MASTER

Airborne Gamma-Ray Spectrometer and Magnetometer Survey

Copalis Beach Quadrangle
(Washington)

Final Report

Volume II

A

prepared by

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LOCATION MAP Copalis Beach

Figure 1

COPALIS BEACH QUADRANGLE

GEOLOGY

The geologic map of the Copalis Beach quadrangle, which provided the geologic background for the interpretation of the radiometric data, was prepared for Bendix Field Engineering Corporation by Salisbury and Dietz, Inc. The explanation of the geologic legend, Appendix C, was taken from this map.

The Copalis Beach quadrangle is in two physiographic provinces: the Olympic Mountains and the Willapa Hills.

The Olympic Mountains are chiefly of Tertiary age and are part of an eugeosynclinal accumulation of marine sedimentary and submarine volcanic rocks that total 50,000 feet as deposited. The earliest Tertiary rocks are a sequence of Eocene argillites and graywackes more than 30,000 feet thick that forms the core of the Olympic Mountains. This was followed by a thick sequence of submarine volcanic rocks. Near centers of volcanism, the accumulated thickness exceeds 20,000 feet, while away from these centers the basalt flows and breccias may exceed 10,000 feet in thickness. In the present Olympic Mountains, these volcanic rocks form many of the structural and topographic highs as they are more resistant to weathering. An uplift in late Eocene time raised the area of the Olympic Mountains above sea level and erosion provided much of the material which was deposited in nearby low areas. Further uplift near the close of the Miocene with intense deformation formed the present Olympic Mountains.

The Willapa Hills, an extension of the Oregon Coast Range, are chiefly of Tertiary age and are part of the same eugeosynclinal accumulation of marine sedimentary and submarine volcanic rocks found in the Olympic Mountains. Near the close of the Miocene there was a regional uplift which formed the present Willapa Hills as exposed in the south most portion of the quadrangle.

Tertiary marine sedimentary deposits crop out along the eastern portion of the quadrangle. Quaternary terrace deposits and glacial deposits, and Recent beach deposits and alluvium also crop out in the eastern portion of the area.

RADIOACTIVE MINERAL OCCURRENCES IN WASHINGTON

Huntting, 1956; and Weissenborn, 1966 documented the radioactive occurrences in Washington (Figure 2). They did not record any in the Copalis Beach quadrangle.

The following types of radioactive occurrence have been found in Washington (Huntting, 1956; Weissenborn, 1966):

- 1) Secondary uranium minerals along the contact between preCambrian metamorphosed sedimentary rocks and porphyritic quartz-monzonite of Cretaceous age - Midnite mine, Stevens County.
- 2) Autunite filling fractures and open spaces in pegmatitic alaskite - Mount Spokane area, Spokane County; Lost Creek area, Pend Oreille County.
- 3) Secondary uranium minerals in interbedded tuffaceous sandstone, arkose, and carbonaceous shale - Midnite mine area, Stevens County.
- 4) Radioactivity in pegmatitic lenses in gneiss.
- 5) Strong radioactivity in soil and gravel around a radioactive spring - Bumping Lake, Yakima County.

The major uranium production from Washington state has been from the Midnite mine, Stevens County; and the Daybreak mine, Spokane County. Minor production has been reported from several other properties in the state (Weissenborn, 1966).

Radioactive Occurrences in Washington

GEOPHYSICAL DATA INTERPRETATION

Radiometric Data

A total of zero (0) uranium anomalies meet the minimum statistical requirements as defined in Volume I. There is no Uranium Anomaly Interpretation Map for the Copalis Beach quadrangle.

Potassium (%K), equivalent Uranium (ppm eU), equivalent Thorium (ppm eT), eU/eT, eU/K, eT/K, and magnetic pseudo-contour maps are presented in Appendix E. Stacked Profiles showing geologic strip maps along each flight-line, together with sensor data, and ancillary data are presented in Appendix F. All maps and profiles were prepared on a scale of 1:250,000, but have been reduced to 1:500,000 for presentation in Volume II.

