SEDIMENTOLOGY, STRATIGRAPHY, AND DEPOSITIONAL HISTORY OF HIGH BENCH GRAVELS ON AUSTRALIAN HILL, KLONDIKE PLACER DISTRICT, YUKON TERRITORY: IMPLICATIONS FOR PLACER AND LODE GOLD EXPLORATION

NTS MAP SHEET 116B/3

LATITUDE 64°02'N
LONGITUDE 139°08'W

WORK CONDUCTED: SEPTEMBER 17 - 28, 1993

OWNERS:
Dave Johnson
P.O. Box 84330
Fairbanks, Alaska
USA, 99078-4330

Jim McFaull
5 - 100 Lewes Boulevard
Whitehorse, YT
Y1A 3W1

OPERATOR:
KENNECOTT CANADA INC.
354 - 200 Granville Street
Vancouver, B.C.
V6C 1S4

Prepared by: Harrison O. Cookenboo November 15, 1993

Kennecott Canada Inc.
Granville Square
#354 - 200 Granville Street
Vancouver, B.C.
V6C 1S4
Tel. (604) 669-1880
Fax (604) 669-5255

March 30, 1994

Kennecott

Arbor Resources Inc.
1000-675 West Hastings Street
Vancouver, B.C.
V6B 1N6

Faith Mines Ltd.
1000 - 675 West Hastings Street
Vancouver, B.C.
V6B 1N6

Attention: Mr. Richard Hughes

Dear Richard,

Re: Australian Hill Property Placer and Quartz Claim Option Agreement, Klondike District, Yukon Territory

Please find attached a table summarising provisional results from the processing of the twenty four White Channel Gravel and Klondike Gravel samples collected in September, 1993 from Australian Hill. An exhaustive report detailing the work will be provided as soon as it is available. Sample locations are shown on the attached figure.

The main conclusions to be drawn from the processing results are as follows:

(i) Gold is not homogeneously distributed through the Australian Hill White Channel Gravel deposit, but occurs primarily at its base. A bulk tonnage target at Australian Hill is therefore untenable.

(ii) Following on from the above, homogeneously distributed ultrafine gold appears not to be present in significant quantity within the White Channel Gravel at Australian Hill. Fine placer gold recoverable by centripetal separation occurs mainly at the base of the unit at concentrations comparable to those exploited in mechanised placer operations worldwide. However, the fine grained gold at Australian Hill is not amenable to efficient separation by conventional gravity separation techniques.

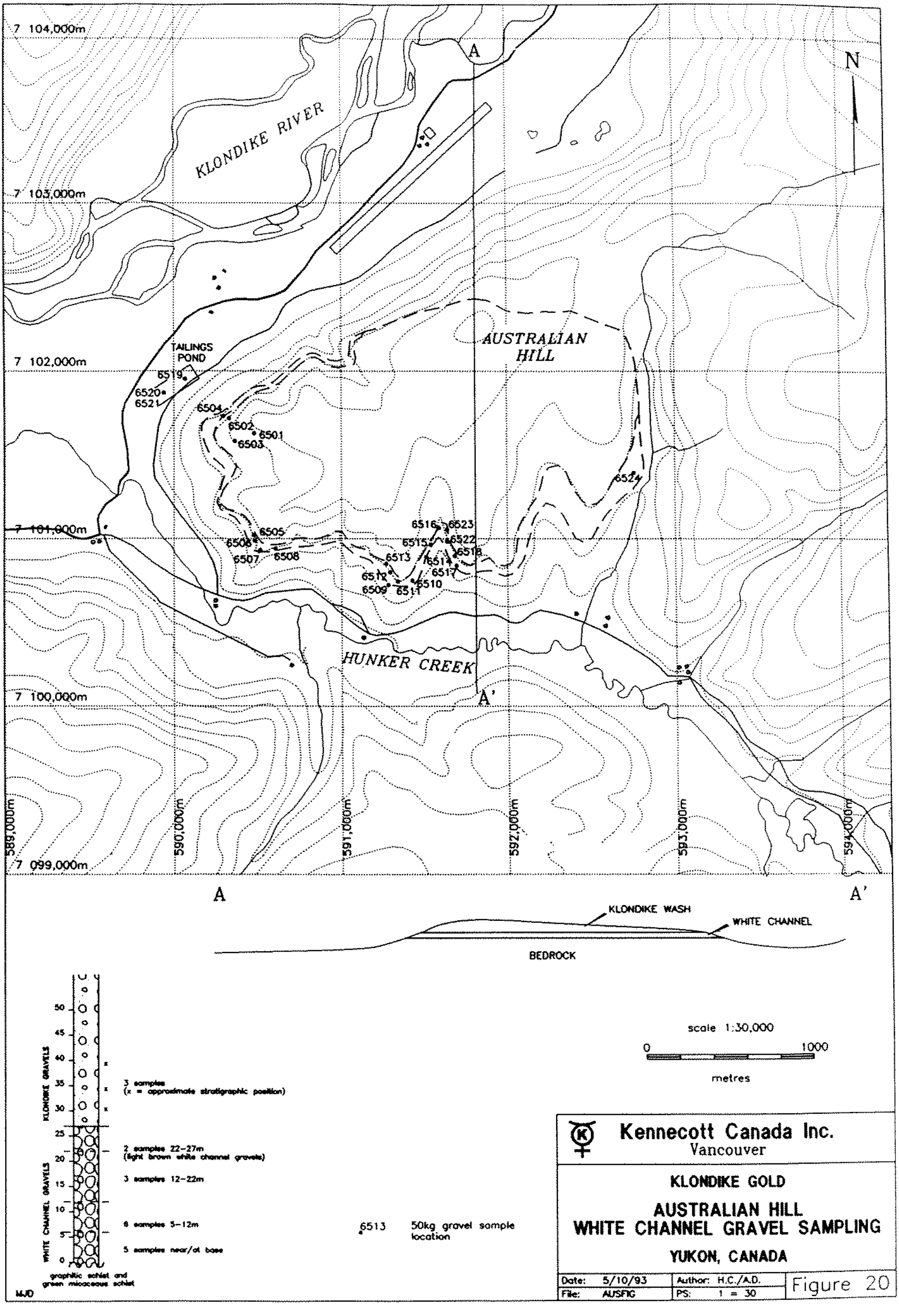
(iii) Minor gold occurs within the Klondike Gravel on Australian Hill. This gold likely originated outside of the Klondike district and is of unknown source.

Based on the results of the sample processing program, Kennecott has decided not to conduct further work on the Australian Hill property. Kennecott will therefore not now participate in the Australian Hill option agreement. Should you require clarification of any of these matters, please do not hesitate to call.

Yours sincerely,
KENNECOTT CANADA INC.

Eric J. Finlayson
Regional Exploration Manager

Attach.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A
A'
KLONDIKE RIVER
TAILINGS POND
AUSTRALIAN HILL
HUNKER CREEK
6501
6502
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6520
6521
6522
6523
6524
KLONDIKE WASH
WHITE CHANNEL
BEDROCK
KLONDIKE GRAVELS
WHITE CHANNEL GRAVELS
3 samples
(x = approximate stratigraphic position)
2 samples 22-27m
(light brown white channel gravels)
3 samples 12-22m
8 samples 5-12m
5 samples near/at base
graphitic schist and
green micaceous schist
MJD
6513 50kg gravel sample location
scale 1:30,000
0 1000
metres
Kennecott Canada Inc.
Vancouver
KLONDIKE GOLD
AUSTRALIAN HILL
WHITE CHANNEL GRAVEL SAMPLING
YUKON, CANADA
Date: 5/10/93
File: AUSFIG
Author: H.C./A.D.
PS: 1 = 30
Figure 20

kilogram gravel samples for metallurgical testing

Table 1

AUSTRALIAN HILL - WHITE CHANNEL GRAVEL AND KLONDIKE GRAVEL RESULTS

SAMPLE NO.	CENTRIPETAL CONCENTRATE Wt (g)	Au (mg)	Au (g/t)	TAILS Wt (kg)	CN⁻ sol. Au (g/t)	SAMPLE GRADE (g/t)	REMARKS
6501	1401	0.109	0.078	42.67	0.073	0.073	Klondike Gravel
6502	1383	0.090	0.065	23.16	0.010	0.013	Klondike Gravel
6503	1258	0.127	0.101	19.53	0.010	0.015	Klondike Gravel
6504	1640	0.707	0.431	13.87	0.011	0.055	Klondike Gravel
6505	1472	0.351	0.238	32.60	0.010	0.020	White Channel Gravel
6506	1470	0.415	0.282	30.83	0.010	0.022	White Channel Gravel
6507	1588	0.368	0.232	23.14	0.017	0.031	White Channel Gravel
6508	1322	2.530	1.914	28.24	0.020	0.105	Base of White Channel Gravel
6509	1483	9.213	6.212	19.65	0.930	1.300	Base of White Channel Gravel
6510	1639	4.552	2.777	22.11	0.010	0.201	Base of White Channel Gravel
6511	1245	1.066	0.856	23.49	0.001	0.044	White Channel Gravel
6512	1588	0.294	0.185	16.23	0.046	0.058	White Channel Gravel
6513	2389	0.127	0.053	26.57	0.039	0.040	White Channel Gravel
6514	1407	34.492	24.519	22.60	0.063	1.496	Base of White Channel Gravel
6515	1479	0.373	0.252	24.06	0.003	0.017	White Channel Gravel
6516	1357	0.180	0.133	17.03	0.016	0.025	White Channel Gravel
6517	1610	13.106	8.140	21.39	0.028	0.596	Base of White Channel Gravel
6518	3459	0.625	0.181	17.10	0.006	0.035	White Channel Gravel
6519	3156	0.268	0.085	35.65	0.039	0.043	Tailings pond
6520	1455	0.061	0.042	25.04	0.005	0.007	Tailings pond
6521	1377	0.066	0.048	23.24	0.004	0.006	Tailings pond
6522	6896	0.903	0.131	14.44	0.004	0.045	White Channel Gravel
6523	1628	0.204	0.125	26.04	0.025	0.031	White Channel Gravel
6524	1360	0.709	0.521	18.30	0.003	0.039	White Channel Gravel

SUMMARY

High bench gravels in the Klondike placer gold district are comprised of two Pleistocene(?) stratigraphic units of markedly different composition and provenance. The lower White Channel Gravel unit has been the target of most paleo-placer mining operations in the district and consists largely of detritus derived by erosion of greenschist facies metamorphic rocks lying to the south of the Tintina Fault Zone. This unit is approximately 27m thick at Australian Hill, where several relatively unsuccessful attempts at paleo-placer mining have been made. The overlying Klondike Gravel unit is largely barren of gold and consists primarily of detritus derived from sedimentary and volcanic rocks lying to the north of the Tintina Fault Zone. The unit records breaching of the southern edge of the Tintina Trench by the ancestral Klondike River and capture of the Klondike River system. The Klondike Gravel is at least 40m thick at Australian Hill.

Detailed sedimentological and stratigraphic study of the White Channel Gravel at Australian Hill demonstrates that the unit records the initiation and aggradation of a Pleistocene(?) fluvial depositional system. At the commencement of White Channel Gravel deposition, sediment accumulation rates were low and extensive reworking of detritus occurred. Coarse stable clasts such as quartz cobbles and heavy minerals such as gold were concentrated in the resulting basal lag gravel facies. As aggradation rates increased with time and sediment reworking diminished, the mechanism for syndepositional concentration of placer gold was removed. The unit overwhelmed and buried pre-existing local topography with detritus derived largely from the headwaters of the White Channel Gravel river systems.

Regional paleotopography at the start of White Channel Gravel deposition consisted of a paleo-drainage surface which sloped from the south to the northwest. Separate braided river systems existed in what are now the Eldorado, Bonanza, Last Chance and Hunker creek valleys. Stream gradients constructed from a map of the paleo-drainage surface abruptly flatten near areas of high historic gold production from the White Channel Gravel. Such areas include the confluence of Eldorado and Bonanza creeks, the mouth of Bonanza Creek near Trail and Lovett hills, and lower Hunker Creek near Preido and Dago hills. Concentration of placer gold at regional breaks in slope is a commonly observed phenomenon in mineralised terrains worldwide. Steep side streams debouching onto the relatively flat reaches of upper Eldorado Creek

may similarly account for the extraordinarily rich placer deposits discovered there within the low level gravels.

Provenance for most of the White Channel sediments, as indicated by paleocurrents and clast composition, was largely the headwaters of the ancestral Eldorado, Bonanza and Hunker creeks. As these were separate drainage systems at the time of White Channel Gravel deposition, separate lode gold sources are required to explain the detrital gold in each. As intimated above, local (ie. subjacent) gold sources are likely to have contributed significantly to the White Channel Gravel only at the commencement of White Channel Gravel deposition when aggradation rates were low and local topography was exposed. Whether or not such local gold sources actually exist has not been resolved as yet but is the subject of the 80 Pup project component of Kennecott's 1994 program in the Klondike district.

Prior to cessation of its deposition, the White Channel Gravel was bleached diagenetically by acid, petroleum-bearing fluids that were introduced along basement faults from a source in the Tintina Fault Zone. Though syndepositional detrital processes were the primary control on gold distribution within the White Channel Gravel, these fluids may have exerted a secondary control on the distribution of fine grained gold through processes of dissolution and reprecipitation. This mechanism may account for the occurrence of finely crystalline, unbraided gold at Australian Hill.

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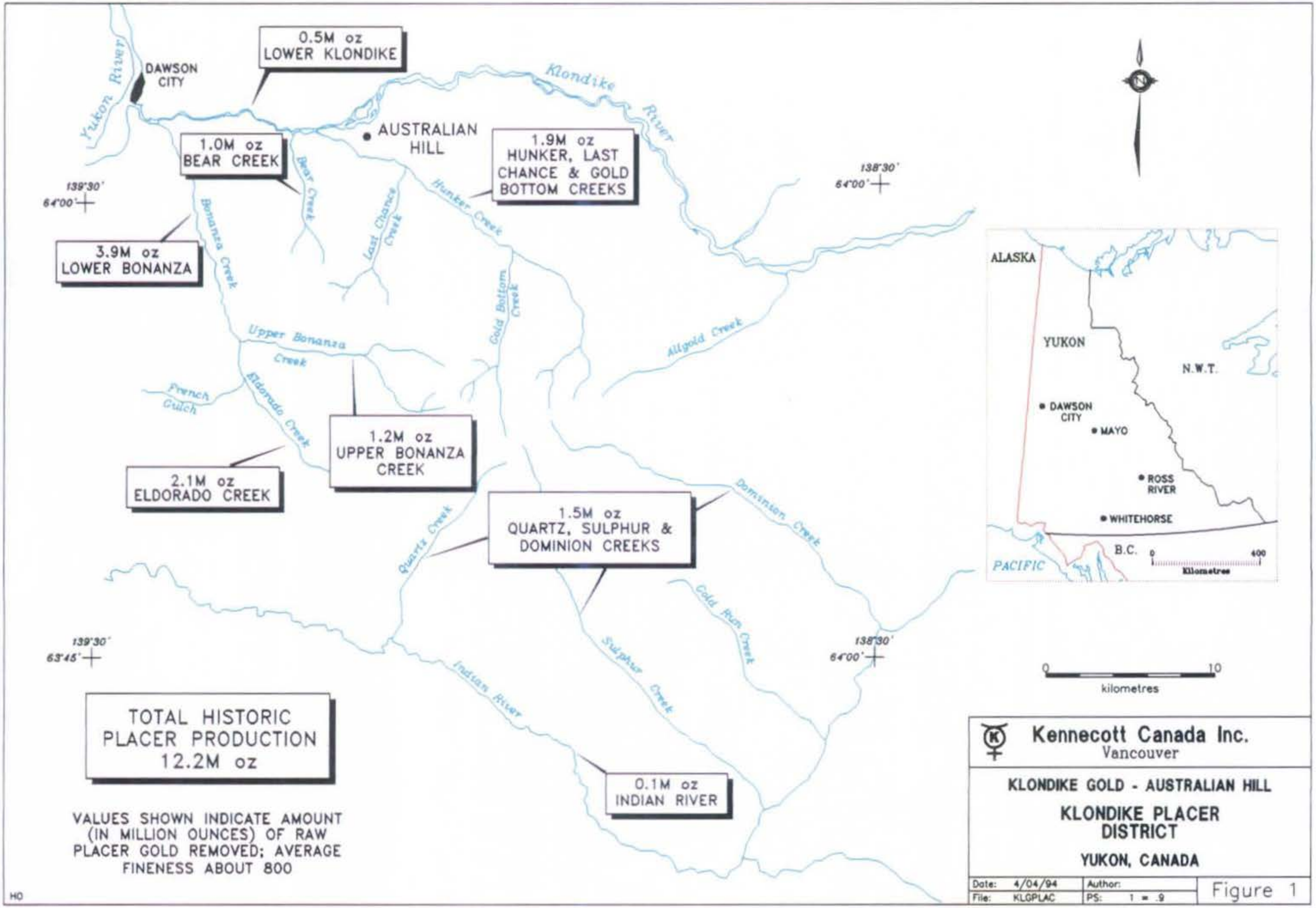
1.0 INTRODUCTION

High bench gravels in the Klondike placer district of Yukon Territory are rich gold producers, and were probably the immediate source for the even-richer placer gold deposits found in the modern creek gravels (McConnell, 1907; Figure 1). Historic small-scale underground drift mining and more recent large-scale open pit mining has focussed on the basal few metres of the high bench gravels where coarse placer gold has accumulated. The abundance, distribution and recoverability of fine placer gold within the gravels has never been systematically investigated.

One of the largest volumes of high bench gravel is located at Australian Hill, near the mouth of Hunker Creek (Figure 1). The Australian Hill gravels have long been considered less productive than other high bench gravels in the district because of limited coarse gold in the basal few metres (McConnell, 1907). The Australian Hill deposit does locally contain coarse gold, as demonstrated by a long history of placer operations in Hattie's Gulch, though anecdotal reports suggest that gold elsewhere on the property is too fine grained for economic recovery by traditional sluicing methods. New recovery techniques for fine gold may make the Australian Hill gravels a more viable mining proposition and may also increase the proportion of high bench gravel amenable to processing elsewhere within the district. With this in mind, a detailed sedimentologic and stratigraphic analysis of the Australian Hill gravels was undertaken by Kennecott Canada Inc. to support a preliminary economic re-evaluation of the deposit. Detailed sedimentology on Australian Hill was also combined with a regional stratigraphic analysis to determine regional controls on Klondike placer gold distribution.

2.0 HIGH BENCH GRAVEL STRATIGRAPHY

Two major stratigraphic units of high bench gravels occur on Australian Hill. The older unit is the White Channel Gravel, which has been the target of most paleo-placer mining operations in the Klondike region. This unit was derived by the erosion of rocks to the south of the present day Klondike River


0.5M oz
LOWER KLONDIKE
DAWSON
CITY
Yukon River
Klondike River
AUSTRALIAN
HILL
1.0M oz
BEAR CREEK
1.9M oz
HUNKER, LAST
CHANCE & GOLD
BOTTOM CREEKS
Bear Creek
Last Chance Creek
Hunker Creek
139°30'
64°00'
138°30'
64°00'
3.9M oz
LOWER BONANZA
Bonanza Creek
Gold Bottom Creek
Allgold Creek
Upper Bonanza Creek
French Gulch
Eldorado Creek
1.2M oz
UPPER BONANZA
CREEK
2.1M oz
ELDORADO CREEK
1.5M oz
QUARTZ, SULPHUR &
DOMINION CREEKS
Dominion Creek
Quartz Creek
Gold Run Creek
Sulphur Creek
Indian River
139°30'
63°45'
138°30'
64°00'
TOTAL HISTORIC
PLACER PRODUCTION
12.2M oz
0.1M oz
INDIAN RIVER
VALUES SHOWN INDICATE AMOUNT
(IN MILLION OUNCES) OF RAW
PLACER GOLD REMOVED; AVERAGE
FINENESS ABOUT 800
ALASKA
YUKON
N.W.T.
DAWSON
CITY
MAYO
ROSS
RIVER
WHITEHORSE
B.C.
PACIFIC
0
400
Kilometres
0
10
kilometres
Kennecott Canada Inc.
Vancouver
KLONDIKE GOLD - AUSTRALIAN HILL
KLONDIKE PLACER
DISTRICT
YUKON, CANADA
Date: 4/04/94
Author:
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PS: 1 = .9
Figure 1
HO

by rivers that flowed north and west towards the Yukon River drainage system. Paraconformably overlying the White Channel Gravel is the iron-stained Klondike Gravel (also referred to as the Klondike Wash). These gravels are largely barren of gold and were transported into the area after capture of the Klondike River system. Detailed description of the two gravel units now follows with special reference to Australian Hill exposures.

3.0 WHITE CHANNEL GRAVEL DESCRIPTION

3.1 Distribution and Composition

The White Channel Gravel was deposited by several separate braided river systems over a pre-existing erosional surface. The unit is 9m to 45m thick and is exposed on valley walls above Hunker, Last Chance, Bonanza, Eldorado and Bear creeks south of the Klondike River (Figure 1). Similar gravels also occur in Dominion, Gold Run, Sulphur and Quartz creeks south of the Hunker Creek headwaters, where they underlie modern creek gravels (McConnell, 1907); at Allgold Creek to the east of Hunker Creek; and at Sixty Mile River to the west of the Yukon River. Based on tests at Dago Hill in the Hunker Creek drainage, and at Trail Hill and Lovett Hill in lower Bonanza Creek, 80% to 90% of the gold recoverable by traditional placer methods occurs in the basal 4m of the unit (Figure 2; data from McConnell, 1907).

