U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

GEOLOGIC INVESTIGATIONS SERIES
MAP I-2621 (SHEET 2 OF 3)
Pamphlet accompanies map

Table 1. Foraminifera recovered from the Port Angeles Oil and Gas Co. Sutter No. 1, SE 1/4, Sec. 15, T. 30 N., R. 5 W., Clallam County, Washington

[R, rare; F, few; C, common; ?, questionable identification;]

Depth in feet: 180'-210', 270'-300', 330'-360', 420'-450', 510'-540', 660'-690', 810'-840', 990'-1,020', 1,050'-1,170', 1,230'-1,320', 1,380'-1,470', 1,530'-1,650', 1,710'-1,890', 1,950'-2,040', 2,100'-2,220', 2,250'-2,370', 2,430'-2,520', 2,910'-3,000', 3,140'-3,240', 3,300'-3,400', 3,460'-3,560', 3,620'-3,800', 3,860'-3,960', 4,020'-4,120', 4,180'-4,280', 4,420'-4,520', 4,580'-4,680', 4,740'-4,760', 4,900'-5,000', 5,060'-5,180', 5,240'-5,260', 5,400'-5,560', 5,620'-5,720', 5,860'-5,880', 6,020'-6,120', 6,200'-6,220'

Occurrence entries not transcribed.

TAXA
Gyroidina orbicularis planata Cushman
Eponides cf. *E. duprei* Cushman and Schenck
Lenticulina spp. (nondiagnostic)
Eponides umbonatus (Reuss)
Cassidulina crassipunctata Cushman and Hobson
Guttulina frankei Cushman and Ozawa
Globigerina spp.
Anomalina californiensis Cushman and Hobson
Bulimina alsatica Cushman and Parker
Pyrgo lupheri Rau
Lagena cf. *L. substriata* Williamson
Arenaceous spp. (nondiagnostic)
Bulimina ovata d'Orbigny
Stilostomella cf. *S. adolphina* (d'Orbigny)
Epistomina eocenica Cushman and MA Hanna
Chilostomella oolina Schwager
Dentalina spp. (non diagnostic)
Melonis pompilioides (Fichtel and Moll)
Valvulineria menloensis Rau
Quinqueloculina weaveri Rau
Quinqueloculina imperialis Hanna and Hanna
Cibicides elmaensis Rau var. A
Sigmomorphina pseudoschencki Rau
Lagena sp. (costae on base only)
Anomalina glabrata Cushman
Spiroloculina texana Cushman and Ellisor
Florilus incisum (Cushman)
Bolivina cf. *B. jacksonensis* Cushman and Applin
Entosolenia sp.
Marginulina subbullata Hantken
Buccella mansfieldi oregonensis (Cushman, Stewart and Stewart)
Pullenia salisburyi Stewart and Stewart
Gaudryina alazanensis Cushman
Karreriella washingtonensis Rau
Plectofrondicularia cf. *P. packardi* Cushman and Schenck
Sphaeroidina variabilis Reuss
Guttulina irregularis d'Orbigny
Guttulina hantkeni Cushman and Ozawa
Cassidulinoides sp.
Dentalina cf. *D. quadrulata* Cushman and Laiming
Eponides duprei ciervoensis Cushman and Simonson
Globocassidulina globosa (Hantken)
Globorotalia insolita Jenkins
Pseudoglandulina aff. *P. inflata* (Bornemann) (elongate)
Pullenia cf. *P. bulloides* (d'Orbigny)
Alabamina wilcoxensis californica Mallory
Cassidulina galvinensis Cushman and Frizzell
Virgulina sp.
Uvigerina garzaensis Cushman and Siegfus
Lenticulina cf. *L. limbosus hockleyensis* (Cushman and Applin)
Valvulineria jacksonensis welcomensis Mallory
Uvigerina cocoaensis Cushman
Cassidulina subglobosa Brady
Cibicides cf. *C. pseudoungerianus evolutus* Cushman & Hobson
Eponides yeguaensis Weinzierl and Applin
Stilostomella frizzelli Rau
Guttulina problema d'Orbigny
Bulimina schencki Beck
Ceratobulimina washburnei Cushman and Schenck
Plectofrondicularia packardi multilineata Cushman & Simonson
Planularia cf. *P. markleyana* Church
? *Elphidium* cf. *E. minutum* Cushman
Cornuspira byramensis Cushman
Dentalina dusenburyi Beck
Vaginulinopsis saundersi (Hanna and Hanna)
Eponides kleinpelli Cushman and Frizzell

Stage	lower ZEMORRIAN	REFUGIAN
Age	OLIGOCENE	late EOCENE
Paleobathymetry	upper to lower bathyal	upper bathyal to neritic
	Twin River Group (undifferentiated)	

Table 2. Foraminifera recovered from the Standard Oil Company of California Engstrom Community No. 1, SE 1/4, sec. 17, T. 30 N., R. 2 E., Island County, Washington

[R, rare; F, few; C, Common; ?, questionable identification; *, potentially significant stratigraphically;]

Depth in feet: 3,260'-3,280', 3,400'-3,460', 3,460'-3,500', 3,500'-3,600', 3,660'-3,700', 3,740'-3,760', 3,780'-3,800', 4,040'-4,100', 4,100'-4,180', 4,500'-4,600', 4,700'-4,760', 4,700'-4,800', 4,860'-4,920', 5,300'-5,400', 5,500'-6,000', 5,600'-5,300', 6,240'-6,300', 6,340'-6,400', 6,760'-6,780', 6,840'-6,860', 6,900'-6,940', 7,100'-7,160', 7,180'-7,200', 7,200'-7,260', 7,260'-7,300', 7,300'-7,360'

Occurrence entries not transcribed.