REFERENCES

Huntting, M.T., (1956); Inventory of Washington Minerals, Part II: Metallic Minerals. Bulletin 37, Department of Natural Resources, State of Washington.

Weissenborn, A.E., (1956); Uranium IN Mineral and Water Resources of Washington. Prepared by the United States Geological Survey.

APPENDIX A - FLIGHT LINE MAP

APPENDIX B - GEOLOGY MAP

COPALIS BEACH, WASHINGTON; OREGON

GEOLOGY OF THE COPALIS BEACH QUADRANGLE

By
Salisbury & Dietz, Inc., Spokane, Washington
In Accordance With BFEC Specification #1125B
for
UNITED STATES DEPARTMENT OF ENERGY

1965 Magnetic declination from true north
for the center of this sheet is 22°
(590 MILS) easterly.

APPENDIX C - EXPLANATION OF GEOLOGIC LEGEND

SEDIMENTARY ROCKS

EXTRUSIVE IGNEOUS ROCKS

Quaternary

Qa Qe

Holocene Surficial Deposits

- Qa- Alluvium; unconsolidated silt, sand, and gravel on floor of main valleys and on beaches. Unit includes small moraines, talus, and landslide deposits. In larger river valleys includes lower river terraces which may be older than Holocene
- Qe- Eolian deposits; active sand dunes; includes beach sand along coast

Qc Qo

Pleistocene and Late Pliocene Surficial Deposits

- Qc- Glacial deposits of the continental ice sheet; moraine and stratified deposits characterized by rock clasts foreign to the Olympic Peninsula. Unit includes some Olympic drift and Holocene deposits
- Qo- Glacial deposits of the Olympic alpine glaciers; moraine and stratified deposits characterized by rock clasts derived from the Olympic Mountains. Includes high river terraces along major rivers that may not be directly associated with glaciation. Also includes marine terrace deposits along coast

Unconformity

Tq

Quinault and Quillayute Formations

- Tq- Sandstone, siltstone, and conglomerate. Fine to coarse grained, angular, poorly sorted lithic subquartzose sandstone is thin to very thick bedded with conspicuous current ripples, cross and graded bedding, flame, scour, and fill structures. Ball and pillow structure, clastic dikes, and intraformational breccia abundant. There are many micro- and macrofossils. Siltstone is thin bedded to massive with concretions and carbonaceous beds. Includes equivalent rocks in area north of Grays Harbor; Td and Tf units of Moore (1965)

Unconformity

Thsr Thc Thr Thts Thsp Thsu

Hoh Lithic Assemblage

- Thsr- Siltstone, and thin bedded sandstone and siltstone in rhythmite sequences. Black to gray siltstone very thin bedded to massive, locally concretionary. Rhythmically bedded fine grained sandstone similar to ThTs. Includes melange rocks
- Thc- Conglomerate; Generally well rounded and sorted clasts up to 10cm are mostly volcanic rocks with minor chert and granitoid rocks
- Thr- Rhythmite sequences; Fine grained sandstone rhythmically interbedded with thin-bedded siltstone
- Thts- Thick bedded sandstone; thick to very thick bedded sandstone and minor thin bedded siltstone and sandstone. Fine to coarse-grained lithic and feldspathic-lithic sandstone, angular, locally well sorted, and containing scattered coaly debris
- Thsp- Sandstone packets with minor siltstone interbeds and very thick beds of sandstone. Commonly coarse to conglomeratic
- Thsu- Sandstone, siltstone, and conglomerate undifferentiated

Holocene

Pleistocene

Late Miocene to Pliocene

Middle Oligocene to Middle Miocene

Tertiary

O

Oligocene Marine Rocks

- O- Massive tuffaceous and non-tuffaceous sandstone and siltstone, locally concretionary. Includes conglomerate

