

Figure F1. Representative marlstone/claystone and interbedded lithologies, Hole M0077A. A. Marlstone with thin dark marlstone/claystone interbed (14R-2). B. Interbedded centimeter-scale marlstone and wackestone (7R-2). C. Wavy to planar laminated dark marlstone/claystone (13R-1). D. Intercalated centimeter-scale dark marlstone/claystone and marlstone (5R-1). E. Claystone (ichnofabric index [II] = 2) (5R-1). F. Claystone intercalated with centimeter-scale dark marlstone/claystone (4R-1). G. Planar-laminated black shale with packstone-infilled burrows at top (II = 2) (37R-1). H. Planar-laminated black shale with thin marlstone interbeds at top (34R-1).

Figure F2. Representative lithologies of Subunit 1E, Hole M0077A. A. Dark marlstone/claystone intercalated with light brownish gray packstone (29R-1). B. Dark marlstone/claystone intercalated with light bluish gray and grayish brown packstone (30R-1). C. Bioturbated light yellowish gray packstone (II = 3) overlying burrowed (II = 2) dark marlstone/claystone (33R-2). D. Planar-laminated dark marlstone/claystone and black shale (33R-4). E. Planar-laminated dark marlstone/claystone and black shale overlying grayish brown bioturbated packstone (II = 4) (34R-1).

Figure F3. Selected lithologies, Hole M0077A. A. Marlstone with foraminifers, radiolarians, and ostracods (31R-3, 75–79 cm; 2.5x; cross-polarized light [XPL]). B. Wackestone with radiolarians and radiolarian molds, locally filled with chalcedony or sparry calcite (11R-3, 41–42 cm; 10x; XPL). C. Wackestone with larger benthic foraminifer and radiolarian molds filled with chalcedony (10R-2, 153–155 cm; 10x; XPL). D. Foraminifer packstone (35R-3, 45–47 cm; 2.5x; plane-polarized light).

Figure F4. Representative lithologies of Subunit 1A, Hole M0077A. A. Planar-laminated dark marlstone/claystone. B. Planar-laminated dark marlstone/claystone overlying laminated white to light brown grainstone and burrow-disrupted bluish gray claystone. C. Interbedded centimeter-scale dark marlstone/claystone and brown marlstone. D. Planar-laminated dark marlstone/claystone. E. Brown marlstone bracketing light yellowish brown wackestone.

Figure F5. Representative lithologies of Subunit 1B, Hole M0077A. A. Brown marlstone and dark marlstone/claystone with carbonate-rich nodule that disrupts bedding (11R-2). B. Dark marlstone/claystone intercalated with dark grayish brown wackestone (12R-2). C. Brown to light yellowish brown packstone bracketing dark marlstone/claystone (13R-1). D. Dark brown wackestone with dark marlstone/claystone interbed overlying light yellowish brown packstone (14R-1). E. Soft-sediment folded light yellowish brown packstone within dark grayish brown wackestone (14R-1).

Figure F6. Representative lithologies of Subunit 1C, Hole M0077A. A. Interbedded light yellowish brown packstone, brown marlstone, and dark marlstone/claystone (15R-1). B. Dark marlstone/claystone, brown marlstone, and light yellowish packstone (16R-1). C. Planar-laminated dark marlstone/claystone (15R-1). D. Soft sediment-deformed dark marlstone/claystone (21R-1). E. Intercalated dark marlstone/claystone, claystone, brown marlstone, and light yellowish brown wackestone (19R-2).

Figure F7. Representative lithologies of Subunit 1D, Hole M0077A. A. Dark marlstone/claystone overlying altered and burrowed light yellowish brown claystone (II = 2–3) (22R-1). B. Bioturbated light yellowish brown wackestone and marlstone overlying dark marlstone/claystone (22R-3). C. Bioturbated light bluish gray claystone overlying light yellowish brown wackestone with burrows locally filled with overlying claystone lithology (24R-2). D. Dark marlstone/claystone interbedded with bluish gray and light bluish gray claystone (26R-1). E. Planar-laminated dark marlstone/claystone (27R-1).

Figure F8. Representative lithologies of Subunit 1F, Hole M0077A. A. Planar-laminated black shale with packstone-infilled burrows at top (II = 2) (37R-1). B. Bluish gray packstone with burrows infilled with diverse lithologies (II = 3) overlying bluish gray claystone (37R-1). C. Cyclically packaged dark bluish gray marlstone (centimeter scale) and light bluish gray packstone (centimeter to decimeter scale) (38R-2). D. Dark bluish gray marlstone (II = 2) grading

upward into bluish gray wackestone (II = 2–3) and light gray wackestone to packstone (II = 3–4) (38R-1). E. Centimeter-scale bedded light to dark bluish gray packstone with wispy stylolites (39R-1). F. Centimeter-scale bedded light bluish gray packstone with wispy stylolites (39R-2).

