GEOLOGICAL SURVEY OF CANADA

DEPARTMENT OF MINES AND TECHNICAL SURVEYS

PAPER 62-7

DAWSON, LARSEN CREEK, AND NASH CREEK MAP-AREAS, YUKON TERRITORY

116 B and 116 C (E ½), 116 A, and 106 D

(Report and Maps 13-1962, 14-1962 and 15-1962)

L. H. Green and J. A. Roddick

Price 50 cents

1962

GEOLOGICAL SURVEY

OF CANADA

PAPER 62-7

DAWSON, LARSEN CREEK, AND NASH CREEK MAP-AREAS, YUKON TERRITORY

(116 B and C E 1/2, 116 A, and 106 D)

By

L.H. Green and J.A. Roddick

DEPARTMENT OF

MINES AND TECHNICAL SURVEYS

CANADA

CONTENTS

DAWSON, LARSEN CREEK, AND NASH CREEK MAP-AREAS, YUKON TERRITORY

INTRODUCTION

The three map-areas—Dawson (lat. 64 to 65°, long. 138 to 141°), Larsen Creek (lat. 64 to 65°, long. 136 to 138°), and Nash Creek (lat. 64 to 65°, long. 134 to 136°)—were mapped geologically in 1961 by a helicopter-supported party, known as 'Operation Ogilvie'.

The writers were ably assisted in the field by K.E. Northcote, G.R. Turnquist, D.C. Burnett, C.K. Roberts, J.J. Sample, and A.P.D. Lorraine. Transport was provided by a Hiller 12E helicopter, supplied by Klondike Helicopters Ltd. of Whitehorse. The aircrew consisted of A.C. Green, Jr., pilot, and M.A.M. O'Reilly, engineer. The authors wish to acknowledge the excellent air support supplied by these men and their company.

The area around Dawson is accessible by an all-weather road. Dublin Gulch in Nash Creek map-area, and Chapman Lake and the Sixtymile district in Dawson map-area, are accessible by road in summer. Yukon River is the only river navigable by large boats. The rest of the area is accessible by helicopter or, with difficulty, by horses. Most of the larger lakes within the project area are suitable for float-equipped aircraft.

References

Bostock, H.S. (comp.)
1957: Yukon Territory (Selected Field Reports of the Geological Survey of Canada, 1898 to 1933); Geol. Surv., Canada, Mem. 284.

Cairnes, D.D.
1914: The Yukon-Alaska International Boundary, Between Porcupine and Yukon Rivers; Geol. Surv., Canada, Mem. 67.

Cockfield, W.E.
1921: Sixtymile and Ladue Rivers Area, Yukon; Geol. Surv., Canada, Mem. 123.

Green, L.H.
1958: McQuesten Lake and Scougale Creek Map-areas, Yukon Territory; Geol. Surv., Canada, Paper 58-4.

Green, L.H., and McTaggart, K.C.
1960: Structural Studies in the Mayo District, Yukon Territory; Proc. Geol. Assoc., Can., vol. 12, pp. 119-134.

Skinner, R.
1961: Mineral Industry of Yukon Territory and Southwestern District of Mackenzie, 1960; Geol. Surv., Canada, Paper 61-23.

GLACIATION

East of Tintina Trench, ice from alpine glaciers filled and modified the shape of most of the major valleys. In Dawson map-area, valley glaciers emerged from the mountains along the valleys of the North Klondike, Chandindu, and Fifteenmile Rivers but generally failed to reach Tintina Trench. No evidence of glaciation was noted southwest of Tintina Trench. In Larsen Creek map-area, ice moved north along the branches of Hart River, depositing morainal material in the low area northeast of Two Beaver Lake. Some ice also moved south along the valleys of Hamilton and Davidson Creeks. In Nash Creek map-area, ice, in part of local origin and in part from east of the area, moved north to northwest along the major valleys in the northern part and south in the valley of McQuesten Lake. The southwest corner of Nash Creek map-area was only slightly affected by glaciation. Maps of the Pleistocene geology of all three map-areas are currently being prepared by O.L. Hughes and P. Vernon, and will be published separately.

GENERAL GEOLOGY

Tintina Trench divides the project area into two geologic provinces: one to the southeast, underlain by metamorphic rocks of unknown age; and one to the northeast, underlain by relatively unmetamorphosed Precambrian to Cenozoic rocks. No correlation has been made across Tintina Trench, and with the exception of the granitic and volcanic rocks, the rocks of the two areas are shown separately in the map-legend. Northeast of Tintina Trench there is a change of facies from north to south in all three map-areas. These facies are also shown separately in the legend; those on the right side of the legend are present mainly in the south and those on the left side, in the north.

Map-unit 1 (Dawson, Larsen Creek, Nash Creek)[1]

Major exposures of rocks of map-unit 1 appear in the north-central part of Dawson map-area, on the northern half of the boundary between Larsen Creek and Nash Creek map-areas, and in the eastern part of Nash Creek map-area. The unit consists mainly of dark-weathering slate and argillite, which appear to exceed 5,000 feet

[1] Map-areas in which unit appears.

in thickness in the eastern part of Nash Creek map-area. In most places the unit is intensely folded and sheared. The folding is least severe east of Wind River, where some open folds are present. Except for the local development of phyllites, the unit is not metamorphosed. The bottom of the unit is not exposed. Near the eastern edge of Nash Creek map-area, the unit grades by interbedding into the overlying orange-weathering dolomite (2). Unit 1a is exposed beneath a fault in the northeast corner of Nash Creek map-area. It may be several thousand feet thick. The relationship between sub-unit 1a and the rest of unit 1 or other units is unknown.

Map-unit 2 (Dawson, Larsen Creek, Nash Creek)

This unit is much more complex in Dawson map-area than in the two map-areas to the east, and therefore will be described in two parts.

In Nash Creek and Larsen Creek map-areas the unit underlies much of the eastern part of Nash Creek map-area and forms a belt along the north side of Beaver River valley. The belt extends westward into Larsen Creek map-area where it is narrowly restricted and intensely deformed. Unit 2 is at least 5,000 feet thick north of Gillespie Lake, and between 1,000 and 1,500 feet thick in Larsen Creek map-area, but the top is not exposed in either map-area. The unit is easily recognizable by its dominant constituent, a brilliant orange-weathering, thin-bedded dolomite. In the vicinity of Gillespie Lake the unit is moderately folded and faulted at low angles. Elsewhere, tight folding, shearing, and high-angle faulting are common. Where intruded by igneous rock, the orange-weathering dolomite is altered to whitish-weathering, talcose limestone. Units 1 and 2 were folded and eroded before the deposition of the lower Palaeozoic carbonate (8). In many places the denudation has entirely removed unit 2, and the carbonates (8) lie directly on unit 1.