TAXA
Valvulineria menloensis Rau
Gyroidina orbicularis planata Cushman
Buccella mansfieldi oregonensis (Cushman, Stewart and Stewart)
Cassidulina crassipunctata Cushman and Hobson
Guttulina frankei Cushman and Ozawa
Guttulina irregularis d'Orbigny
Florilus sp. (cf. incisum)
Lenticulina spp.
Anomalina californiensis Cushman and Hobson (large; cf. A. pomp))
Quinqueloculina imperialis Hanna and Hanna
Cibicides elmaensis Rau
Globigerina spp
Pseudoglandulina inflata (Bornemann)
?*Lagena* sp.
?*Buliminella* sp.
Pyrgo spp.
Anomalina cf. *A. glabrata* Cushman
Pseudoglandulina aff. *P. inflata* (Bornemann)
Dentalina sp.
Quinqueloculina weaveri Rau
**Sigmomorphina schencki* Cushman and Ozawa
Cassidulina galvinensis Cushman and Frizzell
Bolivina sp. (small)
Stilostomella frizzelli (Rau)
Guttulina hantkeni Cushman and Ozawa
**Valvulineria willapaensis* Rau
Gyroidina soldanii d'Orbigny
Pyrgo lupheri Rau
?*Stilostomella* sp. (smooth, small)
Guttulina problema d'Orbigny
Eponides umbonatus (Reuss)
?*Praeglobobulimina* sp.
Melonis pompilioides (Fichtel and Moll)
**Ceratobulimina washburnei* Cushman and Schenck
Stilostomella sanctaecrucis (Kleinpell)

Stage	ZEMORRIAN	REFUGIAN
Age	OLIGOCENE	late EOCENE
Paleobathymetry	upper bathyal	upper-middle to upper bathyal
	rocks of Bulson Creek	

Table 3. Foraminifera recovered from the Standard Oil Company of California Silvana - Community No. 12-1, SE 1/4, sec. 12, T. 31 N., R. 5 E., Snohomish County, Washington [X reportedly present]

TAXA*	2,082'-2,096'	6,762'-6,781'
Buccella mansfieldi oregonensis (Cushman, Stewart and Stewart)	X	
Gyroidina soldanii d'Orbigny	X	
Quinqueloculina weaveri Rau	X	
Nodosaria sp.	X	
Cibicides pseudoungerianus evolutus Cushman and Hobson		X
Guttulina frankei Cushman and Ozawa		X
Guttulina irregularis d'Orbigny		X
Melonis pompilioides (Fichtel and Moll)		X
Sigmomorphina schencki Cushman and Ozawa		X
Stage	ZEMORRIAN	REFUGIAN
Age	OLIGOCENE	late EOCENE
Paleobathymetry	nonmarine to inner neritic	upper bathyal
	rocks of Bulson Creek	

*The above list of species was reportedly encountered. No fauna is available for actual examination.

Table 4. Foraminifera recovered from the Standard Oil Company of California, Socal - Whidbey #1, NE 1/4, sec. 27, T. 29 N., R. 3 E., Island County, Washington

[R, rare; F, few; C, Common; ?, questionable identification; *,potentially significant stratigraphically; SW = sidewall core]

Depth in feet: 900', 1,000', 1,200', 1,400', 1,600', 1,800', 2,000', 2,200', 2,400', 2,600', 2,800', 3,000', 3,120', 3,140', 3,300', 3,500', 3,600', 3,700', 3,800', 3,900', 4,000', 4,100', 4,160', 4,200', 4,260', 4,300', 4,340', 4,400', 4,600', 4,698' SW, 4,800', 4,900', 5,040', 5,060', 5,080', 5,248' SW, 5,300', 5,400', 5,600', 5,700', 5,900', 5,960', 6,000', 6,020', 6,024' SW, 6,080', 6,400'

Occurrence entries not transcribed.

TAXA
Buccella mansfieldi oregonensis (Cushman, Stewart and Stewart)
Cassidulina crassipunctata (Cushman and Hobson)
Pseudoglandulina aff. *P. inflata* (Bornemann)
Anomalina californiensis Cushman and Hobson
Cibicides elmaensis var. Rau
Anomalina cf. *A. glabrata* Cushman
Gyroidina orbicularis d'Orbigny
Sphaeroidina variabilis Reuss
Gaudryina alazanensis Cushman
Cibicides elmaensis Rau
?*Vaginulinopsis* sp. (small)
Quinqueloculina spp.
Melonis pompilioides (Fichtel and Moll)
**Uvigerinella obesa impolita* Cushman and Laiming
Cassidulina sp. (semi glob.)
Guttulina frankei Cushman and Ozawa
Fissurina sp.
Florilus incisum (Cushman)
Buliminella subfusiformis Cushman
Globigerina spp.
Quinqueloculina weaveri Rau
**Cassidulinoides* sp.
Pyrgo lupheri Rau
**Bolivina marginata adelaidana* Cushman and Kleinpell
Uvigerina garzaensis Cushman and Siegfus
Polymorphina sp.
Allomorphina sp.
Oolina sp.
Lenticulina spp.(mostly cf.*L. inornatus*)
Epistomina eocenica Cushman and Hanna
Guttulina irregularis d'Orbigny
**Cassidulina galvinensis* Cushman and Frizzell
Sigmomorphina undulata Rau
Sigmomorphina pseudoschencki Rau (may be *schencki* in part)
Karreriella washingtonensis Rau
?*Nodosaria* sp. (three chmbrs, striate)
Stilostomella frizzelli (Rau)
?*Dentalina* sp. b. Rau (elongate chmbrs, costate)
Eponides duprei Cushman and Schenck
Globobulimina sp.
Dentalina spp.
Uvigerina cf. *U. gallowayi* Cushman
Quinqueloculina imperialis Hanna and Hanna
Guttulina problema d'Orbigny
Pseudoglandulina aff. *P. inflata* (Bornemann)
Globocassidulina globosa (Hantken)
Plectofrondicularia sp
Pullenia cf. *P. bulloides* (d'Orbigny)
?*Saracenaria* sp.
**Ceratobulimina washburnei* Cushman and Schenck
Elphidium cf. *E. minutum* Cushman
**Valvulineria willapaensis* Rau
Chilostomella cf. *C. oolina* Schwager
**Melonis halkyardi* (Cushman)
Dentalina consobrina d'Orbigny
Martinottiella nodulosa (Cushman)
Dentalina sp. b. Rau
Pseudoglandulina hamilli (Kleinpell)
Eponides cf. *E. kleinpelli* Cushman and Frizzell
?*Spiroplectammina* sp. (wide, thin)
* *Vaginulinopsis vacavillensis* (GD Hanna)
Spiroplectammina cf. *S. tejonensis* Mallory
**Tritaxilina colei* Cushman and Siegfus
Nodosaria latejugata Gumbel
Pseudoglandulina cf. *P. conica* (Neugeboren)
Anomalina garzaensis Cushman and Siegfus
**Cibicides venezuelana* Nuttall
Globigerina cf. *G. linaperta* Finlay
**Globigerina* cf. *B. primitiva* (Finlay)
Lenticulina cf. *L. pseudovortex* Cole
**Globorotalia aragonensis* Nuttall
Karreriella elongata Mallory