E

Upper Eocene Marine and non-Marine Rocks

- E- Massive to thin bedded, feldspathic to arkosic sandstone, siltstone, shale, and carbonaceous shale

Ev

Upper Eocene Volcanic Rocks

- Ev- Andesite and basalt flows and associated breccia

Two

Twoc

Twot

Twos

Twor

Western Olympic Lithic Assemblage

- Two- Sandstone and minor granule conglomerate with generally less than 40 percent siltstone and argillite. Medium to very thick bedded, feldspatholithic and lithofeldspathic sandstone; angular, poorly sorted, commonly micaceous, and locally calcareous. Thin coaly laminae and carbonaceous debris ubiquitous. Argillite is common with fine-grained sandstone in rhythmic sequences
- Twoc- Conglomerate; generally very thick beds contain well-rounded pebbles (up to 5 cm) of chert, quartzite, volcanic rocks, limestone, and sandstone
- Twot- Thick bedded sandstone with less than 20 percent slate or argillite; black, medium to coarse-grained lithic to feldspathic sandstone, thick to very thick bedded with thin to very thin slate interbeds. Sandstone is locally calcareous, micaceous, and commonly iron-stained. Some granule conglomerate
- Twos- Slate and phyllite with less than 30 percent small phacoids of foliated sandstone and semi-schist
- Twor- Rhythmically bedded siltstone and sandstone, thin to medium bedded fine-grained sandstone and siltstone similar to those in unit Two

Tur

Undifferentiated Rocks

- Tur- Sandstone and minor granule conglomerate with generally less than 40 percent siltstone and argillite; medium to coarse-grained micaceous lithic to feldspathic sandstone, angular, poorly sorted, commonly calcareous, thick bedded to massive. Lithic varieties are rich in volcanic clasts. Siltstone, argillite, and granule conglomerate similar to comparable rocks in unit Two

Tb

Tertiary Basaltic Rocks - Undifferentiated

- Tb- Basalt flows, basaltic breccia, pillow lavas, tuff, greenstone and greenschist. Unit includes associated red and green argillite

Middle Eocene to Middle Oligocene

Contact

Dashed where approximately located

Anticline

Overturned
Syncline
Folds

Arrowhead on axis shows direction of local plunge, dashed where approximately located, dotted where concealed

Syncline

Fault

Dashed where approximately located, dotted where concealed or inferred.

Parallel arrows show direction of strike slip, U on upthrown side, D on down-thrown side