Figure F9. Lithostratigraphy, gamma ray response, and TOC, Hole M0077A. See Geochemistry and Physical properties for more details.

Figure F10. Representative limestone lithologies, Hole M0077A. A. Light yellowish brown wackestone (II = 3) (15R-1). B. Light yellowish brown wackestone (II = 2–3) overlying marlstone (II = 2) (16R-1). C. Light bluish gray packstone (II = 3) (29R-2). Burrows are locally infilled with brownish wackestone or packstone. D. Light yellowish brown to brown packstone (17R-3). E. Burrow mottled (II = 4) light yellowish brown to whitish grainstone with larger benthic foraminifers and sand-sized carbonate grains (37R-1). F. Light gray grainstone (30R-3). G. Laminated to centimeter-scale bedded dark grayish brown mud/wackestone with thin greenish claystone interbed (II = 2) (40R-1). H. Planar-laminated dark gray and dark grayish brown mud/wackestone (40R-1). Dark gray laminae are 5–10 mm thick, grayish brown laminae are millimeter scale, and the two occur as couplets.

Figure F11. Upper and lower contacts of lithostratigraphic Subunit 1G, Hole M0077A. Upper contact is illustrated and described in Figure F13. Upper portion of subunit displays Cr enrichment based on μ XRF mapping, and base displays enrichment of Ni and Cr based on X-ray intensity mapping (see Geochemistry). The base of the subunit is a sharp stylolitized contact at 109.4 cm (617.33 mbsf).

Figure F12. Lithostratigraphic summary, Hole M0077A. For more on the biostratigraphic scheme, see Biostratigraphy.

Figure F13. Basal contacts of Subunits 1A–1F, Hole M0077A. A. Sharp erosional contact at base of Subunit 1A truncates underlying thin grainstone at 11R-2, 116.8 cm (530.18 mbsf). B. Base of Subunit 1B is packstone that erosionally truncates the underlying dark marlstone/claystone at the top of Subunit 1C at 14R-1, 86.40 cm (537.89 mbsf). Base of Subunit 1C is a gradational contact designated as the last dark millimeter-scale marlstone/limestone overlying marlstone with thin light brown wackestone interbeds at 21R-1, 146.20 cm (559.75 mbsf). D. Base of Subunit 1D is slightly gradational at the bottom of a dark marlstone/claystone with minor burrowing at 28R-1, 125.20 cm (580.89 mbsf). E. Base of Subunit 1E is the top of a prominent carbonate-cemented surface with about 1.5 cm of relief at 37R-1, 25.5 cm (607.27 mbsf). F. Base of Subunit 1F is a sharp contact below the base of the greenish claystone at 40R-1, 34.20 cm (616.58 mbsf) that overlies the brownish mud/wackestone of Subunit 1G.

Figure F14. Line-scan, CT scan, $\text{CT-}\rho_b$ (density), and CT-Z_{eff} (atomic number) images (from top to bottom), Hole M0077A. No scales are included for CT density and atomic number images because they are uncalibrated. A. Section 5R-2 illustrates variations in a laminated dark marlstone/claystone. B. Section 6R-1 illustrates partially silicified dark blue-gray claystone that stands out in the CT imagery.

Figure F15. Line-scan, CT scan, $\text{CT-}\rho_b$ (density), and CT-Z_{eff} (atomic number) images (from top to bottom), Section 364-M0077A-40R-1. No scales are included for CT density and atomic number images because they are uncalibrated. Syndepositional and alteration features in Subunit 1G are particularly evident in CT imagery.

Figure F16. Biostratigraphic zones, Hole M0077A. See Biostratigraphy in the Expedition 364 methods chapter (Gulick et al., 2017) for explanation of zonal scheme. Below Zone Pa is a 75 cm thick brown mud/wackestone that contains a number of Maastrichtian foraminifers and nannoplankton characterizing the “Boundary Cocktail” of Bralower et al. (1998).

Figure F17. Radiolarians typical of those found in the upper Eocene, Hole M0077A. Images taken on a phase contrast light microscope unless other-

wise indicated. A. 3R-1, 10–11 cm (506.22 mbsf). B. 10R-2, 153–155 cm (527.67 mbsf); polarization light microscope. C. 11R-3, 71–72 cm (530.80 mbsf). D. 19R-3, 27–28 cm (55.23 mbsf).