Stage	upper ZEMORRIAN	lower ZEMORRIAN	REFUGIAN	lower ULATISIAN and PENUTIAN
Age	OLIGOCENE		late EOCENE	early and middle EOCENE
Paleobathymetry	upper to upper middle bathyal			upper bathyal
	Blakeley Formation			equivalent to Crescent Formation and sandstone of Scow Bay

Table 5. Foraminifera recovered from the Standard Oil Company of California Alderwood No. 1, NE 1/4, sec. 35, T. 28 N., R. 4 E., Snohomish County, Washington

[X, Reportedly present; *potentially significant stratigraphically]

TAXA	360'-880'	880'-3,289'	3,289'-5,220'	5,220'-5,249'	7,205'-7,228'	10,257'-10,395'
Sphaeroidina variabilis Reuss	X					
Pseudoglandulina inflata (Bornemann)	X					
**Anomalina californiensis* Cushman and Hobson	X					
Karreriella washingtonensis Rau	X					
Cibicides elmaensis Rau	X					
Guttulina problema d'Orbigny	X					
Lenticulina brevispinosa (Nuttall)	X					
Uvigerina garzaensis Cushman and Siegfus	X	X				
Uvigerina cf. *U. gallowayi* Cushman	X					
Marginulina subbullata Hantken	X					
**Sigmomorphina schencki* Cushman and Ozawa		X				
Cibicides baileyi Beck		X				
Eggerella bradyi (Cushman)		X				
Gaudryina alazanensis Cushman		X				
Bulimina pupoides d'Orbigny		X				
Bulimina alsatica Cushman and Parker		X				
Lenticulina chehalisensis (Rau)		X				
**Valvulineria willapaensis* Rau			X			
**Melonis halkyardi* (Cushman)			X			
**Vaginulinopsis mexicana* (Cushman) (var. C?)				X		
Nodosaria latejugata Gumbel				X		
Elphidium californicum Cook				X	X	
Eponides aff. *E. mexicanus* (Cushman)				X		
Quinqueloculina sp. (large)					X	
Lenticulina cf. *L. inornatus* (d'Orbigny)						X
Cibicides cf. *C. venezuelanus* Nuttall						X
Globobulimina sp.						X
Ostracoda spp.					X	

Stage	ZEMORRIAN	REFUGIAN	ULATISIAN			
Age	OLIGOCENE	late EOCENE	early and middle EOCENE			
Paleobathymetry	middle bathyal?		neritic	inner neritic	neritic undif.	
	Blakeley Formation		sandstone of Scow Bay			

This informal listing of taxa is from sketchy notes on faunas reportedly encountered in this well, thus, biostratigraphic and paleoecologic conclusions are accordingly very broad and somewhat tentative.

Table 6. Foraminifera recovered from the Mobil Oil Corporation Kingston No. 1, NE 1/4, sec. 26, T. 27 N., R. 2 E., Kitsap County, Washington

[R, rare; F, few; C, Common; ?, questionable identification; *, potentially significant stratigraphically]

Occurrence entries not transcribed.

Stage	REFUGIAN	sensitive NARIZIAN?	ULATISIAN	PENUTIAN (and possibly older)
Age	OLIGOCENE to late EOCENE		middle EOCENE	early and middle EOCENE
Paleobathymetry	upper bathyal	middle bathyal	undifferentiated bathyal	middle bathyal
	Blakeley Formation	undifferentiated	sandstone of Scow Bay	Crescent Formation

Table 7. Foraminifera recovered from the Standard Oil Company of California Socal - Schroeder No. 1, SW 1/4, sec. 26, T. 27 N., R. 4 E., Snohomish County, Washington

[R, rare; F, few; C, Common; ?, questionable identification; *,potentially significant stratigraphically]

Depth in feet: 680'-720', 740'-780', 1,100'-1,140', 1,160'-1,200', 1,200'-1,260', 1,280'-1,320', 1,340'-1,380', 1,400'-1,440', 1,640'-1,680', 1,700'-1,740', 1,760'-1,800', 1,820'-1,860', 2,120'-2,160', 3,260'-3,300', 3,320'-3,360', 3,380'-3,420', 3,460'-3,500', 3,520'-3,560', 3,580'-3,620', 3,700'-3,740', 3,760'-3,800', 3,820'-3,860', 3,880'-3,926', 5,140'-5,180', 5,560'-5,600', 5,620'-5,660'

Occurrence entries not transcribed.