Thrust Fault

Sawteeth on upper plate

APPENDIX D - FLIGHT LINE/GEOLOGY MAP

APPENDIX E - PSEUDO-CONTOUR MAPS

COPALIS BEACH

Magnetic

CONTOUR INTERVAL = 10.00
REFERENCE CONTOUR (00000) = 0.00

COPALIS BEACH

Total Count

CONTOUR INTERVAL = 100.00
REFERENCE CONTOUR (00000) = 500.00

COPALIS BEACH

eU

CONTOUR INTERVAL =
REFERENCE CONTOUR (000000) = .20
0.00

COPAI IS REACH

eTh

CONTOUR INTERVAL = .25
REFERENCE CONTOUR (00000) = 0.00

COPALIS BEACH

K40

CONTOUR INTERVAL = .25
REFERENCE CONTOUR (00000) = 0.00

COPALIS BEACH 1900

eU/eTH

CONTOUR INTERVAL =
REFERENCE CONTOUR (00000) =

.10
0.00

APPENDIX F - STACKED PROFILES

COPALIS BEACH

eU/K₄₀

CONTOUR INTERVAL = 1.00
REFERENCE CONTOUR (00000) = 0.00

COPALIS BEACH

eTh/K_{40}

CONTOUR INTERVAL = 1.50
REFERENCE CONTOUR (00000) = 0.00

LINE NO. TL1 COPALIS BEACH.WA

RILES 0 4 8 12 16 RILES HIGH LIFE - QEB

LINE NO. 5 COPALIS BEACH, WA

0 4 8 12 16 MILES

LINE NO. 6 COPALIS BEACH, WA

0 4 8 12 16 MILES

LINE NO. 7 COPALIS BEACH, WA

0 4 8 12 16 MILES

HIGH LIFE - QEG

LINE NO. 8 COPALIS BEACH, WA

MILES 0 4 8 12 16 MILES

HIGH LIFE - QEB

LINE NO. 9 COPALIS BEACH, WA

MILES 0 4 8 12 16 MILES

HIGH LIFE - QEB

APPENDIX G - ANOMALY MAPS

COPALIS BEACH, WA

ETH

HIGH LIFE - QEB

COPALIS BEACH, WA

EU/K

HIGH LIFE - QEB

APPENDIX H - GEOLOGIC HISTOGRAMS

UNIT QA

UNIT QE

UNIT QC

UNIT QD

UNIT TQ

UNIT THSR

UNIT THR

UNIT THS

UNIT TWO S

UNIT TWO R

UNIT TWO R

UNIT TWO S

APPENDIX I - SPEED AND ALTITUDE HISTOGRAMS

COPALIS BEACH, WA

10

APPENDIX J - STATISTICAL TABLES

UNIT	ETH			EU			K			EU/ETH			EU/K			ETH/K		
	MEAN	ST.DEV.	EVENTS	MEAN	ST.DEV.	EVENTS	MEAN	ST.DEV.	EVENTS	MEAN	ST.DEV.	EVENTS	MEAN	ST.DEV.	EVENTS	MEAN	ST.DEV.	EVENTS
			DIS.			DIS.			DIS.			DIS.			DIS.			DIS.
QA	2.20	.89	472 L	.76	.23	182 L	.52	.20	512 L	.37	.16	175 L	1.47	.89	182 L	4.52	2.10	472 N
QC	1.71	.69	542 L	.44	.34	35 L	.36	.14	590 N	.24	.23	33 N	1.16	1.05	35 U	5.12	2.38	533 L
QE	1.84	.87	851 L	.72	.21	281 L	.71	.29	959 L	.41	.19	266 L	.96	.45	281 L	2.73	1.28	851 L
QO	2.00	.82	5022 L	.66	.21	1306 L	.37	.17	5247 L	.33	.16	1276 L	1.78	1.02	1302 L	5.89	2.66	5007 U
TB	1.91	.27	18 U	.49	.06	2 U	.30	.07	18 U	.21	.02	2 U	2.71	.93	2 U	7.03	2.98	18 U
THR	2.35	1.02	147 N	.64	.25	44 N	.45	.15	148 N	.29	.17	44 U	1.35	.36	44 U	5.54	2.98	147 N
THSP	1.92	.63	46 U	.65	.20	3 U	.42	.09	47 N	.48	.18	3 U	1.37	.61	3 U	4.62	1.44	46 U
THSR	2.32	.96	737 L	.71	.26	272 L	.48	.20	759 L	.30	.13	265 L	1.42	.64	271 L	5.17	2.01	737 L
THTS	2.12	.97	476 L	.69	.28	168 L	.43	.21	508 L	.27	.14	168 L	1.28	.71	168 L	5.26	2.31	476 N
TQ	1.65	.62	704 L	.58	.15	72 L	.28	.12	778 L	.39	.19	70 L	2.13	1.19	72 L	6.66	3.30	702 N
TUR	3.12	1.20	635 N	.80	.26	336 L	.60	.23	637 L	.29	.14	336 L	1.33	.52	336 L	5.48	1.98	635 L
TWO	2.19	.85	1197 L	.61	.19	256 L	.61	.23	1236 L	.28	.12	250 L	.92	.32	256 L	3.75	1.32	1197 L
TWOC	1.73	.53	18 U	.54	.11	3 U	.48	.07	18 N	.39	.19	3 U	1.18	.08	3 U	3.60	1.12	18 U
TWOR	1.93	.40	31 N	.67	.12	7 U	.50	.10	31 N	.37	.05	7 U	1.16	.26	7 U	3.98	1.10	31 U
TWOS	1.98	.74	47 N	.85	.45	17 U	.45	.24	47 N	.40	.17	17 U	1.61	.59	17 U	4.80	1.30	47 U
TWOT	1.69	.70	80 L	.51	.14	32 L	.45	.10	83 L	.35	.19	31 L	1.20	.35	32 U	3.83	1.58	80 N
WA	1.57	.75	347 L	.72	.47	59 N	.42	.30	601 U	.34	.40	54 U	.89	1.13	59 U	3.08	1.63	343 L