Unit 2d, 10 miles west of Elliott Lake (Nash Creek map-area), is about 4,000 feet thick and is made up of 2,700 feet of spectacular pink-to-cream-weathering dolomite overlain by 1,300 feet of brightly coloured alternating beds of orange dolomite, grey dolomite, both in part cherty, and slate, siltstone, sandstone, and conglomerate. In this area unit 2d forms the upper part of unit 2.

West of Worm Lake (Larsen Creek map-area), unit 2d consists of white, green, and mauve sugary quartzite, dark grey shale, and minor maroon and green shale very similar to that of unit 3.

In Dawson map-area unit 2 underlies most of the north-central part and appears to be much thicker than in the areas to the east. It has an estimated thickness of 10,000 feet. The distinctive orange-weathering dolomite which characterizes the unit in the areas to the east, is present only in parts of the unit. In Dawson map-area the unit has been divided into five parts. At or near the base of this unit is a dark-grey-weathering, thinly laminated dolomite (2e) about 1,000 feet thick. It is overlain by a thin-bedded complex of orange-weathering dolomite, black shale, quartzite, and other rocks (2d) apparently more than 4,000 feet thick. A massive cherty and quartzose, grey dolomite (2c) about 2,000 feet thick overlies member 2d. This

dolomite closely resembles part of unit 8, but is more siliceous and commonly has a thin bright red-weathering dolomite bed near its base. Unit 2c is overlain by a buff-weathering conglomerate (2b) containing white dolomite, grey chert, white quartzite, and some dark grey dolomite boulders that range up to 3 feet in diameter. This conglomerate is about 2,000 feet thick 12 miles northwest of Mount Harper, and about 300 feet thick on the north side of Mount Harper. The upper part of unit 2, consisting mainly of dark shale and platy sandstone, is about 1,300 feet thick. No angular unconformities were noted within unit 2, although a hiatus may exist at the base of the dolomite conglomerate (2b). The structure does not seem complex, most of the beds having moderate southerly dips. Nonetheless the lack of continuity and rather complex outcrop pattern of some of the major subdivisions, especially unit 2c, suggest considerable faulting. Within Dawson map-area, all members of unit 2, except unit 2e, are overlain unconformably by lower Palaeozoic dolomite (8).

Map-unit 3 (Dawson, Larsen Creek, Nash Creek)

Unit 3 extends in a broad band across the southern part of the three map-areas. Throughout most of its length it is split by a narrow belt made up of units 14 and 17, and all three units are truncated by faults along Tintina Trench. Unit 3 is characterized by gritty quartzite, quartz-pebble conglomerate, and maroon and green shale. The thickness of the unit is not known but is probably many thousands of feet. The structure is extremely complex with isoclinal folding and northward thrusting very common. Near the major fault structure marked by Tintina Trench, parallel shearing has developed in unit 3. Although extensively deformed, unit 3 is not metamorphosed except in the area between North McQuesten River and McQuesten Lake, where quartz-mica (chlorite) schists are well developed. The lack of maroon and green shale in this area suggests that their distinctive colours may have been destroyed by metamorphism. The base of the unit is not exposed in the area but the presence of beds of orange-weathering dolomite like that of unit 2, within unit 3 south of the head of Police Creek (west part of Nash Creek map-area), suggests conformity with unit 2. West of Kathleen Lake (Nash Creek map-area), unit 3 seems to be overlain unconformably by lower Palaeozoic dolomite (8). Farther west, unit 3 seems to be thrust over unit 8, except in Dawson map-area where the northern contact of unit 3 is commonly obscured by large bodies of calcareous volcanic rock (4). The southern part of unit 3 appears to be thrust over the massive quartzites of unit 17. The contact between the northern part of unit 3 and unit 14 is marked practically throughout its length by an alluvium-covered depression. The contact is probably a fault but may be an unconformity. In the southwest corner of Larsen Creek map-area and in the southeast corner of Dawson map-area, unit 3 is overlain, apparently accordantly by cherts and argillites (9) bearing Middle Ordovician and younger graptolites. East of North Klondike River unit 3 is thrust over Middle Jurassic siltstones (19). Two collections, one of crinoid columnals and the other of possible algal remains, both suggesting a post-Precambrian age, were made from unit 3. Field relations suggest a Cambrian or Precambrian age.

Map-unit 4 (Dawson, Larsen Creek)

A band of highly calcareous volcanic rock (4) extends east-west across Dawson map-area, following the northern boundary of unit 3. Similar volcanic rocks also occur in thinner bands within units 3 and 9. The unit is fairly competent and commonly forms rough irregular outcrops that stand well above the enclosing rocks. The rock is remarkable for its carbonate content, which is locally as high as 50 per cent. The calcite fills vesicles and is commonly a major constituent of the matrix. Individual flows were not discernible in any of the outcrops examined. Interbedded with the volcanic rocks are thin beds of chert, argillite, limestone, and maroon and green shales. No fossils were found in unit 4, but its intimate association with rocks of units 3 and 9 suggests contemporaneity with these units. The volcanic rocks of unit 4a are identical to those of unit 4 but the unit grades downward into a dolomite conglomerate (2b) north of Mount Harper, and conglomerate and dolomite of unit 2b appear to be interbedded with the volcanic rocks (4a) across Coal Creek. The rocks of unit 4b are fresh and lack the calcite that is characteristic of the rest of unit 4. They have been included in this unit because of their location along the northern contact of unit 3.

Map-unit 5 (Larsen Creek, Nash Creek)

Map-unit 5 underlies rather small areas in the northeast corner of Larsen Creek map-area and the northwest corner of Nash Creek map-area. The unit is best exposed in Nash Creek map-area, where it consists of at least 1,200 feet of conglomerate overlain by 800 feet of brick-red sandstone. The conglomerate contains pebbles and boulders (up to 1 foot in diameter) of red sandstone, grey quartzite, greenstone, black shale, and orange-weathering dolomite. The base of the unit is not exposed here, but the downward increase in abundance of boulders of orange-weathering dolomite indicates that it may overlie unit 2. Locally interbedded with the sandstone and conglomerate are amygdaloidal andesitic or basaltic flows, commonly about 15 feet thick. Elsewhere, the unit consists mainly of red sandstone and is rarely more than a few hundred feet thick. In Nash Creek map-area the unit is essentially undeformed, but in Larsen Creek map-area it has been dragged up along a fault that drops unit 5 against unit 1. The base of unit 5 is exposed in several places where the unit is too thin to map, as well as near Hart River north of Larsen Creek map-area. In all these exposures unit 5 overlies unit 1 with marked angular unconformity. In the Nash Creek map-area unit 5 is overlain conformably by carbonates (unit 7) containing fossils of possible Middle and definite Upper Cambrian age. Unit 5 is therefore probably Cambrian, but may be Precambrian.

