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INTERPRETATION OF GALENA LEAD ISOTOPES FROM THE STEWART-ISKUT AREA* (103O, P; 104A, B, G)

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KEYWORDS: Galena lead isotope, lead fingerprint, deposit age, deposit origin, Jurassic, Hazelton Group, Tertiary, plutons, Stewart, Iskut, Stikine Terrane.

INTRODUCTION

The Stewart-Iskut area has had the most exploration activity in the Canadian Cordillera for the last decade. Consequently, this paper examines all available galena lead isotope data related to this area. These data are from LEADTABLE, a dBaseIV file of about 2000 deposits in British Columbia, Yukon Territory and adjacent Northwest Territories (Godwin *et al.*, 1988).

Table 2-9-1 has 197 galena lead isotope analyses from 60 mineral occurrences. This represents less than 10 per cent of the almost 800 showings in the study area, as listed in MINFILE, the mineral inventory database of the British Columbia Ministry of Energy, Mines and Petroleum Resources. The importance of the Stewart-Iskut area is emphasized by the observation that it contains about eight per cent of the total mineral occurrence inventory of the province.

This paper shows how galena lead isotope fingerprints can be used to date deposits in the Stewart-Iskut area (Figure 2-9-1). The isotope data in Table 2-9-1 define two clusters of points (Figures 2-9-2 and 2-9-3). One represents Jurassic gold-silver-copper-zinc-lead mineralization that is cogenetic with the Hazelton Group and associated plutons. The second cluster identifies Tertiary silver-zinc-lead±molybdenum showings that are related to plutons. Historically, the Jurassic deposits have been of more economic significance than the Tertiary showings. So, galena lead isotopes provide a simple, effective method for evaluating the economic potential of newly discovered or poorly exposed showings.

GENERAL GEOLOGY

Most of the Stewart-Iskut area is within the Stikine Terrane of the Intermontane Belt. The western edge of the area probably includes portions of the Wrangell Terrane of the Insular Belt. All rocks of the region have been intruded by Eocene plutons and dikes of the Coast plutonic complex. The following description of the general geology is confined to Stikinia because it contains most of the occurrences examined here.

Stikine Terrane in the study area consists mainly of Mesozoic Hazelton Group that rests on rarely exposed Paleozoic "basement". Triassic to Early Jurassic strata of the Hazelton Group represent an evolving volcanic arc. This arc consists of a lower mafic volcanic complex that evolved to a thick andesite package which grades upward into dacites of the Mount Dilworth Formation. The Early Jurassic Texas Creek plutonic suite, characterized by potassium-feldspar megacrystic granodiorite, is cogenetic with Hazelton Group volcanics. In the Middle Jurassic the volcanic arc foundered and was covered by a thick succession of turbidites. In the mid-Cretaceous the entire area was regionally metamorphosed to lower greenschist facies.

LEAD FINGERPRINTS

The lead fingerprints (Figures 2-9-2, and 3) divide all but 10 per cent of the showings examined into two groups. Table 2-9-2 shows that 37 of the showings are Jurassic, 24 are Tertiary, and 5 are not clearly defined. Table 2-9-4 summarizes the galena lead isotope ratios for the two clusters.

DISCUSSION

The regional mid-Cretaceous metamorphism makes dating of Triassic to Jurassic mineralization by simple radiogenic isotopes (potassium-argon or rubiduim-strontium) impossible. Galena lead isotopes, however, are not reset by thermal events alone. This emphasizes one of the advantages of the analyses presented here. In addition, at $300 an analysis, the method is relatively inexpensive.

Jurassic and Tertiary clusters of galena lead isotope ratios in the Stewart area were first recognized by Godwin *et al.* (1980). In 1986 Alldrick submitted a suite of samples from ten deposits on eight properties from the same area. The results of this work, reported in Alldrick *et al.* (1987), were so definitive that additional samples were collected from as many showings in the Stewart-Iskut area as possible. A preliminary interpretation of resulting data was presented by Alldrick *et al.* (1990).

The clusters clearly define two separate, relatively short-lived metallogenic events. An Early Jurassic and a Tertiary interpretation for these events is consistent with stratigraphic information and other radiogenic dates. Brief