N=NORMAL DISTRIBUTION
L=LOG-NORMAL DISTRIBUTION
U=UNKNOWN DISTRIBUTION

	QA	QC	QE	QO	TB	THR	THSP	THSR	THTS	TQ	TUR	TWO	TWOC	TWOR	TWGS
1	1.48	0.00	2.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	1.38	0.00	2.04	1.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	2.16	0.00	0.00	1.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.76	0.00	0.00	0.00	0.00	0.00
5	1.03	0.00	4.79	0.00	0.00	0.00	0.00	0.00	0.00	1.55	0.00	0.00	0.00	0.00	0.00
6	0.00	1.97	0.00	2.30	0.00	0.00	0.00	0.00	0.00	2.09	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	2.00	1.85	0.00	0.00	0.00	0.00	0.00	1.70	0.00	0.00	0.00	0.00	0.00
8	2.84	0.00	0.00	2.38	1.91	0.00	0.00	0.00	0.00	2.45	0.00	0.00	0.00	0.00	0.00
9	2.27	0.00	0.00	2.55	0.00	0.00	0.00	2.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	2.71	0.00	0.00	2.15	0.00	0.00	0.00	2.93	0.00	0.00	3.80	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	2.37	0.00	3.16	1.34	2.68	2.02	0.00	3.30	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	1.59	0.00	0.00	2.06	2.29	2.02	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	1.76	0.00	2.07	1.89	1.87	1.64	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	1.61	0.00	1.25	0.00	1.65	1.48	0.00	0.00	1.56	0.00	0.00	0.00
15	2.74	1.68	0.00	1.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.28	0.00	0.00	0.00
501	2.23	1.81	1.31	0.00	0.00	0.00	0.00	1.26	1.60	0.00	0.00	0.00	0.00	0.00	0.00
502	2.11	1.43	1.77	1.87	0.00	0.00	0.00	3.15	3.05	1.31	2.74	1.98	1.73	1.93	1.98

	TWOT	WA
1	0.00	0.00
2	0.00	0.00
3	0.00	0.00
4	0.00	1.38
5	0.00	0.00
6	0.00	0.00
7	0.00	3.03
8	0.00	0.00
9	0.00	0.00
10	0.00	0.00
11	0.00	0.00
12	0.00	1.16
13	0.00	0.00
14	0.00	0.00
15	0.00	0.00
501	0.00	0.00
502	1.69	1.58

COMPUTER LINES 1 THRU 15 REFER TO PROFILE LINES 1 THRU 15.

COMPUTER LINES 501 THRU 502 REFER TO NORTH - SOUTH TIE LINES 1 THRU 2.