Unit 6 (Dawson)

Unit 6 is probably less than 1,000 feet thick. Much of it is recessive and poorly exposed, and some shale and sandstone may be present. Fossils of Middle or Upper Cambrian age were collected from the unit within the map-area, and in Alaska, just to the west of the map-area, Lower Cambrian fossils are reported near the base of

the unit. As mapped, unit 6a contains some recessive rocks equivalent to those of unit 6 as well as a competent thick carbonate sequence that appears to underlie the rest of unit 6. Due to structural complications, the thickness of the competent carbonates is not known, but several thousand feet seem to be present. On Jones Ridge, approximately 8 miles north of Dawson map-area and on the Yukon-Alaska boundary, massive carbonates lithologically similar to those of unit 6a contain fossils of Lower Cambrian to Ordovician age, suggesting equivalence in part to the more recessive rocks of unit 6.

Map-unit 7 (Nash Creek)

Unit 7 is restricted to the northwest corner of Nash Creek map-area. It is about 1,300 feet thick and consists mainly of buff-, brown-, and grey-weathering limestone and dolomite. The unit is divisible into four parts which, from bottom to top, are: buff-weathering, thin- to medium-bedded limestone (360 feet); brown-weathering, thin-bedded, platy limestone (320 feet); grey-weathering, medium- to thick-bedded dolomite (420 feet); and buff-weathering, thin-bedded dolomite (270 feet). A few interbeds of the underlying red sandstone (unit 5) are present in the basal part of unit 7. Units 7 and 5 are conformable. Unit 7 is overlain without angular unconformity, but probably disconformably, by lower Palaeozoic dolomite (8). In Royal Creek, only 11 miles to the east, the 3,300 feet of strata represented by units 5 and 7 is reduced to about 200 feet of brick red sandstone. This rapid thinning probably resulted from block faulting and erosion prior to the deposition of the dolomite (unit 8), although other explanations are possible. At their western limit units 5 and 7 are thrust westward over units 1 and 8. Fossils of possible Middle, and definite Upper Cambrian age were collected from unit 7.

Map-unit 8 (Dawson, Larsen Creek, Nash Creek)

Unit 8 is almost entirely carbonate but varies considerably; in composition between limestone and dolomite, in thickness of bedding, and in colour, in places within relatively short distances. Distinctive marker beds that can be traced for several miles or more occur locally but none persists throughout the entire area. Most of the unit is poorly fossiliferous but good collections were made from some beds. The collections range in age from late Cambrian to late Silurian.

In Nash Creek map-area, in a section 5 miles east of Royal Creek (about 64°53'N, 134°57'W), the unit is about 4,700 feet thick and may be divided as follows into seven parts, from bottom to top: buff-grey-weathering, medium-bedded to massive, medium- to coarse-grained dolomite (1,670 feet); dark grey, medium- to thick-bedded limestone (300 feet); interbedded dark to light grey, medium-bedded dolomite (940 feet); dark grey, medium-bedded limestone (400 feet); dark grey, thin-bedded argillaceous limestone and dolomite (320 feet); light grey, massive dolomite and dark grey thick-bedded limestone (900 feet); and black, argillaceous, thin-bedded limestone (210 feet). In this section, organic remains were found throughout the unit, but identifiable fossils were found only in the upper 1,300 feet. The oldest of these are Upper Ordovician, and the youngest, near the top of the section, are Upper (?) Silurian or Lower

Devonian. In a composite section 10 miles west of Hart Lake (Nash Creek map-area) the unit is about 2,800 feet thick and may be divided as follows into four parts, from bottom to top: grey-weathering, thin- to medium-bedded, grey to tan limestone and dolomite (600 feet); dark weathering, thin-bedded, slabby, black limestone and shale (300 feet); greenish weathering, thin-bedded, grey-green tuffaceous argillite, in part limy, and thin-bedded buff-weathering limestone, both mapped as unit 8a (900 feet); and grey-weathering, thick-bedded, grey dolomite (1,000 feet). Lower Middle Ordovician graptolites were found in the black limestone and shale, Lower (?) to Upper Ordovician fossils in the tuffaceous unit (8a), and Upper Ordovician and Upper Silurian fossils in the massive dolomite. Elsewhere in Nash Creek map-area unit 8 is mainly thick-bedded, very poorly fossiliferous dolomite. In addition, much of the structure is complex and it has not been possible to measure sections accurately. Between, but not in the two sections described, is a thin-bedded, platy, black limestone with Lower Silurian fossils, that forms a good horizon marker in an area in which much of the structure is complex.

Along the northern margin of Larsen Creek map-area, carbonates of unit 8 are gently folded and in the centre of the area they occur mainly in thrust blocks. In the north, unit 8 is possibly 3,000 feet thick and consists mainly of thick-bedded limestone and dolomite. Upper Cambrian fossils were collected from unit 8 about 2,000 feet above the unconformity with Precambrian rocks (1) about 2 miles north of the map-area, and Upper Silurian fossils were obtained from near the top of the unit immediately beneath the contact with unit 11 near the forks of Hart River.

In Dawson map-area carbonates of unit 8 overlie rocks assigned to unit 2, forming a major, westerly plunging, anticlinal structure. In this area the maximum thickness of the unit is perhaps 3,000 feet and it consists mainly of thick-bedded to massive, light-grey-weathering dolomite. No fossils were found in the unit within Dawson map-area, but along Monster River unit 8 is overlain by rocks of unit 9 containing Silurian fossils.

Unit 8a outcrops near Hart Lake in Nash Creek map-area. West of Hart Lake and near Castle Mountain it consists of perhaps 1,000 feet of brown tuffaceous argillite, in part limy, and thin beds of limestone. South and southeast of Hart Lake unit 8a grades into more massive volcanic rocks that are in part vesicular. Some of the volcanic rocks are very similar to the intrusive rocks of unit 20. Fossils of Lower (?) and Middle to Upper Ordovician age were collected from unit 8a.

Throughout much of the project area unit 8 has undergone moderate folding and some thrusting. In contrast, complex structures characterized by isoclinal folds, steep faults and considerable thrusting, alternate with more open structures in the area north of Hart Lake (Nash Creek map-area). Complex folding is particularly well shown along the north side of Hart Lake valley. In the central part of Larsen Creek map-area, complex structures are present in some of the thrust blocks.