The White Channel Gravel is typically light grey to bright orange on fresh surfaces and white to pale orange on weathered surfaces (Figure 3). The gravel is clast supported and usually matrix filled, though layers of bright orange stained openwork gravel occur locally. Clasts consist of pebbles and cobbles of white quartz; dark gray graphitic quartz schist or phyllite; light green to pale pink to brown chlorite and muscovite schist; bright green non-foliated rocks (probably altered ultramafics); and rhyolite porphyry. The relative proportion of these different clast types varies across the area covered by the unit. Green, pink and brown chlorite and muscovite schist clasts are most abundant in the southern (stratigraphically up-dip) portions of Bonanza, Eldorado and Hunker creeks. White quartz becomes more abundant downstream in the Bonanza and Hunker creek drainages, and is the dominant clast type on Australian Hill.

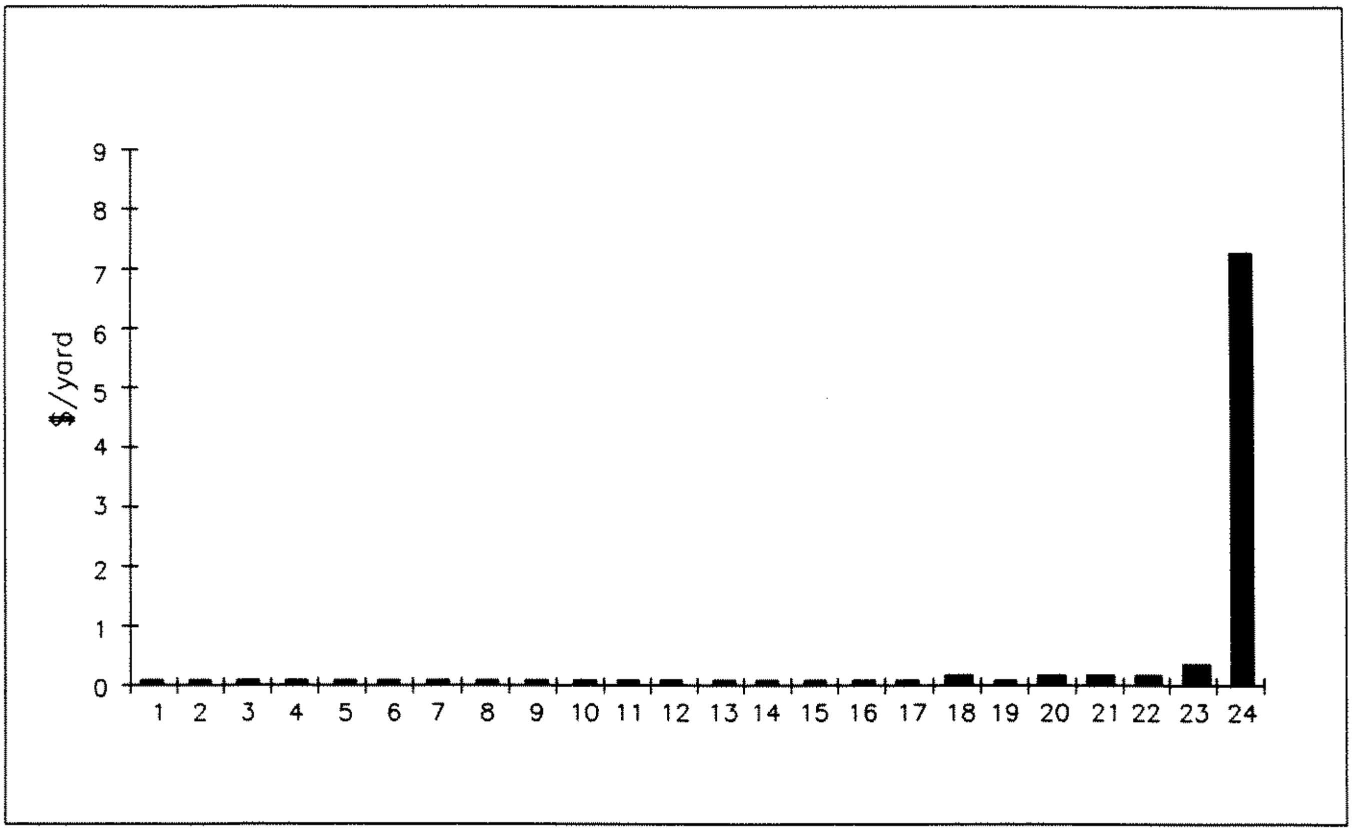


Figure 2 Average gold distribution at Trail and Lovett Hills by six foot interval based on placer tests by McConnell (1907). Base is at interval number 24.

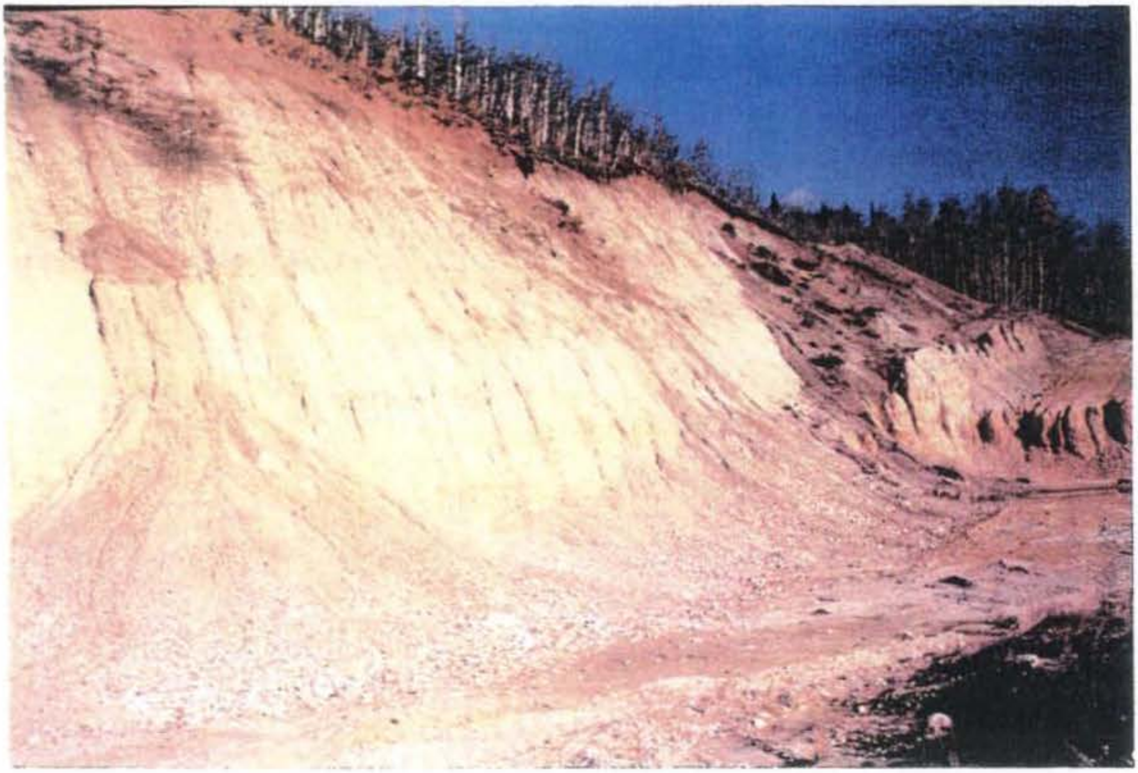


Figure 3 Light coloured weathered surface of White Channel gravels exposed on east-west trending face on the southwest corner of Australian Hill.

Graphitic schist or phyllite fragments occur in lower Hunker Creek exposures and comprise an estimated 15% of the large pebbles and cobbles on Australian Hill. Rhyolite porphyry and green non-foliated clasts constitute persistent but volumetrically minor clast types on Australian Hill and in other lower Hunker Creek exposures. Outcrops of rhyolite porphyry, graphitic phyllite and green non-foliated (altered ultramafic) rocks in lower Hunker Creek suggest a local source for at least some of these clasts.

Matrix material comprises poorly sorted, very fine to fine grained quartz sand with abundant muscovite/sericite, and minor feldspar and metamorphic lithic fragments. Grains are angular to sub-angular, and many quartz grains retain well formed crystal faces. Sand in lenses is similar to that in the gravel matrix, although commonly coarser (medium to coarse grained). Euhedral smokey quartz crystals, identical to those in the rhyolite porphyry cobbles, occur as rare medium to coarse sand grains scattered throughout both gravel matrix and sand beds in lower Hunker Creek exposures.

The importance of local sources of detritus is demonstrated in exposures created by placer mining at Frank Short's pit on Preido Hill. A 3m high paleo-hill of green altered ultramafic rock enclosed within black graphitic phyllite has clearly contributed the ultramafic cobbles that are abundant in adjacent White Channel Gravel. The relative abundance of graphitic phyllite clasts on Australian Hill, as compared to White Channel Gravel deposits in the Bonanza Creek drainage, is similarly due to erosion of graphitic phyllite basement which underlies Australian Hill (Figure 4). It is entirely plausible that some or all of the placer gold contained within the White Channel Gravel also has local sources.

3.2 Sedimentary Facies

White Channel Gravel is well exposed on Australian Hill in four open cuts produced by placer miners. The following facies descriptions are based on observations at these locations.

Crudely stratified to massive gravel facies

Crudely stratified to massive gravel is clast supported, matrix filled and occurs in grossly fining upward beds 1m to 2m thick in the lower part of the White Channel Gravel unit (Figure 5). Coarse placer gold occurs primarily within this facies. Distinctly stratified cobble lag layers typically possess good clast imbrication with as many as 70% to 80% of the clasts displaying upstream A-axis dip orientations. Less distinctly stratified pebble and cobble gravel layers have imbricated clasts with upstream B-axis dips. The large clast size and dominant A-axis imbrication of the cobble lag layers suggest that finer clasts were winnowed by stream currents following sediment deposition. Larger clasts were probably rotated to the dominantly upstream A-axis dip orientation as a result of settling due to removal of the finer sediment. Matrix material filled the interstices between clasts during subsequent reduced flow conditions. This interpretation contrasts with an earlier suggestion (Morison, 1985) that A-axis imbrication resulted directly from gravelly debris flow deposition during peak flow. The facies is interpreted here as intensively reworked and winnowed channel and gravel bar deposits of a braided river system.

Scour and fill pebble-cobble gravel facies

The scour and fill pebble-cobble gravel facies occurs as lens-shaped deposits roughly 10m wide and up to 2m thick. The scoured base is distinctly concave up, and eroded 2m to 3m down into other facies (Figures 5 and 6).

The facies typically has a cobble supported and matrix filled basal layer that fines up to trough cross bedded pebble and cobble gravel. Rare openwork gravel layers stained bright rusty orange occur in addition to the matrix filled gravel.

The scour and fill facies is interpreted as channel deposits of a braided river. Preservation of some openwork gravel and the presence of laterally equivalent cross bedded sands supports the conclusion that sediment accumulation was relatively rapid and that sediment reworking was minor. This contrasts with the

Figure 5: Cobble lag at the base of scour and fill facies. Openwork gravel layer at top of cobble lag is bright orange colored. Card at base of cobble lag (arrow) is 9 cm wide.

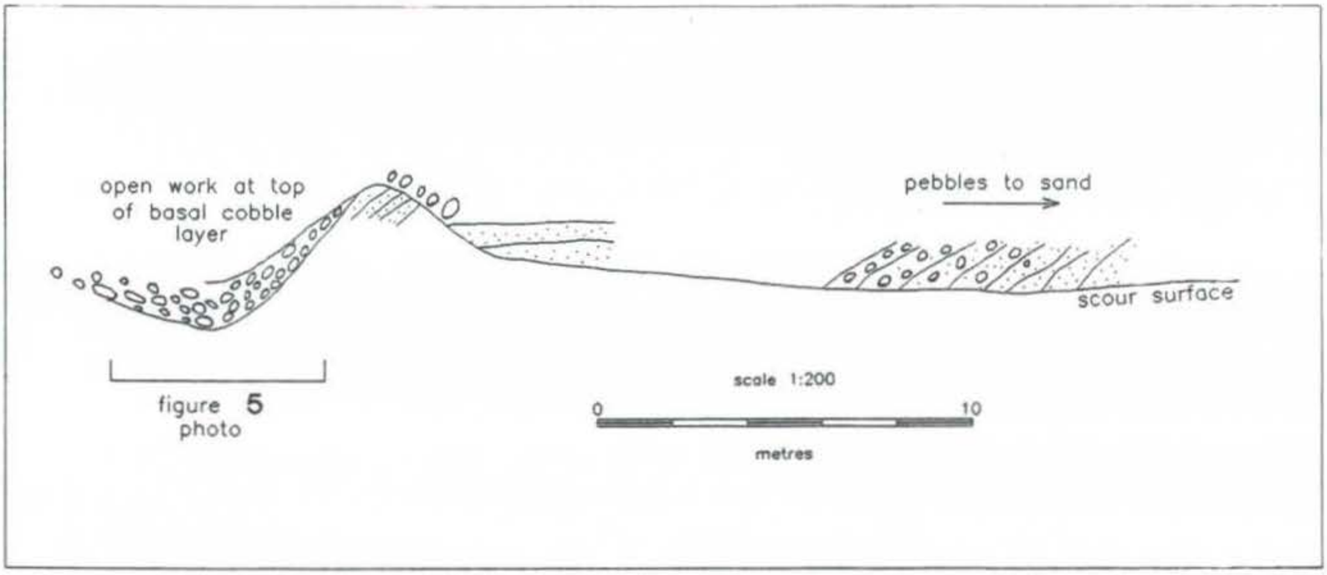


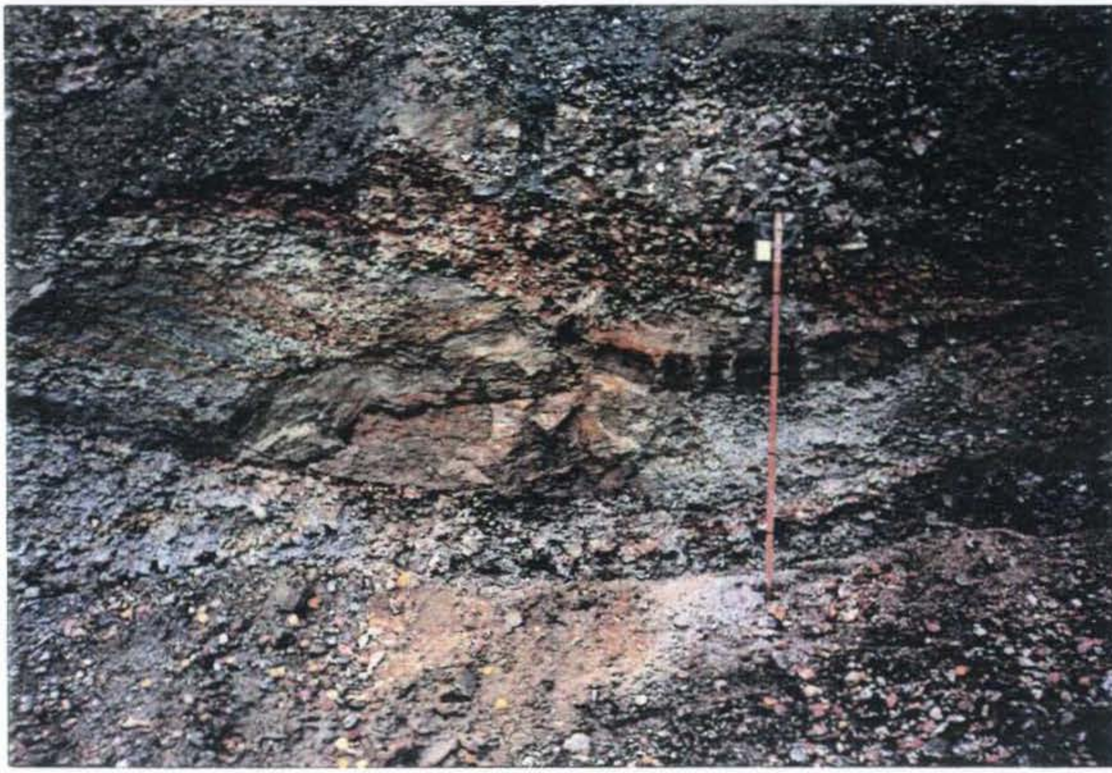
Figure 6 : Sketch of scour surface in figure 5 extending from base of cobble lag west 30 metres across section 2.

previously described crudely stratified to massive gravel facies where deposition rates were low and reworking was extensive.

Sand and pebbly sand facies

Sand and pebbly sand facies occur in beds up to 1.5m thick which usually display trough or planar (commonly tangentially-based) crossbeds. This facies occurs as isolated lenses roughly 10m across and usually less than 30cm thick, and as more laterally extensive beds that locally grade into pebble and cobble gravel. Trough crossbeds are the deposits of arcuate dunes at high flow conditions, and record sandy dune fields in braided alluvial channels. The planar and tangentially-based crossbeds fine upward within each layer and were deposited at the angle of repose. The angle of repose crossbeds grade into gravel crossbeds, which formed by accretion on the downstream side of gravelly channel bars. Soft-sediment slumping of a sand layer near the head of Hattie's Gulch (Figure 7) occurred as a result of deposition on gravel bar foreset beds at the angle of repose.

Preservation of sandy crossbed facies suggests relatively rapid sediment accumulation, with little opportunity for reworking of the deposits after deposition. This facies is the lateral equivalent of the scour and fill pebble-cobble gravel facies described above. An example of facies equivalence is provided by the scour surface in Figure 5 which can be traced south for 30m to where it is overlain by gravel and pebbly sand with planar to tangentially-based, angle of repose crossbeds (Figure 6).



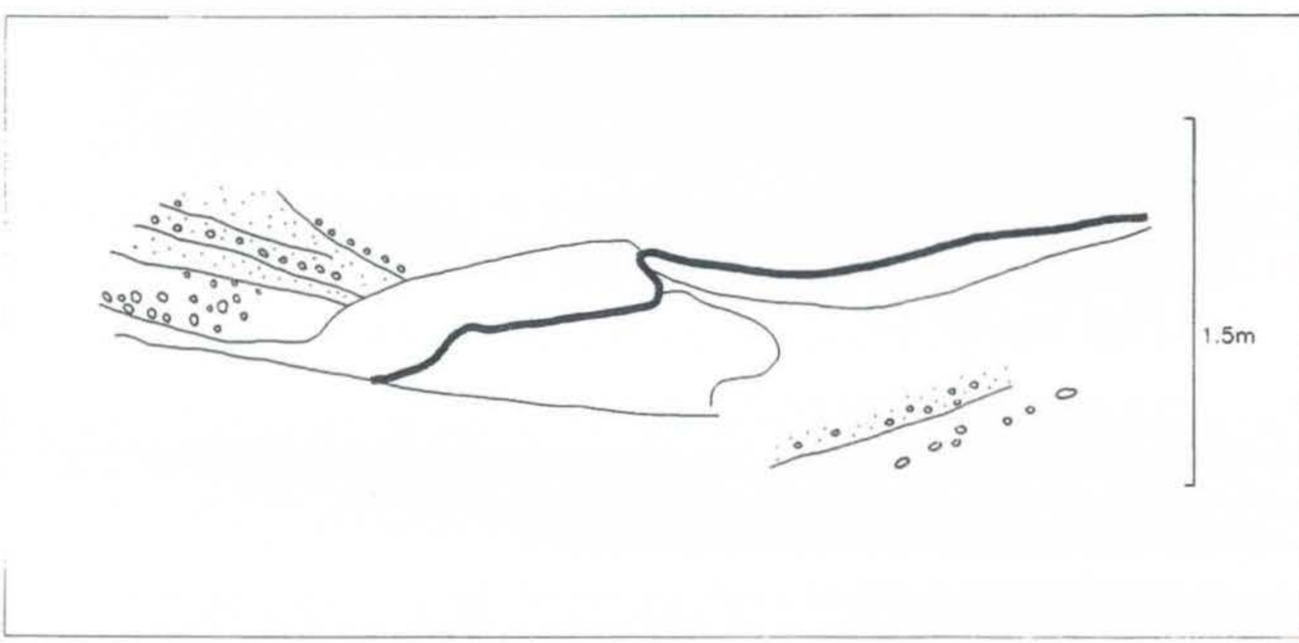


Figure 7 : Photograph and sketch at same scale of sand bed that experienced soft-sediment slumping and subsequently was buried by fining upward sandy gravel cross beds. The black layer (arrow) is oil saturated sand. Base of photograph is at 12 m level in section 1, stick is 1.5 m tall.