GEOLOGIC UNIT AVERAGE VALUE AS A
FUNCTION OF MAP LINE FOR PPM ETH

	QA	QC	QE	QO	TB	THR	THSP	THSR	THTS	TQ	TQR	TWO	TWOC	TWOR	TWOS
1	.47	0.00	.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	.52	0.00	.77	.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	.83	0.00	0.00	.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	1.24	0.00	0.00	0.00	0.00	0.00	0.00	.53	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	.65	0.00	0.00	0.00	0.00	0.00	.64	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	.84	.60	0.00	0.00	0.00	0.00	0.00	.50	0.00	0.00	0.00	0.00	0.00
8	.79	0.00	0.00	.67	.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	.53	0.00	0.00	.68	0.00	0.00	0.00	.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	.83	0.00	0.00	.66	0.00	0.00	0.00	0.00	0.00	0.00	.80	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	.61	0.00	.72	0.00	.80	.59	0.00	.68	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	.68	0.00	0.00	.65	.64	.69	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	.59	0.00	.61	0.00	.59	.50	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	.52	0.00	.52	0.00	.57	.67	0.00	0.00	.38	0.00	0.00	0.00
15	0.00	.37	0.00	.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.60	0.00	0.00	0.00
501	0.00	.43	.45	0.00	0.00	0.00	0.00	.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00
502	.77	.61	.69	.72	0.00	0.00	0.00	.97	.79	.56	.81	.65	.54	.67	.85

	TWOT	WA
1	0.00	0.00
2	0.00	0.00
3	0.00	0.00
4	0.00	0.00
5	0.00	0.00
6	0.00	0.00
7	0.00	.79
8	0.00	0.00
9	0.00	0.00
10	0.00	0.00
11	0.00	0.00
12	0.00	.12
13	0.00	0.00
14	0.00	0.00
15	0.00	0.00
501	0.00	0.00
502	.51	.81

COMPUTER LINES 1 THRU 15 REFER TO PROFILE LINES 1 THRU 15.

COMPUTER LINES 501 THRU 502 REFER TO NORTH - SOUTH TIE LINES 1 THRU 2.

GEOLOGIC UNIT AVERAGE VALUE AS A

FUNCTION OF MAP LINE FOR PPM EU

	QA	QC	QE	QO	TB	THR	THSP	THSR	THTS	TQ	TUR	TWO	TWOC	TWOR	TWOS
1	.62	0.00	.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	.38	0.00	.86	.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	.56	0.00	0.00	.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.27	0.00	0.00	0.00	0.00	0.00
5	.22	0.00	.74	0.00	0.00	0.00	0.00	0.00	0.00	.24	0.00	0.00	0.00	0.00	0.00
6	0.00	.61	0.00	.31	0.00	0.00	0.00	0.00	0.00	.29	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	.40	.25	0.00	0.00	0.00	0.00	0.00	.24	0.00	0.00	0.00	0.00	0.00
8	.58	0.00	0.00	.40	.30	0.00	0.00	0.00	0.00	.48	0.00	0.00	0.00	0.00	0.00
9	.42	0.00	0.00	.42	0.00	0.00	0.00	.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	.65	0.00	0.00	.37	0.00	0.00	0.00	.63	0.00	0.00	.69	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	.39	0.00	.47	.29	.40	.30	0.00	.46	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	.29	0.00	0.00	.45	.50	.45	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	.43	0.00	.46	.41	.41	.36	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	.32	0.00	.32	0.00	.34	.30	0.00	0.00	.31	0.00	0.00	0.00
15	.43	.34	0.00	.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.61	0.00	0.00	0.00
501	.47	.35	.31	0.00	0.00	0.00	0.00	.18	.29	0.00	0.00	0.00	0.00	0.00	0.00
502	.53	.41	.71	.39	0.00	0.00	0.00	.75	.66	.33	.60	.67	.48	.50	.45

	TWOT	WA
1	0.00	0.00
2	0.00	0.00
3	0.00	0.00
4	0.00	.31
5	0.00	0.00
6	0.00	0.00
7	0.00	.50
8	0.00	0.00
9	0.00	0.00
10	0.00	0.00
11	0.00	0.00
12	0.00	.22
13	0.00	0.00
14	0.00	0.00
15	0.00	0.00
501	0.00	0.00
502	.45	.45

COMPUTER LINES 1 THRU 15 REFER TO PROFILE LINES 1 THRU 15.