Unit 8 overlies units 1, 2, and 3 with profound unconformity and probably overlies unit 7 unconformably, although no

certain discordance was observed at this contact. In Nash Creek map-area unit 8 is overlain conformably by unit 10 but to the west it is overlain unconformably by units 9, 11, and 13.

Map-unit 9 (Dawson, Larsen Creek)

Unit 9 outcrops in three localities: (1) in the southeast corner of Dawson map-area and the southwest corner of Larsen Creek map-area; (2) in two bands extending from the western side of Larsen Creek map-area west to Tintina Trench; and (3), in the northwest corner of Dawson map-area. In general, the unit is poorly exposed.

At localities 1 and 2 the relatively wide distribution suggests a minimum thickness of several thousand feet. The contact of unit 9 with the underlying unit (3) appears to be gradational as chert bands become increasingly numerous in unit 3 near the contact. In the Tombstone Mountain area, unit 9 appears to be overlain conformably by unit 14. Northeast of North Fork Pass unit 9 seems to overlie unit 13 but this may be a result of overturning or northward thrusting. Graptolites collected from several localities in unit 9 indicate a range in age from Middle Ordovician to Upper Silurian.

Unit 9 is poorly exposed in the northwest corner of the Dawson map-area, where it is about 500 feet thick and is believed to consist mainly of black chert and black shale. West of Monster River, unit 9 appears to overlie unit 6 conformably and to grade upwards into unit 13, although regional relationships suggest that the contact with unit 13 is unconformable. Along Monster River unit 9 appears to overlie unit 8 conformably and to have a gradational contact with unit 13. In both these areas units 9 and 13 are lithologically very similar and the contact has been drawn rather arbitrarily between the highest graptolite and the lowest plant occurrences. One collection of Middle or Upper Ordovician fossils was made near the western boundary of the area and two collections of, respectively, Silurian and Upper Silurian fossils, were made to the east, in the valley of Monster River.

Map-unit 10 (Nash Creek)

Unit 10 consists mainly of light grey and dark grey-brown limestone and dolomite. The light- and dark-coloured beds alternate every 3 to 5 feet, giving the unit its characteristic banded appearance. In the section 5 miles east of Royal Creek (about 64° 53'N, 134° 57'W) the unit is 3,540 feet thick; about three quarters of this is limestone and the remainder is dolomite. The major subdivisions, from bottom to top, are: interbedded dark grey limestone and light grey dolomite (940 feet); alternating light grey and dark brownish grey dolomite (500 feet); interbedded dark grey limestone and light grey dolomite (750 feet); and alternating dark grey and light grey limestone (1,350 feet). Unit 10 conformably overlies limestone of unit 8 containing Upper (?) Silurian or Lower Devonian fossils, and is overlain conformably by limestone containing lower Middle Devonian fossils. No fossils were found in unit 10.

Map-unit 11 (Larsen Creek, Nash Creek)

Unit 11 is present near Hart Lake and Royal Creek in Nash Creek map-area, and east of Hart River in Larsen Creek map-area. In the section 5 miles east of Royal Creek the unit is about 900 feet thick and the upper contact is not exposed. There, the unit consists entirely of very fine grained, dark grey to black limestone. A central bed, 240 feet thick, and a capping bed about 100 feet thick, comprise the two competent massive beds in the unit. The remainder of the unit is thin to medium bedded and recessive. At Royal Creek and near Hart Lake unit 11 appears to overlie unit 10 conformably, but in Larsen Creek map-area it overlies unit 8, presumably unconformably. Near Hart Lake, unit 11 is overlain unconformably by unit 15b. Unit 11 is abundantly fossiliferous and numerous collections of lower Middle Devonian age were made from it.

Map-unit 12 (Nash Creek)

Unit 12 outcrops in a low-lying basin north of Hart Lake. The thickness of the unit is probably more than 1,000 feet but it is difficult to determine because of complex folding and intense shearing. At one point, near the head of Royal Creek, unit 12 appears to overlie, conformably, lithologically similar rocks of Lower Silurian age belonging to unit 8. South of there unit 12 appears to have been overthrust by massive dolomites of unit 8 but the structure is not well understood. Unit 12 contains fossils of definite lower Middle Devonian age and some that may be Lower Devonian or Silurian. The unit is apparently a facies equivalent of all or part of units 10 and 11 and possibly of unit 8. It is overlain, apparently unconformably, by unit 15b.

Map-unit 13 (Dawson, Larsen Creek, Nash Creek)

Because of its recessive nature and resultant lack of exposures, little is known about unit 13. It underlies low areas, mainly in the northeastern part of Dawson map-area and the northwestern part of Larsen Creek map-area. It consists of several thousand feet of strata, chiefly platy black argillaceous and limy rocks. They weather mainly black, but locally are a characteristic yellowish red and silvery grey. Northeast of North Fork Pass (Dawson map-area) the lower part of unit 13 contains beds of black chert that make it difficult to distinguish from unit 9 with which it is in contact. Unit 13 is capped by a laterally extensive bed of chert-pebble conglomerate that is characterized by an abundance of light-coloured chert pebbles up to about 3 inches in diameter. East of Two Beaver Lake (Larsen Creek map-area) the conglomerate is overlain, apparently conformably, by unit 15. In Larsen Creek map-area unit 13 contains fossils of lower Middle Devonian, possibly Upper Devonian, and Carboniferous to Permian age. The unit contains plant remains north of the south fork of Tatonduk River (northwest part of Dawson map-area).

Unit 13a outcrops in the northwest corner of the Dawson map-area where it is more than 1,000 feet thick. The unit contains layers of both fine conglomerate and sandstone up to several hundred feet thick. Within the layers the rocks are commonly medium to thick bedded. The pebbles of the conglomerates are composed of chert in approximately equal amounts of black, medium to light grey, and light

cream to buff varieties, as well as minor green chert. Most of them are fine, rarely exceeding 1/2 inch in diameter. Both the conglomerate and sandstone are flecked with fine spots of iron oxides. No identifiable fossils were found within the map-area but specimens collected approximately 3 miles northwest of boundary monument 105 contain spores of Upper Devonian age. Unit 13a is similar to unit 22b and the two can only be separated with certainty where identifiable fossils are present. Unit 13a appears to be the upper part of unit 13.

Map-unit 14 (Dawson, Larsen Creek, Nash Creek)

A band of unit 14 has been traced from the southeast corner of Nash Creek map-area west to Dawson map-area, where it is truncated by the Tintina Trench structure. The thickness of the unit is not known, owing to complex internal deformation. If no repetitions are present it may have a maximum thickness of 20,000 feet north of McQuesten Lake in Nash Creek map-area and 10,000 feet in Dawson map-area.