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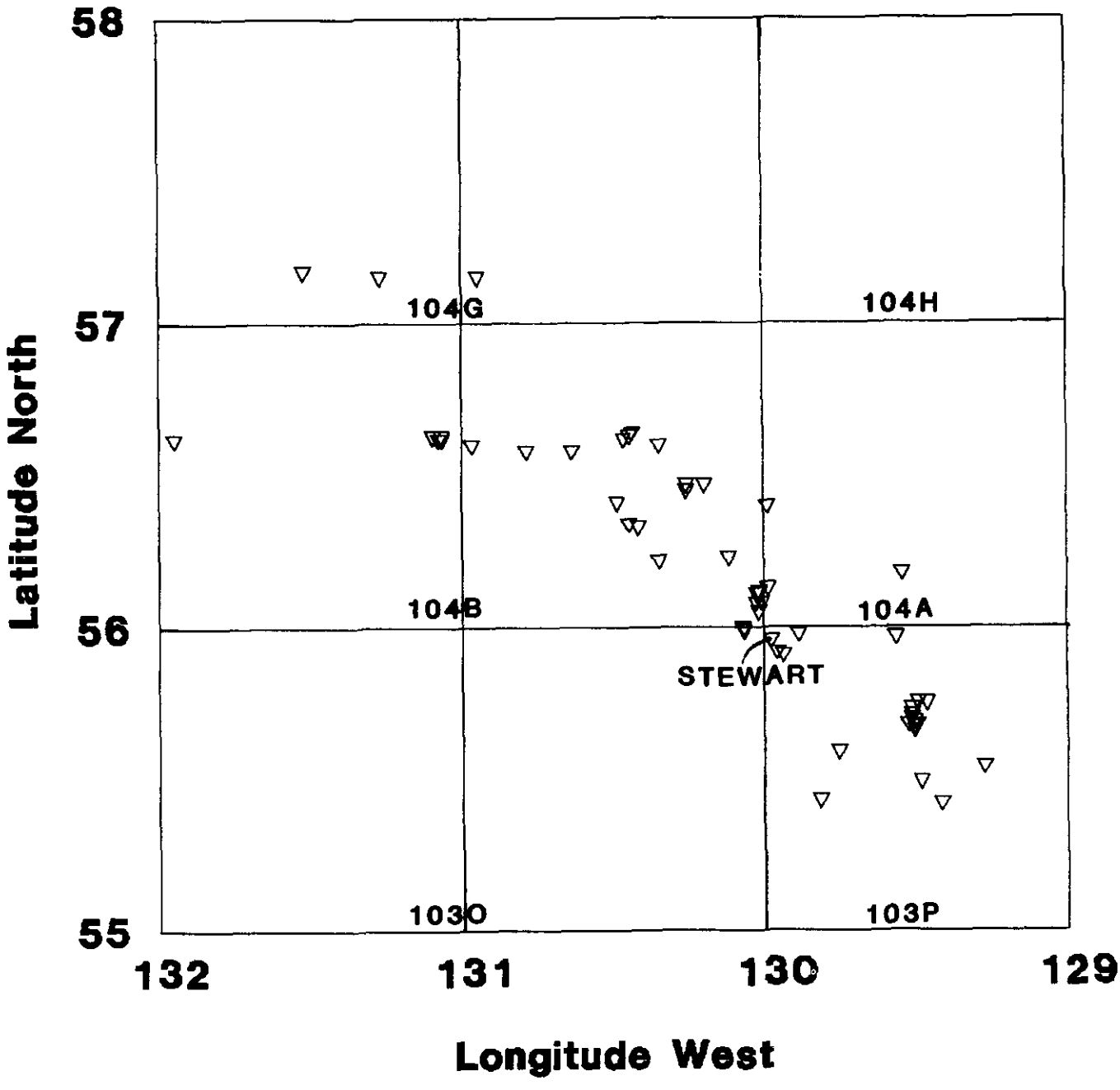

Figure 2-9-1. Location of analyses and deposits in Tables 2-9-1 and 2-9-2, Stewart-Iskut area, northwestern British Columbia.

TABLE 2-9-1
GALENA LEAD ISOTOPE ANALYSES FOR THE STEWART – ISKUT AREA, NORTHWESTERN B.C.
(103O&P AND 104A, B&G)

Lab Number	Deposit Name	Analyst	$^{206}Pb/^{204}Pb$	$^{207}Pb/^{204}Pb$	$^{208}Pb/^{204}Pb$	$^{207}Pb/^{206}Pb$	$^{208}Pb/^{206}Pb$	Date
NTS: 103O								
50055-001A1	JARVIS	86GA	19.164	15.607	38.579	0.81439	2.0131	R
50055-001A2	JARVIS	87GA	19.114	15.642	38.555	0.81835	2.0171	R
50055-002A1	JARVIS	86GA	19.158	15.625	38.616	0.81556	2.0156	R
50055-002A2	JARVIS	86GA	19.180	15.643	38.695	0.81561	2.0175	R
50055-003A	JARVIS	86GA	19.174	15.635	38.656	0.81545	2.0161	R
NTS: 103P								
30062-001A	WILBY	88GA	19.031	15.644	38.788	0.82202	2.0381	-
30062-001B1	WILBY	89PI	18.949	15.597	38.361	0.82310	2.0245	-
30062-001B2	WILBY	89PI	18.951	15.596	38.356	0.82296	2.0240	-
30062-002A1	WILBY	89PI	18.976	15.614	38.412	0.82285	2.0243	-
30062-002A2	WILBY	89PI	18.959	15.600	38.371	0.82284	2.0239	-
30492-001A	PROSPER-IDAHO	84GA	19.130	15.627	38.644	0.81687	2.0201	R
30492-002A	PROSPER-IDAHO	84GA	19.116	15.624	38.616	0.81732	2.0201	R
30492-003A1	PROSPER-IDAHO	84GA	19.114	15.610	38.589	0.81667	2.0189	R
30492-003A2	PROSPER-IDAHO	84GA	19.122	15.619	38.614	0.81677	2.0193	R
30555-001A1	RED POINT	84GA	18.814	15.608	38.394	0.82956	2.0407	J
30555-001A2	RED POINT	85GA	18.824	15.612	38.327	0.82940	2.0414	J
30556-001A	NORTH STAR	84GA	18.874	15.623	38.482	0.82775	2.0389	J
30556-002A	NORTH STAR	79GA	18.856	15.610	38.287	0.82785	2.0305	J
30556-002B	NORTH STAR	87GA	18.885	15.636	38.532	0.82796	2.0404	J
30556-003A	NORTH STAR	90PI	18.889	15.630	38.519	0.82744	2.0392	J
30556-003B	NORTH STAR	90PI	18.886	15.626	38.503	0.82742	2.0388	J
30557-001A	TORBRIT	79RY	18.844	15.580	38.295	0.82679	2.0322	-
30557-001B	TORBRIT	87GA	18.869	15.609	38.438	0.82725	2.0371	J
30557-003A	TORBRIT	85GA	18.875	15.625	38.485	0.82778	2.0389	J
30557-095A	TORBRIT	79RY	18.918	15.642	38.546	0.82683	2.0375	J
