

### Location/Identification

<b>MINFILE Number:</b>	094M 002	<b>National Mineral Inventory Number:</b>	094M8,9 Fsp1
<b>Name(s):</b>	<u>GEM</u> GEM E, LIARD FLUORSPAR		
<b>Status:</b>	Prospect	<b>Mining Division:</b>	Liard
<b>Regions:</b>	British Columbia	<b>Electoral District:</b>	Peace River North
<b>BCGS Map:</b>	094M050	<b>Resource District:</b>	Fort Nelson Natural Resource District
<b>NTS Map:</b>	094M08E	<b>UTM Zone:</b>	09 (NAD 83)
<b>Latitude:</b>	59 27 10 N	<b>Northing:</b>	6594071
<b>Longitude:</b>	126 05 37 W	<b>Easting:</b>	664747
<b>Elevation:</b>	860 metres		
<b>Location Accuracy:</b>	Within 500M		
<b>Comments:</b>	Located on Showing A or Gem A, roughly in centre of Gem claim group, 3.5 kilometres north of settlement of Liard River on Alaska Highway (Assessment Report 109, Map 8; Fieldwork 1988, page 478).		

### Mineral Occurrence

**Commodities:** Fluorite, Barite, Strontium

**Minerals**

<b>Significant:</b>	Fluorite, Witherite, Barite		
<b>Significant Comments:</b>	Fluorite and witherite are typically subequal. Barite is usually subordinate.		
<b>Associated:</b>	Quartz, Calcite		
<b>Mineralization Age:</b>	Mississippian		
<b>Isotopic Age:</b>	332 +/- 56 Ma	<b>Dating Method:</b>	Fission Track
		<b>Material Dated:</b>	Fluorite
<b>Deposit</b>	<b>Character:</b>	Stratabound, Podiform, Massive, Breccia	
	<b>Classification:</b>	Replacement, Hydrothermal, Epigenetic, Industrial Min.	
	<b>Type:</b>	E11: Carbonate-hosted fluorspar, E10: Carbonate-hosted barite	
	<b>Shape:</b>	Irregular	
	<b>Dimension:</b>	1800x1500x3 metres	
	<b>Comments:</b>	Maximum length and approximate width of whole mineralized area, and typical thickness of mineralization. Attitude of mineralized zone is variable and subhorizontal, in open, gently south-plunging anticline.	

### Host Rock

**Dominant Host Rock:** Sedimentary

Stratigraphic Age	Group	Formation	Igneous/Metamorphic/Other
Middle Devonian	Undefined Group	Dunedin	-----
Upper Devonian	Undefined Group	Besa River	-----

Isotopic Age	Dating Method	Material Dated
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**Lithology:** Brecciated Limestone, Brecciated Argillite, Fossiliferous Limestone, Black Argillite, Black Slate

**Comments:** Dunedin Formation exposed in core of open anticline, below Besa River Formation. Mineralization straddles unconformity.

### Geological Setting

<b>Tectonic Belt:</b>	Foreland	<b>Physiographic Area:</b>	Hyland Highland
<b>Terrane:</b>	Ancestral North America		
<b>Comments:</b>	Part of 17-kilometres long fluorite belt, north of Liard Hot Springs.		

## Inventory

**Ore Zone:** TOTAL **Year:** 1981  
**Category:** Unclassified **Report On:** N  
**Quantity:** 2,400,000 tonnes **NI 43-101:** N

Commodity	Grade
Fluorite	30 per cent

**Comments:** Possible geological reserves of approximately 2.4 million tonnes of fluorspar mineralization averaging 30 per cent fluorite.

**Reference:** McCallum, N.G. (2012-12-12): Technical Report on the Liard Fluorspar Project.

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**Ore Zone:** TOTAL **Year:** 1975  
**Category:** Unclassified **Report On:** N  
**Quantity:** 3,200,000 tonnes **NI 43-101:** N

Commodity	Grade
Fluorite	32 per cent

**Comments:** An engineering report estimated a possible reserve of 3.2 million tonnes grading 32 per cent CaF<sub>2</sub>.

**Reference:** McCallum, N.G. (2012-12-12): Technical Report on the Liard Fluorspar Project.

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**Ore Zone:** DRILLHOLE **Year:** 1972  
**Category:** Assay/analysis **Report On:** N  
**NI 43-101:** N

**Sample Type:** Drill Core

Commodity	Grade
Fluorite	39.0000 per cent

**Comments:** Best intersection, over 15 metres, hole 72-12 in Gem E showing.

**Reference:** Assessment Report 3975, page 10.

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## Capsule Geology

The Gem fluorite prospect is situated in the Gem claim group, 3.5 kilometres north of the settlement of Liard River on the Alaska Highway (Assessment Reports 109, Map 8; 3975, Maps 3, 17), in one of the most important areas of fluorite mineralization in British Columbia. The occurrence is centred on Showing A, roughly in the centre of a triangular area of several mineral showings measuring 1.8 by 1.5 by 1.5 kilometres.

The region is underlain by Lower to Upper Paleozoic platformal sedimentary rocks of Ancestral North America (Geological Survey of Canada Maps 46-1962, 1712A, 1713A). The Gem prospect is one of many similar and significant fluorite deposits in a 17-kilometre-long belt extending north from Liard Hot Springs Provincial Park. This belt is defined by an open anticline, with a gently south-plunging axis, in the Upper Devonian Besa River Formation, with the Middle Devonian Dunedin Formation exposed in a 2- to 4-kilometre-wide zone in the core of the fold. All the fluorite deposits in the belt are situated at or just above or below the unconformity between these units.