The unit is characteristically thin bedded, with few beds more than 6 inches thick. The proportion of slate and phyllite to quartzite varies widely in each outcrop; some are almost entirely slate or phyllite and others are thin-bedded quartzite separated by fine partings of argillaceous material.

Unit 14 has undergone greater deformation to the east where many of the rocks are phyllite and commonly exhibit well-developed foliation cutting across the bedding. It seems to have been deformed by shearing parallel or subparallel with the bedding rather than by large-scale folding. The only known large folds in the unit are the overturned isoclinal fold in Davidson Range and some isoclinal folds associated with greenstones of unit 20 (Green and McTaggart, 1960).

Unit 14 overlies or is in fault contact with unit 3 in the eastern areas and overlies unit 9 in Dawson map-area. Fossils, identified as Carboniferous or Permian, were collected approximately 7 miles north of the east end of McQuesten Lake in Nash Creek map-area. They occur in a limestone band at the contact of unit 14 with unit 3. Unfortunately, the exact stratigraphic relationship is not clear and the fossils may be in an infolded bed. Two collections of crinoid columnals indicating a probable post-Cambrian age were collected from unit 14 in Larsen Creek map-area.

Map-unit 15 (Dawson, Larsen Creek, Nash Creek)

Unit 15 outcrops in the northwest corner of Larsen Creek map-area, and extends into Dawson map-area. It is approximately 1,800 feet thick where measured 8 miles northwest of Two Beaver Lake. The lower 500 feet consists mainly of thin- to medium-bedded, dark grey limestone, but is characterized by several beds of chert-pebble conglomerate up to about 30 feet thick. The upper 1,300 feet consists mainly of limestone, with minor chert, shale and quartzite. The limestone is dark grey to black and comprises beds from 1 foot to 6 feet thick, becoming thinner at the top of the section. The shale is black and cherty, and is restricted to a single 50-foot

bed near the centre of the upper part of the unit.

Unit 15 is moderately folded, and broken by east-west-trending normal faults which drop the north side. Most of the fossils collected from the unit are Permian, but some are Carboniferous. Unit 15 is underlain, apparently conformably, by unit 13, and overlain conformably by unit 16.

Unit 15a outcrops poorly in the northwest corner of Dawson map-area. Although it appears to be in the same stratigraphic position as unit 15 near Two Beaver Lake, it differs somewhat in lithology. A section north of Tatonduk River, with base not exposed, consists of the following four parts, from bottom to top: 200 feet of calcareous sandstone with a few thin beds of chert-pebble conglomerate; 1,700 feet mostly covered but with a few outcrops of limy siltstone; 200 feet of thin-bedded limestone; and 200 feet covered. Carboniferous and Permian fossils were collected from unit 15a.

Unit 15b outcrops on the sides of the valley above Hart Lake in Nash Creek map-area. One fossil collection of Carboniferous or Permian age and another of Pennsylvanian or Permian age were made from it.

Map-unit 16 (Larsen Creek, Dawson)

Small remnants of unit 16 overlie unit 15 in the northwestern part of Larsen Creek map-area. It is about 1,200 feet thick. The lower 500 feet consists of dark shale, black chert, and some interbedded limestone. The upper 700 feet grades from chert with limestone nodules to a cherty limestone. Most of the chert in the upper part is light grey and weathers white. In the small syncline in the northwest corner of Dawson map-area, unit 16 is about 1,000 feet thick and consists mainly of cream- to light-buff-weathering, thin-bedded chert with some limestone. Unit 16 contains Permian fossils.

Map-unit 17 (Dawson, Larsen Creek, Nash Creek)

Unit 17 outcrops from the southeastern part of Nash Creek map-area to the centre of Dawson map-area where it is truncated by Tintina Trench. The stratigraphic thickness of the unit is unknown as the internal structure is complicated by numerous minor and possibly some major isoclinal folds. Apparent maximum thicknesses, without making allowance for structural repetition, are: Dawson area—north of Little Twelvemile River to Klondike River, 45,000 feet; Larsen Creek area—southwest of Worm Lake, 4,500 feet; Nash Creek area—Davidson Range, 1,200 feet, and Patterson Range, including quartzite to the south of the map-area, 14,000 feet.

Typical outcrops of unit 17 consist of dark blue-grey to grey quartzite with beds a few feet to 10 feet thick separated by thinner-bedded quartzite, and slate or phyllite, commonly graphitic. The thinner-bedded rocks occur both as thin partings between beds of massive quartzite and in thicker bands within the area mapped as unit 17. In general, the phyllitic rocks are less competent than the more massive quartzites and the unit probably contains considerably more phyllitic material than is apparent from outcrops.

The rocks of unit 17 almost invariably show a well-developed foliation which appears to be parallel with the bedding in most places but in some transects it. Isoclinal folds are common in the unit. These range in size from a fraction of an inch between the limbs, to about 1 1/2 miles in the large overturned fold in Davidson Range. The axial planes of these folds are commonly parallel with the bedding. In most of the folds the upper beds have moved to the north or northeast.

Everywhere in the area unit 17 overlies unit 14. In most places the rocks stratigraphically overlying unit 17 are not exposed, as unit 3 has been thrust onto unit 17 along a major east-west-trending thrust fault. In part of Dawson map-area, however, unit 17 is overlain, possibly conformably, by Middle Jurassic rocks (19), and in Davidson Range (Nash Creek map-area) by rocks mapped as 14 (?). These rocks are lithologically more like those of unit 14, which underlie unit 17, than the more graphitic rocks that overlie the quartzites correlated with unit 17 south of the map-area. The geology of Davidson Range is complex and is not fully understood. Either facies changes or structural repetition may be present.

Quartzites of unit 17 in Nash Creek map-area and similar quartzites in the Keno and Galena Hills area to the south were previously mapped as Precambrian and included in the Yukon Group. However, two collections of poorly preserved plant fossils suggesting a late Palaeozoic or Mesozoic age were collected from unit 17 in Dawson map-area. Also, massive quartzite mapped as unit 17 occurs near Kathleen Lake (Nash Creek map-area) where it is associated with rocks bearing Triassic fossils (18). Exposures are not complete but there is a suggestion that the two units there (17 and 18) may be conformable. In addition, three collections indicating a Palaeozoic age were made from unit 14 which underlies unit 17.

Map-unit 18 (Dawson, Nash Creek)

Unit 18 outcrops along the northern margin of Dawson map-area and near Kathleen Lake in Nash Creek map-area. Outcrops are poor and the thickness of the unit cannot be estimated in either area. One large outcrop along Monster River exposes about 300 feet of beds.