30557-095B	TORBRIT	87GA	18.902	15.629	38.524	0.82681	2.0381	J
30557-502	TORBRIT	60RU	19.566	16.082	39.573	0.82194	2.0225	-
30717-001A	RUTH & FRANC	79RY	19.231	15.629	38.712	0.81270	2.0130	R
30718-001A	KITSAULT	86GA	19.098	15.627	38.671	0.81826	2.0249	R
30718-002A	KITSAULT	79RY	19.203	15.637	38.893	0.81430	2.0254	R
30718-002B	KITSAULT	86GA	19.088	15.617	38.640	0.81817	2.0243	R
30765-001A	BAYVIEW	79RY	18.501	15.592	38.213	0.84276	2.0655	-
30765-002A	BAYVIEW	86GA	19.153	15.616	38.608	0.81532	2.0158	R
30765-003A	BAYVIEW	86GA	19.151	15.623	38.633	0.81582	2.0173	R
30765-004A	BAYVIEW	86GA	19.152	15.622	38.633	0.81570	2.0171	R
30766-001A1	SILVERADO	86GA	19.162	15.650	38.731	0.81669	2.0212	R
30766-001A2	SILVERADO	86GA	19.148	15.631	38.656	0.81634	2.0188	R
30766-002A1	SILVERADO	86GA	19.167	15.645	38.713	0.81623	2.0197	R
30766-002A2	SILVERADO	86GA	19.156	15.630	38.672	0.81595	2.0188	R
30771-001A	DOLLY VARDEN	79RY	18.948	15.673	38.779	0.82716	2.0466	-
30771-002A	DOLLY VARDEN	79RY	18.866	15.629	38.432	0.82842	2.0371	J
30771-003A	DOLLY VARDEN	85GA	18.852	15.612	38.452	0.82814	2.0397	J
30771-004A	DOLLY VARDEN	85GA	18.898	15.624	38.519	0.82675	2.0383	J
30773-001A	ESPERANZA	79RY	18.791	15.617	38.620	0.83109	2.0552	?
30773-001B	ESPERANZA	87GA	19.072	15.635	38.643	0.81979	2.0262	R
30776-136A	ROBIN	79RY	18.912	15.688	38.784	0.82953	2.0508	-
30776-136B	ROBIN	86GA	18.908	15.622	38.533	0.82622	2.0379	J
30776-136C	ROBIN	87GA	18.523	15.641	37.766	0.84442	2.0389	-
30777-001A	HIDDEN CK	79RY	18.489	15.590	38.380	0.84320	2.0758	-
30777-001B	HIDDEN CK	87GA	19.310	15.866	39.245	0.82164	2.0324	-
30777-001C	HIDDEN CK	87GA	19.211	15.765	39.193	0.82061	2.0401	-
30785-001A	MASTODON	79RY	18.758	15.654	38.546	0.83452	2.0549	J
30785-001B	MASTODON	86GA	18.793	15.682	38.578	0.83446	2.0528	J
30785-001C	MASTODON	87GA	18.806	15.692	38.622	0.83443	2.0537	J
30798-198A	BELLEVUE	79RY	18.858	15.671	38.503	0.83100	2.0417	-
30798-198B	BELLEVUE	87GA	18.818	15.603	38.415	0.82915	2.0414	J
30904-001A	WOLF	85GA	18.859	15.613	38.464	0.82789	2.0396	J
30993-001A	KIT	90PI	18.902	15.624	38.520	0.82656	2.0379	J