Silty and clayey (muddy) facies

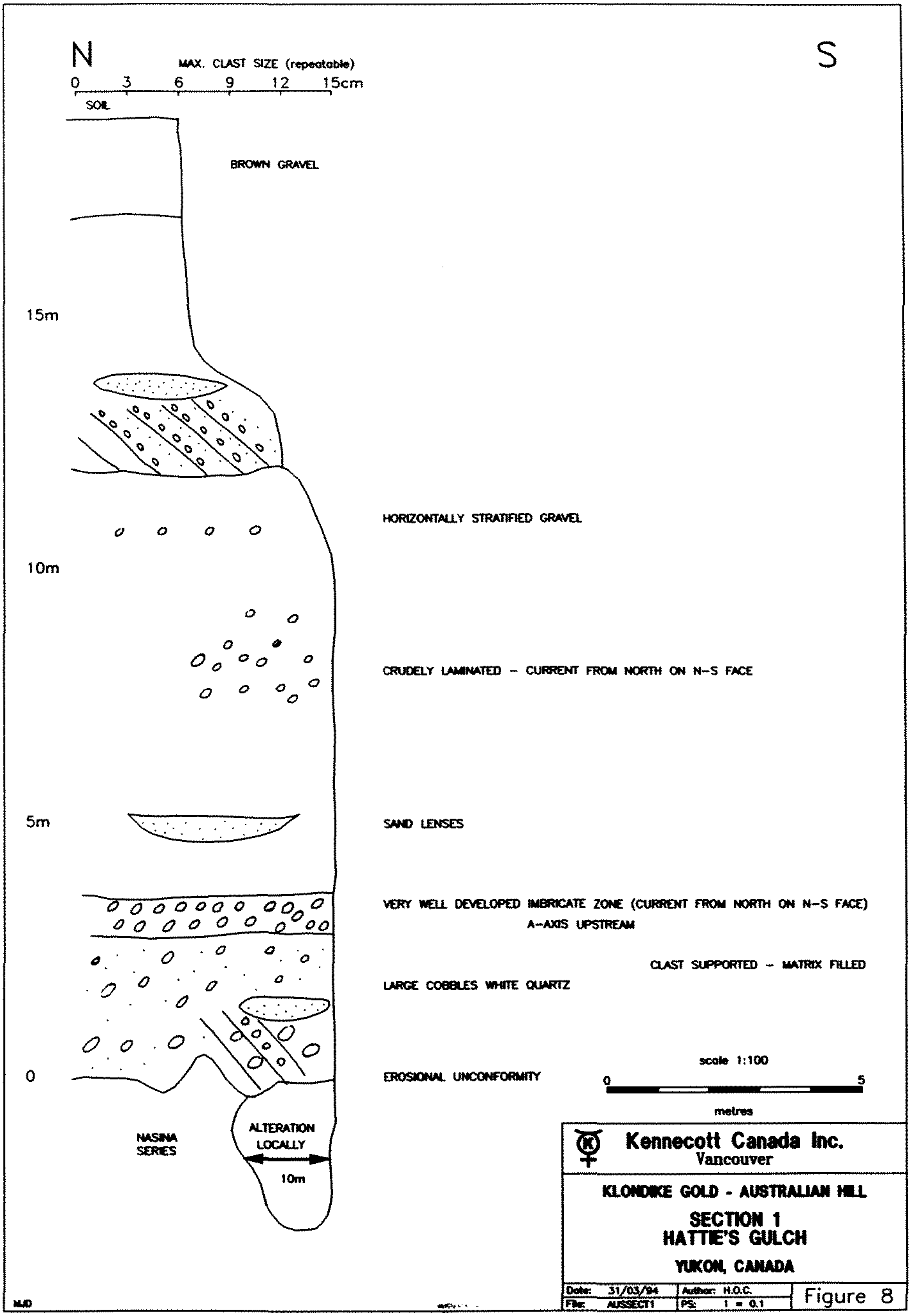
Silt and clay (muddy) facies are rare at Australian Hill, but occur in Hattie's Gulch in beds up to 50cm thick. The muds are medium to dark brown, contain abundant organic matter and appear to grade into gravels exposed in the east and west cuts at Hattie's Gulch. The muddy facies accumulated in quiet waters such as those of an abandoned channel (oxbow lake). Muds and peats continued to accumulate in Hattie's Gulch up to recent times, probably as differential compaction of the White Channel muds tended to perpetuate topographic depressions.

3.3 Internal Stratigraphy at Australian Hill

Six stratigraphic sections have been prepared from the exposures on Australian Hill (Figures 8, 9, 10, 11, 12 and 13) and a composite section shows the stratigraphic distribution of samples collected for metallurgical testing (Figure 14). A 1:5000 scale map showing formation limits and sample locations has also been prepared from these and other minor exposures (Figure 4).

0m - 5m zone

The basal 0m - 5m zone is the coarsest portion of the White Channel Gravel both in terms of maximum clast size, which reaches small boulders (up to 52cm, although more commonly 25cm to 30cm), and in overall abundance of cobbles. The crudely stratified to massive gravel facies is dominant and clast composition is dominated by white quartz, especially among the larger cobbles. Coarse cobbles (defined here as >10cm in longest dimension) are almost exclusively white quartz, with only a few rare large graphitic schist clasts observed. The composition of large pebbles and small cobbles (6cm to 10cm in longest dimension) is more variable, and includes dark grey and light green schistose clasts in addition to white quartz. Overall, the clast composition in the zone is estimated to be 80% white quartz, 15% dark grey graphitic phyllite and schist, and 5% light green quartz-muscovite schist.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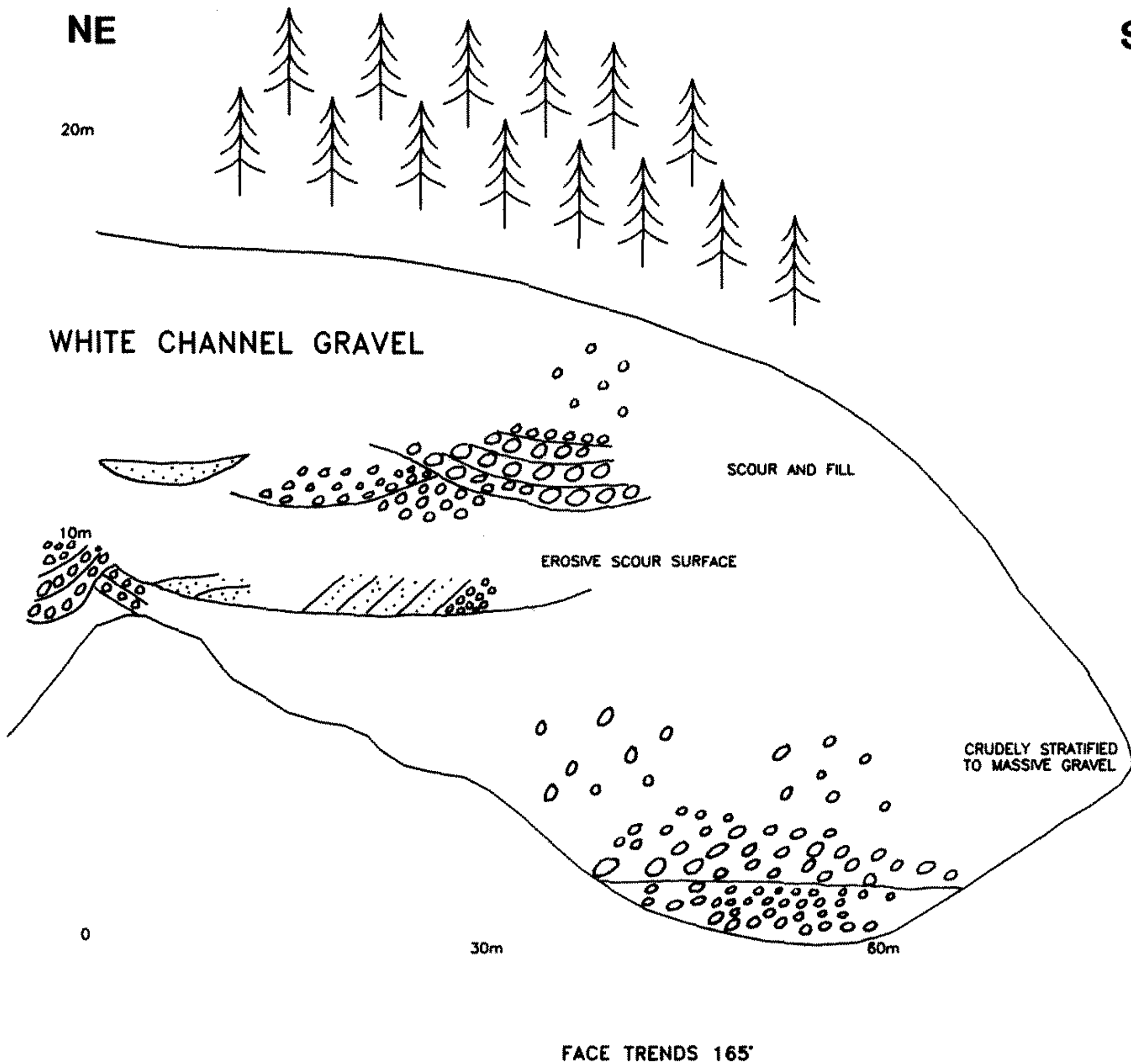
S
MAX. CLAST SIZE (repeatable)
0 3 6 9 12 15cm
SOIL
BROWN GRAVEL
15m
HORIZONTALLY STRATIFIED GRAVEL
10m
CRUDELY LAMINATED - CURRENT FROM NORTH ON N-S FACE
5m
SAND LENSES
VERY WELL DEVELOPED IMBRICATE ZONE (CURRENT FROM NORTH ON N-S FACE)
A-AXIS UPSTREAM
CLAST SUPPORTED - MATRIX FILLED
LARGE COBBLES WHITE QUARTZ
0
EROSIONAL UNCONFORMITY
scale 1:100
0 5
metres
NASINA SERIES
ALTERATION LOCALLY
10m
Kennecott Canada Inc.
Vancouver
KLONDIKE GOLD - AUSTRALIAN HILL
SECTION 1
HATTIE'S GULCH
YUKON, CANADA
Date: 31/03/94
Author: H.O.C.
File: AUSSECT1
PS: 1 = 0.1
Figure 8
NJD



MJD

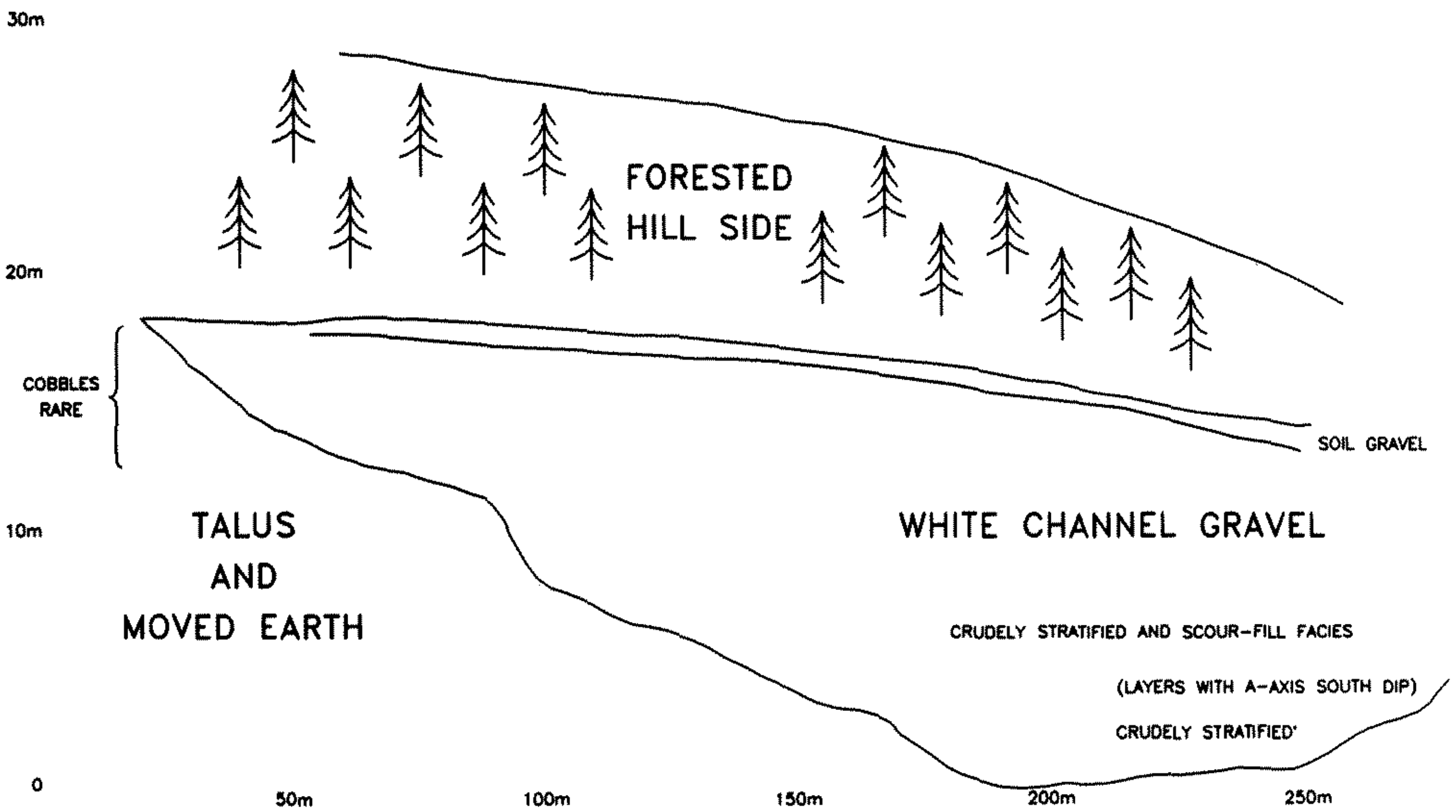
Kennecott Canada Inc.
Vancouver

KLONDIKE GOLD - AUSTRALIAN HILL

SECTION 2
EAST SIDE OF HATTIE'S GULCH

YUKON, CANADA

Date: 11/11/93	Author: H.O.C.	Figure 9
File: AUSSECT2	PS: 1 = 0.5	



FACE TRENDS 163°

Kennecott Canada Inc.
Vancouver

KLONDIKE GOLD - AUSTRALIAN HILL

SECTION 3
EAST SIDE OF HATTIE'S GULCH

NORTHWEST TERRITORIES, CANADA

Date: 9/11/93	Author: H.O.C.	Figure 10
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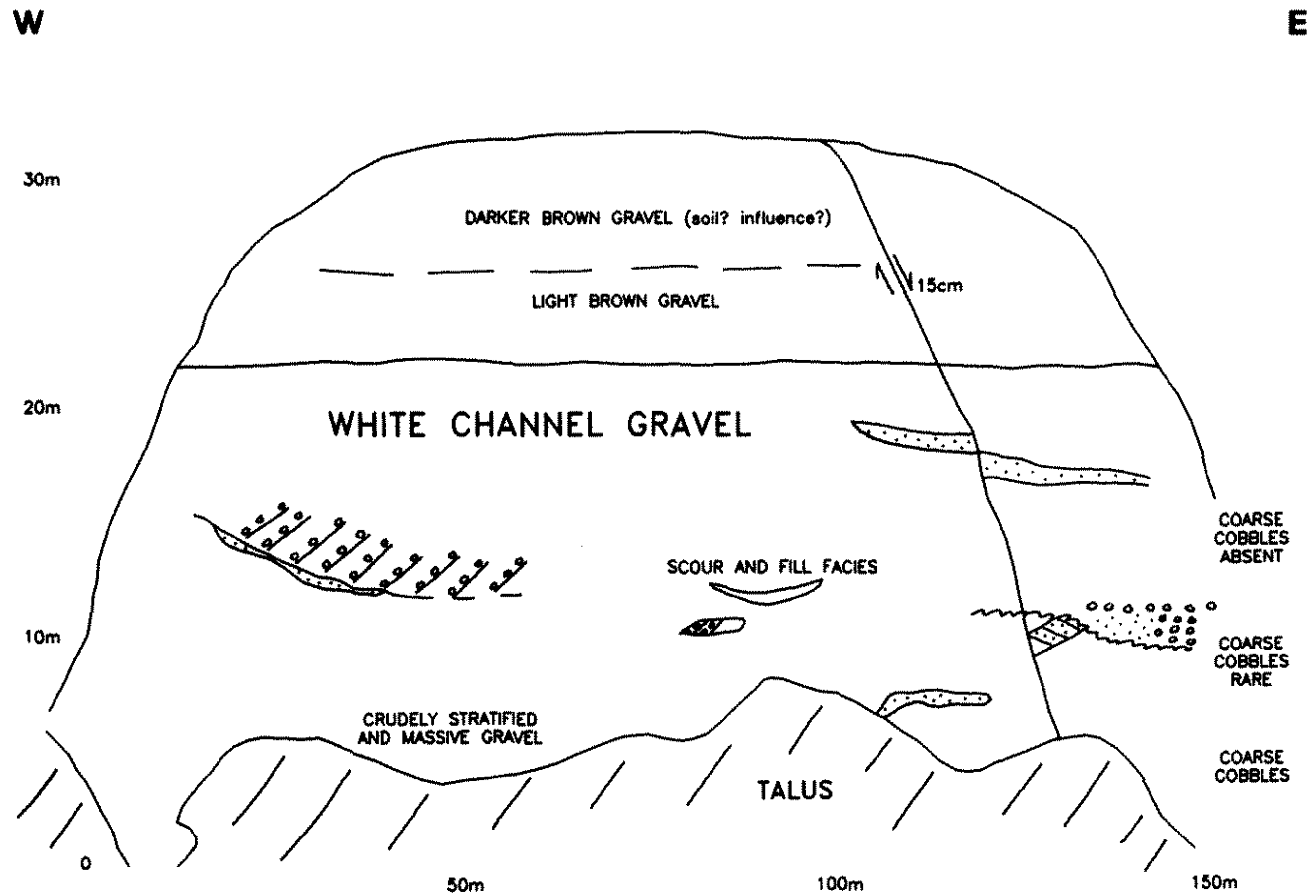
MJD



FACE BEARING 130°(SW)

Kennecott Canada Inc.
Vancouver

KLONDIKE GOLD - AUSTRALIAN HILL

SECTION 4
WEST SIDE OF HATTIE'S GULCH

YUKON, CANADA

Date: 11/11/93	Author: H.O.C.	Figure 11
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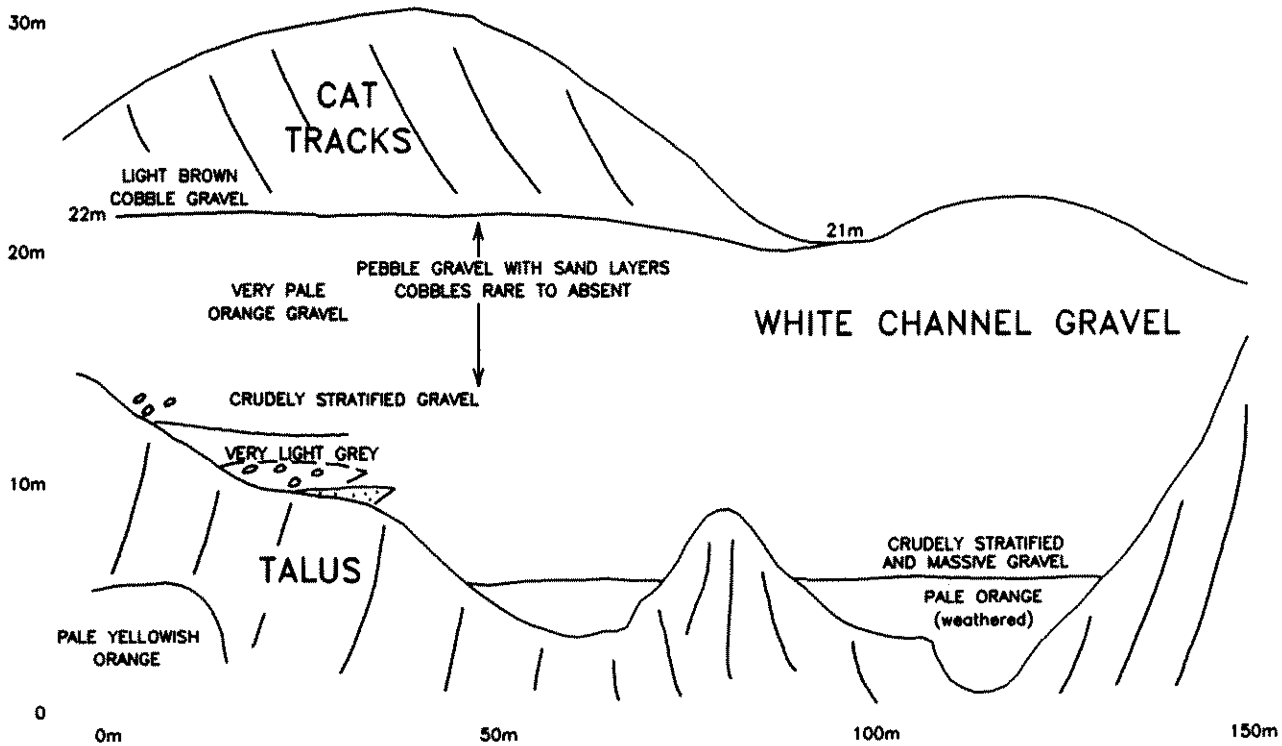
MJD



BASEMENT WHERE EXPOSED IS HIGHLY ALTERED MICACEOUS SCHIST – LIGHT GREEN TO YELLOWISH

EW FACE BEARING 97°

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KLONDIKE GOLD - AUSTRALIAN HILL