In Dawson map-area, unit 18 is believed to lie unconformably on units 15a and 16. It is overlain unconformably by unit 22 which truncates unit 18 to the west. Upper Triassic fossils were collected from unit 18 in both Dawson and Nash Creek map-areas.

Map-unit 19 (Dawson, Larsen Creek)

Unit 19 is best exposed on the ridge east of North Klondike River in Dawson map-area, where a maximum thickness of 9,000 feet may be present if strata are not repeated through faulting or folding. The unit overlies quartzites of unit 17, possibly conformably. Rocks overlying unit 19 are not exposed, as unit 3 has been thrust onto unit 19 along a major east-trending thrust fault.

Ammonite fragments of late Middle Jurassic age were collected from a black shale band near the top of the unit. This band also contains numerous spherical concretions of black chert.

Map-unit 20 (Dawson, Larsen Creek, Nash Creek)

Sills (20) of diorite, gabbro, and altered equivalents have intruded units 1, 2, 3, 9, 14, and 17. They are most common in unit 14 in Nash Creek map-area and unit 17 in Dawson map-area. They are much more numerous than shown on the map. In some units, particularly 1, 3, and 9, the sills weather much like the enclosing rock and often escaped notice unless crossed by a ground traverse. Many other sills were too small or too close together to be shown on the scale of the present map.

The sills vary in size from a minimum of a few feet thick and less than 100 feet long to a maximum that is represented by one near Mount Cameron in Nash Creek map-area, which is approximately 600 feet thick and exposed for over 5 miles. They range from fresh igneous rocks to rocks that have been completely altered to a mass of secondary minerals, commonly amphibole, albite, and epidote. In some sills the secondary minerals show foliation parallel with that of the enclosing sedimentary rocks. Some of the sills are younger than unit 17 which is believed to be late Palaeozoic or early Mesozoic. The sills may be of more than one age but they do not appear to differ significantly in the different units.

Map-unit 21 (Dawson, Larsen Creek, Nash Creek)

Between Hanson Lakes and Dublin Gulch (Nash Creek map-area) are several small stocks ranging in composition from granodiorite to quartz monzonite (21a). Their texture is very uneven, and the grain-size ranges from fine to coarse. They commonly have a porphyritic appearance owing to large crystals of potassium feldspar. The mafic mineral is biotite, more or less altered to chlorite. Locally, the rock is foliated. It contains rare fine-grained inclusions.

In Dawson map-area a belt of related syenite stocks (21b) extends from the head of Alder Creek to O'Brien Creek. The belt is represented in the southwest corner of Larsen Creek map-area by a few very small bodies. The principal rock type is hornblende/biotite syenite, but it grades into local biotite-rich varieties, and in places, into diorite. The texture is very uneven, ranging from fine to coarse grained. The rock commonly contains large potassium feldspar crystals (up to 1 inch in length) which give the rock a porphyritic appearance. Local lineation is given to the rock by a sort of fluidal alignment of hornblende laths. The syenite contains rare, rounded inclusions of dark grey granulite, commonly about 3 inches in diameter. The syenite has forcefully intruded units 3, 4, 9, 14, and 17. The country rocks have been only slightly altered by the intrusions, and the metamorphic effects are limited to a few feet adjacent to the contact. No dykes were seen emanating from the stocks. The larger of the two stocks lying between Fish and O'Brien Creeks (Dawson map-area) is cut by a few later dykes of brown-weathering basalt. The age of the syenite stocks is not known, though they are thought to

be contemporaneous with granitic rocks far to the southeast which have been dated as Middle Cretaceous.

Map-unit 22 (Dawson)

Although fossils of the same age have been collected from unit 22a and 22b, the two differ considerably in lithology and will, therefore, be described separately.

Scattered exposures of unit 22a occur in Tintina Trench. The rock is poorly consolidated and many of the outcrops are nearly buried by debris. Exposures are so poor that it is not possible to make any estimate of the thickness of the unit or to determine the structure. Both the conglomerates and the sandstones are poorly sorted and commonly contain angular fragments of schist. Lignite float occurs in some areas but it too is extremely friable and no seams were observed in place. Some of the better outcrops show dips to 45 degrees or more indicating that the unit has undergone at least moderate deformation. Plant remains of late Cretaceous to Tertiary age were collected from this unit.

Unit 22b outcrops in the northwest corner of Dawson map-area. The top of the section is not exposed, but in the syncline north of Monster River a section at least 4,000 feet and possibly as much as 6,000 feet thick is exposed.

Competent layers of sandstone and conglomerate, generally less than 100 feet thick, are scattered throughout unit 22b. Within these layers the rocks are commonly thin to medium bedded. The shale and siltstone are recessive and rarely outcrop. The rocks of unit 22b differ markedly from those of unit 22a; in unit 22b the coarser sandstones and conglomerates are well sorted, the coarser grains and pebbles are nearly all chert, and the outcrops lack the wide lithological variety characteristic of unit 22a. Unit 22b lies unconformably on units 16 and 18. The actual contact is rarely exposed but the angle of discordance appears to be slight. Plant remains of possible Upper Cretaceous to Tertiary age were collected from the unit in the syncline north of Monster River.

Map-unit 23 (Dawson, Larsen Creek, Nash Creek)

Exposures of unit 23 are rare in the areas, but are most common along Yukon River and in unit 14 near the southern margin of Nash Creek map-area. Most of the exposures seem to be of sill-like bodies less than 50 feet thick. Few can be traced more than a few hundred feet. They commonly appear to parallel the foliation of the enclosing sediments, but one particularly well-exposed body was observed alternately to parallel and to crosscut the foliation of the enclosing rocks. The porphyries commonly contain phenocrysts of quartz, feldspar, and, less commonly, biotite and muscovite, in a sugary-textured to aphanitic groundmass.

Map-unit 24 (Dawson, Larsen Creek)

Tertiary volcanic rocks and associated sedimentary rocks (24) outcrop in the southwest corner of Dawson map-area and in one small area along the southern boundary of the Larsen Creek map-area. Along Sixtymile road, unit 24 appears to form a thin capping on unit C, but the volcanic rocks extend down to the valley of Sixtymile River, approximately 2,000 feet below the crest, indicating that unit 24 was not deposited on the plateau surface. The unit outcrops poorly, and reliable attitudes could not be obtained. The associated sedimentary rocks occur in scattered bands throughout the unit. Loose gravels along Sixtymile road in the area underlain by unit 24 appear to have been derived from the weathering of conglomerates within the unit. No fossils were obtained from the unit. The Tertiary age is based on the age assigned to similar rocks to the southeast.