TAXA
**Bolivina marginata adelaidana* Cushman and Kleinpell
Gyroidina orbicularis planata Cushman
Cassidulina cf. *C. galvinensis* Cushman and Parker
Florilus sp.
Buliminella bassendorfensis Cushman and Frizzell
Cassidulina sp. (smooth, keel)
Valvulineria menloensis Rau
Quinqueloculina imperialis Hanna and Hanna
Quinqueloculina weaveri Rau
Nodogenerina sanctaecrucis Kleinpell
Pseudoglandulina inflata (Bornemann)
Melonis pompilioides (Fichtel and Moll)
Cibicides cf. *C. elmaensis* var. A Rau
Anomalina cf. *A. glabrata* Cushman
Dentalina quadrulata Cushman and Laiming
Fursenkoina (*virgulina*) sp.
Lenticulina sp.
Sphaeroidina variabilis Reuss
Globigerina sp.
Cibicides elmaensis Rau
Lagena spp.
Guttulina cf. *G. problema* d'Orbigny
Dentalina spp.
Anomalina californiensis Cushman and Hobson
Guttulina frankei Cushman and Ozawa
Guttulina irregularis d'Orbigny
**Epistomina eocenica* Cushman and MA Hanna
Bolivina cf. *B. advena* Cushman
Globobulimina sp.
Siphogenerina nodifera Cushman and Kleinpell
Uvigerina garzaensis Cushman and Siegfus
Bulimina cf. *B. alligata* Cushman and Laiming
Stilostomella frizzelli (Rau)
Fissurina sp
Lenticulina cf. *L. warmani* Barbat and von Estorff
Elphidium californicum Smith
Bucella mansfieldi oregonensis (Cushman, Stewart and Stewart)
**Valvulineria willapaensis* Rau
Cassidulina sp.
**Melonis halkyardi* (Cushman)
Eponides kleinpelli Cushman and Frizzell
**Ceratobulimina washburnei* Cushman and Schenck
Sigmomorphina undulata Rau
Sigmomorphina schencki Cushman and Ozawa
Gyroidina cf. *G. condoni* (Cushman and Schenck)
Pseudoglandulina sp. (elongate)
Lenticulina sp. (large)
Anomalina sp. (flat)

Stage	ZEMORRIAN	REFUGIAN
Age	OLIGOCENE	late EOCENE
Paleobathymetry	upper bathyal	neritic, shallow marine, nonmarine
	Blakeley Formation	Renton Formation?

Table 8. Foraminifera recovered from the Amoco Production Company No. WC-83-14, SE 1/4 sec. 14, T. 23 N., R. 7 E., King County, Washington

X = reportedly present

TAXA	1255-1263 ft	1693-1700 ft
Dentalina spp.	X	
Gyroidina sp.	X	
Quinqueloculina cf. *Q. triangularis* d'Orbigny	X	
Amphimorphina cf. *A. californica* Cushman and McMasters	X	
?*Pseudoglandulina* sp.	X	
Plectofrondicularia packardi packardi Cushman and Schenck		X
Pseudoglandulina cf. *P. pyrula* (d'Orbigny)		X
Dentalina sp.		X
Stage	NARIZIAN	
Age	middle EOCENE	
Paleobathymetry	upper to middle bathyal	bathyal or neritic
	Raging River Formation	

Table 9. Foraminifera recovered from the Union Oil Company of California Wilson Creek No. 1, NE 1/4, sec. 20, T. 14 N., R. 7 W., Pacific County, Washington

[R, rare; F, few; C, common; ?, questionable identification, *, potentially significant stratigraphically;]

Depth in feet: 130'-160', 220'-250', 300'-330', 490'-520', 580'-610', 700'-730', 790'-820', 880'-910', 1000'-1030', 1100'-1130', 1190'-1220', 1380'-1410', 1590'-1620', 1790'-1820', 1990'-2010', 2200'-2230', 2410'-2440', 2600'-2630', 2780'-2810', 2870'-2900', 2960'-2990', 2990'-3020', 3080'-3110', 3200'-3230', 3290'-3320', 3390'-3420', 3490'-3520', 3580'-3610', 3740'-3770', 3800'-3830', 3880'-3910', 4000'-4030', 4090'-4120', 4180'-4210', 4240'-4300', 4350'-4410', 4500'-4530', 4590'-4620', 4625'-4715', 4840'-4870', 4930'-4970'

Occurrence entries not transcribed.

TAXA
Baggina washingtonensis Rau
Uvigerina californica Cushman
Valvulineria menloensis Rau
Florilus incisum kernensis (Kleinpell)
Bolivina chehalisensis Rau
Epistominella pacifica (Cushman)
Cibicides elmaensis var. A. Rau
Buccella mansfieldi orugonensis (Cushman, RE & KC Stewart)
Quinqueloculina sp. (elongata)
Lenticulina spp.
Florilus costiferum (Cushman)
Buliminella subfusiformis Cushman
Buliminella eligantissima (d'Orbigny)
Globigerina spp.
Nonionella miocenica Cushman
Praeglobobulimina cf. *P. ovula* (d'Orbigny)
Cassidulina cf. *C. translusens* Cushman and Hughes
Elphidium cf. *E. tumidum* Natland
Entosolenia sp.
Cassidulina cf. *C. quadrata* Cushman and Hughes
Uvigerina aubeiana d'Orbigny
Valvulineria araucana (d'Orbigny)
Siphogenerina Kleinpelli Cushman
Sigmomorphina sp.
Lenticulina mayi (Cushman and Parker)
Epistominella parva (Cushman and Laiming)
Virgulina bramlettei Galloway and Morrey
Lagena spp.
Uvigerinella obesa impolita Cushman and Laiming
Bolivina marginata adelaidana Cushman and Kleinpell
Cassidulina cf. *C. californica* Cushman and Hughes
Valvulineria cf. *V. williami* Kleinpell
Ellipsonodosaria ? spp.
Allomorphina sp.
Melonis pompilioides (Fichtel and Moll)
Planulina astoriensis Cushman, R.E. and K.C. Stewart
Plectofrondicularia cf. *P. miocenica* Cushman
Dentalina quadulata Cushman and Laiming
Eponides umbonatus (Reuss)
Lenticulina brevispinosus (Nuttal)
Cassidulina cf. *C. subglobosa* Brady
Gyroidina soldanii d'Orbigny
Pseudoglandulina inflata (Borneman)
Silicosigmoilina sp.
Cassidulina crassipunctata Cushman and Hobson
Cibicides elmaensis Rau
Nodosaria cf. *N. hamilli* Kleinpell
Pyrgo sp.
Sphaeroidina bulloides d'Orbigny