COMPUTER LINES 501 THRU 502 REFER TO NORTH - SOUTH TIE LINES 1 THRU 2.

GEOLOGIC UNIT AVERAGE VALUE AS A

FUNCTION OF MAP LINE FOR

	QA	QC	QE	QO	TB	THR	THSP	THSR	THTS	TQ	TUR	TWO	TWOC	TWOR	TWOS
1	.38	0.00	.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	.41	0.00	.41	.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	.39	0.00	0.00	.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	.22	0.00	0.00	0.00	0.00	0.00	0.00	.50	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	.27	0.00	0.00	0.00	0.00	0.00	.31	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	.42	.34	0.00	0.00	0.00	0.00	0.00	.32	0.00	0.00	0.00	0.00	0.00
8	.29	0.00	0.00	.32	.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	.24	0.00	0.00	.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	.30	0.00	0.00	.35	0.00	0.00	0.00	0.00	0.00	0.00	.23	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	.24	0.00	.21	0.00	.26	.29	0.00	.21	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	.38	0.00	0.00	.48	.30	.29	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	.33	0.00	.32	0.00	.32	.28	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	.33	0.00	.40	0.00	.47	.32	0.00	0.00	.49	0.00	0.00	0.00
15	0.00	.22	0.00	.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.25	0.00	0.00	0.00
501	0.00	.22	.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
502	.41	.34	.43	.37	0.00	0.00	0.00	.29	.26	.44	.32	.39	.39	.37	.40

	TWOT	WA
1	0.00	0.00
2	0.00	0.00
3	0.00	0.00
4	0.00	0.00
5	0.00	0.00
6	0.00	0.00
7	0.00	.25
8	0.00	0.00
9	0.00	0.00
10	0.00	0.00
11	0.00	0.00
12	0.00	0.00
13	0.00	0.00
14	0.00	0.00
15	0.00	0.00
501	0.00	0.00
502	.35	.44

COMPUTER LINES 1 THRU 15 REFER TO PROFILE LINES 1 THRU 15.

COMPUTER LINES 501 THRU 502 REFER TO NORTH - SOUTH TIE LINES 1 THRU 2.

GEOLOGIC UNIT AVERAGE VALUE AS A

FUNCTION OF MAP LINE FOR EU/ETH

	QA	QC	QE	QO	TB	THR	THSP	THSR	THTS	TQ	TUR	TWO	TWOC	TWOR	TWOS
1	.67	0.00	.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	1.69	0.00	.92	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	1.40	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	1.49	0.00	0.00	0.00	0.00	0.00	0.00	2.58	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	2.28	0.00	0.00	0.00	0.00	0.00	2.46	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	2.13	2.76	0.00	0.00	0.00	0.00	0.00	2.48	0.00	0.00	0.00	0.00	0.00
8	1.25	0.00	0.00	1.90	2.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	1.06	0.00	0.00	1.70	0.00	0.00	0.00	1.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	1.22	0.00	0.00	2.07	0.00	0.00	0.00	0.00	0.00	0.00	1.24	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	1.34	0.00	1.33	0.00	1.81	1.96	0.00	1.56	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	1.92	0.00	0.00	1.37	1.32	1.24	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	1.19	0.00	1.34	0.00	1.42	1.24	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	1.52	0.00	1.65	0.00	1.43	1.36	0.00	0.00	1.87	0.00	0.00	0.00
15	0.00	1.34	0.00	1.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.86	0.00	0.00	0.00
501	0.00	1.04	1.71	0.00	0.00	0.00	0.00	3.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00
502	1.61	1.11	.92	1.76	0.00	0.00	0.00	1.23	1.25	1.35	1.35	1.04	1.18	1.16	1.61

	TWOT	WA
1	0.00	0.00
2	0.00	0.00
3	0.00	0.00
4	0.00	0.00
5	0.00	0.00
6	0.00	0.00
7	0.00	1.58
8	0.00	0.00
9	0.00	0.00
10	0.00	0.00
11	0.00	0.00
12	0.00	0.00
13	0.00	0.00
14	0.00	0.00
15	0.00	0.00
501	0.00	0.00
502	1.20	1.06

COMPUTER LINES 1 THRU 15 REFER TO PROFILE LINES 1 THRU 15.