SECTION 5
E-W FACE AUSTRALIAN HILL

YUKON, CANADA

Date: 11/11/93	Author: H.O.C.	Figure 12
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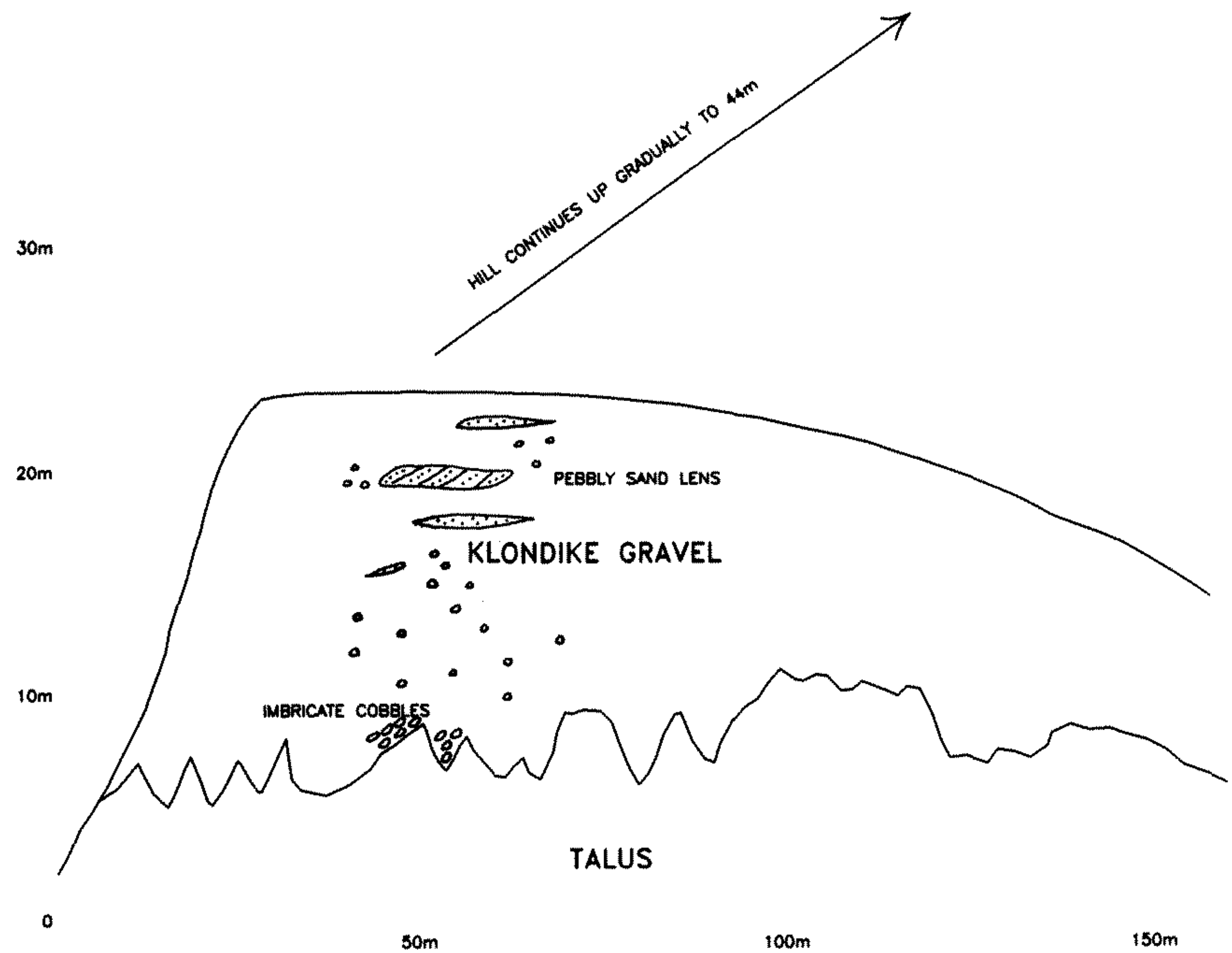

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KLONDIKE GOLD - AUSTRALIAN HILL

SECTION 6

YUKON, CANADA

Date:	11/11/93	Author: H.O.C.		Figure 13
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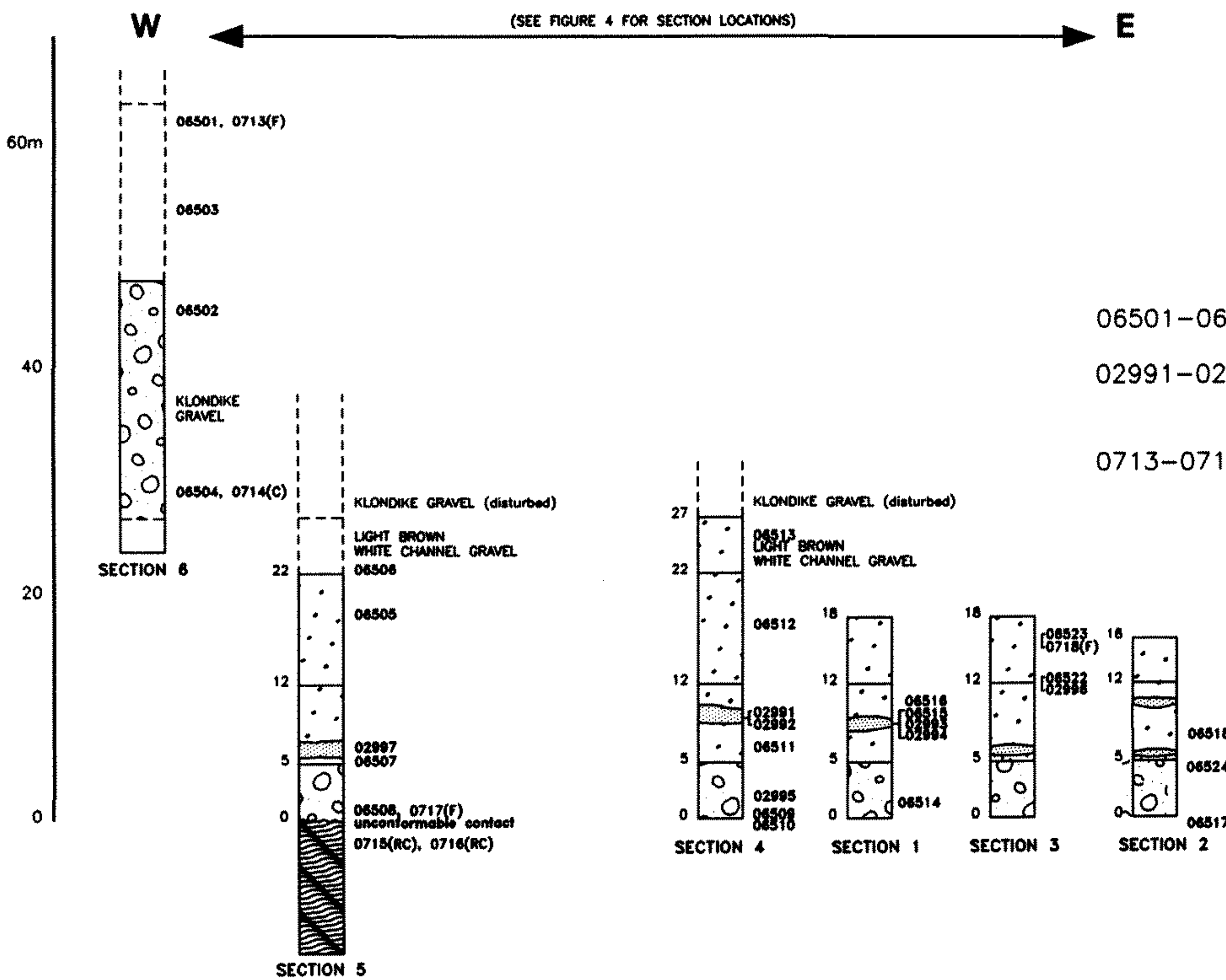

06501–06524 are 50 kg gravel samples for metallurgical testing;
02991–02997 are grab samples for gold assay and ICP–ES multi–element analysis
0713–0718 are float (F), clast (C) and rock chip (RC) samples for gold assay and ICP–ES multi–element analysis

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KLONDIKE GOLD - AUSTRALIAN HILL

STRATIGRAPHIC SECTIONS WITH SAMPLE LOCATIONS

YUKON, CANADA

Date: 7/04/94	Author: HOC	Figure 14
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The basal contact of the zone is sharp and unconformable above graphitic or micaceous schist basement. The top contact of the zone is gradational with the 5m - 12m zone of the White Channel Gravel.

5m - 12m zone

The 5m - 12m zone is less coarse than the underlying 0m - 5m zone. Large cobbles are less common, and maximum clast size is between 10cm and 15cm in most beds. Sand to pebbly sand beds and discontinuous lenses are also more abundant than in the 0m - 5m zone, and crossbeds are common in both gravels and sands. In further contrast to the basal zone, most of the largest cobbles above the 5m level are graphitic quartz schist or phyllite. The lower and upper contacts of this zone are gradational.

12m - 22m zone

The 12m - 22m zone continues trends observed from the lower two zones. Upwards from the underlying 5m - 12m zone, large cobbles become increasingly rare; crossbeds in gravels and sands become increasingly common; and sand interbeds become increasingly abundant. Additionally, bright orange stained openwork gravel and thin dark grey oil-saturated sand layers are more common than in lower zones.

22m - 27m zone

The 22m - 27m zone comprises light brown gravel at the top of the White Channel Gravel section. This zone is well exposed at section 4 west of Hattie's Gulch (Figure 15), but access is limited. Similar light brown gravels also occur at Dago Hill (Morison, 1985). This zone is sandier and finer grained in general than underlying zones and shows less evidence of post-depositional bleaching by acid formation waters (Morison, 1985; also see below). The contact with underlying White Channel Gravel is sharp, and with overlying Klondike Gravel is sharp and paraconformable (Morison, 1985).

3.4 Paleocurrent Indicators and Provenance

Cobble imbrication and accretionary crossbeds at Australian Hill demonstrate that paleocurrents were dominantly from the east to southeast. Imbricated cobbles were counted in 5 beds between 0m and 17m on the east-west trending face of section 5 (Figure 12). Of the 128 cobbles counted, 116 dip to the east (imbrication dip up-current). The consistent imbrication direction at this east-west exposure indicates that this face parallels the paleocurrent direction. Cobble imbrications counted on the western edge of section 4 (1.5m to 3m), where the cut face trends 053°, were less consistent (14 cobbles dip to the northeast; 47 cobbles dip to the southwest), but again indicate that currents came generally from the south. The variable directions suggest that actual paleocurrent direction did not parallel the face as in section 5, but rather moved into the face from the southeast.

Crossbeds form by accretion of sediment on the downstream side of dunes and gravelly bars. Most crossbeds exposed at Australian Hill dip to the north (on north-south trending faces) or west (on east-west trending faces). These dips indicate that paleocurrents flowed from the east and south, consistent with cobble imbrications.

Cobble imbrications at Lovett Hill, Trail Hill, Adam's Gulch and French Gulch in the Bonanza Creek drainage, and 15 Above Pup in the Last Chance Creek drainage, consistently indicate that currents flowed to the northwest.

3.5 Authigenic Mineral Growth

White Channel Gravel has been bleached to variable degrees in different areas where it is exposed. Starting with Tempelman-Kluit (1982), several workers have suggested that fluids responsible for bleaching of the White Channel Gravel may also have mobilized and precipitated gold. Dufresne (1986) established from X-ray diffraction analysis (XRD) of samples from Dago Hill that the gravel matrix mostly comprises kaolinite, with lesser illite, smectite and minor adularia (K feldspar). Dufresne (ibid.) further demonstrated that the kaolinite has a high degree of crystallinity similar to some hydrothermally produced kaolinites. Kaolinite, illite, and K-feldspar are all capable of being formed by progressive neutralisation of moderately acid waters through feldspar and mica hydrolysis (Figure 16).

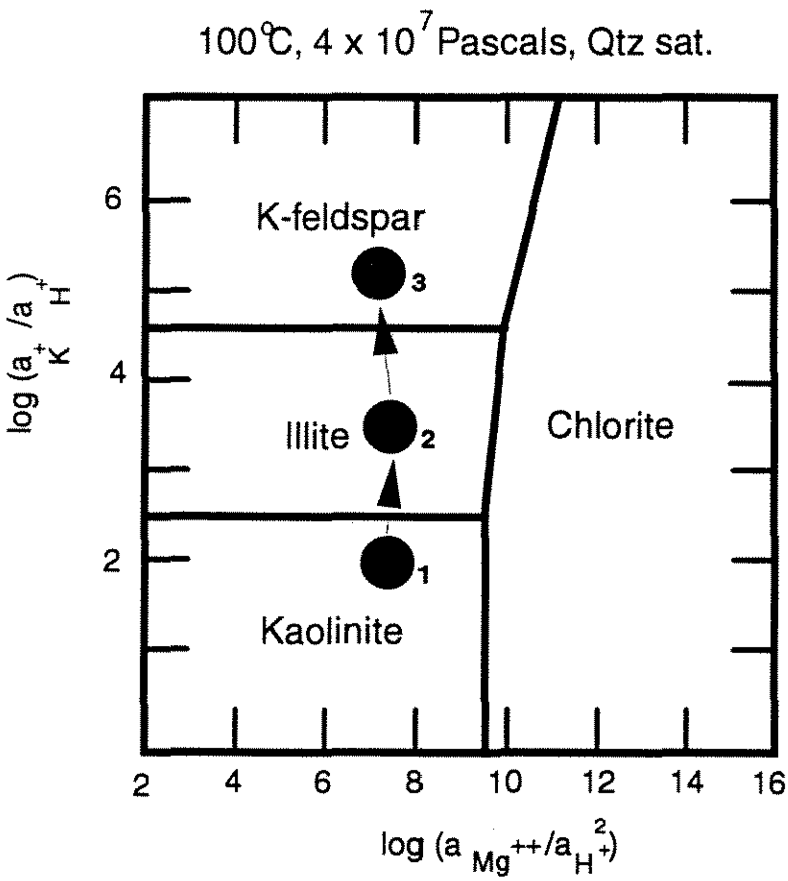
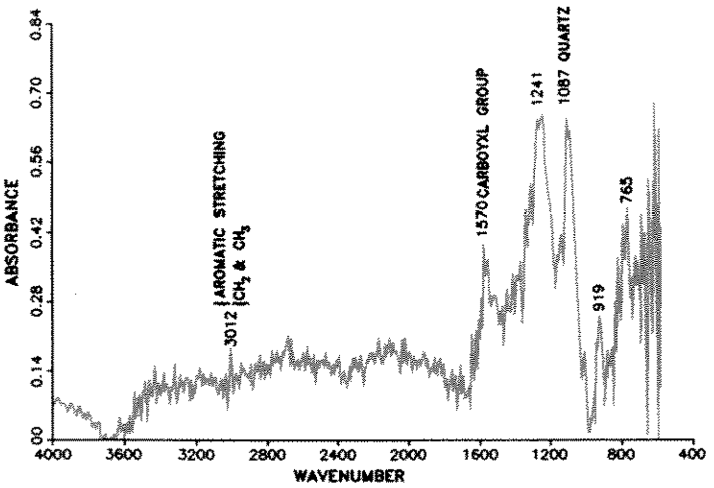


Figure 16: Possible pore fluid evolution during alteration of White Channel gravels. Phase diagram after Jahrens and Aagaard (1989).

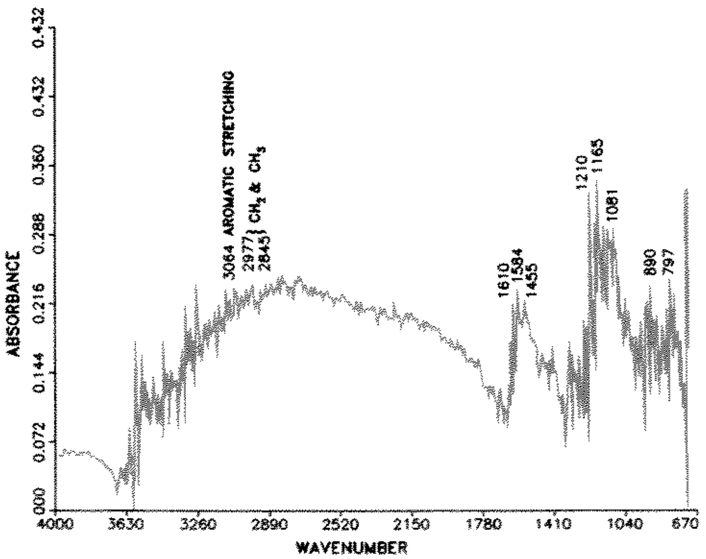
Additional evidence for the passage of acid waters through the White Channel Gravel comes from observations at Australian Hill. Black to dark grey streaks up to 15cm thick occur scattered throughout White Channel sands (Figure 7) and less commonly gravels, but are especially common above 12m in Hattie's Gulch. Though these streaks tend to follow bedding, they are locally bedding transgressive indicating that they formed after deposition. Petrographic examination shows that pore spaces in these sands are filled with black opaque material, and micro- Fourier Transform Infrared Spectroscopy (m-FTIR) demonstrates that the opaque material is degraded petroleum derived from immature terrestrial organic matter (Figure 17; Appendix A). The occurrence of petroleum in White Channel Gravel means that the fluids which moved through the gravels were warmed at some time in their history to temperatures above 50°C or 60°C. As petroleum generation also produces large amounts of organic acids, the acid waters produced by maturation of organic matter were likely the fluids that bleached the White Channel Gravel. The fact that substantial volumes of gravel appear to be affected implies a large fluid reservoir. As greenschist facies basement is not a plausible source of the hydrocarbons, the fluids must have been introduced from elsewhere via faults.

Fabric - disruptive bleaching is also observed locally in graphitic schist underlying the White Channel Gravel (Figure 18). These zones may mark conduits which channeled the petroleum fluids described above. The mineralogy of the bleached schist as deduced by XRD analysis is quartz + muscovite + albite + kaolinite, an assemblage suggestive of incomplete hydrolysis of the original greenschist facies paragenesis.

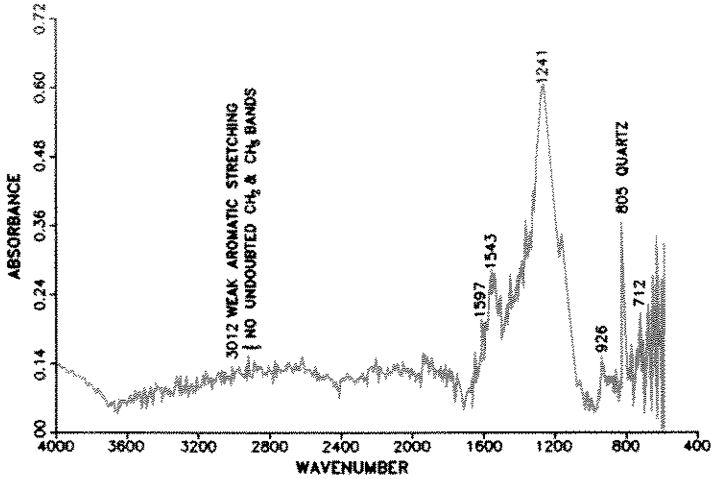
Bright orange staining of open work gravels is common within the White Channel Gravel, especially in the 12m - 22m zone. Botryoidal black crusts (identified as goethite by XRD) locally coat the orange gravel. Similar staining also occurs to a more limited degree at lower levels in the White Channel Gravel and in the overlying Klondike Gravel. The occurrence of bright orange stain in the openwork gravels and in the unbleached Klondike Gravel, both of which retain significant permeability today, suggests that this staining is recent and probably results from precipitation of iron from near-surface groundwater. Bright orange stain and associated black crusts also occur in the fault plane of at least one of a series of minor normal faults in section 4 (fault dips 74° to 085° and has a throw of less than 30cm), which also supports a recent origin to the stain.



a) pore-filling hydrocarbons



b) hydrocarbon grain coating



c) quartz grain and trace hydrocarbons

Spectrographs from three points within oil saturated sand of sample 1-4. Spectrograph (a) and (b) were taken in pore spaces within the sands and show clear indications of hydrocarbons. Spectrograph (c) was taken within a quartz grain as a check, and shows spectra characteristic of quartz and a weak hydrocarbon response. The weak response in hydrocarbon frequency range probably is a reflection from outside measured spot due to the irregular surface of sample.