Zones (of Rau, 1981)	*Baggina washingtonensis*	*Siphogenerina kleinpelli*	"upper Zemorrian"
Stage	Relizian	Saucesian	Zemorrian
Age	middle MIOCENE	early MIOCENE	OLIGOCENE
Paleobathymetry	upper bathyal	upper to upper middle bathyal	lower-middle to lower bathyal
Formation	Astoria (?) Formation		Lincoln Creek Formation

Table 10. Foraminifera recovered from the El Paso Products Company Montesano No. 1-X, NW 1/4, sec. 13, T. 17 N., R. 8 W., Grays Harbor County, Washington

[R, rare; F, few; C, Common; ?, questionable identification]

Depth in feet: 240'-260', 260'-320', 330'-340', 470'-550', 550'-600', 600'-650', 750'-850', 850'-900', 900'-950', 970'-1020', 1060'-1100', 1140'-1200', 1200'-1290', 1400'-1480', 1700'-1800', 1900'-2000', 2000'-2060', 2160'-2230', 2320'-2410', 2430'-2495', 2530'-2620', 2770'-2860', 2950'-3040', 3130'-3220', 3340'-3430', 3520'-3610', 3610'-3670', 3760'-3820', 3850'-3910', 3940'-4000', 4000'-4060', 4150'-4200', 4270'-4290', 4300'-4360', 4360'-4420', 4450'-4500', 4500'-4560', 4560'-4600', 4600'-4660', 4720'-4780', 4800'-4860', 4900'-4940', 4940'-5000', 5000'-5100', 5100'-5200', 5200'-5300', 5300'-5400', 5400'-5500', 5500'-5600', 5600'-5700', 5720'-5760', 5800'-5900', 5900'-6000', 6000'-6100', 6100'-6200', 6200'-6300', 6300'-6400', 6400'-6500', 6500'-6600', 6600'-6700', 6700'-6800', 6800'-6900', 6900'-6924'

Occurrence entries not transcribed.

TAXA (from cuttings)
Siphogenerina Kleinpelli Cushman
Florilus costiferum (Cushman)
Lenticulina inornatus d'Orbigny
Buliminella subfusiformis Cushman
Valvulineria araucana (d'Orbigny)
Cassidulina crassipunctata Cushman and Hobson
Epistominella cf. *E. parva* (Cushman and Laiming)
Dentalina spp.
Buccella mansfieldi oregonensis (Cushman and R.E. and K.C. Stewart)
Uvigerinella californica Cushman
Bolivina cf. *B. advena* Cushman
Bolivina marginata Cushman
Nonion pompilioides (Fichtel and Moll)
Quinqueloculina sp.
Gaudryina cf. *G. alazanensis* Cushman
Cibicides elmaensis Rau
Bulimina alligata Cushman and Laiming
Cibicides cf. *C. elmaensis var.* A. Rau
Plectofrondicularia spp.
Spiroplectammina sp.
Nonionella cf. *N. miocenica* Cushman
Eponides umbonatus (Reuss)
Praeglobobulimina cf. *P. ovula* (d'Orbigny)
Sphaeroidina bulloides d'Orbigny
Cyclammina spp.
Haplophragmoides spp.
Globigerina spp.
Uvigerinella obesa impolita Cushman and Laiming
Uvigerina auberiana d'Orbigny
Plectofrondicularia californica Cushman and Stewart
Fissurina sp.
Uvigerina gallowayi Cushman
Spirosigmoilinella? sp.
Pyrgo lupheri Rau
Cibicides elmaensis var. A Rau
Angulogerina sp.
Anomalina californiensis Cushman and Hobson
Lagena hexagona (Williamson)
Quinqueloculina cf. *Q. weaveri* Rau
Eponides healdi R.E. and K.C. Stewart
Dentalina quadrulata Cushman and Hobson
Plectofrondicularia vaughani Cushman
Globobulimina cf. *G. pacifica* Cushman
Gyroidina orbicularis planata Cushman
Stilostomella cf. *S. sanctaecrucis* Kleinpell
Martinottiella communis (d'Orbigny)
Nodosaria longiscata (d'Orbigny)
Pseudoglandulina inflata (Bornemann)
Pullenia bulloides (d'Orbigny)
Cassidulina cf. *C. subglobosa* Brady
Guttulina irregularis d'Orbigny
Valvulineria menloensis Rau
Stilostomella cf. *S. cocoaensis* (Cushman)
Florilis cf. *F. incisum* (Cushman)
Cassidulinoides sp.
Lagena cf. *L. conscripta* Cushman and Barksdale
Vaginulinopsis sp.
Karreriella washingtonensis Rau
Gaudryina alazanensis Cushman
Bulimina cf. B. alazanensis Cushman
Siphogenerina nodifera Cushman and Kleinpell
Plectofrondicularia packardi multilineata Cushman and Simonson
Elphidium cf. *E. minutum* Cushman
Cibicides cf. *C. pseudoungerianus* Cushman and Hobson
Elphidium sp.
Globocassidulina globosa (Hantken)
Quinqueloculina weaveri Rau
Lagena cf. *L. vulgaris* Williamson
Lagena substriata Williamson
Anomalina glabrata Cushman
Lagena costata Williamson
Lagena cf. *L. becki* Sullivan
Hoeglundina eocenica (Cushman and Hanna)
Stilostomella adolphina (d'Orbigny)
Sigmomorphina sp.
Pseudoglandulina aff. *P. inflata* (Bornemann)
Cassidulina galvinensis Cushman and Frizzell
Eponides duprei Cushman and Schenck
Lenticulina cf. *L. calcar* (Linne)
Marginulina cf. *M. subbullata* Hantken
Sigmoilina tenuis (Czjzek)
Pullenia cf. *P. salisburyi* R.E. and K.C. Stewart
Vaginulinopsis saundersi (Hanna and Hanna)
Spiroloculina sp.
Cyclogyra byramensis (Cushman)
Quinqueloculina imperialis Hanna and Hanna
Uvigerina cocoaensis Cushman
Allomorphina macrostomata Karrer
Chilostomella oolina Schwager
Uvigerina garzaensis Cushman and Siegfus
Planularia cf. *P. crepidula* (Fichtel and Moll)
Lenticulina cf. *L. limbosus hockleyensis* (Cushman and Applin)
Dentalina consobrina d'Orbigny
Stilostomella frizzelli Rau
Alabamina cf. *A. wilcoxensis californica* Mallory
Guttulina hantkeni Cushman and Ozawa
Nonion halkyardi Cushman
Ceratobulimina washburnei Cushman and Schenck
Valvulineria willapaensis Rau
Gyroidina condoni (Cushman and Schenck)
Guttulina problema d'Orbigny
Cibicides hodgei Cushman and Schenck
Globorotalia insolita Jenkins
Karreriella? sp.
Cibicides mcmasteri Beck
**Amphistegina* sp.
Valvulineria aff. *V. willapaensis* Rau
Eponides cf. *E. yeguaensis* Weinzierl and Applin
Bulimina schencki Beck
Angulogerina hannai Beck
Plectofrondicularia packardi packardi Cushman and Schenck
Lenticulina cf. *L. coaledoensis* (Detling)
Bulimina cf. *B. curtissima* Cushman and Siegfus
Cibicides spiropunctatus Galloway and Morrey
Lenticulina welchi (Church)
Stilostomella sp.
Amphimorphina californica Cushman and McMasters
**Silicosigmoilina* sp.
Dentalina spinosa d'Orbigny
Bulimina corrugata Cushman and Siegfus
Bulimina microcostata Cushman and Parker
Spiroloculina cf. *S. lamposa* Hussey
Quinqueloculina minuta Beck
Valvulineria tumeyensis Cushman and Simonson
Bulimina cf. *B. jacksonensis* Cushman
**Vaginulinopsis vocavillensis* (G.D. Hanna)
*Globigerina cf. *G. nitida* Martin
**Nodosaria latejugata* (Gumbel)