TABLE 2-9-1 — *Continued*
GALENA LEAD ISOTOPE ANALYSES FOR THE STEWART – ISKUT AREA, NORTHWESTERN B.C.
(103O&P AND 104A, B&G)

Lab Number	Deposit Name	Analyst	$^{206}Pb/^{204}Pb$	$^{207}Pb/^{204}Pb$	$^{208}Pb/^{204}Pb$	$^{207}Pb/^{206}Pb$	$^{208}Pb/^{206}Pb$	Date
30994-001A1	SUMMIT	90PI	18.882	15.610	38.460	0.82673	2.0369	J
30994-001A2	SUMMIT	90PI	18.909	15.644	38.574	0.82733	2.0400	J
30994-001B1	SUMMIT	90PI	18.868	15.606	38.475	0.82712	2.0392	J
30994-001B2	SUMMIT	90PI	18.878	15.611	38.467	0.82693	2.0377	J
31026-001A	E AND D	90PI	18.920	15.628	38.545	0.82600	2.0373	J
31027-001A	COPPERFIELD	90PI	18.864	15.618	38.465	0.82793	2.0391	J
NTS: 104A								
30455-001A1	KNIP	90PI	19.159	15.628	38.643	0.81570	2.0170	R
30455-001A2	KNIP	90PI	19.137	15.605	38.576	0.81543	2.0158	R
30455-001A3	KNIP	90PI	19.181	15.646	38.701	0.81572	2.0177	R
30455-002A	KNIP	90PI	19.159	15.625	38.635	0.81557	2.0166	R
30616-001A	SPIDER	86GA	19.085	15.609	38.590	0.81788	2.0220	R
30929-001A	SURPRISE CK	87GA	19.125	15.611	38.589	0.81628	2.0177	R
30929-002A	SURPRISE CK	87GA	19.144	15.630	38.637	0.81644	2.0182	R
NTS: 104B								
30361-001A	GRACY	90PI	19.157	15.635	38.673	0.81616	2.0188	R
30361-001B	GRACY	90PI	19.149	15.629	38.651	0.81618	2.0184	R
30361-002A1	GRACY	90PI	19.132	15.637	38.659	0.81729	2.0206	R
30361-002A2	GRACY	90PI	19.188	15.642	38.724	0.81521	2.0181	R
30361-002B1	GRACY	90PI	19.169	15.624	38.676	0.81508	2.0177	R
30361-002B2	GRACY	90GO	19.218	15.674	38.824	0.81561	2.0202	-
30361-002C	GRACY	90PI	19.186	15.638	38.717	0.81506	2.0180	R
30415-001A	BIG MISSOURI	81RY	18.857	15.603	38.489	0.82744	2.0411	J
30415-002A	BIG MISSOURI	81RY	18.857	15.645	38.474	0.82966	2.0403	J
30415-003A	BIG MISSOURI	81RY	18.816	15.624	38.535	0.83036	2.0480	J
30415-004A	BIG MISSOURI	81RY	18.803	15.655	38.512	0.83258	2.0482	J
30415-005A	BIG MISSOURI	81RY	18.780	15.642	38.530	0.83291	2.0517	J
30415-006A	BIG MISSOURI	84GA	18.820	15.615	38.456	0.82970	2.0433	J
30415-007A	BIG MISSOURI	84GA	18.823	15.609	38.435	0.82927	2.0420	J
30415-008A1	BIG MISSOURI	84GA	18.824	15.610	38.458	0.82928	2.0430	J
30415-008A2	BIG MISSOURI	84GA	18.822	15.611	38.453	0.82939	2.0430	J
30415-009A	BIG MISSOURI	86GA	18.812	15.592	38.373	0.82882	2.0399	J
30415-009B	BIG MISSOURI	87GA	18.835	15.615	38.450	0.82904	2.0414	J
30415-010A	BIG MISSOURI	79RY	18.175	15.521	37.634	0.85398	2.0707	-
30415-011A	BIG MISSOURI	87GA	18.827	15.616	38.464	0.82945	2.0430	J
30415-012A	BIG MISSOURI	87GA	18.828	15.617	38.474	0.82949	2.0435	J
30415-013A	BIG MISSOURI	79RY	18.753	15.634	39.057	0.83368	2.0827	J
30415-013B	BIG MISSOURI	87GA	18.734	15.612	38.990	0.83333	2.0813	J
30441-001A1	GLOBE	90PI	19.133	15.624	38.614	0.81656	2.0181	R
30441-001A2	GLOBE	90PI	19.135	15.632	38.656	0.81690	2.0201	R
30441-001A3	GLOBE	90PI	19.133	15.627	38.624	0.81677	2.0187	R
30446-001A	BRUCE GLACIER	90PI	18.828	15.589	38.338	0.82797	2.0362	J
30453-001A	COLAGH	90PI	18.847	15.609	38.433	0.82820	2.0392	J
30459-001A	KERR 15	90GO	18.801	15.613	38.427	0.83042	2.0439	J
30493-001A	SCOTTIE GOLD	84GA	18.804	15.608	38.426	0.83007	2.0435	J
30494-001A	SILBAK PREMIER	79RY	18.825	15.577	38.357	0.82746	2.0376	-
30494-002A	SILBAK PREMIER	79RY	18.849	15.639	38.551	0.82970	2.0453	J
30494-003A	SILBAK PREMIER	79RY	18.839	15.632	38.475	0.82977	2.0423	J
30494-004A	SILBAK PREMIER	79RY	18.767	15.594	38.494	0.83093	2.0512	J
30494-004B	SILBAK PREMIER	87GA	18.833	15.611	38.450	0.82891	2.0417	J
30494-005A	SILBAK PREMIER	86GA	19.229	15.758	38.251	0.81947	2.0412	-
30494-005B	SILBAK PREMIER	87GA	19.210	15.738	39.201	0.81923	2.0406	-
30494-006A	SILBAK PREMIER	87GA	18.836	15.617	38.464	0.82907	2.0420	J
30494-007A	SILBAK PREMIER	84GA	18.825	15.611	38.421	0.82926	2.0410	J
30494-010A	SILBAK PREMIER	87GA	18.817	15.602	38.382	0.82915	2.0397	J
30494-011A	SILBAK PREMIER	87GA	18.838	15.612	38.421	0.82871	2.0395	J
30494-012A	SILBAK PREMIER	87GA	18.841	15.619	38.465	0.82901	2.0416	J
30494-013A	SILBAK PREMIER	87GA	18.833	15.618	38.450	0.82930	2.0416	J
30495-001A	SILVER CONSOL	84GA	18.828	15.619	38.474	0.82954	2.0435	J
30495-001A	SILVER CONSOL	85GA	18.812	15.605	38.432	0.82957	2.0430	J
30629-001A	TAMI	85GA	18.857	15.610	38.456	0.82781	2.0394	J

TABLE 2-9-1 — *Continued*
GALENA LEAD ISOTOPE ANALYSES FOR THE STEWART – ISKUT AREA, NORTHWESTERN B.C.
(103O&P AND 104A, B&G)

