



  
**Province of British Columbia**  
 Ministry of Energy, Mines and Petroleum Resources  
 GEOLOGICAL SURVEY BRANCH  
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**NEAR SHORE MINERAL RESOURCES  
 DEEP SEA RIDGE SYSTEMS AND  
 METAL DEPOSITS**

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 MINERAL DEVELOPMENT AGREEMENT, 1985-1990

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 Energy, Mines and Resources Canada  
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- Platinum-Group Element Placer Occurrence
- Platinum-Group Element Lode Occurrence
- Alaskan-Type Ultramafics (Pt, Cr, Ti, Au Source)
- ▲ Lode Gold Source
- ▲▲ Multiple Lode Gold Sources
- Placer Gold (Beach Deposits)
- Designated Placer Gold Areas
- Gravel Deposits - Generalized Distribution in Economic Recovery Zones (SEE NOTE) Source: COGLA
- Gravel Deposits - Surveyed, Gravel-Bearing Zones in Pattern Source: GSC

NOTE:  
 HEAVY-MINERAL-BEARING SANDS ARE KNOWN TO OCCUR IN QUEEN CHARLOTTE SOUND AND HECAETE STRAIT, BUT THEIR EXTENT IS UNDETERMINED

- ★ Known Sites (Metalliferous sediments)
- ☆ Possible Sites
- 1. TUZO WILSON SEAMOUNTS
- 2. DELLWOOD KNOLLS
- 3. EXPLORER DEEP
- 4. RAINBOW SITE
- 5. MAGIC MOUNTAIN
- 6. MIDDLE VALLEY
- 7. ENDEAVOUR SEAMOUNT
- 8. AXIAL SEAMOUNT