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KLONDIKE GOLD - AUSTRALIAN HILL

INFRARED SPECTROGRAPHY

YUKON, CANADA

Date: 31/03/94	Author: HOC	Figure 17
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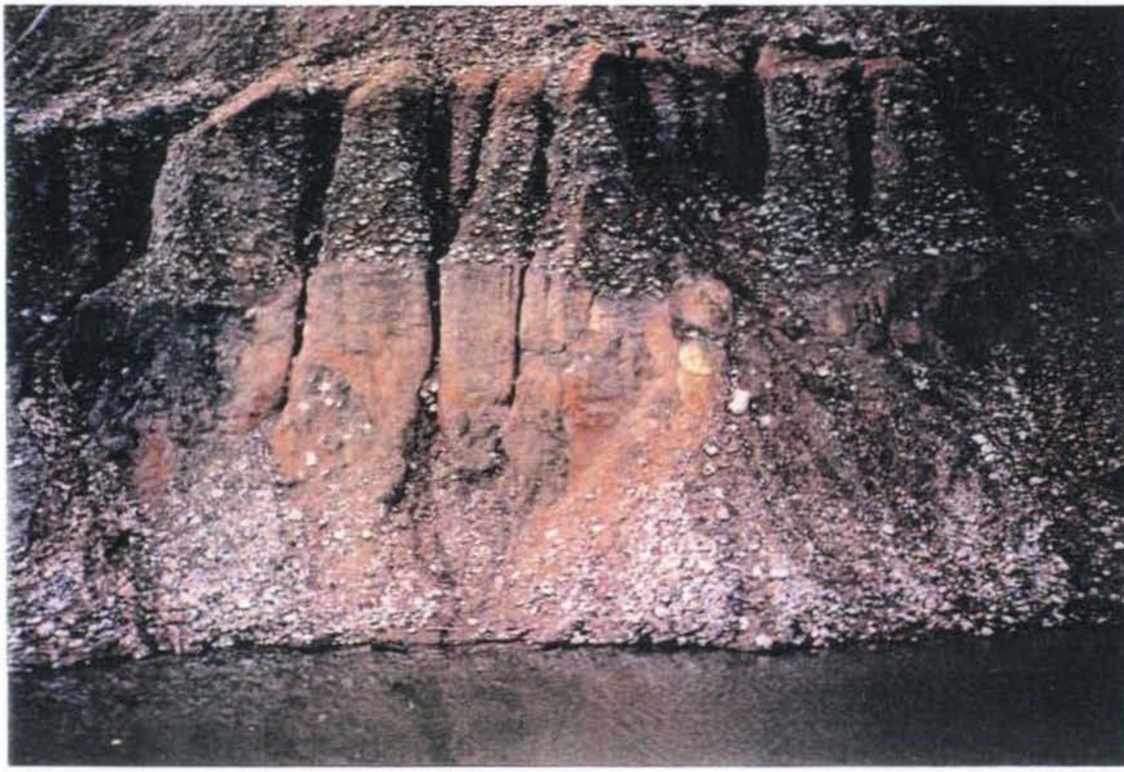


Figure 18: Alteration zone at top of basement in Hattie's Gulch.

The occurrence at Australian Hill of finely crystalline gold showing little evidence of fluvial transport appears to support either local derivation or in situ growth of gold. Dufresne (1986) suggested that hydrothermal alteration and gold deposition occurred within White Channel Gravel as a result of near-surface discharge of a Plio-Pleistocene geothermal system. Absence of permafrost at Australian Hill is commonly cited as evidence of a continuing geothermal anomaly in the area (D. Johnson and J. McFaull, personal communications, 1993). In contrast, data presented above suggest that bleaching of White Channel Gravel is attributable to a low temperature petroleum-bearing fluid. As palynomorphs recovered from White Channel Gravel during the present study show no evidence of thermal alteration (G.E. Rouse, personal communication, 1993; Appendix B), an epithermal model for gold emplacement into the unit is unlikely. Though grab samples of oil-impregnated sands from Australian Hill failed to return significant gold assays (Appendices C and D), it is plausible that the petroleum fluid was responsible for local dissolution and recrystallisation of fine detrital gold within the White Channel Gravel.

The most reasonable source for the petroleum fluids which passed through the White Channel Gravel is the Tintina Fault Zone. Accumulations of lignite-bearing Neogene fluvial and lacustrine sediments occur within the fault zone and presumably evolved hydrocarbons either during simple burial or as a result of enhanced heat flow. These fluids were then seismically pumped out along subsidiary structures into permeable hosts such as the White Channel Gravel. Hydrothermal fluids circulating within the Tintina Fault Zone may also have behaved in a similar manner.

3.6 Age

Age controls on the White Channel Gravel are poor. A Plio-Pleistocene age is suspected on the basis of its poor consolidation and stratigraphic relationships with overlying Klondike Gravel. Palynomorph assemblages identified during the present study were pre-Holocene though not otherwise age-diagnostic (Appendix B).

4.0 KLONDIKE GRAVEL DESCRIPTION

4.1 Distribution and Composition

Klondike Gravel is a medium brown iron-stained deposit that overlies the White Channel Gravel and that weathers recessively. The Klondike Gravel has never supported successful placer mining, except near the confluence of the Klondike and Yukon rivers. On Dago Hill, Klondike Gravel paraconformably overlies White Channel Gravel (Morison, 1985), as evidenced by normal faults of approximately 3m throw that cut White Channel Gravel but not Klondike Gravel. On Australian Hill, the contact between Klondike Gravel and White Channel Gravel is sharp but only well exposed in a pit freshly dug for sampling (sample site 06513). Although generally poorly exposed, the iron-stained gravels comprise the upper 75m of Australian Hill. Good exposure is available for the lowest 24m at the northwest corner of Australian Hill, where section 6 is located.

Composition of the Klondike Gravel contrasts sharply with that of the White Channel Gravel. Clasts comprise volcanics of several types, cherts, and siliceous argillites, with only rare examples of foliated clasts, white quartz, or rhyolite porphyry. Interestingly, the largest cobbles include the rare examples of rhyolite porphyry and green micaceous schist, which suggests some minor local clast derivation. Matrix material is fine grained sand composed of 40% quartz, 35% black chert or volcanic lithic fragments, 15% pink chert, and 10% green lithic fragments (including green chert), as estimated from hand sample.

4.2 Sedimentary Facies

The Klondike Gravel is clast supported and mostly matrix filled, except for thin layers of openwork gravel that are usually stained bright orange. Maximum clast size is 18cm in long dimension. Beds are generally less than 1m thick and crossbeds are common. Sand interbeds are medium to coarse grained and up to 30cm thick. The interbeds occur on average about 2m apart in section 6. The crudely stratified gravel facies and crossbedded sand to pebbly sand facies are interpreted as braided alluvial deposits.

4.3 Paleocurrent Indicators and Provenance

Pebble and cobble imbrication in Klondike Gravel is variable in orientation but generally dips to the northeast, indicating that the braided alluvial system was fed from this direction. Provenance was probably the Ogilvie Mountains to the northeast (McConnell, 1907), and clearly differs from the southeasterly provenance for the White Channel Gravel.

4.4 Authigenic Mineral Growth

There is no evidence of post-depositional bleaching within the Klondike Gravel.

4.5 Age

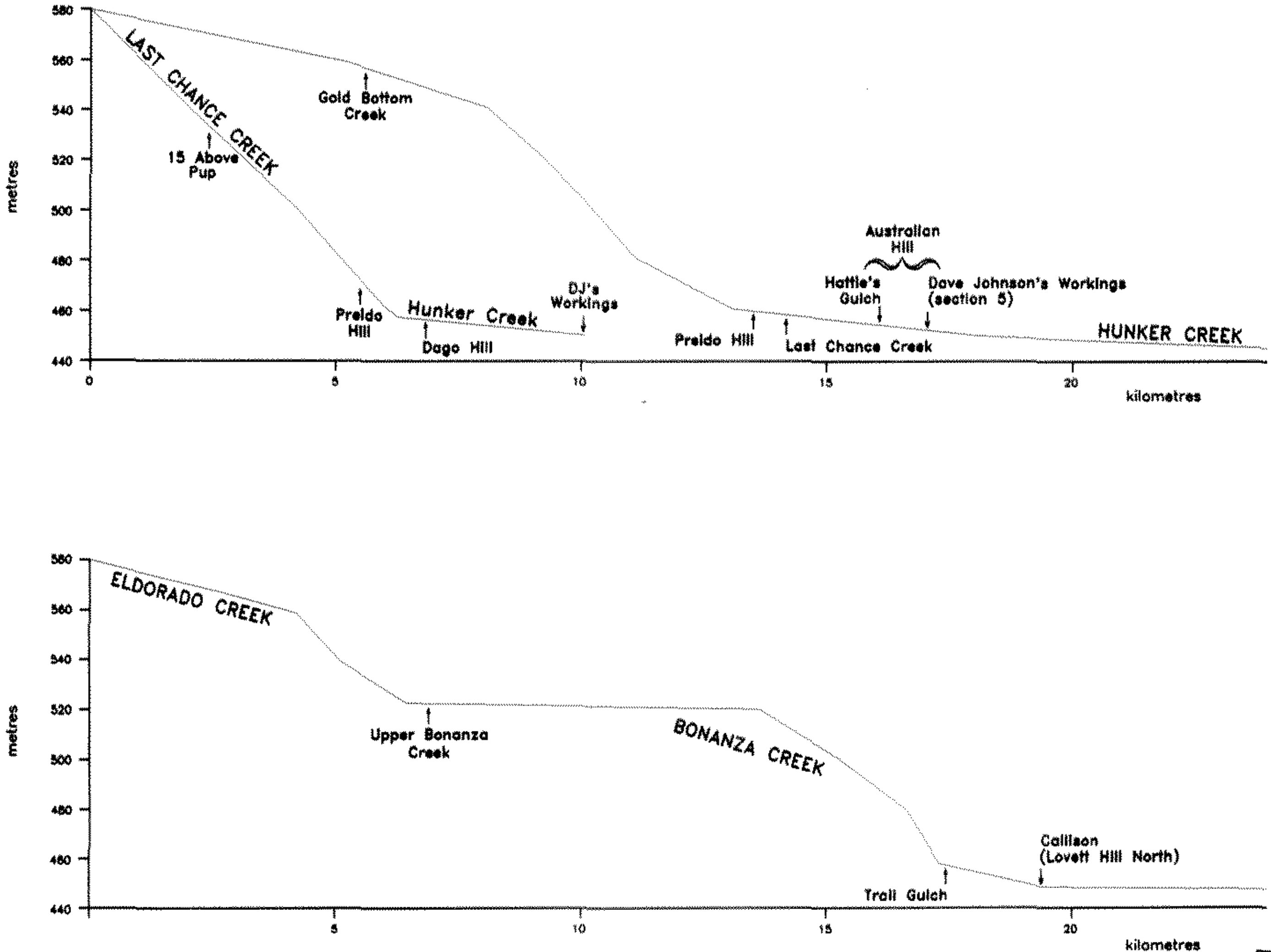
A Pleistocene age for the Klondike Gravel is likely on the basis of degree of consolidation and stratigraphic position. As with the White Channel Gravel, biostratigraphic constraints on age are poor.

5.0 PALEOTOPOGRAPHY DURING WHITE CHANNEL GRAVEL DEPOSITION

5.1 Regional Paleotopography

The topographic surface upon which White Channel Gravel was deposited has been mapped at a regional scale from the elevations of high bench placer operations marked on published 1:50,000 topographic maps (Figure 19). The paleo-drainage surface sloped north and northwest down the Bonanza, Eldorado, Last Chance and Hunker Creek drainages, and to the west down the lower Klondike valley towards the Yukon River. Stream profiles constructed from the measured elevations show that ramps on the paleo-drainage surface bottom out near the confluence of Eldorado and Bonanza Creeks, between Trail and Lovett Hills, and near Preido Hill on both Last Chance and Hunker creeks (Figure 20). Historically, each of these areas was a site of high gold production from both the White Channel Gravel and modern stream gravels (McConnell, 1907). As accumulation of placer gold is commonly associated with breaks in regional slope (Craw and Youngson, 1993), paleotopography would appear to be a first order control on gold distribution within the White Channel Gravel.

Upland areas separated creek drainages during high bench gravel accumulation and formed continuous highlands south of their headwaters. These uplands were the source areas for the White Channel Gravel. A paleo-high running north of Hunker Creek which forms the northeastern side of Australian Hill ends abruptly at the Klondike River today, but may have been continuous with the present day topographic high north of the river at the time of White Channel Gravel deposition. If continuous, this high would have held back the Klondike



Stream profiles at the beginning of White Channel deposition. Profiles were constructed from the paleo–drainage surface map (figure 19).

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KLONDIKE GOLD - AUSTRALIAN HILL

WHITE CHANNEL GRAVEL STREAM PROFILES

YUKON TERRITORY, CANADA

Date: 5/04/95	Author: HOC	Figure 20
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River, suggesting that the White Channel Gravel formed on a paleo-drainage surface that fed downstream into the Yukon River drainage but which did not receive any input from the upper portion of the present day Klondike River system. The Klondike River at that time presumably flowed further to the northwest along the Tintina Trench before debouching into the Yukon River.

Precise surveying of basement topography was conducted at exposures around Australian Hill (Figure 21; Appendix E). On the south and west sides of Australian Hill, basement slopes gently to the west with small irregularities on the scale of ~1m elevation change over 3m lateral distance (Figure 22). The northeastern side of Australian Hill, however, was a paleo-high that was probably exposed throughout deposition of the high bench gravels. As noted above, this high is part of the paleo-high that forms the northern valley edge for Hunker Creek, and that likely originally separated the White Channel Gravel river systems from the Klondike River.

5.2 Local Paleotopography

The White Channel Gravel was deposited upon an incised paleotopographic surface produced by a pre-existing erosional fluvial regime. An erosional paleochannel underlying White Channel Gravel is exposed on the south side of Dago Hill. This channel is 40m across, 3m to 4m deep, and cuts sharply into black graphitic phyllite (Figure 23). Clasts in this paleochannel are dominated by cobbles and boulders of rhyolite porphyry, with less abundant pebbles of black graphitic phyllite, light green micaceous schist and rare quartz (Figure 24). The large size, angularity and great abundance of rhyolite porphyry clasts indicates a local source. The northwest side of the channel is filled by pebble-cobble gravel composed predominantly of white quartz, suggesting that initial White Channel Gravel transport and deposition occurred within the pre-existing drainage channels.

The nature of the older erosional system is speculative, but the broad, flat bottomed valleys, lack of preserved soil cover, and paleotopographic ramps at the mouths of Eldorado and Bonanza creeks (Figures 19 and 20) are all geomorphic features common in glacially carved terrains. Although this part of Yukon was apparently not covered by continental ice sheets during recent glacial epochs, a paleotopography comprising major drainages in u-shaped valleys fed by tributary drainages in hanging valleys suggests that the pre-White Channel drainage surface was in part glacier cut. Mountain glaciers may have

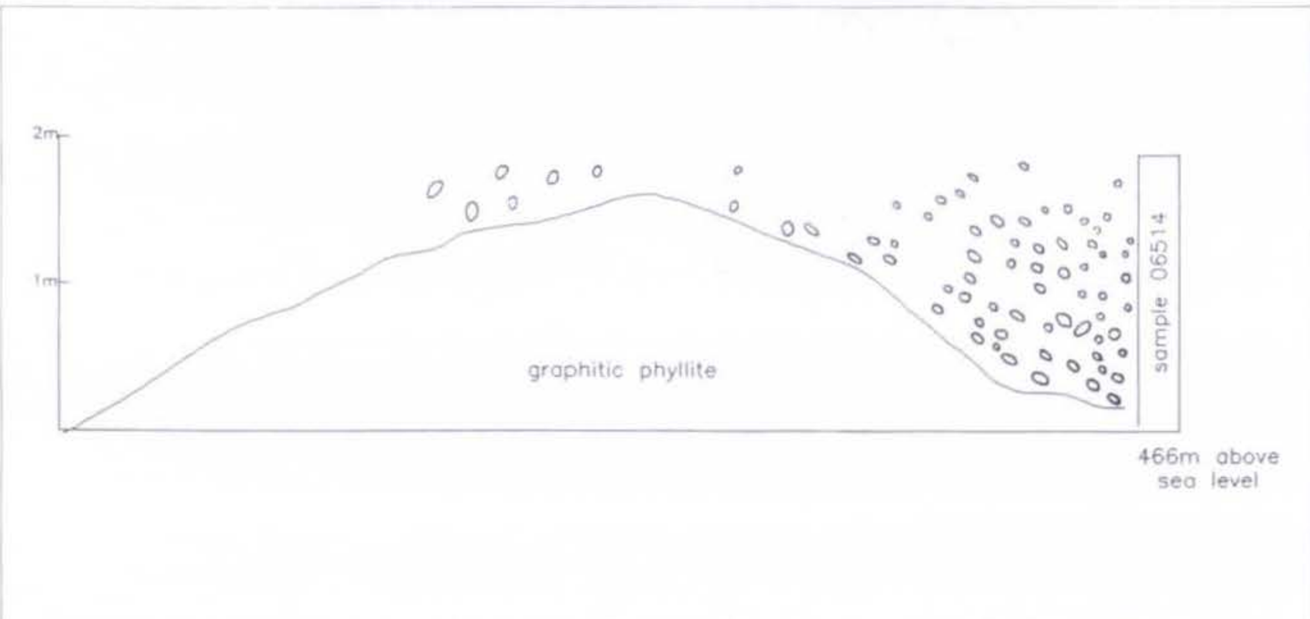

Figure 22: Basement topographic relief of 1.2 m buried by White Channel Gravel. Located west side of Hattie's gulch at site of sample 06514. Hammer (arrow) is 30 cm long.

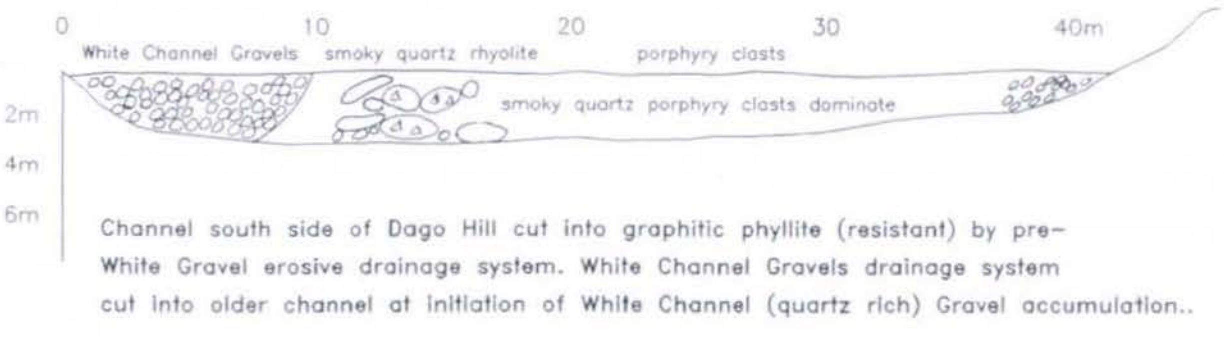

Figure 23: Channel at base of White Channel Gravel cut into graphitic schist: a) photograph of eastern erosive channel margin (hammer is 30 long); b) sketch showing the entire channel, including White Channel gravels that formed a channel within the pre-existing channel deposits.

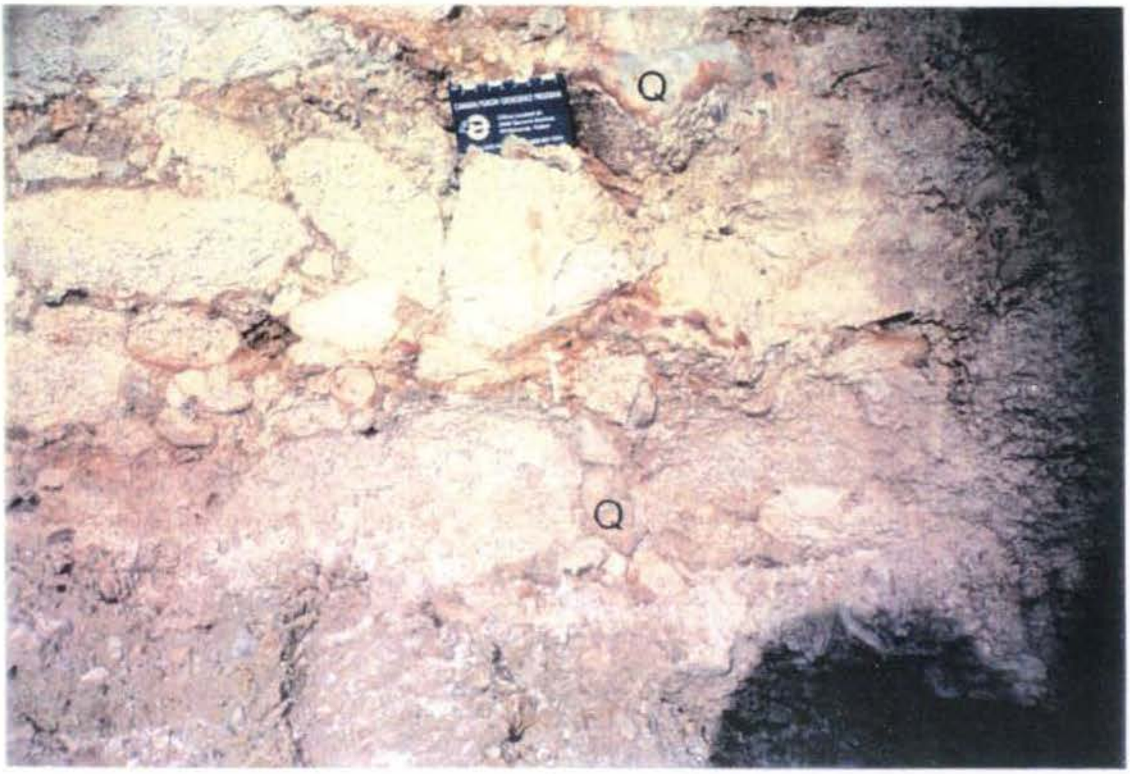

Figure 24: Rhyolite porphyry cobbles and boulders in channel pictured in figure 23. Rare white quartz cobbles labelled Q; card is scaled in centimetres.

descended north from highlands located in the headwaters of Eldorado, Bonanza and Hunker creeks.

6.0 DEPOSITIONAL HISTORY OF THE HIGH BENCH GRAVELS

Initial deposits of White Channel Gravel record the change from an erosional to a depositional alluvial system in the Klondike placer district. Aggradation of the White Channel Gravel began slowly, as demonstrated by the highly winnowed gravel facies that dominates the basal 0m to 5m zone at Australian Hill. Increasingly rapid aggradation occurred higher in the White Channel Gravel, as recorded by the decrease in large cobbles and the simultaneous increase in crossbed and sand preservation. The increase in aggradation rate during White Channel Gravel accumulation is consistent with observations by placer miners on Australian Hill (P. Gould, personal communication, 1993) that the greatest concentrations of coarse placer gold occur near the base of the unit.