*probably reworked

Zone	*Siphogenerina* Kleinpelli	undifferentiated		*Bulimina schencki* - *Plectofrondicularia* cf. *P. jenkinsi*	undifferentiated
Stage	SAUCESIAN	ZEMORRIAN	REFUGIAN	NARIZIAN	
Paleobathymetry	upper to upper-middle bathyal			upper middle bathyal	
	Astoria(?)Formation	Lincoln Creek Formation		Humptulips Formation	

Table 11. Foraminifera recovered from the Ohio Oil Company Berry Robinson No. 1, NW 1/4, sec. 5, T. 17 N., R. 9 W., Grays Harbor County, Washington

[R, rare; F, few; C, Common;, ?, questionable identification]

Depth in feet: 1400'-1416', 1416'-1442', 1442'-1488', 1488'-1528', 1529'-1568', 1568'-1588', 1588'-1608', 1608'-1629', 1641'-1670', 1688'-1724', 1724'-1744', 1782'-1803', 1803'-1835', 1835'-1870', 1870'-1879', 1899'-1935', 1955'-1973', 1973'-2014', 2014'-2058', 2058'-2098', 2098'-2140', 2140'-2182', 2182'-2227', 2227'-2271', 2271'-2312', 2324'-2366', 2366'-2392', 2392'-2436', 2436'-2480', 2480'-2509', 2509'-2543', 2592'-2614', 2614'-2732', 2732'-2768', 2768'-2798', 2798'-2851', 2902'-2941', 2945'-2959', 2986'-3030', 3030'-3074', 3074'-3096', 3123'-3158', 3158'-3187', 3187'-3209', 3366'-3376', 3400'-3442', 3637'-3659', 3813'-3835', 4282'-4302', 4346'-4366', 4480'-4498', 5345'-5361', 5498'-5551'

Occurrence entries not transcribed.