Map-unit A (Dawson)

Numerous small bodies of serpentinized ultrabasic rocks (A) occur in units C and D. Most of them are poorly exposed and they are probably much more numerous than indicated on the map. Some of the bodies are associated with greenstones and basic igneous rocks; others lack intermediate rocks and occur as small lenses or sill-like bodies in the enclosing sedimentary rocks of unit C.

Map-unit B (Dawson)

Unit B is restricted to the area southwest of Tintina Trench. It consists of light-buff-weathering schists, which are commonly very micaceous. The schists contain considerable albite, in apparent equilibrium with quartz, chlorite, and calcite. They include some igneous material, chiefly in the form of sheared quartz-feldspar porphyries, but are mainly of sedimentary origin. Some of the schists contain conspicuous bluish grey quartz eyes, similar to some of the gritty quartzites in unit 3. Nearly identical counterparts to some of the rocks in unit B (and C) were found in the metamorphosed parts of unit 3 between McQuesten Lake and North McQuesten River (Larsen Creek and Nash Creek map-areas). These similarities suggest that units B and C may be in part equivalent to unit 3.

Map-unit C (Dawson)

Unit C consists chiefly of dark grey rocks which grade from pure quartzite, through micaceous quartzites, to quartz-mica schists. Between Sixtymile road and Fortymile River, the unit includes substantial bodies of whitish, coarse-grained, crystalline limestone. Minor bedding features have been destroyed by metamorphism, but the major fluctuations in original lithology are preserved in their metamorphic equivalents. The structure is apparently very complex, but owing to poor outcrops, it is not understood. Unit C (which has been referred to as "Nasina Series" or "Birch Creek Formation" in early reports) seems to grade downward into the gneisses of unit E. It also seems to grade upward into unit B but this is very uncertain.

Crinoid ossicles were found in unit C a short distance south of the point where Yukon River enters Alaska, and at several localities in what appear to be similar rocks within Alaska. These collections indicate a Palaeozoic age for at least part of unit C. Among the unmetamorphosed strata northwest of Tintina Trench, the nearest lithologic equivalent is unit 3.

Map-unit D (Dawson)

Unit D forms the bluffs at Dawson and outcrops downstream along Yukon River from near the mouth of Chandindu River almost to Forty Mile. Included within the unit are dense, altered greenstone and light to dark green gneiss which appears to have developed from the former, particularly near the granitic rocks (21 a) along Yukon River. Associated with the unit is minor quartz-muscovite-chlorite schist similar to that of unit B, and quartzite and quartz-mica schist similar to those of unit C, as well as limestone and dolomite. Unit D probably formed mainly from altered volcanic rocks.

Map-unit E (Dawson)

Unit E consists primarily of fine- to medium-grained quartz-biotite gneiss. White quartz veins are very numerous, and large quartz-feldspar pegmatite veins cut the unit at several localities. The upper part of the unit is distinctly bedded, but downward the bedding disappears, although a well-developed foliation (parallel with the bedding) remains. In spite of the igneous appearance of some hand specimens of the gneiss, the rocks of this unit seem to have been derived from well-stratified sedimentary rocks.

The age of the metamorphism that affected units B, C, and E is not known, but some inferences can be made from two K-Ar age determinations made on specimens from unit B. A specimen collected from Hunker Creek road just south of the map-area yielded an age of 138 million years, and one from Sixtymile road yielded an age of 175 million years. Owing to possible argon loss, the older age is probably the more significant, and it suggests that the metamorphism is older than Upper Triassic.

STRUCTURAL GEOLOGY

The structure of the area will be considered in four belts: (i) a belt in the northern part of all three map-areas lying north of unit 3 in Nash Creek map-area and most of Larsen Creek map-area and following the northern outcrop of units 9 and 4 from north of Seela Pass to the head of Eagle Creek and then unit 3 to the Alaska boundary; (ii) a belt south of (i) but exclusive of Tintina Trench and the area to the southwest; (iii) a belt in and adjacent to Tintina Trench; (iv)south-west of Tintina Trench in Dawson map-area.

(i) The structure of this belt involves two major periods of folding, the first restricted to the Precambrian rocks and the second involving both Precambrian and later rocks. The Precambrian rocks (1 and 2) underwent considerable folding prior to the deposition

of the overlying Palaeozoic rocks of units 5 and 8. This early folding is well shown in places where the overlying carbonate rocks are either horizontal or gently dipping. In some of these places, steep to vertical dips were observed in the older rocks beneath the unconformity. On a regional scale, much of unit 2 has been cut out by the unconformity so that in many places unit 8 rests directly on unit 1. Between Wind River and Gillespie Lake in Nash Creek map-area, units 1 and 2 show relatively open folds. Elsewhere the folding is more complex and the development of steeply dipping to vertical foliation is common in unit 1. In the domal structure north of Mount Harper in Dawson map-area the rocks of unit 2 appear to show relatively open folds but the lack of continuity and the rather complex outcrop pattern of the sub-units suggests considerable faulting.

No angular unconformity was observed between units 5 and 7 and unit 8. The absence of units 5 and 7 in many places beneath unit 8 and the variation in thickness in others suggest that units 5 and 7 may have undergone block faulting or gentle folding followed by erosion prior to the deposition of unit 8.

In this belt, most of the Palaeozoic and later rocks (units 5, 6, 7, 8, 10, 11, 12, 13, 15, 16, 18, and 22) have relatively open structures, generally with dips less than 30 degrees. Within these open structures, however, complex folding is present locally, particularly in the less competent units. In the northern half of Nash Creek map-area, relatively simple folds pass quickly into areas with very complex folds, many of which are isoclinal and overturned to recumbent, and steeply dipping faults. Two fault directions seem to be present in the belt, the stronger being northwest and the weaker north. West of the more complex area near Hart Lake, rocks of unit 8 and unit 1 are brought into contact by steeply dipping to vertical faults. West of Worm Lake in Larsen Creek map-area, Palaeozoic rocks of unit 8 and Precambrian rocks of units 1 and 2 occur together in complex thrust structures.

In addition to the major unconformity beneath unit 8, unconformities are believed to be present, at least locally, at the base of the following units: 12, 13, 15, 18, and 22. None of the latter shows major differences in the fold pattern above and below the unconformity.