White Channel Gravel in lower Hunker Creek was deposited as coalescing alluvial fans by a braided river system. The fans formed an alluvial braidplain that covered most of Australian Hill and that continued down the lower Klondike River valley to the Yukon River drainage. Thickness of White Channel Gravel increases downstream and reaches a maximum near the confluence of Bonanza Creek and the Klondike River (Figure 25). Assuming that basement highs which presently exceed the elevation of the highest known bench gravels were hills during White Channel deposition, it can be deduced that separate alluvial fans occupied each of the Bonanza, Bear, Last Chance and Hunker creek valleys (Figure 26). The alternative assumption, that the alluvial fans were deposited as a "bajada" type fan apron, requires that each of the drainages with preserved White Channel Gravel was down-dropped more than 500m relative to the ridge tops after sedimentation. This alternative is unlikely due to the consistent elevation of basement in different creek valleys (Figure 19), and the dearth of White Channel clasts in overlying Klondike Gravel.

Provenance and paleocurrent directions demonstrate that the White Channel Gravel was derived primarily from schistose rocks exposed at the upstream (southeast) ends of each major creek valley. Accepting that the alluvial fans were separate implies that separate lode gold sources existed for each valley. The alluvial fan that filled Bonanza Creek was derived from uplift of rocks south of French Gulch while the alluvial fan that filled Hunker Creek was probably derived from rocks near King Solomon Dome. The sources for these alluvial fans are primarily Klondike Schist.

A hiatus followed the termination of White Channel Gravel sedimentation. Erosion of elevated areas continued during this hiatus, and headward erosion north of Australian Hill resulted in capture of the ancestral Klondike River by the Yukon River drainage. The ancient Klondike River occupied the Tintina Trench, in which low relief topography occurs more than 200m above White Channel Gravel elevations. After capture, the Klondike descended out of the higher Tintina Trench and began to flow west through the lower Klondike River valley for the first time to join the Yukon River. This newly captured river locally reworked the White Channel Gravel and its contained gold, and deposited the unfoliated volcanic and chert clasts that comprise the Klondike Gravel.

Subsequent to Klondike Gravel accumulation, base level for the Klondike River dropped (or the entire region was uplifted) leading to renewed incision and the modern topography of high bench gravels. Gold eroded from the high bench gravels was reworked to form placers in the modern stream gravels.

7.0 CONCLUSIONS AND IMPLICATIONS FOR GOLD EXPLORATION

(1) Placer gold distribution in the White Channel Gravel was primarily controlled by detrital processes. Gold is concentrated in a highly winnowed sedimentary facies directly overlying basement and highest placer production occurs from the base of ramps in the pre-White Channel Gravel paleotopographic surface. Local dissolution and reprecipitation of placer gold is possible given the White Channel Gravel pore fluid history and may be especially important for very fine grained gold.

(2) White Channel Gravel on Australian Hill was deposited by a braided river on the northern edge of its valley. The location of Australian Hill 4km downstream from the point where stream gradient in the ancestral Hunker Creek abruptly flattened probably contributed to the relatively low reported abundance of coarse gold in the deposit (ie. gold recoverable by traditional placer methods).

(3) White Channel Gravel has multiple lode gold sources. A minimum of three sources are needed to account for Bonanza, Last Chance and Hunker creeks, and more sources are probable.

(4) Klondike Gravel was derived from an entirely different source, and experienced negligible mixing with the older White Channel Gravel, at least in the vicinity of Australian Hill. Therefore, if the Klondike Gravel at Australian Hill contains gold, it was derived from an unrelated source.

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APPENDIX A

Micro-Fourier Transform Infrared
Spectroscopy Results

Maria Mastalerz

Micro-FTIR analysis of organic fraction in poorly consolidated sandstone

METHODS

Functional groups in organic matter were determined from FTIR spectra using a Nicolet 710 micro-FTIR spectrometer equipped with a NICPLAN microscope. A 35 IR-objective was used, which allowed analysis of areas of 20 m in size. Spectra were obtained in reflectance mode at a resolution of 8 cm^{-1}; 128 scans were co-added (a ratio to a background of 128 scans was calculated) and Kramers-Kronig transformation was applied. The bands were assigned according to Painter et al. (1981) and Wang and Griffith (1985). FOCAS curve deconvolution program was used in curve spectral analysis.

RESULTS

The analysis of coatings around quartz grains and material filling pores between grains show that organic matter is substantial component of this material. The presence of organic matter is indicated by: 1) distinct aliphatic stretching bands in the 2820-3000 cm^{-1} region, assigned to CH_2 and CH_3; 2) detectable aromatic stretching bands in the 3000-3100 cm^{-1} region; 3) presence of aliphatic rocking modes at 776 cm^{-1} in the coating around quartz grains; and 4) presence of aromatic carbon (C=C) at a wavenumber of around 1600 cm^{-1} in the coating. All the above mentioned wavenumber regions are dominated by organic compounds and virtually are free of mineral matter bands. There are also some other organic compounds such as carboxyl/carbonyl (C=O) or C-O streching in alcohols, indicating organic fraction. All the spectra have also bands characteristic of inorganic matter, namely quartz (1084-1088, 807 cm^{-1}), kaolinite (1008-1015 cm^{-1}) and carbonate (~1412 cm^{-1}).

Relative intensity of organic compound bands and inorganic matter bands in the FTIR spectra suggests that organic matter is the major component or one of major components in coatings and pore filings of the sandstone. When minerals dominate, the intensity of their bands is high and, as a result, organic matter in some regions can be overprinted, which is not the case in the present situation.

Remarks on origin and maturity of organic matter

Ratio of aromatic (3000-3100 cm^{-1}) to aliphatic (2800-3000 cm^{-1}) hydrogen fractions, ratio of CH_2/CH_3 and the distribution of oxygeneted functional groups can give some indication about the type of organic matter, its maturity and biodegradation. Table below summarises some of these parameters in 2800-3000 cm^{-1} region..

Sample	Ar	Al	Ar/Al	CH_2	CH_3	CH2/CH3
coating	26.4	51.9	0.51	29.3	22.7	1.29
pore filling	9.3	18.8	0.49	9.9	8.9	1.11

note: values of Ar, Al, CH_2 and CH_3 represent integration areas under the peaks in absorbance units.

The FTIR results strongly suggest that the material filling the pore spaces and coating the quartz grains is a bitumen, a hydrocarbon originated from organic matter. CH_2/CH_3 ratio in a range of 1.11 to 1.29 is relatively low and suggest that aliphatic structure was predominantly composed of short chain aliphatics. This indicates terrestrially-derived rather than marine material for the bitumen precursor. The observed differences in CH_2/CH_3 ratio are unlikely to represent differences in the source material and rather result from degradational processs. Most relavant process here seems to be water washing, which would result in CH_2 degradation and oxidation into carboxyl/carbonyl groups. FTIR spectrum of the pore filling is a good illustration of such situation.

Although FTIR data alone cannot determine maturation level of organic matter, the lack of distinct out-of-plane aromatic modes in the 700-900 cm^{-1} region suggests that the bitumen is rather immature. The ratios of aromatic to aliphatic hydrogen of around 0.5 also suggests low maturity. If this is the case, the source material has to be immature as well, and water washing and biodegradation processes associated with thermal processes rather than thermal processes alone would be responsible for the bitumen formation..

APPENDIX B

Palynology Results

PCI PALYNOROX CONSULTING INC.

Dr. Glenn E. Rouse, President
2134 West 53rd Avenue
Vancouver, B.C., Canada V6P 1L6
(604) 263-9088

December 9, 1993

RECEIVED

Eric J. Finlayson
Reg. Exp. Manager
Kennecott Canada Inc.
Granville Sqiare
#354-200 Granville Street
VANCOUVER, B.C. V6C 1S4

Dear Mr. Finlayson: re: 3 samples from Klondike for palynology submitted by Dr. H. Cookenboo.

I have now completed analyses of the 3 samples from the Klondike submitted by Dr. Cookenboo, and the detailed results are presented on p.2. All three samples were treated with HF, HCl to disolve most of the mineral matter, sieved with 140 and 15µm screens to rid the coarse and fine fractions, stained with safranine dye, and slides made. Sample #1 from Gould's Gulch was treated with heavy liquid (Zn Br_2) to float the organic fraction; this step was omitted in samples 2 and 3 because of the low organic fractions recovered from those 2 samples.

If you would like clarification, please phone at 822-3352(O) or 263-9088 (H).

Please find enclosed and invoice for the analyses plus my up-to-date price list.

Yours sincerely,

Glenn E. Rouse

GER:cr

SAMPLE #1. Gould's Gulch. Predominently fine quartz, with much iron.

Palynomorphs recovered, with numbers counted in brackets with sum of 150.

Picea sp. probably *Picea glauca*	(97)
Pinus sp. *cf. P. contorta*	(46)
P. sp. *cf. P. albicaulis*	(02)
Epilobium angustifolium	(05)
Total....	150

Interpretation: - The most striking feature is the combination of the spruce-pine forest, but with a complete absence of *Alnus* (alder) and *Betula* (birch), an assemblage with no modern counterpart. Such a combination strongly suggests that this deposit predates the interval of ca.9-7 ka (=1000 yrs) (see eg. Matthews et al., 1989, Chapt.7 in Quaternary Geology of Canada and Greenland, R.J. Fulton Ed. p. 494). This period represents a warming trend in the middle interval of the last postglacial period, at a time before *Alnus* and *Betula* invaded this region.

SAMPLE #2. HC sample 1-5. Barren of palynomorphs. A few fragments of orange brown wood are scattered in the sample. Probably represents a glacial phase of deposition.

SAMPLE #3. HC sample 06523A. No palynomorphs. There are a few orange brown wood fragments. Probably represents a glacial phase of deposition.

APPENDIX C

Grab Sample Descriptions

Australian Hill Rock Sample Descriptions

SAMPLE #	CERTIF. #	PROJ.	PROPERTY	NTS	UTM N	UTM E	DATE	GEOL.	S-TYPE	MOD 1	MOD 2	MOD 3	R-TYPE	NOTES
VR0713A	A9322753	KG	AUST HILL	116B/3	7,101,750	590,480	9/24/93	RLC	FL	QTZ			VEN	SUCROSIC VUGGY QTZ 60%, IN SCH
VR0714A	A9412287	KG	AUST HILL	116B/3	7,101,700	590,290	9/24/93	RLC	GR					SCREENED @ 6504, 5-7M ABOVE BASEMENT
VR0715A	A9322753	KG	AUST HILL	116B/3	7,100,830	590,460	9/25/93	RLC	CH				SCH	CLAY ALTERED, @ SITE OF GRIZZLY, 5% GOE IN VEINS
VR0716A	A9412287	KG	AUST HILL	116B/3	7,100,920	590,570	9/25/93	RLC	CH				POR	QTZ POR, STRONG ARG, STRONG PHY?, AT BASE OF GRAVELS, AT 6508
VR0717A	A9412287	KG	AUST HILL	116B/3	7,100,920	590,570	9/25/93	RLC	FL					SCREENED AT BASE OF WCG (3-5M UP) @ 6508
VR0718A	A9412287	KG	AUST HILL	116B/3	7,101,135	591,610	9/25/93	RLC	FL					SCREENED AT 15-16M UP IN WCG, @ 6523
VR2991A	A9323366	KG	AUST HILL	116B/3	7,100,865	591,289	9/21/93	HOC	GR					BLACK SAND LAYER AT 8M, SECTION 4 #3A
VR2992A	A9323366	KG	AUST HILL	116B/3	7,100,865	591,289	9/21/93	HOC	GR					BLACK SAND LAYER AT 8M, SECTION 4 #3B
VR2993A	A9323366	KG	AUST HILL	116B/3	7,101,038	591,518	9/21/93	HOC	GR					BLACK SAND LAYER, HYDROCARBON
VR2994A	A9323366	KG	AUST HILL	116B/3	7,101,038	591,518	9/21/93	HOC	GR					BLACK SAND LAYER, HYDROCARBON
VR2995A	A9323366	KG	AUST HILL	116B/3	7,100,845	591,299	9/21/93	HOC	GR					SAND LENS 2M FROM BASE OF WCG
VR2996A	A9323366	KG	AUST HILL	116B/3	7,101,062	591,619	9/21/93	HOC	GR					OILY SAND?
VR2997A	A9323366	KG	AUST HILL	116B/3	7,100,912	590,526	9/21/93	HOC	GR					SAND LENS, SECTION 5

Kennecott № VR 00713 A

Property Project: Klondike

Date: 07-24-93 (mm-dd-yy) Geologist: RLC

Map Sheet:

Map Scale:

D.H. No. From To ft m

LOCATION

Country: St./Prov.: County:

Coordinate System: UTM State Local

Zone/Grid Id: ft m

East: 590480 Elev: NW corner ft m

North: 7101750 Austr. Hill Klon.

Longitude: ° ' " E W Gravels

Latitude: ° ' " N S (top)

SAMPLE TYPE: FL cobble in gravel

ROCKS:

Color: Rock Type: VEN

Age: Modifiers:

Alteration	Int.	Structure	Azm.	Dip	Int.
OXI	M				

Minerals	%	Occur.
QTZ	60	VEN
SCH	40	

Notes: sucrosic, vuggy

Kennecott № VR 00714 A

Property Project:

Date: (mm-dd-yy) Geologist:

Map Sheet:

Map Scale:

D.H. No. From To ft m

LOCATION

Country: St./Prov.: County:

Coordinate System: UTM State Local

Zone/Grid Id: ft m

East: 590290 Elev: ft m

North: 7101700 screened @

Longitude: ° ' " E W ~~[illegible]~~ 065 [illegible]

Latitude: ° ' " N S ~ ~~5m~~ 7m above base of Klondike Gravel

SAMPLE TYPE:

ROCKS:

Color: Rock Type:

Age: Modifiers:

Alteration	Int.	Structure	Azm.	Dip	Int.

Minerals	%	Occur.

Notes:

Kennecott № VR 00715 A

Property Project: Klondike

Date: 09-25-93 Geologist: RLC

Map Sheet:

Map Scale:

D.H. No. From To ft m

LOCATION

Country: St./Prov.: County:

Coordinate System: UTM State Local

Zone/Grid Id: ft m

East: 520460 Elev: ft m

North: 7100830

Longitude: ° ' " E W Austr. Hill

Latitude: ° ' " N S @ grizzly

SAMPLE TYPE: CH (1.5m)

ROCKS:

Color: OR Rock Type: SCH (klondike?)

Age: Modifiers:

Alteration	Int.	Structure	Azm.	Dip	Int.
OXI	S	± clay			

Minerals	%	Occur.	Notes:
GOE	5	VEN	discordant

Kennecott № VR 00716 A

Property Project: Klondike

Date: 09-25-93 Geologist: RLC

Map Sheet:

Map Scale:

D.H. No. From To ft m

LOCATION

Country: St./Prov.: County:

Coordinate System: UTM State Local

Zone/Grid Id: ft m

East: 520576 Elev: ft m

North: 7100920

Longitude: ° ' " E W base of

Latitude: ° ' " N S 06508

SAMPLE TYPE: CH - TM o/c or in situ alt n of conglom/gravel

ROCKS:

Color: Rock Type: POR? or ERV

Age: Modifiers:

Alteration	Int.	Structure	Azm.	Dip	Int.
ARG	S				
? PHY	S				

Minerals	%	Occur.	Notes:
QTZ	5		frags
			poss ghosted fsps

Kennecott № VR 00717 A

Property
Project: ______

Date: __-__-__ (mm dd yy) Geologist: ______

Map Sheet: ______

Map Scale: ______

D.H. No. ______ From ______ To ______ ft m

LOCATION

Country: ______ St./Prov.: ______ County: ______

Coordinate System: UTM State Local

Zone/Grid Id: ______ ft m

East: 520570 Elev: ______ ft m

North: 7100920

Longitude: ___° ___' ___" E W

Latitude: ___° ___' ___" N S

screened @ base of WC 6 (3-5m up) (@ 06508)

SAMPLE TYPE: ______

ROCKS:

Color: ______ Rock Type: ______

Age: ______ Modifiers: ______ ______ ______

Alteration	Int.	Structure	Azm.	Dip	Int.

Minerals	%	Occur.

Notes:

Kennecott № VR 00718 A

Property
Project: ______

Date: __-__-__ (mm dd yy) Geologist: ______

Map Sheet: ______

Map Scale: ______

D.H. No. ______ From ______ To ______ ft m

LOCATION

Country: ______ St./Prov.: ______ County: ______

Coordinate System: UTM State Local

Zone/Grid Id: ______ ft m

East: 521610 Elev: ______ ft m

North: 7101135 (screened @ 06523)

Longitude: ___° ___' ___" E W

Latitude: ___° ___' ___" N S

SAMPLE TYPE: ______

✓ 15-16m, up in WCG

ROCKS:

Color: ______ Rock Type: ______

Age: ______ Modifiers: ______ ______ ______

Alteration	Int.	Structure	Azm.	Dip	Int.

Minerals	%	Occur.

Notes:

Assay

Kennecott № VR 02991 A

Property
Project: AUSH SAMPLE 4-3A

Date: __-__-__ Geologist: H.D.COOK

Map Sheet:

Map Scale:

D.H. No. From To ft m

Black Sand Layer @ 8m — Section 4 #3A

LOCATION

Country: St./Prov.: County:

Coordinate System: UTM State Local

Zone/Grid Id: ft m

East: Elev: ft m

North:

Longitude: ° ' " E W

Latitude: ° ' " N S

SAMPLE TYPE: REPR.

ROCKS:

Color: Rock Type:

Age: Modifiers:

Alteration	Int.	Structure	Azm.	Dip	Int.

Minerals	%	Occur.

Notes:

LEVEL (S)

R O PENHALL LTD. MADE IN VANCOUVER, CANADA DUKSBAK WATERPROOF

BEST AVAILABLE IMAGE

[00719 - Ross took sample of p...

Kennecott   № VR 02991 A

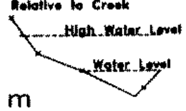
SOIL SAMPLES·

Color: ___   Depth: ___ in cm
Horizon: A B C   Organics: ___ %
Clay: H M L   Moisture: Wet Dry

STREAM SEDIMENT SAMPLES·

Stream: Wet Dry
Width: ___   Depth: ___ ft m
Gradient: ___   Color: ___
%Silt: ___   %Gravel: ___
%Sand: ___   %Organic: ___
Distance to Bedrock: ___ ft m
Sieve: ___ .   Sample Wt: ___ kg
Pan Concentrate — Conc. Factor: ___

Circle Sample Location Relative to Creek



VEGETATION SAMPLES·

Species: ___
No. of Plants: ___

Notes:

[Coont was took sample of parking [illegible]

Kennecott   № VR 02992 A

Property
Project: *AUSH SAMPLE 4-3B*
Date: ___-___-___   Geologist: ___
Map Sheet: ___
Map Scale: ___
D.H. No. ___   From ___
To ___ ft m

Black Sand Layer @ 8m - Section 4 #3B

LOCATION

Country: ___   St./Prov.: ___   County: ___
Coordinate System: UTM State Local
Zone/Grid Id: ___ ft m
East: ___   Elev: ___ ft m
North: ___
Longitude: ___° ___' ___" E W
Latitude: ___° ___' ___" N S

SAMPLE TYPE· ___

ROCKS·

Color: ___   Rock Type: ___
Age: ___   Modifiers: ___ ___ ___

Alteration	Int.	Structure	Azm.	Dip	Int.
___	___	___	___	___	___
___	___	___	___	___	___
___	___	___	___	___	___

Minerals	%	Occur.
___	___	___
___	___	___
___	___	___
___	___	___
___	___	___

Notes:

Kennecott №VR 02992 A

SOIL SAMPLES:

Color: ___ Depth: ___ in cm

Horizon: A B C Organics: ___ %

Clay: H M L Moisture: Wet Dry

STREAM SEDIMENT SAMPLES:

Stream: Wet Dry

Width: ___ Depth: ___ ft m

Gradient: ___ Color: ___

%Silt: ___ %Gravel: ___

%Sand: ___ %Organic: ___

Distance to Bedrock: ___ ft m

Sieve: ___ . Sample Wt: ___ kg

Pan Concentrate — Conc. Factor: ___

Circle Sample Location Relative to Creek

High Water Level

Water Level

VEGETATION SAMPLES:

Species: ___

No. of Plants: ___

Notes:

Kennecott №VR 02993 A

AUSK SAMPLE 1-4A

Date: ___ Geologist: Cook ENBoo

Map Sheet: ___

Map Scale: ___

D.H. No. ___ From ___ ft m

To ___

Black sd layer - hydrocarbon by MPTIA

LOCATION

Country: ___ St./Prov.: ___ County: ___

Coordinate System: UTM State Local

Zone/Grid Id: ___ ft m

East: ___ Elev: ___ ft m

North: ___

Longitude: ___° ___' ___" E W

Latitude: ___° ___' ___" N S

SAMPLE TYPE: ___

ROCKS:

Color: ___ Rock Type: ___

Age: ___ Modifiers: ___ ___ ___

Alteration	Int.	Structure	Azm.	Dip	Int.
___	___	___	___	___	___
___	___	___	___	___	___
___	___	___	___	___	___

Minerals	%	Occur.	Notes:
___	___	___	___
___	___	___	___
___	___	___	___
___	___	___	___
___	___	___	___

[Cont'd - Ross took sample of perky...