The Dunedin Formation consists of mid- to dark-grey, massive to thinly bedded fossiliferous limestone. It is generally exposed in the Teeter and Mould creek valleys, which are characterized by karst and 'mesa and butte' topography. The overlying Besa River Formation is predominantly black shale or slate and argillite, with some calcareous shale and minor, buff-brown dolomitic layers. The unconformity between the units is very irregular in detail, probably due to an erosional or disconformable relationship between them, or to later faulting (Assessment Report 3975). Such faulting and shearing is shown by brecciated argillite.

The occurrence encompasses approximately seven showings in the Gem claim group, covering an area southeast of Mould Creek, at the southern end

of the fluorite belt referred to above (Assessment Reports 109, 3975, Geology, Exploration and Mining in British Columbia 1972, Open File 1992-16). The deposits generally occur as lenticular replacements in Dunedin Formation limestone, or Besa River Formation argillite near their contact, or in both units. These replacement bodies are usually irregular but may be stratiform and massive, particularly in the limestone. Much of the mineralization is in the form of fracture filling in brecciated limestone (or less commonly argillite), possibly a solution collapse feature of the replacement process or due to the replacing solutions invading fault breccia. The hostrock breccia fragments are mostly angular and a few centimetres across.

The strongest mineralization generally consists of 60 per cent combined fluorite and witherite, typically in subequal amounts, with a smaller proportion of barite (Assessment Report 109). Minor quartz and calcite may be associated. The fluorite varies from dark purple and coarse grained, to black and fine grained. Prolonged exposure to sunlight tends to render the fluorite colourless (Assessment Report 109). The witherite is massive, very fine grained, and varies from white to black. Mineralization in the argillite and slate is much more friable and is locally much richer in witherite and barite than fluorite.

The showings have been designated A to G and have been studied in detail (Assessment Reports 109, 3975); geochemical analyses are given in Geology, Exploration and Mining in British Columbia 1972, page 591, and Open File 1992-16, page 35. Showing A, or Gem A, is a replacement of limestone and is 6 metres thick but may reach 9 metres. Showing B is similar and is 2.4 metres thick. Showing C is 12 metres long and 2.75 metres thick. The 'ore' has a horizontal cleavage and may be a replacement of argillite. Showing D consists of argillite with numerous stringers and lenses of witherite.

Showing E is a replacement of argillite and slate immediately above the limestone and comprises lenses and stringers of fluorite and witherite (up to 74 per cent very friable witherite, locally) and an unusually large amount of barite. A sample collected at the main trench contained 18.27 per cent calcium oxide, 13.83 per cent fluorine, 19.34 per cent barium, 9.6 per cent carbon dioxide, 2.37 per cent sulfur trioxide, 14.04 per cent silicon dioxide and greater than 3 per cent strontium (Geology, Exploration and Mining in British Columbia, 1972). Diamond drilling has shown the mineralization at Gem E to be quite extensive, but much of it is less than 3 metres thick. Three holes intersected greater widths; the best mineralization graded 39 per cent fluorite over 15 metres in hole 72-12 (Assessment Report 3975).

Showings F and G are replacement bodies in limestone. Showing F consists of coarse purple fluorite and witherite but is not well exposed.

Given the consistent setting of the mineralization, it is possible that the showings represent remnants of a much larger, semi-continuous, stratabound deposit, although apparently not one of significant thickness (Assessment Report 3975).

Fission-track studies of fluorite from the Gem showings suggest that the age of formation of the deposit is  $332 \pm 56$  Ma (Fieldwork 1988, page 479).

#### Work History

In 1954, Conwest Exploration Ltd. constructed an access road to the occurrence, conducted a program of geological mapping and stripping, and collected an approximately 3.6-tonne bulk sample from fluorspar occurrences for metallurgical testing.

In 1971 and 1972, Conwest Exploration completed programs of prospecting, geological mapping, trenching, 60 diamond drill holes and bulk sampling on several of the fluorspar occurrences.

In 1975, an engineering report estimated a possible reserve of 3.2 million tonnes grading 32 per cent calcium fluoride (McCallum, N.G. [2012-12-12]: Technical Report on the Liard Fluorspar Project).

In 1981, Conwest Exploration reported possible geological reserves of approximately 2.4 million tonnes of fluorspar mineralization averaging 30 per cent fluorite (McCallum, N.G. [2012-12-12]: Technical Report on the Liard Fluorspar Project).

In 2012, Prima Resources conducted a program of historical review, soil sampling and channel sampling on the area as the Liard Fluorspar property.

In 2013, Prima Fluorspar conducted a gravity survey, along with mapping and bulk sampling programs.

### ***Bibliography***

EMPR AR 1954-178  
EMPR ASS RPT \*109, 1233, 3840, \*3975, \*33580, \*34081, \*34808  
EMPR FIELDWORK 1988, pp. 478-479  
EMPR GEM 1972-587  
EMPR OF \*1992-16, pp. 33-40  
GSC BULL 186  
GSC P 72-32, p. 20  
GSC MAP 46-1962; 1712A; 1713A

CJES, Vol. 15, pp. 1391-1406

N MINER, Vol. 57, No. 33, 1972

\*McCallum, N.G. (2012-12-12): Technical Report on the Liard Fluorspar Project

EMPR PFD 843248, 675851

**Date Coded:** 1985/07/24

**Coded By:** BC Geological Survey (BCGS)

**Field Check:** N

**Date Revised:** 2023/05/12

**Revised By:** Nicole Barlow (NB)

**Field Check:** N