Figure F18. Planktic foraminifers found in the Eocene, Hole M0077A. All images taken on a phase contrast light microscope. A. Benthic (*Coryphostoma?* sp. (3R-1, 10–11 cm; 506.22 mbsf). B. *Acarinina cf. cuneicamerata* (3R-1, 10–11 cm; 506.22 mbsf). C. *Subbotina* sp. (16R-1, 67–69 cm; 543.71 mbsf). D. *Pseudohastigerina wilcoxensis* (16R-1, 67–69 cm; 543.71 mbsf). E. *Morozovella aragonensis* (32R-3, 58–59 cm; 594.84 mbsf). F. *Morozovella subbotinae* (32R-3, 58–59 cm; 594.84 mbsf). G. *Acarinina* sp. (34R-3, 54–57 cm; 600.96 mbsf). H. *Morozovella* sp. (34R-3, 54–57 cm; 600.96 mbsf).

Figure F19. Typical and marker calcareous nannoplankton, Hole M0077A. All images taken at 1000 \times on a polarization light microscope. A. *Discoaster sublodoensis*, marker for base of Zone CP12 (Eocene mud). B. *Discoaster lodoensis*, marker for base of Zone CP10 (13R-3, 73–74 cm; 536.96 mbsf). C. 5-rayed *D. lodoensis* (9R-2, 15–17.5 cm; 523.02 mbsf). D. *Discoaster barbadiensis* (13R-3, 73–74 cm; 536.96 mbsf). E. *Nannotetra* sp. (10R-2, 93–94 cm; 527.07 mbsf). F. *Tribrachiatus orthostylus* (11R-1, 100–102.5 cm; 528.69 mbsf). G. *Toweius crassus*, marker for base of Zone CP11 (11R-1, 100–102.5 cm; 528.69 mbsf). H. *Discoaster multiradiatus*, marker for base of Zone CP8 (37R-1, 6–7 cm; 607.08 mbsf). I. *Fasciculithus tympaniformis*, marker for base of Zone CP4 (37R-1, 11–13 cm; 607.13 mbsf). J. *Helolithus kleinpellii*, marker for base of Zone CP5 (37R-1, 35–37 cm; 607.37 mbsf). K. *Braarudosphaera bigelowii* acme below late Paleocene hardground (38R-1, 60–62 cm; 610.74 mbsf). L. *Chiasmolithus danicus*, marker for base of Zone CP2 (38R-2, 90–92 cm; 612.50 mbsf). M. *Prinsius tenuiculus coccosphe* (38R-2, 140–142 cm; 613.00 mbsf). N. Early nannoplankton recovery assemblage containing *B. bigelowii* and *Thoracosphaera* sp. (39R-2, 46–49 cm; 615.02 mbsf). O. *B. bigelowii* above K-Pg boundary (40R-1, 10–11 cm; 616.34 mbsf). P. Reworked Cretaceous *Watznaueria barnesiae* in Subunit 1G (40R-1, 97–98 cm; 612.21 mbsf).

Figure F20. Abundance counts of specimens observed in thin section.

Figure F21. Biostratigraphic zones and unconformities, Sections 364-M0077A-36R-3 through 37R-1.

Figure F22. Biostratigraphic zones and major paleoecologic events encompassing the base of the post-impact sedimentary section and the uppermost part of the impact-related sediments, Hole M0077A. A. *Thoracosphaera* spp. acme event (39R-3, 41–44 cm; 616.18 mbsf). B. LO of *Parvularugoglobigerina eugubina* (40R-1, 32–33 cm; 616.56 mbsf). C. Reworked Cretaceous foraminifers (40R-1, 97–98 cm; 617.21 mbsf). D. Reworked Cretaceous nannoplankton (40R-1, 97–98 cm; 617.21 mbsf).

Figure F23. Magnetostratigraphic plots, Hole M0077A. A. Stratigraphic column. B. Intensity. C. Inclination. D. Magnetic susceptibility. E. Polarity. MSCL magnetic susceptibility values were measured within 1 cm of corresponding paleomagnetic sample plugs. Polarity: black = normal, white = reversed, gray = uncertain.

Figure F24. AF demagnetization, Hole M0077A. A. 11R-1, 100.0–102.5 cm. B. 34R-2, 44.0–46.5 cm.

Figure F25. Biostratigraphic datums and linear sedimentation rate, Cores 364-M0077A-1R through 40R.