Kennecott № VR 02993 A

SOIL SAMPLES:

Color: ____ Depth: ____ in cm

Horizon: A B C Organics: ____ %

Clay: H M L Moisture: Wet Dry

STREAM SEDIMENT SAMPLES:

Stream: Wet Dry

Width: ____ Depth: ____ ft m

Gradient: ____ Color: ____

%Silt: ____ %Gravel: ____

%Sand: ____ %Organic: ____

Distance to Bedrock: ____ ft m

Sieve: ____ Sample Wt: ____ kg

Pan Concentrate — Conc. Factor: ____

Circle Sample Location Relative to Creek

High Water Level

Water Level

VEGETATION SAMPLES:

Species: ____

No. of Plants: ____

Notes:

[Cont'] ... took sample of ...

Kennecott № VR 02994 A

Fire Assay

Project: *AUS H SAMPLE 1-4B*

Date: ____-____-____ Geologist: ____

Map Sheet: ____

Map Scale: ____

D.H. No. ____ From ____ To ____ ft m

Black Sd layer - hydrocarbons

LOCATION

Country: ____ St./Prov.: ____ County: ____

Coordinate System: UTM State Local

Zone/Grid Id: ____ ft m

East: ____ Elev: ____ ft m

North: ____

Longitude: ____° ____' ____" E W

Latitude: ____° ____' ____" N S

SAMPLE TYPE: ____

ROCKS:

Color: ____ Rock Type: ____

Age: ____ Modifiers: ____ ____ ____

Alteration	Int.	Structure	Azm.	Dip	Int.

Minerals	%	Occur.

Notes:

Kennecott № VR [illegible] A

SOIL SAMPLES

Color: ____ Depth: ____ in cm

Horizon: A B C Organics: ____ %

Clay: H M L Moisture: Wet Dry

STREAM SEDIMENT SAMPLES

Stream: Wet Dry

Width: ____ Depth: ____ ft m

Gradient: ____ Color: ____

%Silt: ____ %Gravel: ____

%Sand: ____ %Organic: ____

Circle Sample Location Relative to Creek: High Water Level / Water Level

Distance to Bedrock: ____ ft m

Sieve: ____ Sample Wt: ____ kg

Pan Concentrate – Conc. Factor: ____

VEGETATION SAMPLES

Species: ____

No. of Plants: ____

Notes:

[illegible]

Kennecott № VR 02995 A

Fire Assay

Property Project: *AUS H SAMPLE 4-2*

Date: ____-____-____ (mm-dd-yy) Geologist: ____

Map Sheet: ____

Map Scale: ____

D.H. No. ____ From ____ To ____ ft m

Sand lens 2m from base

LOCATION

Country: ____ St./Prov.: ____ County: ____

Coordinate System: UTM State Local

Zone/Grid Id: ____ ft m

East: ____ Elev: ____ ft m

North: ____

Longitude: ____° ____' ____" E W

Latitude: ____° ____' ____" N S

SAMPLE TYPE: ____

ROCKS

Color: ____ Rock Type: ____

Age: ____ Modifiers: ____ ____ ____

Alteration	Int.	Structure	Azm.	Dip	Int.

Minerals	%	Occur.	Notes:

Kennecott

№ VR 02995 A

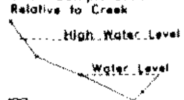
SOIL SAMPLES.

Color: ____ Depth: ______ in cm
Horizon: A B C Organics: ____ %
Clay: H M L Moisture: Wet Dry

STREAM SEDIMENT SAMPLES.

Stream: Wet Dry
Width: ______ Depth: ______ ft m
Gradient: ____ Color: ____
%Silt: ____ %Gravel: ____
%Sand: ____ %Organic: ____
Distance to Bedrock: ______ ft m
Sieve: ______ Sample Wt: ______ kg
Pan Concentrate – Conc. Factor: ____

Circle Sample Location Relative to Creek



VEGETATION SAMPLES.

Species: ______________________________
No. of Plants: ____

Notes:

[illegible] Bolter]

Fire Assay

Kennecott

№ VR 02996 A

Property
Project: *AUSH SAMPLE 06522A*
Date: ____ - ____ - ____ (mm dd yy) Geologist: __________
Map Sheet: ______________________________
Map Scale: __________
D.H. No. __________ From __________
To __________ ft m

"oily sand?"

LOCATION

Country: ____ St./Prov.: ____ County: ______
Coordinate System: UTM State Local
Zone/Grid Id: ______________ ft m
East: ______________ Elev: __________ ft m
North: ______________
Longitude: ____° ____' ____" E W
Latitude: ____° ____' ____" N S

SAMPLE TYPE. ____

ROCKS.

Color: ____ Rock Type: ______
Age: ____ Modifiers: ______ ______ ______

Alteration	Int.	Structure	Azm.	Dip	Int.

Minerals	%	Occur.

Notes:

Kennecott № VR 02996 A

SOIL SAMPLES:

Color: ___ Depth: ___ in cm

Horizon: A B C Organics: ___ %

Clay: H M L Moisture: Wet Dry

STREAM SEDIMENT SAMPLES:

Stream: Wet Dry

Width: ___ Depth: ___ ft m

Gradient: ___ Color: ___

%Silt: ___ %Gravel: ___

%Sand: ___ %Organic: ___

Circle Sample Location Relative to Creek

High Water Level

Water Level

Distance to Bedrock: ___ ft m

Sieve: ___ . Sample Wt: ___ kg

Pan Concentrate — Conc. Factor: ___

VEGETATION SAMPLES:

Species: ___

No. of Plants: ___

Notes:

[Cont - Rock task sample of porphyry boulder]

Fire Assay

Kennecott № VR 02997 A

Property Project: AUSH SAMPLE 5-2

Date: ___-___-___ Geologist: ___

Map Sheet: ___

Map Scale: ___

D.H. No. ___ From ___ To ___ ft m

Sand lens sections

LOCATION

Country: ___ St./Prov.: ___ County: ___

Coordinate System: UTM State Local

Zone/Grid Id: ___ ft m

East: ___ Elev: ___ ft m

North: ___

Longitude: ___° ___' ___" E W

Latitude: ___° ___' ___" N S

SAMPLE TYPE: ___

ROCKS:

Color: ___ Rock Type: ___

Age: ___ Modifiers: ___ ___ ___

Alteration	Int.	Structure	Azm.	Dip	Int.

Minerals	%	Occur.	Notes:

APPENDIX D

Grab Sample Assays

Note: Sample VR02990 is not from the Australian Hill property, nor is it a sample of White Channel Gravel

Chemex Labs Ltd.
Analytical Chemists * Geochemists * Registered Assayers
212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221

To: KENNECOTT CANADA, INC.

354 - 200 GRANVILLE ST.
VANCOUVER, BC
V6C 1S4

Project :
Comments: ATTN: A. DOYLE CC: R. CRANSWICK

Page .ber :1-A
Total Pages :1
Certificate Date: 20-OCT-93
Invoice No. : I9322753
P.O. Number :
Account :KAVA

CERTIFICATE OF ANALYSIS A9322753

SAMPLE	PREP CODE		Au ppb FA+AA	Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Ga ppm	Hg ppm	K %	La ppm	Mg %	Mn ppm
VR00713	205	274	< 5	< 0.2	1.80	< 2	30	< 0.5	< 2	1.35	< 0.5	11	263	42	2.25	< 10	< 1	0.03	< 10	1.15	375
VR00715	205	274	< 5	< 0.2	2.48	14	680	< 0.5	< 2	0.20	0.5	48	332	53	5.67	< 10	< 1	0.40	< 10	0.99	470

CERTIFICATION: HartBichler

CERTIFICATE OF ANALYSIS A9322753

SAMPLE	PREP CODE		Mo ppm	Na %	Ni ppm	P ppm	Pb ppm	Sb ppm	Sc ppm	Sr ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Zn ppm
VR00713	205	274	< 1	0.04	20	770	2	< 2	4	454	0.12	< 10	20	68	< 10	36
VR00715	205	274	1	0.02	73	170	< 2	< 2	11	12	< 0.01	< 10	< 10	51	10	156

CERTIFICATION:

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers
212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221

To: KENNECOTT CANADA, INC.

354 - 200 GRANVILLE ST.
VANCOUVER, BC
V6C 1S4

Project :
Comments: ATTN: A. DOYLE CC: R. CRANSWICK

Page Number : 1-A
Total Pages : 1
Certificate Date: 12-MAR-94
Invoice No. : I9412287
P.O. Number :
Account : KAVA

CERTIFICATE OF ANALYSIS A9412287

SAMPLE	PREP CODE		Au ppb FA+AA	Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Ga ppm	Hg ppm	K %	La ppm	Mg %	Mn ppm
VR00714	205	274	< 5	0.4	1.04	< 2	830	< 0.5	2	0.29	< 0.5	6	131	34	1.48	< 10	< 1	0.20	10	0.32	80
VR00716	205	274	< 5	0.4	0.87	< 2	310	< 0.5	< 2	0.07	< 0.5	4	178	25	1.19	< 10	< 1	0.18	10	0.04	35
VR00717	205	274	200	0.2	0.83	12	170	< 0.5	< 2	0.02	0.5	3	240	27	0.70	< 10	< 1	0.18	10	0.03	30
VR00718	205	274	< 5	0.2	0.63	< 2	190	< 0.5	< 2	0.09	< 0.5	2	210	16	0.57	< 10	< 1	0.17	< 10	0.26	60

CERTIFICATION:

CERTIFICATE OF ANALYSIS A9412287

SAMPLE	PREP CODE		Mo ppm	Na %	Ni ppm	P ppm	Pb ppm	Sb ppm	Sc ppm	Sr ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Zn ppm
VR00714	205	274	< 1	0.02	21	770	46	< 2	3	33	0.01	< 10	< 10	36	< 10	82
VR00716	205	274	1	< 0.01	17	140	22	< 2	4	23	< 0.01	< 10	< 10	17	< 10	74
VR00717	205	274	< 1	< 0.01	17	90	22	< 2	1	4	< 0.01	< 10	< 10	25	< 10	58
VR00718	205	274	< 1	0.02	12	90	16	< 2	1	9	0.01	< 10	< 10	9	< 10	30

CERTIFICATION:

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers

212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221

KENNECOTT CANADA, INC.

354 - 200 GRANVILLE ST.
VANCOUVER, BC
V6C 1S4

Project : 05-428
Comments: ATTN: RUSS CRANSWICK

Page Nur. : 1-A
Total Pages : 1
Certificate Date: 28-OCT-93
Invoice No. : I9323366
P.O. Number :
Account : KAV

CERTIFICATE OF ANALYSIS A9323366

SAMPLE	PREP CODE		Au ppb FA+AA	Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Ga ppm	Hg ppm	K %	La ppm	Mg %	Mn ppm
VR02990	208	274	< 5	0.8	1.16	12	1150	3.5	< 2	1.18	< 0.5	17	46	40	4.23	10	< 1	0.42	80	1.64	590
VR02991	208	274	< 5	0.6	3.33	6	320	0.5	< 2	0.29	< 0.5	9	238	58	1.33	10	< 1	0.35	20	0.60	175
VR02992	208	274	< 5	0.4	3.11	6	310	0.5	< 2	0.25	< 0.5	4	225	49	1.07	10	< 1	0.34	10	0.34	130
VR02993	208	274	5	0.4	4.27	46	370	0.5	< 2	0.42	< 0.5	7	335	133	1.73	10	< 1	0.42	20	0.38	125
VR02994	208	274	30	0.6	4.15	42	390	0.5	< 2	0.44	< 0.5	6	253	160	1.71	10	< 1	0.45	20	0.37	115
VR02995	208	274	< 5	< 0.2	1.39	20	210	< 0.5	< 2	0.23	< 0.5	3	243	36	1.02	< 10	< 1	0.24	20	0.36	100
VR02996	208	274	< 5	0.2	2.08	6	160	< 0.5	< 2	0.28	< 0.5	3	221	25	0.88	10	< 1	0.19	10	0.20	75
VR02997	208	274	< 5	0.4	1.05	2	190	< 0.5	< 2	0.13	< 0.5	2	249	8	0.62	10	< 1	0.22	10	0.17	55

CERTIFICATION: Hart Bichler

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers

212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221

KENNECOTT CANADA, INC.

354 - 200 GRANVILLE ST.
VANCOUVER, BC
V6C 1S4

Project : 05-428
Comments: ATTN: RUSS CRANSWICK

Certificate Date: 28-OCT-93
Invoice No. : I9323366
P.O. Number :
Account : KAV

CERTIFICATE OF ANALYSIS A9323366

SAMPLE	PREP CODE		Mo ppm	Na %	Ni ppm	P ppm	Pb ppm	Sb ppm	Sc ppm	Sr ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Zn ppm
VR02990	208	274	2	0.13	31	2210	34	4	10	108	0.40	< 10	< 10	121	< 10	72
VR02991	208	274	1	0.05	40	120	80	4	6	24	0.09	< 10	< 10	31	< 10	60
VR02992	208	274	1	0.05	29	80	64	2	4	20	0.07	< 10	< 10	26	< 10	56
VR02993	208	274	3	0.07	30	130	40	6	8	34	0.12	< 10	< 10	48	< 10	52
VR02994	208	274	4	0.08	27	140	38	4	8	36	0.12	< 10	< 10	52	< 10	52
VR02995	208	274	1	0.04	19	130	14	2	3	17	0.05	< 10	< 10	22	< 10	58
VR02996	208	274	2	0.08	16	100	16	4	3	20	0.07	< 10	< 10	21	< 10	30
VR02997	208	274	< 1	0.04	9	30	18	< 2	1	12	0.03	< 10	< 10	13	< 10	26

CERTIFICATION: Hart Bichler

APPENDIX E

Survey Results

Survey results for Australian Hill. Survey is tied to only one bench mark (at Dawson City airport), and therefore, coordinates are not true locations, but only a relative coordinate system. Actual locations are obtained by rotation of relative coordinate system around airport benchmark to achieve a best fit on the 1:50,000 topography map.

						UTM (NAD83)		
		ELEV. (m	ABRITRARY	GRID	ARB. ELE	N	E	ELEV. (ft)
	A-1	453.12	5000.00	5000.00	500.00	590307.9	7100995	1486.61
	A-6	480.91	5829.10	4792.73	527.79	591137.0	7100788	1577.79
	A-2	437.73	4754.79	5291.93	484.61	590062.7	7101287	1436.12
SAMPLE	06508	450.77	5112.17	4994.30	497.65	590420.1	7100989	1478.90
above spl.	06505	471.40	5005.31	5062.12	518.28	590313.2	7101057	1546.59
	A-3	476.61	4854.69	5671.78	523.49	590162.6	7101667	1563.68
	A-4	479.62	4835.16	5757.73	526.50	590143.1	7101753	1573.56
TOP OF	SECTION	495.64	4890.55	5680.54	542.52	590198.5	7101676	1626.12
CLAIM PS	D.JOHNSO	453.43	4837.28	5596.23	500.31	590145.2	7101591	1487.63
	HKB	450.02	4805.83	5602.51	496.90	590113.7	7101598	1476.44
	QTZ BOUL	447.37	4798.37	5573.83	494.25	590106.3	7101569	1467.75
	HPB	447.52	4810.49	5814.96	494.40	590118.4	7101810	1468.24
	HKB	446.63	4802.85	5808.41	493.51	590110.8	7101803	1465.32
CLAIM PS	OMEGA 1	472.67	4901.47	5847.97	519.55	590209.4	7101843	1550.75
	A-5	446.46	4905.38	5950.79	493.34	590213.3	7101946	1464.76
	HKB	449.58	4936.94	5953.28	496.46	590244.8	7101948	1475.00
	BM AIRPO	369.42	6465.99	7528.48	416.30	591773.9	7103523	1212.01
	HKB (NW)	453.22	5070.56	6000.90	500.10	590378.5	7101996	1486.94
SAMPLE	06509	465.69	5836.56	4882.14	512.57	591144.5	7100877	1527.85
SAMPLE	06517	466.36	6185.40	4918.20	513.24	591493.3	7100913	1530.05
SAMPLE	06510	466.47	5922.07	4832.17	513.35	591230.0	7100827	1530.41
NEAR BASEMENT		463.90	5964.90	4849.31	510.78	591272.8	7100844	1521.98
24 m SECTION 4		486.80	5810.17	4903.87	533.68	591118.1	7100899	1597.11
	A-7	471.62	6162.04	4952.12	518.50	591469.9	7100947	1547.31
SAMPLE	06514	465.91	6031.79	4971.61	512.79	591339.7	7100967	1528.58

APPENDIX F

Field Notes for
Australian Hill Project

(604) 222-1596

HARRISON COOKENBOO

Sept. 17, 1993

low clouds, strong breeze, light rain.

Cursory examination of Australian Hill - identify outcrops & plan sections.

"John Gould's [workings] gulch"

: good cut-bank exposures of White Channel & overlying Klondike gravels, Contact with very weathered bedrock - black graphitic schist - ? Nissina exposed - may [probably] be disturbed by grading

Mineralized pods at top of ?Nissina & into Wh Chge.

"Mucky" brown to black laminated mud - silty & organic rich layers at end of gulch conformable with & slightly interbedded with gravels.

Palynos guaranteed here [guess]

18 m to top exposure at track site, 36 m to top [illegible]

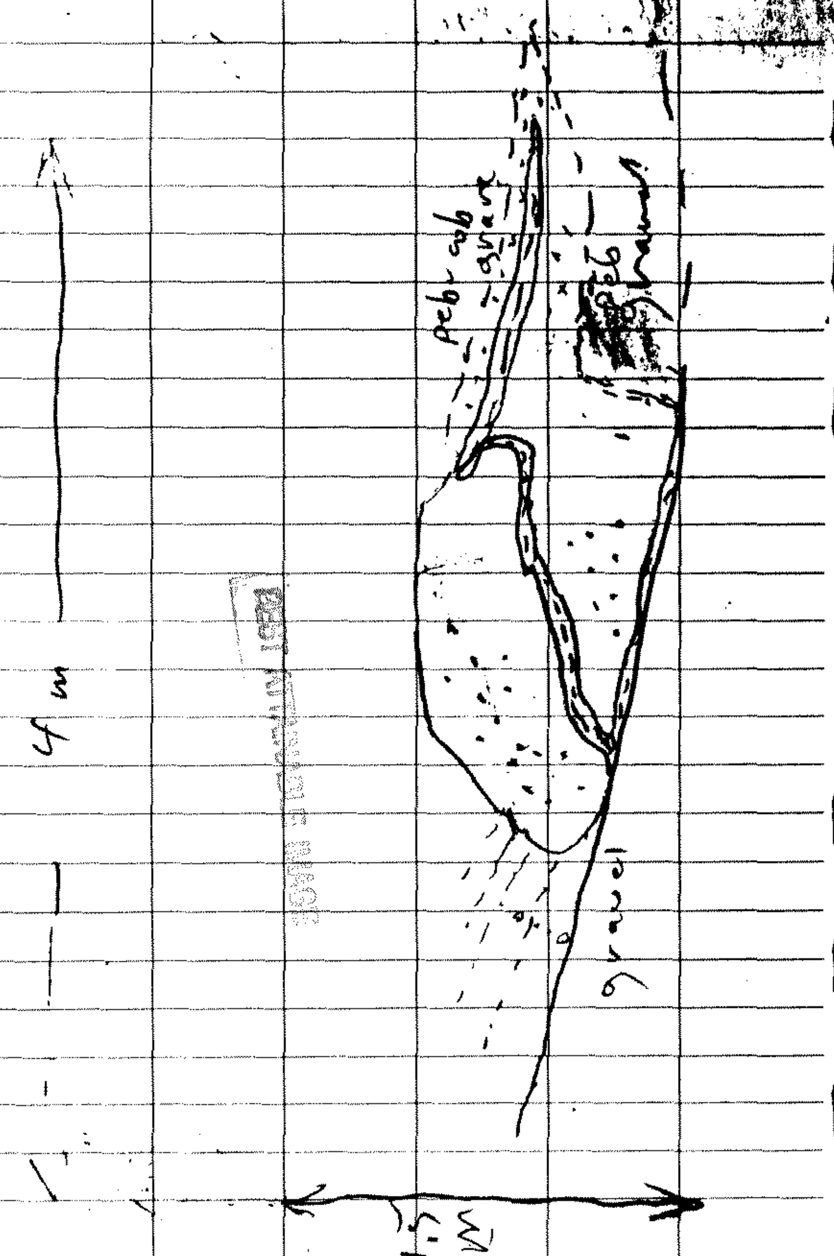
East of "lake delta deposit" in J. Goulds' Gulch

8 · 1.5 m = 12 m from Nissina Contact

fining up x-bed gran → peb layer

fill around convoluted slump [illegible]

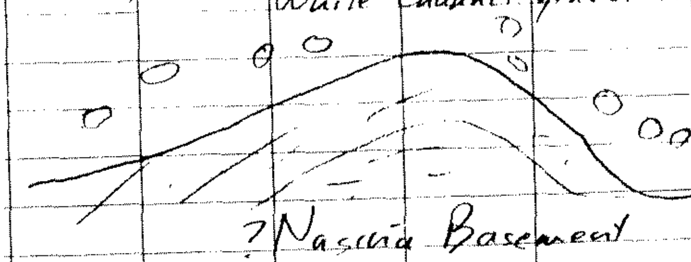
clay base; see sketch on page



Sept 18 1993 - Sunny & cold

Section: HOC AUSH 00193
East facing cut @ John Gould's workings - ≈ 200 m cliff w/ loose (falling!) gravel - full Sun - frozen in AM.