TAXA
Martinottiella communis (d'Orbigny)
Lenticulina inornatus (d'Orbigny)
Hoeglundina eocenica (Cushman and Hanna)
Dentalina (?) sp. (single globular chambers)
Nodosaria longiscata d'Orbigny
Nodosaria cf. *N. pyrula* d'Orbigny
Pseudoglandulina inflata (BornemanN)
Globocassidulina globosa (Hantken)
Uvigerina gallowayi Cushman
Eponides duprei ciervoensis Cushman and Simonson
Epistominella (?) sp.
Bulimina cf. *B. alsatica* Cushman and Parker
Catapsydrax unicavus Bolli, Loeblich and Tappan
Globigerina cf. *G. bulloides* d'Orbigny
Plectofrondicularia packardi multilineata Cushman and Simonson
Bulimina ovata d'Orbigny
Cassidulina crassipunctata Cushman and Hobson
Pyrgo lupheri Rau
Gyroidina orbicularis planata Cushman
Uvigerina garzaensis Cushman and Siegfus
Anomalina californiensis Cushman and Hobson
Cassidulinoides sp.
Gyroidina cf. *G. condoni* (Cushman and Schenck)
Guttulina irregularis d'Orbigny
Dentalina spinosa d'Orbigny
Bulimina cf. *B. alazanensis* Cushman
Sigmomorphina cf. *S. pseudoschencki* Rau
Pullenia bulloides (d'Orbigny)
Globigerina cf. *G. eocena* Gumbel
Stilostomella adolphina (d'Orbigny)
Lagena substriata Williamson
Cibicides pseudoungerianus evolutus Cushman and Hobson
Bolivina jacksonensis Cushman and Applin
Spiroloculina texana Cushman and Ellisor
Quinqueloculina weaveri Rau
Quinqueloculina imperialis Hanna and Hanna
Dentalina pauperata d'Orbigny
Buliminella sp.
Globorotalia cf. *G. insolita* Jenkins
Cyclogyra byramensis (Cushman)
Stilostomella frizzelli (Rau)
Cassidulina galvinensis Cushman and Frizzell
Gaudryina alazanensis Cushman
Marginulina cf. *M. alazanensis* Nuttall
Anomalina cf. *A. glabrata* Cushman
Eponides umbonatus (Reuss)
Pullenia salisburyi R.E. and K.C. Stewart
Entosolenia sp.
Karreriella chilostoma (Reuss)
Dentalina dusenburyi Beck
Dentalina communis (d'Orbigny)
Melonis pompilioides (Fichtel and Moll)
Guttulina frankei Cushman and Ozawa
Cibicides elmaensis Rau
Ceratobulimina washburnei Cushman and Schenck
Lagena sp. (large smooth to faint costa)
Lagena becki Sullivan
Alabamina wilcoxensis californica Mallory
Lenticulina cf. *L. limbosa hockleyensis* (Cushman and Applin)
Vulvulina curta Cushman and Siegfus
Spiroloculina cf. *S. lamposa* Hussey
Eggerella bradyi (Cushman)
Ammodiscus incertus (d'Orbigny)
Uvigerina? sp. (small, narrow)
Cyclammina spp.
Plectofrondicularia vaughani Cushman
Globigerina cf. *G. triloculinoides* Plummer
Sphaeroidina variabilis Reuss
Florilus cf. *F. inflatum* Cushman and Ellisor
Cibicides hodgei Cushman and Schenck
Cancris joaquinensis Smith
Quinqueloculina spp.
Lagena hexagona (Williamson)
Robertina declivis (Reuss)
Dentalina quadrulata Cushman and Laiming
Sigmomorphina schencki Cushman and Ozawa
Glandulina laevigata ovata (Cushman and Applin)
Bulimina? sp. (very small)
Angulogerina hannai Beck
Lenticulina limbosus hockleyensis (Cushman and Applin)
Dentalina delicatula Cushman
Vaginulinopsis saundersi (Hanna and Hanna)
Uvigerina cocoaensis Cushman
Bolivina? sp. (very small, thick)
Bolivina cf. *B. melettica ormoyensis* Cushman
Bolivina cf. *B. alazanensis* Cushman
Bulimina microcostata Cushman and Parker
Bulimina schencki Beck
Pseudopolymorphina? sp.
Sigmoilina cf. *S. tenuis* (Czjzek)
Guttulina problema d'Orbigny
Lagena costata (Williamson)
Lagena cf. *L. semistriata* Williamson
Globulimina pacifica Cushman
Stilostomella cf. *S. wegemanni* (Cole)
Allomorphina macrostomata Karrer
Nodosaria grandis Reuss
Virgulina cf. *V. recta* Cushman
Planulina sp.
Lagena sulcata (Walker and Jacob)
Bulimina sculptilis lacinlata Cushman and Parker
Dentalina sp. (cf. sp. b and Rau 1948)
Gyroidina condoni (Cushman and Schenck)
Plectofrondicularia packardi packardi Cushman and Schenck
Cassidulina subglobosa Brady
Stilostomella cooperensis (Cushman)
Karreriella cf. *K. chilostoma* (Reuss)
Cibicides cf. *C. mcmastersi* Beck
Buliminella? sp. (very small)
Pseudohastigerina micra (Cole)
Plectofrondicularia cf. *P. jenkinsi* Church
Lenticulina welchi (Church)
Lenticulina cf. *L. coaledoensis* (Detling)
Quinqueloculina cf. *Q. minuta* Beck
Valvulineria tumeyensis Cushman and Simonson
Bulimina corrugata Cushman and Siegfus
Uvigerina cf. *U. yazooensis* Cushman
Spiroplectammina sp. (very thin, sutures nearly horizontal)
Stilostomella(?) sp. (small spines each chamber)
Amphimorphina californica Cushman and Mcmasters
Ellipsonodosaria sp. A. of Cushman and Siegfus
Praeglobobulimina cf. *P. pyrula* (d'Orbigny)
Quinqueloculina minuta Beck
Bolivina basisenta Cushman and Stone
Cibicides natlandi Beck
Bolivina cf. *B. alazanensis* Cushman
Marginulina subbullata Hantken
Quinqueloculina cf. *Q. triangularis* d'Orbigny
Planularia tolmani Cushman and Simonson
Bulimina sp. (scattered spines, base of chambers)
Cibicides cf. *C. spiropunctatus* Galloway and Morrey
Tritaxilina colei Cushman and Siegfus
Pleurostomella acuta Hantken
Spiroplectammina directa (Cushman and Siegfus)
Stilostomella aff. *S. sagrinensis* (Bagg)
Uvigerina churchi Cushman and Siegfus
Cibicides cf. *C. ouachitaensis alhambrensis* Smith
Globigerina spp.
Globorotalia cf. *G. pseudotopilensis* (Subbotina)
Dentalina cf. *D. consobrina* d'Orbigny
Pleurostomella cf. *P. nuttalli* Cushman and Siegfus
Amodiscus cf. *A. glabratus* Cushman and Jarvis
Cibicides cf. *C. venezuelanus* Nuttall

Stage	Zemorrian	Refugian	Narizian	Ulatisian
Age	OLIGOCENE		EOCENE	
Paleobathymetry	upper middle bathyal		lower middle bathyal	lower middle to lower bathyal
Formation	Lincoln Creek Formation		Humptulips Formation	Crescent Formation