Lab Number	Deposit Name	Analyst	$^{206}Pb/^{204}Pb$	$^{207}Pb/^{204}Pb$	$^{208}Pb/^{204}Pb$	$^{207}Pb/^{206}Pb$	$^{208}Pb/^{206}Pb$	Date
30631-002A1	SNIPPAKER	85GA	19.146	15.616	38.584	0.81565	2.0152	R
30631-002A2	SNIPPAKER	85GA	19.155	15.624	38.614	0.81565	2.0159	R
30631-003A	SNIPPAKER	85GA	18.812	15.614	38.441	0.83001	2.0434	J
30631-004A1	SNIPPAKER	85GA	18.806	15.599	38.419	0.82944	2.0429	J
30631-004A2	INEL	87GA	18.823	15.610	38.424	0.82927	2.0413	J
30720-001A	PACKER FRACT	79RY	19.155	15.585	39.602	0.81363	2.0675	R
30720-001B	PACKER FRACT	87GA	19.177	15.629	38.661	0.81500	2.0160	R
30772-001A1	ESKAY CK	90PI	18.812	15.602	38.348	0.82938	2.0385	J
30772-001A2	ESKAY CK	90PI	18.801	15.597	38.344	0.82957	2.0395	J
30772-002A	ESKAY CK	90PI	18.810	15.598	38.335	0.82924	2.0380	J
30772-003A1	ESKAY CK	90PI	18.844	15.635	38.461	0.82968	2.0410	J
30772-003A2	ESKAY CK	90PI	18.835	15.624	38.445	0.82952	2.0411	J
30772-004A	ESKAY CK	90PI	18.817	15.603	38.351	0.82920	2.0381	J
30772-005A	ESKAY CK	90PI	18.806	15.594	38.309	0.82922	2.0371	J
30772-006A1	ESKAY CK	90GO	18.832	15.632	38.466	0.83008	2.0426	J
30772-006A2	ESKAY CK	90GO	18.838	15.626	38.432	0.82947	2.0401	J
30772-007A	ESKAY CK	90PI	18.826	15.613	38.385	0.82932	2.0389	J
30772-008A	ESKAY CK	90PI	18.821	15.605	38.349	0.82916	2.0376	J
30772-009A	ESKAY CK	90PI	18.823	15.609	38.371	0.82923	2.0385	J
30772-013A	ESKAY CK	90PI	18.856	15.660	38.541	0.83053	2.0440	J
30772-013B	ESKAY CK	90PI	18.820	15.608	38.366	0.82930	2.0385	J
30772-014A	ESKAY CK	90PI	18.801	15.595	38.336	0.82951	2.0391	J
30775-001A	GRANDUC	86GA	19.099	15.614	38.561	0.81754	2.0190	R
30775-002A	GRANDUC	87GA	19.144	15.609	38.592	0.81532	2.0159	R
30775-003A	GRANDUC	79RY	18.722	15.600	38.428	0.83324	2.0526	-
30775-003B	GRANDUC	87GA	18.671	15.578	38.256	0.83438	2.0490	-
30775-005A	GRANDUC	88GA	19.085	15.602	38.532	0.81758	2.0190	R
30794-001A	TOM MACKAY LK	79RY	18.773	15.600	38.330	0.83098	2.0418	J
30794-002A	TOM MACKAY LK	79RY	18.792	15.589	38.438	0.82956	2.0454	J
30794-003A	EMMA	90PI	18.819	15.608	38.383	0.82939	2.0396	J
30794-004A1	EMMA	90PI	18.815	15.605	38.370	0.82939	2.0393	J
30794-004A2	EMMA	90PI	18.802	15.593	38.341	0.82936	2.0392	J
30797-001A	UNUK	79RY	18.861	15.629	38.373	0.82864	2.0345	J
30799-001A	MACKAY	90GO	18.816	15.601	38.339	0.82911	2.0376	J
30799-002A	MACKAY	90PI	18.820	15.606	38.348	0.82922	2.0376	J
30799-003A	MACKAY	90PI	18.811	15.596	38.319	0.82910	2.037	J
30813-001A	TWO BARREL	85GA	18.837	15.595	38.399	0.82788	2.0384	J
30814-001A	JOHNNY MT	85GA	18.848	15.605	38.427	0.82797	2.0388	J
30814-001B	JOHNNY MT	87GA	18.855	15.611	38.450	0.82796	2.0393	J
30814-002A1	JOHNNY MT	85GA	19.065	15.625	38.586	0.81956	2.0239	R
30814-002A2	JOHNNY MT	85GA	19.054	15.615	38.562	0.81952	2.0238	R
30814-003A	JOHNNY MT	90PI	18.842	15.591	38.403	0.82746	2.0381	J
30814-005A	JOHNNY MT	90PI	18.853	15.603	38.430	0.82762	2.0385	J
30889-001A	KERR (NANCY)	85GA	18.779	15.599	38.327	0.83066	2.0410	J
30890-001A	SULPHURETS	85GA	18.809	15.626	38.477	0.83077	2.0457	J
30890-002A	SULPHURETS	86GA	18.809	15.608	38.430	0.82979	2.0431	J
30890-002B	SULPHURETS	87GA	18.822	15.617	38.452	0.82969	2.0429	J
30890-003A1	SULPHURETS	85GA	18.803	15.600	38.399	0.82965	2.0422	J
30890-003A2	SULPHURETS	86GA	18.804	15.598	38.388	0.82932	2.0415	J
30890-004A	SULPHURETS	87GA	18.818	15.616	38.444	0.82986	2.0430	J
30890-005A	SULPHURETS	87GA	18.815	15.595	38.407	0.82885	2.0413	J
30890-006A	SULPHURETS	88GA	19.196	15.668	38.842	0.81631	2.0234	R
30891-001A	KHYBER PASS	85GA	19.134	15.615	38.585	0.81610	2.0166	R
30891-002A1	KHYBER PASS	85GA	18.862	15.630	38.526	0.82862	2.0425	J
30891-002B	KHYBER PASS	87GA	18.846	15.611	38.470	0.82835	2.0413	J
30891-002A2	KHYBER PASS	85GA	18.842	15.611	38.448	0.82854	2.0406	J
30923-001A1	START	86GA	19.150	15.654	38.749	0.81747	2.0235	R
30923-001A2	START	86GA	19.132	15.629	38.642	0.81689	2.0198	R
30923-002A1	START	86GA	19.159	15.663	38.719	0.81755	2.0210	R
30923-002A2	START	86GA	19.134	15.641	38.683	0.81746	2.0218	R
30923-003A	START	86GA	19.114	15.621	38.629	0.81729	2.0210	R
30923-003B	START	86GA	19.121	15.628	38.643	0.81733	2.0210	R

TABLE 2-9-1 — *Continued*
GALENA LEAD ISOTOPE ANALYSES FOR THE STEWART – ISKUT AREA, NORTHWESTERN B.C.
(1030&P AND 104A, B&G)