COMPUTER LINES 501 THRU 502 REFER TO NORTH-SOUTH TIE LINES 1 THRU 2.

GEOLOGIC UNIT AVERAGE VALUE AS A

FUNCTION OF MAP LINE FOR EU/ZK

	QA	QC	QE	QO	TB	THR	THSP	THSR	THTS	TQ	TUR	TWO	TWOC	TWOR	TWOS
1	2.46	0.00	2.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	4.46	0.00	2.44	3.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	4.19	0.00	0.00	5.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.51	0.00	0.00	0.00	0.00	0.00
5	5.12	0.00	6.51	0.00	0.00	0.00	0.00	0.00	0.00	7.10	0.00	0.00	0.00	0.00	0.00
6	0.00	3.29	0.00	8.01	0.00	0.00	0.00	0.00	0.00	8.22	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	5.07	8.04	0.00	0.00	0.00	0.00	0.00	7.11	0.00	0.00	0.00	0.00	0.00
8	5.25	0.00	0.00	6.78	7.03	0.00	0.00	0.00	0.00	5.08	0.00	0.00	0.00	0.00	0.00
9	5.64	0.00	0.00	6.57	0.00	0.00	0.00	4.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	4.46	0.00	0.00	6.31	0.00	0.00	0.00	4.78	0.00	0.00	5.68	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	6.34	0.00	7.51	4.75	7.03	7.12	0.00	7.36	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	5.84	0.00	0.00	4.76	4.74	4.78	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	4.45	0.00	4.71	4.53	4.85	4.79	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	5.71	0.00	3.88	0.00	5.61	5.28	0.00	0.00	4.96	0.00	0.00	0.00
15	7.88	5.26	0.00	4.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.86	0.00	0.00	0.00
501	4.81	5.44	4.56	0.00	0.00	0.00	0.00	7.75	5.99	0.00	0.00	0.00	0.00	0.00	0.00
502	4.11	3.75	2.61	5.17	0.00	0.00	0.00	4.16	4.83	4.24	4.72	3.07	3.60	3.98	4.80

	TWOT	WA
1	0.00	0.00
2	0.00	0.00
3	0.00	0.00
4	0.00	4.63
5	0.00	0.00
6	0.00	0.00
7	0.00	6.11
8	0.00	0.00
9	0.00	0.00
10	0.00	0.00
11	0.00	0.00
12	0.00	5.26
13	0.00	0.00
14	0.00	0.00
15	0.00	0.00
501	0.00	0.00
502	3.83	676.32

COMPUTER LINES 1 THRU 15 REFER TO PROFILE LINES 1 THRU 15.

COMPUTER LINES 501 THRU 502 REFER TO NORTH - SOUTH TIE LINES 1 THRU 2.

GEOLOGIC UNIT AVERAGE VALUE AS A
FUNCTION OF MAP LINE FOR ETH/2K

APPENDIX K - MAGNETIC AND ANCILLARY PROFILES

LINE NO. TL1 COPALIS BEACH, WA

NILES 0 4 8 12 16 NILES

HIGH LIFE - QEE

APPENDIX L - TEST LINE DATA

PRE-FLIGHT AND POST-FLIGHT TEST LINE DATA

COPALIS BEACH QUADRANGLE

	<u>8/3/80</u>	<u>8/4/80</u>
Pre TL	10.41	10.03
Post TL	10.06	9.52
Pre Bi	2.14	2.22
Post Bi	2.17	2.15
Pre K	39.23	38.96
Post K	38.02	40.58
Pre TC	357.96	365.70
Post TC	362.43	380.38