Table 12. Foraminifera recovered from the Amoco Production Company Amoco-Weyerhaeuser No. 1-29, SW 1/4, sec. 29, T. 19 N., R. 8 W., Grays Harbor County, Washington

[R, rare; F, few; C, Common; ?, questionable identification]

Depth in feet: 170'-175', 310'-340', 370'-400', 520'-550', 580'-610', 670'-760', 760'-850', 1,570'-1,660', 1,660'-1,750', 1,840'-1,930', 2,020'-2,140', 2,200'-2,230', 2,230'-2,260', 2,320'-2,350', 2,470'-2,620', 2,800'-2,830', 2,830'-2,860', 2,860'-2,890', 2,980'-3,010', 3,070'-3,100', 3,160'-3,190', 3,250'-3,280', 3,340'-3,370', 3,430'-3,460', 3,490'-3,580', 3,580'-3,670', 3,670'-3,760', 4,030'-4,120', 4,120'-4,210', 4,210'-4,300', 4,570'-4,660', 4,660'-4,750', 4,930'-5,020', 5,020'-5,110', 5,200'-5,230', 5,350'-5,410', 5,800'-5,860', 9,000'-9,030', 9,030'-9,066', 9,090'-9,150', 9,360'-9,390'

Occurrence entries not transcribed.

TAXA
Cassidulina laevigata d'Orbigny
Epistominella pacifica (Cushman)
Globobulimina sp.
Buliminella curta Cushman
Uvigerina modeloensis Cushman and Kleinpell
Bolivina cf. *B. marginata* Cushman
Globigerina sp.
Virgulina californiensis ticensis (Cushman and Kleinpell)
Karrierella sp.
Pullenia salisburyi Stewart and Stewart
Cibicides mckannai Galloway and Wissler
Quinqueloculina sp.
Nonionella miocenica Cushman
Uvigerina cf. *U. hootsi* Rankin
Cassidulina translucens Cushman and Hughes
Uvigerinella cf. *U. californica* Cushman
Bolivina advena Cushman
Plectofrondicularia californica Cushman and Stewart
Buccella mansfieldi oregonensis (Cushman and R.E. and K.C. Stewart)
Siphogenerina sp. ?
Uvigerina subperegrina Cushman and Kleinpell
Siphogenerina Kleinpelli Cushman
Baggina washingtonensis Rau
Quinqueloculina weaveri Rau
Uvigerinella obesa impolita Cushman and Laiming
Uvigerinella californica ornata Cushman
Bolivina marginata adelaidana Cushman and Kleinpell
Valvulineria araucana (d'Orbigny)
Lenticulina cf. *L. nikobarensis* (Schwager)
Buliminella subfusiformis Cushman
Eponides tenera (H.B. Brady)
Lagena sp.
Planulina cushmani (Barbat and von Estorff)
Florilus costiferum (Cushman)
Globobulimina pacifica Cushman
Sphaeroidina variabilis Reuss
Cibicides aff. *C. perlucida* Nuttall
Anomalina californiensis Cushman and Hobson
Arenaceous spp.
Spiroplectammina sp
Valvulineria cf. *V. menloensis* Rau
Bulimina inflata alligata Cushman and Laiming
Epistominella cf. *E. parva* (Cushman and Laiming)
Cyclammina sp.
Cibicides elmaensis var. *A.* Rau
Guadryina cf *G. alazanensis* Cushman
Fissurina sp.
Lenticulina inornatus d'Orbigny
Quinqueloculina imperialis Hanna and Hanna
Martinottiella sp.
Gyroidina cf. *G. orbicularis planata* Cushman
Uvigerina auberiana d'Orbigny
Pseudoglandulina inflata (Bornemann)
Chilostomella oolina Schwager
Karreriella washingtonensis Rau
Nodosaria longiscata d'Orbigny
Eponides duprei Cushman and Schenck
Uvigerina gallowayi Cushman
Sigmoilina tenuis (Czjzek)
Stilostomella adolfina (d'Orbigny)
Cassidulina galvinensis Cushman and Frizzell
Plectofrondicularia cf. *P.* Vaughani Cushman
Stilostomella cf. *S. santaecrucis* Kleinpell
Uvigerina sp. (long narrow costa)
Bulimina alsatica Cushman and Parker
Eponides umbonatus (Reuss)
Pullenia bulloides (d'Orbigny)
"*Ellipsonodosaria* sp. A" Cushman and Siegfus
Dentalina quadrulata Cushman and Laiming
Gyroidina condoni (Cushman and Schenck)
Karrierella sp
Hoeglundina eocenica (Cushman and Hanna)
Buccella sp.
Spiroloculina lamposa Hussey
Bulimina corrugata Cushman and Siegfus
Vaginulinopsis saundersi (Hanna and Hanna)
Saracenaria schencki Cushman and Hobson
Eponides cf. *E. yeguaensis* Weinzierl and Applin
Melonis pompilioides (Fichtel and Moll)
Cibicides natlandi Beck
Lenticulina welchi (Church)

Zone		*Baggina washingtonensis* *Siphogenerina Kleinpelli* undifferentiated		
Stage	undif. Mohnian-Delmontian	Relizian - Saucesian undifferentiated	Zemorrian	Narizian
Age	MIOCENE		OLIGOCENE	EOCENE
Paleobathymetry	upper bathyal	upper middle bathyal	upper to upper middle bathyal	bathyal
Formation	Montesano Formation	Astoria Formation (?) - (lower)	Lincoln Creek Formation - (upper)	Humptulips Formation

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1999

WELL STRATIGRAPHY AND CORRELATIONS, WESTERN WASHINGTON AND NORTHWESTERN OREGON

By

Weldon W. Rau[1] and Samuel Y. Johnson[2]

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[1]Washington Division of Geology and Earth Resources, Olympia, WA 98504
[2]U.S. Geological Survey, MS 966, BOX 25046, DFC, Denver, CO 80225

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