Lab Number	Deposit Name	Analyst	$^{206}Pb/^{204}Pb$	$^{207}Pb/^{204}Pb$	$^{208}Pb/^{204}Pb$	$^{207}Pb/^{206}Pb$	$^{208}Pb/^{206}Pb$	Date
30939-001A	INDIAN	84GA	19.150	15.625	38.665	0.81595	2.0191	R
30939-002A	INDIAN	84GA	19.159	15.621	38.650	0.81537	2.0174	R
30989-001A	TRISH	90PI	18.838	15.588	38.370	0.82747	2.0368	J
30990-001A	TWIN CK	90PI	18.829	15.586	38.366	0.82779	2.0377	J
30991-001A	C-1	90PI	19.176	15.622	38.634	0.81466	2.0147	R
31002-001A	SNIP	90PI	18.847	15.606	38.429	0.82802	2.0390	J
31002-002A	SNIP	90PI	18.809	15.598	38.393	0.82931	2.0412	J
31002-003A	SNIP	90PI	18.865	15.611	38.450	0.82752	2.0382	J
31025-001A	CE ZONE	90PI	18.819	15.624	38.465	0.83021	2.0439	J
50058-001A1	RIVERSIDE	86GA	19.191	15.656	38.726	0.81578	2.0179	R
50058-001A2	RIVERSIDE	87GA	19.160	15.621	38.594	0.81529	2.0143	R
NTS: 104G								
30074-001A	PTARMIGAN	88GA	19.119	15.643	38.639	0.81829	2.0210	R
30074-002A	PTARMIGAN	88GA	19.098	15.622	38.576	0.81806	2.0199	R
30420-001A	BJ	82AN	18.718	15.545	38.183	0.83048	2.0399	-
30420-002A	BJ	82AN	18.741	15.448	37.985	0.82429	2.0268	-
30420-005A	BJ	82AN	19.291	15.702	38.987	0.81395	2.0210	R
30421-002A	SHAFT CK	90PI	18.686	15.584	38.271	0.83399	2.0481	-
30558-001A1	HORN SILVER	85GA	18.846	15.590	38.364	0.82721	2.0357	J
30558-001A2	HORN SILVER	85GA	18.858	15.598	38.393	0.82712	2.0359	J

geological descriptions of hostrock and style of mineralization are in Table 2-9-2. An explanation of abbreviations in Tables 2-9-1 and 2-9-2 is in Table 2-9-3).

Jurassic deposits (Table 2-9-2) include: Eskay Creek, Premier, Scotty Gold, Kerr, Johnny Mountain, Snip and Dolly Varden. Eskay Creek is Early Jurassic on preliminary fossil evidence (P.L. Smith, personal communication, 1990). The Premier, Scotty Gold, Kerr and Johnny Mountain deposits are closely associated with granodiorites of the Texas Creek plutonic suite. This has been dated throughout the study area as Early Jurassic (U-Pb from zircon: Brown, 1987). The Dolly Varden and Snip deposits have the same lead and therefore are also Early Jurassic.

The Early Jurassic produced a wide variety of deposit types. First, they are precious metal rich, but most have associated copper, lead and zinc. Classification of deposits is varied and includes: mesothermal gold veins at Snip and Johnny Mountain, porphyry copper-gold systems at Kerr, epithermal gold-silver and base metal deposits at Sulphurets and Premier, and volcanogenic (Donnelly, 1976; Devlin, 1987) precious metal rich deposits at Eskay Creek (gold rich) and Dolly Varden (silver rich). Overall metal association is gold and silver with copper, lead and zinc (Table 2-9-4).

Tertiary deposits (Table 2-9-2) include Indian, Prosperity-Idaho and Kitsault. These represent the two main deposit types associated with this Eocene metallogenic event. Indian and Prosperity-Idaho are representative of silver-lead-zinc-rich mesothermal veins. These are abundant throughout the study area, but are generally smaller than these examples. Kitsault, dated as Eocene (K-Ar: Carter, 1982), is a porphyry molybdenum deposit with potentially recoverable silver. Thus, the overall metal association is silver and lead with zinc and, sometimes, molybdenum (Table 2-9-4).

Deposits with both Jurassic and Tertiary lead in Table 2-9-2 are Snippaker, Sulphurets, BJ and Granduc. In all cases the area of these deposits contains Tertiary veins as well as mineralization that is apparently older. This emphasizes the strong overprint by Tertiary intrusions associated with the Coast plutonic complex throughout the study area.

Undefined deposits in Table 2-9-2 are BJ, Granduc, Hidden Creek, Shaft Creek and Wilby. In all cases, additional analyses are desirable. However, tentative ages are assigned in the table. The BJ deposit is hosted by Permian schist, and Granduc by Triassic basalt. As neither of these units are part of the Hazelton Group, their associated lead might reflect a different model of lead evolution. Shaft Creek lead plots at the lower, left-hand edge of the Jurassic cluster in Figures 2-9-2 and 3. Consequently, it is slightly anomalous given its Middle Jurassic age (Panteleyev, 1974). Wilby lead is more radiogenic than most deposits examined here. This deposit is stratabound. Markedly radiogenic lead can be characteristic of such deposits (Godwin *et al.*, 1982; 1988).

CONCLUSIONS

Distinctions between the Jurassic and Tertiary galena lead isotope clusters in the Stewart-Iskut area are summarized in Table 2-9-4. Distinctive galena lead ratios conveniently discriminate Jurassic from Tertiary deposits. Historically, the Jurassic deposits are more significant because they tend to be larger and richer in precious metals – especially gold. Deposits with lead isotope ratios that are outside the well-defined Jurassic and Tertiary clusters need more analyses. Some of them formed from lead with a different source.