(ii) The structure of belt (ii) is characterized by the development of foliation, isoclinal folding, and overthrusting in contrast to the more open folding in belt (i) to the north of it. The pattern of deformation varies considerably within each component map-unit. Complex folding is best shown in the quartzite of unit 17. In this unit isoclinal folds several hundred feet between the limbs are common and the axial planes of these folds almost all parallel the regional strike and dip of the unit. The largest fold of this type is in Davidson Range in Nash Creek map-area, where the entire unit (17) has been folded into a large recumbent fold. In addition to the larger folds, small-scale folds and the development of a strong foliation, mostly parallel with the bedding, are common in unit 17. Much of the bedding of unit 3 has been destroyed through folding and the development of foliation. In a few of the larger outcrops, particularly in the head-wall of cirques, complex isoclinal folds were observed. Unit 9 outcrops poorly and the structure is unknown. Although most of the strikes are similar the considerable variation in the dip suggests repetition by folding within the unit. Unit 14 commonly shows well-developed foliation parallel with the bedding

and some small-scale isoclinal folding. Some relatively large fold-like structures are associated with sills of unit 20 in this unit (Green and McTaggart, 1960). Unit 19 appears to be relatively undeformed and the well-bedded rocks show little if any foliation. A major fault has thrust unit 3 over units 17 and 19. This thrust is clearly exposed on some of the ridges in the western part of Larsen Creek map-area. Another large thrust places unit 3 on unit 8 across most of Nash Creek and Larsen Creek map-areas and separates the structures of belts (i) and (ii).

(iii) Tintina Trench is believed to represent the topographic expression of a major fault extending from deep in Alaska to southeastern Yukon where it is en échelon with the northwest end of the Rocky Mountain Trench. In the area, the only rocks that occur on both sides of the trench are the granitic rocks (21), the quartz porphyries (23), and the Tertiary volcanic rocks (24). The altered sedimentary rocks southwest of Tintina Trench (units B, C, and E) are of higher metamorphic rank than those to the northeast and no close correlation is possible although there is a suggestion that units B and C may be equivalent to unit 3. In this regard, it should be noted that the Tindir and Yukon Groups, as described by Cairnes (1914, p. 40), lie on opposite sides of Tintina Trench, and age relationships based on the difference in metamorphism, in this area, cannot be considered valid.

Structures related to Tintina Trench were observed in the trench and along the northeast side but not on the southwest side. Outcrops are poor within the trench but some of the scattered outcrops of unit 22a have dips up to 45 degrees, indicating that this unit has undergone some folding. On the northeast side of the trench unit 3 appears to swing northwest, parallel with the trench, whereas units 9, 14, and 17 trend at right angles to the trench and appear to be truncated by it. Unfortunately, outcrops are poor in this area and the exact relationship is uncertain. Where unit 3 is parallel with Tintina Trench, chevron folding is shown by the limestone bands (3a). These folds commonly have an amplitude of 500 to 1,000 feet and a wavelength of about twice the amplitude. The folds have vertical axial planes which strike parallel with the trench. Outcrops are poor along the southwest side of the trench but no marked increase in metamorphism or deformation was noted in the metamorphic rocks of units B, C, and D near the trench.

(iv) Southwest of Tintina Trench the structural pattern is believed to be tight small-scale, and possibly large-scale, isoclinal folding with the development of a strong foliation, which in places has obliterated the bedding. The foliation varies considerably in attitude, suggesting that the area may have undergone further folding subsequent to the development of the foliation. Map-unit 24 is younger than the foliation and appears to have undergone only open folding or block faulting.

Most outcrops of units B and C are strongly foliated along micaceous partings. Most of the bedding appears to be parallel with this foliation but in many outcrops, places can be seen where the bedding is at an angle to the foliation and beds have been sliced into tiny segments between micaceous foliation planes (gleitbrett structure). In addition, attenuated isoclinal folds up to 10 feet in amplitude are fairly common, mostly with axial planes parallel with the foliation. Much of the gleitbrett structure may represent the axial parts of folds

that are so drawn out and deformed that the complete fold cannot be recognized. Foliation near the top of unit E is parallel with the bedding, but lower in the valley of Sixtymile River all trace of bedding has been destroyed and only foliation remains.

ECONOMIC GEOLOGY

Dawson Map-area

The northern tip of the Klondike gold fields and most of the Sixtymile gold fields lie within the map-area. Some placer operations are still being carried on in both areas (Skinner, 1961).

Numerous showings of asbestos are known in serpentinized ultrabasic rocks (A) west of Tintina Trench, the largest being the Clinton Creek property near Forty Mile. None of these is currently being explored.

The iron prospect near Shell Creek consists of fine-grained magnetite and minor hematite occurring in phyllite and phyllitic quartzite of unit 3.

Cockfield has described silver-lead prospects from Little Twelvemile area (Bostock, 1957, p. 477) and the Fifteenmile River area (Bostock, 1957, p. 576).

Numerous lignite prospects occur in the Tertiary rocks (22a) of Tintina Trench (Bostock, 1957, pp. 30, 63). In the early days of the gold rush some mining was done on Cliff Creek, Coal Creek, Rock Creek, and another Coal Creek tributary to Rock Creek. None of these deposits is of economic interest at present.

Larsen Creek Map-area

Small lenses of relatively massive copper sulphides have been reported in the range between Worm Lake and the forks of Hart River.

Nash Creek Map-area

Placer gold has been recovered from Dublin Gulch (Skinner, 1961), and from Haggart Creek between Dublin Gulch and the mouth of Lynx Creek. The Potato Hills are believed to have shielded these valleys from erosion by ice moving across the area towards the southwest.

A number of silver-lead-zinc prospects are known in the area. Many of these were visited and described by Cockfield in 1921 and 1924 (Bostock, 1957, pp. 494-500 and 528-543) and little work has been done since. The most common minerals are galena, sphalerite, and minor chalcopyrite in a gangue of siderite or, less commonly, quartz. The silver content of the ores from these properties appears to be lower than those of Keno and Galena Hills to the south of the map-area. In the map-area most of the assays are 1 ounce of silver

to 1 per cent lead or less, as contrasted to assays from Keno and Galena Hills which are commonly 3 to 4 ounces of silver to 1 per cent lead. A silver-lead-antimony prospect west of Haggart Creek is currently being explored (Skinner, 1961, p. 32).

Showings of chalcopyrite and specular hematite have been reported in unit 1, commonly near the unconformity with the overlying Palaeozoic carbonate rocks (8), but most appear to be relatively small.

Prospecting Possibilities

Southwest of Tintina Trench the best prospecting possibilities are probably for small placer deposits and asbestos. A large number of serpentinized ultrabasic bodies, many of them poorly exposed, occur in this area and all are worthy of careful prospecting. Northeast of Tintina Trench, the massive quartzites of unit 17 are an extension of those at Keno and Galena Hills and might also be expected to contain silver-lead deposits.