale	ABDP-9	182.50	2501	256.6	48	4.4	---	---	5.4	0.29	0.66	---
Mt. McRae Shale	ABDP-9	183.65	2501	213.7	45	3.1	---	---	4.8	0.41	0.46	---
Mt. McRae Shale	ABDP-9	185.43	2501	149.8	44	2.5	---	---	3.4	0.55	0.15	---
Mt. McRae Shale	ABDP-9	187.46	2501	224.0	38	3.6	---	---	6.0	---	---	---
Mt. McRae Shale	ABDP-9	188.01	2501	201.8	37	4.0	---	---	5.5	0.37	0.81	---
Mt. McRae Shale	ABDP-9	188.87	2501	191.3	39	3.3	---	---	4.9	0.26	0.57	---
Mt. McRae Shale	ABDP-9	189.39	2501	157.8	33		---	---	4.8	---	---	---
Jerinah	FVG-1	748.3	2650	50	6	1.8	0.7	6.6	8.4	---	0.5	---
Jerinah	FVG-1	749.65	2650	33	4	3.3	2.9	4.7	8.6	---	0.6	---
Jerinah	FVG-1	750.56	2650	30	3	6.1	1.2	2.4	9.0	---	0.6	---
Jerinah	FVG-1	752.65	2650	13	2	7.5	1.6	1.4	8.8	---	0.8	---
Jerinah	FVG-1	753.95	2650	17	3	4.8	0.8	1.7	6.0	---	0.5	---
Jerinah	FVG-1	760.7	2650	17	2	7.6	2.2	2.4	7.3	---	0.9	---
Jerinah	FVG-1	761.8	2650	11	2	5.9	3.7	3.9	6.2	---	0.9	---
Jerinah	FVG-1	765	2650	13	2	10.7	3.0	2.7	5.5	---	0.7	---
Jerinah	FVG-1	767.6	2650	9	2	4.6	2.1	2.1	4.5	---	0.9	---
Jerinah	FVG-1	774	2650	1179	208	4.4	4.2	4.5	5.7	---	0.9	---
Jerinah	FVG-1	775.55	2650	609	102	4.7	2.3	2.5	6.0	---	0.8	---
Jerinah	FVG-1	776.4	2650	1452	236	5.8	3.0	3.0	6.2	---	0.8	---

Table S2

Jerinah	FVG-1	777.8	2650	1701	294	11.3	3.3	3.0	5.8	---	0.9	---
Jerinah	FVG-1	779.45	2650	2154	375	10.1	3.3	3.0	5.8	---	0.9	---
Jerinah	FVG-1	780.95	2650	715	100	10.0	2.8	2.5	7.2	---	0.8	---
Jerinah	FVG-1	787.4	2650	375	59	7.6	3.9	4.5	6.4	---	0.8	---
Jerinah	FVG-1	791	2650	107	14	4.7	1.1	3.6	7.7	---	0.4	---
Jerinah	FVG-1	794.1	2650	416	62	5.0	3.1	5.0	6.7	---	0.7	---
Roy Hill Shale	RHDH-2A		2700	413	44.8	---	---	---	9.21	---	---	---
Roy Hill Shale	RHDH-2A		2700	85	7.6	---	---	---	11.22	---	---	---
Roy Hill Shale	RHDH-2A		2700	141	9.4	---	---	---	14.95	---	---	---
Roy Hill Shale	RHDH-2A		2700	105	32.7	---	---	---	3.21	---	---	---
Roy Hill Shale	RHDH-2A		2700	204	29.2	---	---	---	6.98	---	---	---
Roy Hill Shale	RHDH-2A		2700	11	9.6	---	---	---	1.11	---	---	---
Roy Hill Shale	RHDH-2A		2700	382	46.2	---	---	---	8.27	---	---	---

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Table S3

	Sediment [Zn]	Sediment Zn/Al	Enrichment factor	Water column [Zn]	Reference dissolved [Zn]	Reference sediment [Zn]
	ppm	ppm / %		(nM)		
Cariaco*‡	101	17.3	2	0.5	1	2
Black Sea‡	47	25	3	0.7	3	2
Jelly fish lake	45	145	17	2.5	4	4
Framvaren‡	1740	1090	128	10	3	5,6

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* estimate of water column [Zn] taken from upper part of the Western Atalantic

‡Dissolved and sediment concentrations derived from separate studies