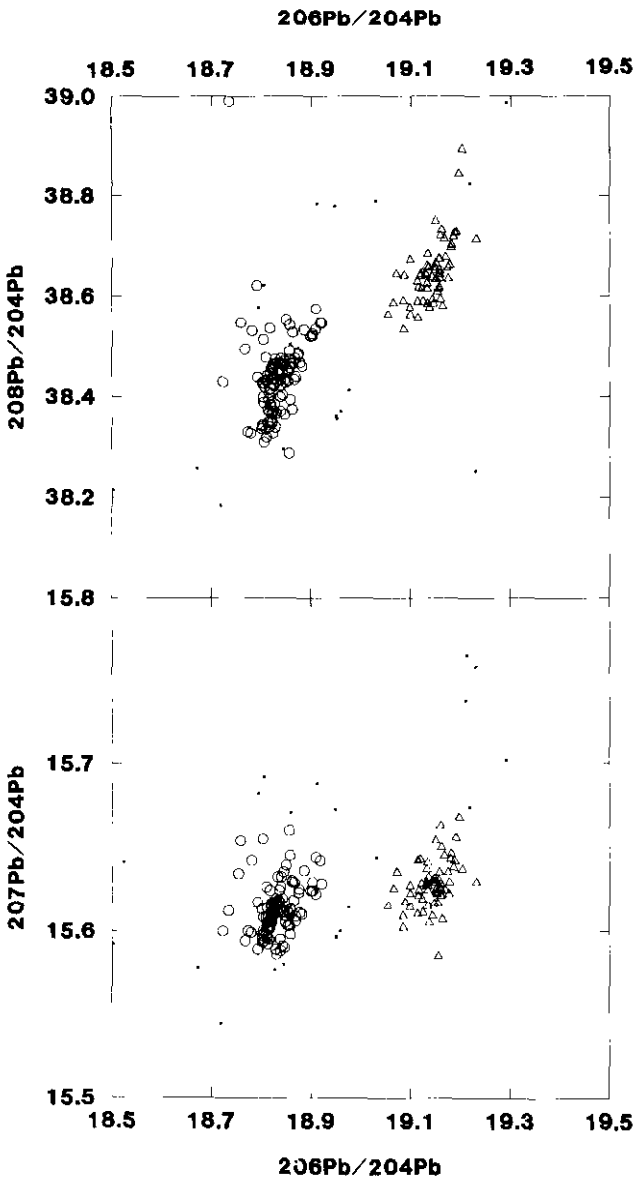

Figure 2-9-2. Lead-lead plots of galena lead isotopes from mineral deposits in the Stewart-Iskut area. The data plot in two clusters. Circles represent Early Jurassic, gold-silver and base metal mineralization that is coeval with the Hazelton Group. Triangles represent Tertiary, silver-lead-zinc±molybdenum deposits generated by granitic intrusions. Dots represent analyses that cannot be assigned or are of poor quality. See also Figure 2-9-3.

Galena lead isotope analysis is a powerful tool for evaluation of mineral showings in the Stewart-Iskut area. The method enables definition of the age and precious metal potential for poorly exposed or newly discovered mineral showings. It therefore allows exploration priorities to be set up for occurrences on a regional, district or local property scale. Application of this scheme should lead to improved success in mine discovery. It allows efforts to be focused on the potentially most productive showings under investigation. Time is a particularly precious commodity during the short field seasons in northwestern British Columbia.

TABLE 2-9-2
ALPHABETICAL LISTING OF DEPOSITS CLASSIFIED BY DATE AND DESCRIBED BY LOCATION, HOST AGE AND DEPOSIT TYPE (103O&P AND 104A, B&G)

Dep No.	Deposit Name	NTS-MINFILE	Lat N	Long W	Host	Type	Date
Jurassic Deposits							
30798	Bellevue	103P-NW139	55.54	129.28	JM	?	J
30415	Big Missouri	104B-SE092	56.12	130.02	JE	?	J
30446	Bruce GLC	104B-NE072	56.60	130.35	JE	V	J
31025	CE Zone	104B-NW	56.63	131.07	?	V	J
31027	Copperfield	103P-NW185	55.67	129.51	JE	L	J
30453	Colagh	104B-NE252	56.58	130.64	JE	L	J
30771	Dolly Varden	103P-NW188	55.68	129.53	JE	L	J
31026	E and D	103P-NW183	55.66	129.51	J	?	J
30794	Emma	104B-NE008	56.63	130.45	JE	L	J
30772	Eskay Ck	104B-NE008	56.64	130.44	JM	L	J
30558	Horn Silver	104G-SW059	57.17	131.52	J	V	J
30631	Inel	104B-NE113	56.62	131.95	T-J	V	J
30814	Johnny Mt	104B-NW107	56.62	131.07	T-J	V	J
30459	Kerr 15	104B-SE278	56.45	130.26	JE	V	J
30889	Kerr (Nancy)	104B-SE100	56.47	130.26	JE	L	J
30993	Kit	103P-NW239	55.75	129.47	J	L	J
30891	Khyber Pass	104B-NW138	56.60	130.97	JE	V	J
30799	Mackay	104B-NE008	56.62	130.47	JE	L	J
30785	Mastodon	103P NW020	55.59	129.76	?	?	J
30556	North Star	103P-NW189	55.68	129.50	JE	L	J
30555	Red Point	103P-NW196	55.70	129.52	JE	V	J
30776	Robin	103P-NW208	55.73	129.52	J	V	J
30493	Scottie Gold	104B-SE074	56.23	130.12	JE	V	J
30494	Silbak Premier	104B-SE054	56.05	130.02	JE	V	J
30495	Silver Consol	104B-SE095	56.11	130.03	JE	V	J
30631	Snippaker	104B-NE113	56.62	131.95	T-J	V	J
31002	Snip	104B-NW250	56.67	131.10	JE	V	J
30994	Summit	103P-NW172	55.75	129.50	JLM	V	J
30890	Sulphurets	104B-SE022	56.47	130.20	JE	V	J
30629	Tami	104B-NE116	56.58	130.79	JE	V	J
30794	Tom Mackay Lk	104B-NE008	56.63	130.45	JE	L	J
30557	Torbrit	103P-NW191	55.69	129.51	JE	L	J
30989	Trish	104B-NW107	56.63	131.07	T-J	V	J
30990	Twin Ck	104B-NW107	56.63	131.10	T-J	V	J
30813	Two Barrel	104B-NW261	56.62	131.07	T-J	V	J
30797	Unuk	104B-SE018	56.41	130.49	T-J	?	J
30904	Wolf	103P-NW198	55.71	129.52	JE	V	J
Tertiary Deposits							
30765	Bayview	103P-NW051	55.96	129.98	JE	V	R
30420	BJ	104G-SE070	57.15	130.95	P	V	R
30991	C-1	104B-NW262	56.62	131.08	T-J	V	R
30773	Esperanza	103P-SW126	55.49	129.49	JM	V	R
30441	Globe	104B-SE015	56.33	130.42	T-JE	V	R
30361	Gracy	104B-SE014	56.34	130.45	T-JE	V	R
30775	Granduc	104B-SE021	56.22	130.35	TL	V	R
30939	Indian	104B-SE031	56.08	130.03	JE	V	R
50055	Jarvis	103O-NE	55.99	130.07	JE	V	R
30814	Johnny Mt	104B-NW107	56.62	131.07	T-J	V	R
30891	Khyber Pass	104B-NW138	56.60	130.97	JE	V	R
30718	Kitsault	103P-SW120	55.42	129.42	R	#	R
30455	Knip	104A-SW095	56.40	129.99	JE	V	R
30720	Packer Fract	104B-SE	56.11	130.02	JE	V	R
30492	Prosper-Idaho	103P-NW089	55.91	129.94	J	V	R
30074	Ptarmigan	104G-SW053	57.15	131.27	T	V	R
50058	Riverside	104B-SE073	56.00	130.07	JE	V	R
30717	Ruth & Franc	103P-NW062	55.98	129.89	J	V	R
30766	Silverado	103P-NW088	55.92	129.96	J	V	R
30631	Snippaker	104B-NE113	56.62	131.95	T-J	V	R
30616	Spider	104A-SW010	56.13	129.99	JE	V	R
30923	Start	104B-SW051	56.08	130.01	JE	V	R
30890	Sulphurets	104B-SE022	56.47	130.20	JE	V	R
30929	Surprise Ck	104A-SW002	56.18	129.55	J	V	R
Undefined Deposits							
30420	BJ	104G-SE070	57.15	130.95	P	V	J?
30775	Granduc	104B-SE021	56.22	130.35	TL	V	T?
30777	Hidden Ck	103P-SW021	55.43	129.82	T	?	R?
30421	Shaft Ck	104G-SE015	57.33	131.01	J	#	J?
30062	Wilby	103P-NW006	55.97	129.57	J	B	R?