Figure F26. MAR for the Eocene interval calculated at a 500 ky time interval, Hole M0077A. Maximum and minimum rates are based on the stratigraphic uncertainty of datum depths.

Figure F27. Organic carbon MAR for the Eocene interval calculated at a 500 ky time interval, Hole M0077A. Maximum and minimum rates are based on the stratigraphic uncertainty of datum depths.

Figure F28. Bulk carbonate MAR for the Eocene interval calculated at a 500 ky time interval, Hole M0077A. Maximum and minimum rates are based on the stratigraphic uncertainty of datum depths.

Figure F29. Major element compositions, Sections 364-M0077A-3R-1 through 39R-2 (506.12–615.77 mbsf).

Figure F30. C_{carb} and CaO contents, Sections 364-M0077A-3R-1 through 39R-2 (506.12–615.77 mbsf). Line with a slope of 0.21 = stoichiometric line of CaCO₃.

Figure F31. Carbon and sulfur contents, Sections 364-M0077A-3R-1 through 39R-2 (506.12–615.77 mbsf).

Figure F32. Trace element compositions, Sections 364-M0077A-3R-1 through 39R-2 (506.12–615.77 mbsf).

Figure F33. Selected trace metals and organic carbon contents, Sections 364-M0077A-3R-1 through 39R-2 (506.12–615.77 mbsf).

Figure F34. Zn, Pb, Ni, S, Fe, and Ca concentrations, Section 364-M0077A-40R-1 (616.24–616.67 mbsf).

Figure F35. Ti, Sr, Ba, and Mn concentrations, Section 364-M0077A-40R-1 (616.24–616.67 mbsf).

Figure F36. Zr, Rb, Br, Al, Si, and K concentrations, Section 364-M0077A-40R-1 (616.24–616.67 mbsf).

Figure F37. μ X-ray intensity maps, Section 364-M0077A-40R-1 (Subsection 1; 616.54–616.60 mbsf).

Figure F38. μ X-ray intensity maps, Section 364-M0077A-40R-1 (Subsection 1; 616.54–616.60 mbsf).

Figure F39. μ X-ray intensity maps, Section 364-M0077A-40R-1 (Subsection 2; ~617.00–617.08 mbsf).

Figure F40. μ X-ray intensity maps, Section 364-M0077A-40R-1 (Subsection 3; 617.27–617.36 mbsf).

Figure F41. μ X-ray intensity maps, Section 364-M0077A-40R-1 (Subsection 4; 617.44–617.54 mbsf).

Figure F42. Bulk mineralogy, Hole M0077A, 505.7–620 mbsf. Other minerals = those occurring at <15%.

Figure F43. P-wave velocity, porosity, density, thermal conductivity, and resistivity from discrete core samples and downhole measurements, Hole M0077A. mbsf = discrete samples and MSCL, WSF = downhole logs. Yellow curves = downhole measurements of sonic velocity and conductivity converted to resistivity.

Figure F44. Magnetic susceptibility, NGR, and L*, a*, and b* from discrete core samples and downhole measurements, Hole M0077A. mbsf = discrete samples and MSCL, WSF = downhole logs. cps = MSCL values, API = down-hole measurements.

Figure F45. Wireline downhole log data, Hole M0077A. Res from IL = resistivity from induction, IL = conductivity, V_p = P-wave velocity, MSUS = magnetic susceptibility, GR = total gamma ray, T°(fluid) = borehole fluid temperature, Cond(fluid) = conductivity, Magn.Field = local magnetic field, ABI TT = traveltime acoustic image, ACCAL-max = maximum acoustic borehole diameter, ABI TT cross section = traveltime cross section of the borehole. See Downhole logging in the Expedition 364 methods chapter (Gulick et al., 2017) for tool descriptions.

Figure F46. Core-log integration data between downhole logging amplitude ABIs (ABI amplitude) and core line-scan images, Hole M077A. Core images should be shifted downward by as much as 0.21 to align them with the wire-line data.

Figure F47. VSP, Hole M0077A. A. Vertical component data recorded at receiver depths between 500.0 and 620.0 m WSF. Noisy traces were removed. Data are stacked and plotted with an automatic gain control. A top mute was applied to remove noise prior to the first breaks. T = possible

tube waves. B. One-way traveltimes for first-break picks. C. Differential P-wave velocity.

Figure F48. VSP, Hole M0077A. Horizontal component data recorded at receiver depths between 500.0 and 620.0 m WSF. A. Radial component. B. Azimuthal component. Noisy traces were removed. Data are stacked and plotted with an automatic gain control. A top mute was applied to remove noise prior to the first breaks.