**METAL DEPOSITS IN  
 DEEP SEA RIDGE SYSTEMS FORMED BY  
 EXPLORER - JUAN DE FUCA - PACIFIC PLATE INTERACTIONS**

SITE NAME	LATITUDE/ LONGITUDE	RIDGE SEGMENT	DESCRIPTION
1. J. TUZO WILSON	51° 31' N 130° 53' W	NEAR NORTHERN TERMINATION OF SPREADING RIDGES AT QUEEN CHARLOTTE FAULT	EVIDENCE OF METALLIFEROUS DEPOSITS HAS BEEN RECENTLY DISCOVERED. TEMPERATURE AND CONDUCTIVITY ANOMALIES HAVE BEEN RECORDED.
2. DELLWOOD KNOLLS	50° 40' N 130° 28' W	SMALL SPREADING SEGMENT AT TRANSFORM PLATE BOUNDARY	IRON-RICH SEDIMENTS WITH Fe-Mn CRUSTS ARE COMMON. THE ORIGIN OF THESE CHEMICAL SEDIMENTS IS UNDETERMINED AS THERE ARE NO RECORDED THERMAL ANOMALIES. SOME UNUSUALLY HIGH Zn CONCENTRATIONS HAVE BEEN DETECTED.
3. EXPLORER DEEP	50° 12' N 129° 48' W	NORTHERN SECTION OF EXPLORER RIDGE	METALLIFEROUS CRUST WAS RECOVERED BY DREDGE HAUL, COMPRISED OF SOFT YELLOW CLAYS AND FRIBLE ORANGE-BLACK FERROMANGANESE OXIDES. CRUST SAMPLES INDICATE THE PRESENCE OF LOCALIZED HYDROTHERMAL CIRCULATION WITHIN THE EXPLORER DEEP.
4. RAINBOW SITE	50° 15' N 130° 19' W	NORTHERN SECTION OF EXPLORER RIDGE	TEMPERATURE ANOMALY IN WATER AND FRESH BASALTS DREDGE, JULY 1986 CRUISE, ENDEAVOUR.
5. MAGIC MOUNTAIN (AND AREA)	49° 46' N 130° 16' N	SOUTHERN SEGMENT OF EXPLORER RIDGE	THREE MAJOR ACTIVE DEPOSITS COMPRISE THE MAGIC MOUNTAIN AREA, CONSISTING OF MOUNDS AT LEAST 100 METRES X 100 METRES AND OF UNKNOWN THICKNESS. AT LEAST 60 HYDROTHERMAL FEATURES HAVE BEEN IDENTIFIED, INCLUDING ACTIVE AND INACTIVE MASSIVE SULPHIDE STRUCTURES (CHIMNEYS), SULPHIDE TALUS AND METALLIFEROUS SEDIMENTS. ALL KNOWN SULPHIDE DEPOSITS AND VENT FIELDS ON THE SOUTHERN EXPLORER RIDGE ARE LOCATED ON THE SHALLOWEST PORTION OF THE RIDGE SEGMENT. COMPOSITION OF THE DEPOSITS VARIES FROM IRON HYDROXIDE TO ZINC OR COPPER-RICH IRON SULPHIDE DEPOSITS. THE AVERAGE BULK COMPOSITION OF EIGHT SAMPLES INCLUDES: 18.2% SiO <sub>2</sub> , 10.8% Fe, 8.0% Zn, 6.1% Cu, 7.2% S, 11.2 PPM Ag, AND 0.8 PPM Au. A CONSERVATIVE ESTIMATE OF RESERVES FROM THE SEVEN MAJOR DEPOSITS TOTALS 1.5 MILLION TONNES, CALCULATED ON AN AVERAGE SIZE OF 75 METRES X 100 METRES X 7.5 METRES THICK WITH A DENSITY OF 4 TONNES/MP.
6. MIDDLE VALLEY	48° 39' N 128° 43' W	SOUTHERN SECTION OF SOVANCO FRACTURE ZONE (TRANSFORM FAULT ZONE), NORTHERNMOST JUAN DE FUCA RIDGE	MIDDLE VALLEY HAS BEEN CONFIRMED IN MAY 1986 AS A SITE OF HYDROTHERMAL ACTIVITY AND METAL DEPOSITION. MUCH OF THE VALLEY IS FILLED WITH THERMALLY ACTIVE SEDIMENT IN WHICH BLACK AND WHITE SMOKERS AND METALLIFEROUS SEDIMENT MOUNDS HAVE BEEN DISCOVERED. THERMAL ANOMALIES AVERAGE 250°C WITH LOCALIZED TEMPERATURES UP TO 650°C.
7. ENDEAVOUR SEAMOUNT (AND AREA)	47° 57' N 129° 06' W	MIDDLE SECTION OF THE ENDEAVOUR SEGMENT	THIS IS AN IMPORTANT SITE BECAUSE OF THE ABUNDANCE OF MASSIVE SULPHIDE AND MONTICONITE (CLAY MINERAL) DEPOSITS. THIS EXTENSIVE SITE CONTAINS NUMEROUS RELATIVELY SMALL BLACK SMOKERS, INACTIVE SULPHIDE STRUCTURES, AND SCATTERED CHIMNEY FRAGMENTS. THE ENDEAVOUR SULPHIDES ARE PRIMARILY COMPOSED OF Fe WITH LOW Zn AND Cu CONTENTS WITH IRON SULPHIDES (PYRITE AND MARCASITE) BEING THE DOMINANT MINERALS. SEISMIC PROFILES REVEAL A RIDGE COMPLEX CHARACTERIZED BY A SERIES OF HORST AND GRABEN STRUCTURES RESULTING FROM EXTENSIVE BLOCK FAULTING AND TILTING. THE HYDROTHERMAL FEATURES SEEM TO BE RESTRICTED TO THE WESTERN MARGIN OF THE AXIAL VALLEY WITHIN THE ZONE OF EXTENSIVE NORMAL FAULTING. THE MASSIVE SULPHIDE STRUCTURES OCCUR AS STEPSIDED FEATURES INCLUDING FLOWLIPS AND ELONGATE COALESCING STRUCTURES WHICH PROTRUDE FROM A DEEPLY FISSURED TERRAIN, CHARACTERIZED BY LIGHTLY SEDIMENTED, TRUNCATED SHEET FLOWS.
8. AXIAL SEAMOUNT	45° 51' N 130° 02' W	CENTRAL SECTION OF THE JUAN DE FUCA RIDGE	THIS SITE LIES 63° TO THE SOUTH OF THE MAP BOUNDARY. HOWEVER INVESTIGATIONS INDICATE SIGNIFICANT HYDROTHERMAL ACTIVITY ASSOCIATED WITH RECENTLY ACTIVE FISSURES WITHIN THE CENTRAL CALDERA. LOW TEMPERATURE VENTS (<35°C) OCCUR AS OPEN FRACTURES IN BASALT AND AS THREE LARGE SPIRES ALONG THE FRACTURE ZONE. HYDROTHERMAL FLUID CONTINUES TO CIRCULATE IN THE POROUS INTERIORS OF THE INACTIVE ZONES.

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