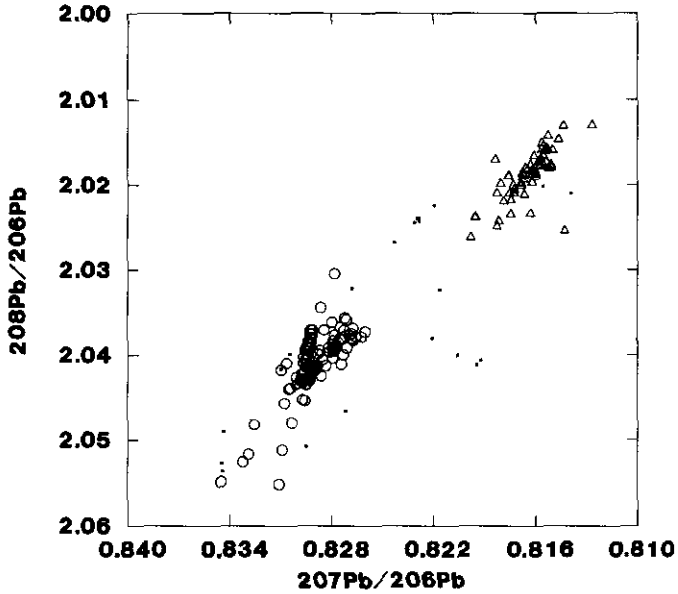

Figure 2-9-3. Lead-lead plot of galena lead isotopes as defined in Figure 2-9-2. However, different ratios are plotted. This plot minimizes effects of ^{204}Pb error.

TABLE 2-9-3
CODES USED IN TABLES 2-0-1 AND 2-0-2

Date and Host
(Deposit Date and Host Age)

R = Tertiary
J = Jurassic
T = Triassic
P = Permian
? = Unknown

\- = Undefined
E = Early
M = Middle
L = Late

Type
(Deposit Type)

V = Vein
L = Volcanogenic
B = Stratabound
# = Porphyry
? = Unknown

Analyst
(Analyst or Reference)
60-90 = Year of Analysis or reference
GA = Gabites[1]
GO = Godwin[2]
PI = Pickering[2]
RU = Russell and Farquhar, 1960[3]
RY = Ryan[3]

[1] GA analyses have been normalized to the Broken Hill Standard sample UBCBHS1 with accepted values (absolute error) from Richards (1981) of: $^{206}Pb/^{204}Pb = 16.004$ (0.006), $^{207}Pb/^{204}Pb = 15.390$ (0.007), $^{208}Pb/^{204}Pb = 35.651$ (0.017), $^{207}Pb/^{206}Pb = 0.96163$ (0.00057), and $^{208}Pb/^{206}Pb = 2.2276$ (0.0014). Sample preparation and analytical techniques are described in Godwin *et al.* (1988).

[2] GO & PI analyses have been normalized to the National Bureau of Standard sample NBS981 with accepted values (absolute error) of: $^{206}Pb/^{204}Pb = 16.937$ (0.001), $^{207}Pb/^{204}Pb = 15.493$ (0.001), $^{208}Pb/^{204}Pb = 36.705$ (0.004), $^{207}Pb/^{206}Pb = 0.91470$ (0.00003), and $^{208}Pb/^{206}Pb = 2.1671$ (0.0001). Sample preparation and analytical techniques are described in Godwin *et al.* (1988).

[3] These analyses are older and sometimes less accurate. See Godwin *et al.* (1988) for normalization factors.

TABLE 2-9-4
SUMMARY FOR THE TWO CLUSTERS OF GALENA LEAD ISOTOPE RATIOS, STEWART-ISKUT AREA (103O&P AND 104A, B&G)

Cogenesis	Age	Metals	$^{206}Pb/^{204}Pb$	$^{207}Pb/^{204}Pb$	$^{208}Pb/^{204}Pb$	$^{207}Pb/^{206}Pb$	$^{208}Pb/^{206}Pb$
Hazelton Group	Jurassic	Au-Ag-Cu-Zn-Pb	18.82	15.61	38.41	0.8290	2.040
Plutons	Tertiary	Ag-Pb-Zn±Mo	19.15	15.64	38.68	0.8150	2.018

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NOTES