Basal Contact exposed - altered ~~weathered~~ dark gray ? Nasina graphitic schist forms eroded basement -
1.2 m of relief in ≈ 3 m of length in one place



Gravel: rounded to sub-ang cobbles & pebbles of mostly [≈80% Visual Est] white qtz w/ very fine grain qtz matrix. clast supported - matrix filled.

Matrix - orange/tan fresh white

Beige on weathered surface.
mod. well sorted; minor clay size material.
v. fine grain to silt size mica (flakes
remain on hand after wiping matrix
across palm).

Basal contact erosive, with down-cut
relief of 1.2m in <3m lateral, but
Basically horizontal on scale of pit
[200-300m] - Plane table survey
to confirm any regional trends.

[Falsified - contention by Dufresne
& Morison that alteration of basement
is necessarily post-Wh. Ch. gr. due to
softness of altered basement. Base-
ment was eroded prior to Wh.
Ch. gr. accumulation, and altered
bits are at contact.]

Sample 1-1: Alteration pod ½ 10m wide
& + 3m deep sampled near top.
1-1A - wh. ch. gravel directly
overlying (up to 15 cm above) alteratn.

No. 312

Near base @ irregular basement
skethed earlier - ~~less~~ < 2m from base

Single Max Obs clast ~~[illegible]~~ dimension 18 cm
5 Next " " clasts 15 cm

- All large cobbles white qtz
except 1-15cm schist.

~~[illegible] or very rare small~~ Sand lenses
in bottom 3-5m are less abundant? than
higher. they do exist. None Southern part of
outcrop - basal 5 m.

- Crudely fining up cobble + pebble
x-beds filling space beside basement
relief - 2m thick; dipping 16°N on face
bearing 200

Sample 1-3 - typical qtz congl.

Sand layer from crudely fining up
zone above - x-bedded 24°N
in plane bearing 200

Sample 1-2
Sand vfgr quartz + 90%
traces of green (? epidote)
Muscovite
sub-ang

Well imbricated zone at 3m above basement. Current from North in 200 bearing face. Zone dominantly disk shape clasts - A dips upstream
Max A = 15 cm
Zone of well developed imbrication ~.5m thick. v. few spheroidal cobbles/large pebbles in this zone.
- above well dev. imbrication is crude imbr. for 35 - dominantly north current (dip to N)
5m - sand lens channel 1m wide
20 cm ~~deep~~ thick, ~~concave~~

@ 9m Crudely fining up x-beds +1m thick - bright orange color (open-work)
~~[illegible]~~ cobbles up to small pebbles
top cobble surface strongly iron-stained red-orange.
[filled water + 1m deep - ? ~~point~~ ~~bar~~ small Gilbert delta foreset?]
Max clast size ~15 cm (one schist corner to corner 19 cm → 15 cm side to side), but large cobbles less abundant + more large cobbles are disk shaped.

[openwork most porous most recent; tend to be bright orange-red; ∴ oxidize iron most recent effect!]

@ 12m - [back near end of exposed gulch] - Gilbert-type fining up foresets - sand slump in photo a interbedded organic rich sds + gravels (to 30cm) to the east into lake sediments

- ~~first~~ openwork layer ≈ 10cm - orange/red st.
Max clast size ≈ 12 cm
- bigger cobbles are schist now; qtz cobbles not as abundant nor as large!

Sample 1-4 → dark-layer from sd. why is it dark?

Above 14m cobbles rare - largest is 16cm qtz vein w/open vessicles - obviously locally derived! Angular too!

Brown congl above 17m, soil @ 19m.

Sample 1-5 for palynos - taken ≈ 12m - east of cut face, near head of gulch; Towards the "Lake seds" in muddy sd bed (30cm) between congl layers.

Sept. 19 - 1993
- high clouds, Cool + light Frost

AM: Peter Gould stopped by + asked to be told what our plans were before backhoeing. Any tests etc. ok, just let him know first. Don't want to interfere with the sluicing operation.

P. Gould also said: good gold along the west facing cut - near basement - About $26 a yard along 200' stretch better back in towards the north, almost all in bottom metre.

P.G. also noted best gold above green micaceous basement, little above "black stuff" -

One cut on western ridge yielded 6 oz. of nuggets up to 1.5 oz each, not rounded, "like they just peeled off the rocks." PG thought they came from qtz veins in the green basement.

P.G. mentioned 5 drifts going up to 200 ft into west ridge, but gold best on east side!

East side J. Gould's Gulch
face cut 168° (north end) +
~165° south end.
16 m thick from "very near
basement" (P.G.) to top @ south end
of cut.

Section 2 starts at south end, goes up to North 40m.

0 - 1m covered by talus
1 - 1.5m - Sand fine to med grain, weathered
+ fresh med-light gray, mod. sorted,
granule x-lam (poorly exposed).
some (wave) poorly defined dark lam. (<4mm)
consisting of [ ] of dark minerals
(heavy minerals.

Comp: Vis. est. 80% qtz; 10%
feldspar; 10% black lithics (schist? +
heavy minerals) trace + 2% green
(? epidote)

1.5-3m - Cobble-pebble ~~congl.~~ gravel - cobbles
white qtz (80%); dk gray schist (15%)
large pebbles to sm. cobble of green
foliated + non-foliated clasts
(ML) + (VL)

[1.5-3m is aggrading channel deposit

Max clast size: 21 cm (2)
next = 18 cm
many 15 cm
largest clasts are wh. quartz

Gravel is clast supported,
clast fine up with cobbles
concentrated at base (50cm) & in
scattered clusters above
base is erosive 30cm into
ss.
Clasts imbricated near base
a-axis dip south
- at least 10m wide "channel
Matrix poorly sorted vf gr to granules.

3m-4m
Gravel - clast supported matrix
filled (as 1.5-3m). ~~fo~~ clasts
fine up, cobbles - largest ~~near at~~
base - imbrication dips north-
northwest. Max clasts 26 cm (2)
- fining up - crudely imbricated -
matrix filled gravel.
some largest clasts a-axis south-~~west~~.
4m - 30cm layer (~8m wide), bottom
15cm well imbricated cobbles
a-axis south dip - 1 or 2 layers thick,
covered by well sorted fine sd. granules
to pebble gravel. A single 25 cm lt. gray schist
matrix-filled, clast-supported

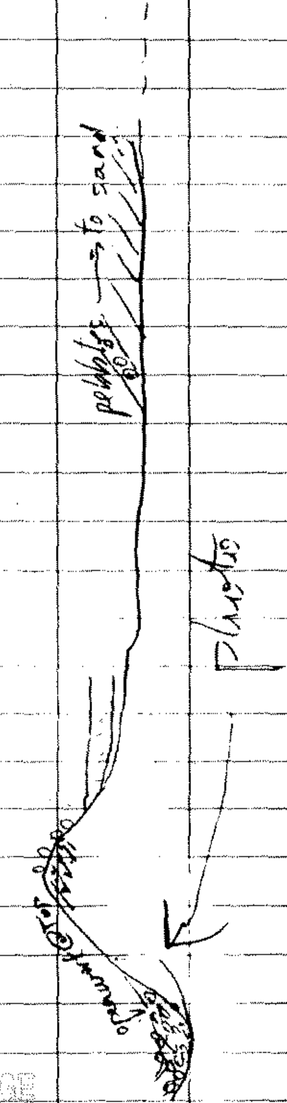
4-6m - Gravel channels (as 1.5-3m) grade to pebbly sand ~10m to 30m. Some 5-10m well imbricated cobble layers & horizontal covered by 30 cm pebble gravel grades up to pebbly sand.

q wide - [channels not as well developed as near base, but similar facies.] Most large clasts wh. qtz - rare dk gray schists

6m - 12.5m - Gravel w/ sand to pebbly sand lenses. Cobbles in ±30cm thick lenses down cut less than 5 m wide - Top of cobbles openwork in at least one accessible example

Gravel grades to pebbly sand or well sorted sand laterally. One sand lense 8m wide at Top (@ 11-12m); erosive base @ 10m ±1 can be traced across 30 m faces.

Most erosive cobble filled



channels ~~3~~ ~~5~~ 2-4m wide,
downcut as much as 2m.
Imbrication not well developed
[This facies preserves more
sand - pebbly gravel; less
reworking :. more rapid aggradation
Max Cobbles smaller than below
largest are (mostly) dark gray schist!

In vertical line measured by
tape 5-12.5m zone has 5 distinct
erosive surfaces; the erosive
surface at 8m has 1.5m of relief
and can be followed for ~30m;
it grades from sharp (2m wide)
fining up 'scoop' of cobbles @ north
and to pebbly sand in planar x-beds
at south end (see opposite page)

12.5-16 Pebble gravel w/sandy interbeds.
horizontally stratified. color more
tan that light gray below 12.5m.
iron stained horizontal layers to ~5cm
pebbles mostly horizontal orientation
(not reached on south end)

Section 3 - East side of J. Gould's Gulch - (same face as section 2, but carried north to end of gulch cut)

0m is lowest point - not basement, but very close to 0m on Section 2,

0m - 3m Gravel → pebble - cobble, most large clasts white qtz; some dk gray schist + rare green clast, clast supported, matrix-filled

Max obs clasts 22cm + 24cm

Crude horizontal strat; no normal grading observed, no erosive bases + imbrication poorly developed.

3-5m Gravel with sd + pebbly sand layers - 2m thick x-bed defined by variation in clast size from fine sd to cobbles (12cm), small cobbles/lg pebbles that are disk shaped have dominantly a-axis south dip imbrication in some layers

x-bed sigmoidal 16° dip to north on 168° [illegible]

dip lessens near base
base not erosive; undistinct alteration in grain size that defines x-bed sharp - not graded
[∴ not Gilbert-type delta foreset - rather a gravel bar in channel.]
Can see for 20 m width. less well defined until buried + 10m further.
[@ 3.5 m a 33 cm angular schist
@ 4 m - pebbly sand w/pebbles in trough shape lays - south dipping imbrication, north dipping 15 cm planar x-bed in sand.

3-12 m Crudely strat. cobbles [in] horizontal to trough shape (scoured) layers usually <15 cm thick laterally extensive pebble layers to .5 m thick; local sd lenses
clast supported - matrix filled
rarely openwork

looks like oil stain → crosses stratification

cobbles ~~only~~ less abundant up
- locally grouped as scoured channels, lags & clusters above 5m
cobbles rare above 12m - sand lenses thicker & more abundant
gradational change

12m - 18m Pebble gravel w/rare cobbles & sand lenses up to .6m + 10m wide
Sand (and less commonly gravel) ~~be~~ contains thin (<1cm) black ?organic stained layers, sand lenses erosive-based; cut to .5m
Pebble gravel ~~som~~ local orange-red stained & openwork locally
- Clasts variable granule to large pebbles; planar Horizontal, & inclined x-beds, trough
- cobbles, where present, are commonly found in clusters

- x-bed orientations north & south
- ? meandering?

Sample Section 3 clayey sand at 12m for palynos
IHOC AKSH B-1

12 m clay plug (Sample 3-1)
30 cm thick + apparently
at same level as "lake peat
+ clay" in gulch ~~bottom~~ center.

Level sight from 12" clay plug
goes directly to top of muddy-
peat in gulch center! - (right to
where gravel layers interfinger
with mud!!

from north end of outcrop

38m to 15m

80m to end of dip flag

[75m to 12m exposure]

130m to 6m

165m to 3m

195m to 0m

then up again

0m to 0 distance = 75m

0m to end section 2 = 28m

∴ 280m face

Est. 75m across mud-filled gully at <u>head</u> of gully

No. 312

Sept 20 1993 - overcast, mild

Dago Hill -

Oligomict wh qtz congl. overlies Klondike schist basement

Schist: mix of micaceous grey to purple schist, graphitic schist + pods of white/beige alteration

Basal White Channel pebble congl. with thin laminae silty v. fine grain sd. preserved in lenses

Overlying White channel is light Brown v. fine gr sd to muddy facies w/ 1.5 m planar x bed conglomerate (dipping north interbedded

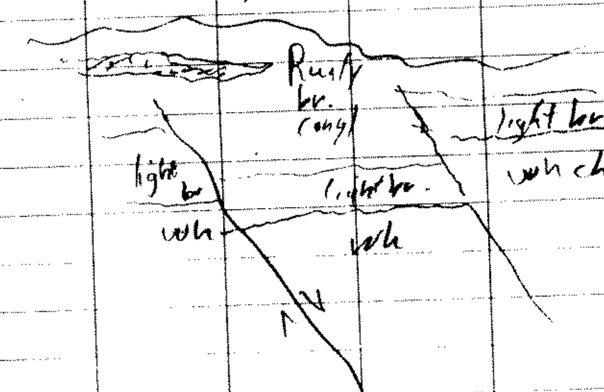
Morison's overbank facies

Clinometer sight puts this ∆ at ~ 12 m mark on AUSTRALIA Hill

Δ from white to light brown still mostly qtz pebbles.

Overlying light Brown facies is rusty brown horizontal strat congl & sandstone (bedding < 1m)

Normal fault cuts wh ch & light brown ≈ 1.5 m - does not cut rusty congl/sandstones



white channel matrix: qtz vf gr. to silty, subangular, clay (prob. authigenic, white i.e. Kaolinite?)

East end Dago Hill ~~at west end~~ - contact exposed by fresh cut (workings). At contact, channel fill from pre-White Channel stream is preserved. Cobbles/pebbles ~~are~~ in pre Wh. Ch gravel are polymict & locally

derived ± 40 of large pebs to large cobbles are smoky quartz-white Feldspar porphyry.
Oligomict white qtz of white channel gravel begins above this channel.
Well preserved schist - mostly black graphite - form irregular paleodrainage surface

Map Bedrock!

Predo Hill - no bedrock exposure
sharp contact @ Top of white channel / base of rusty brown light brown gravel removed by erosion in one place - ~~fault~~ ~~scarp?~~

Frank Short's Pit adjacent to Paradise Hill
Huge operation!
Basement irregular w/ slump block? of schist - building size - + paleo high graphite
of ultramafic → contact w/ gravel green

No. 312

Most irregular Paleotopography
we've seen → maybe key to
placer success

Basal Wh. Ch. contains qtz
boulder/large cobbles + locally
derived green ultramafics?
+ black graphitic? schist
Clast supported - argillaceous
matrix filled.

Sept 21 - 1993 - broken clouds, mild
Walked up trench mapped
by Peter D. Marked "Trench"
Schist → w/ ? ultramafics covered
by breccia & conglomerate which
contain schist clasts + qtz - strata
folded + covered by volcaniclastics
then covered by ? Gravels →
Gravels are white with ~~one~~ rusty
beds (openwork). Clast pebbles
& cobbles + 80% metamorphics
imbrication mostly [illegible]
to the north (some say [illegible] layers) Clinometer reading
to Fred. Hill (Dog not Frank Short's)
suggests we are level with top
of Wh. Ch. gravel / cliffs
= ∴ tilted seds. were a paleo-
high.

Australian Hill south east face ~~west~~ out
of Hattie Gulch (= J. Gould's gulch)
Bearing 130 SW
140 m across base - base is flat
on basement ≈ 1 foot below
contact - Contact w/ which is talus

covered. Top of white gravel
@ 22m.

Top of Brown gravel @
Top of rusty Brown gr @ 30
(top of cliff cut)

0 - 8m Coarse cobble + pebble gravel
~~[illegible]~~ Most Cobbles wh qtz
~~[illegible]~~ Max clast size ~~[illegible]~~ 52x18cm
- a single, locally derived vein
qtz (vugs on surface, etc) w/
trace of greenish muscovite -
located in bottom metre
Sample 4-1 - sand matrix
bottom metre next to 52cm boulder

Gravel is clast supported - matrix
filled imbricated w/ layers of
well sorted granule + pebble gravel.
Rusty weathered layers to 8cm.
Matrix is qtz sd w/ minor
green grains + schist - fine gr sand
mod. wellsorted. ~~[illegible]~~ minor muscovite.
Imbrication dominantly ~~towards~~
dips toward E, i.e. current to
west.
Clast of smoky qtz porphyry 2m from base
Cobbles decrease in size
upwards - large (+15cm) rare above 2.8m
@ 2m Sample 4-2 - sand lens 30cm
thick sampled top to base

Sample 4-3 - Dark heavy mineral? channel lag @ base of Peb-granule layer.
? oil stained?

8-12m gradational change from ~~Pebble~~ Cobble to Pebble gravel

12-22m - Gravel-pebble w/pebbly sand x-beds (dominantly west current +75%). Cobbles rare to absent for large cobbles

22m-27m - Light Brown Gravel - less resistant than which gravel below cobbles in channels in bottom 1-1.5 m

Several Normal Faults 10-20 cm throw
One well exposed has dark orange iron stain on clasts in fault zone for +2m vertical. ∴ fluid conduits
Strike Trend 175° down to the east Dip 74°
175/74°E

1?? m /97
??? m /1??

Sept. 28, 1993
Partly cloud - chilly wind - patchy full sun.
Basement mostly green/brown mica schist + lesser graphitic sch.
Section 5 - E-W face of
Wh ch gravel on south west end of Australian Hill. Artificial exposure.
Basement contact not exposed; est. base ±1m

0-5 abm
Qtz Cobble - pebble gravel ~~altered~~ weathers to pale orange color. clast supported matrix filled -
Max obs clast size 21cm + 27cm + 29cm
many @ 15cm;
All large cobbles qtz

"fresh" altered gravel, medium to bright orange
Sndy Qtz F porphyry clasts weathered to clay, some mica schists hard, others soft.

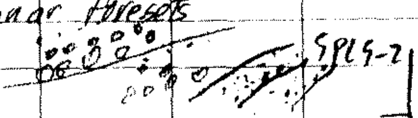
6-8m Pebble Cobble (sm. cobbles mostly) Gravel cs-mf w/ med-fine sd lenses to .6 x 2m wide - West dip A-axis
10-12m pebble gravel cp-mf - imbr dip 160-170
12-13.5m 140° 6/65 A Axis dip - sm cobbles 160°
Max clast 30cm wh qtz - A Axis
Clast supported -> current from Dago Hill
matrix filled - Coarse cobble gravel

- A-axis imbrication (dipping to SE) dominates bed & outcrop
→ sm qtz-F-porphyry ~~clast~~ couple hard but weathered
black schist pebbles common; cobbles rare
→ Foliated green micaceous qtz schist cobble → mod hard (→ crumbles with a couple hard blows)
→ Other sm q-F-P clay-soft + green mic-qtz sch. nearly clay soft.

Sample 5-1 matrix @ 13 m - near base of Cobble sup-matrix f a-axis imbr. channel gravels

13.5 - 15m Gravel w/ pebbly sand lenses
fining up x-bed in coarse to fine sand lens → Nwest dip - preserved fill + 40 cm thick [slower aggrad!]

Sample 5-2
Other conformable fining up x-beds
pebbles (1-2cm) to fine-med sd!
Planar foresets



[A channel-scour fill - not lake-fill!]

15-22m = Cobble to Pebble ~~[illegible]~~ gravel w/interbedded sd lenses - gravel clast supported bedded ≈ 1-2m; matrix filled. Grossly fining upward. Imbrication poorly ~~[illegible]~~ exposed (~ West face) Apparently ≈ horizontal clast fabric very large cobbles (+25 cm etc) absent

Above ≈ 18m → sd layers to ~30%
→ pebbles 60%
→ cobbles rare - large cobbles absent!

≈ 17m - Max abs clasts 11 & 12 cm → black to gray qtz schist.

Bright rusty red to black stain in layers ≈ 4cm thick Spl 5.3
- ~~generally~~ openwork layers

Top of hill = called ! < 22.5 pages
= 34m + 21 = 55m from 0m
∴ 34m of light & rusty Brown gravel

Rusty Brown gravel: clasts include black green & gray chert; volc; SRF?; None Foliated

No. 362

Sept 23

AM → Guided Ann Doyle around AUSTRALIA HILL + showed potential test sites. General approval.

PM - Bonanza Creek Tour

Stop 1 - Trail Hill

White Channel Gravel - appears thicker than in Hunker Creek

- Basement Black graphitic + green-brown micaceous schist.

White ch. grv. comp: 60% light green micaceous schist cobbles + pebbles; 90% white qtz - matrix - coarse sd/granular + [illegible].

Imbrication multi-directional - ? predominantly from S-SE?

- North along exposure → clasts up to boulders → most boulders are well foliated micaceous schist

French Gulch - J. Archibald's spot

+ 90% green pink-yellowish foliated qtz schists →

~~[illegible]~~ [illegible]

No. 362

Well imbricated - B axis dip to 145±6°

[SE derived current.]

[updip equivalent to Trail Hill]

B axis dip dominates

Max clasts clast = 30 cm

Adams Gulch - south side

- foliated micaceous green & pink Schist
- quartz pebbles cobbles up from French Gulch - less than Trail Hill.
- Imbrication consistent 150° Dip
  - B-axis imbrication dominant

Bottom 15m exposed - maybe 15m of Which

[Alluvial Fan!]

12-15m of Thick sand - horizontal Laminated

~~[illegible]~~

J.L. DARLING CORP. TACOMA, WA 98421

"Rite in the Rain"

Sept 24, 1993 – Sunny & Cold (Below 0°)

Section 6

Klondike Gravels – Northwest corner of Australian Hill.

Section starts @ 24m above Highest [^] basement on north side of Hill.

Underlying White Channel gravels are buried by ?moved material.

Exposure ≈ 140m wide

Face N-S (bearing 203 - south end angles to 180°).

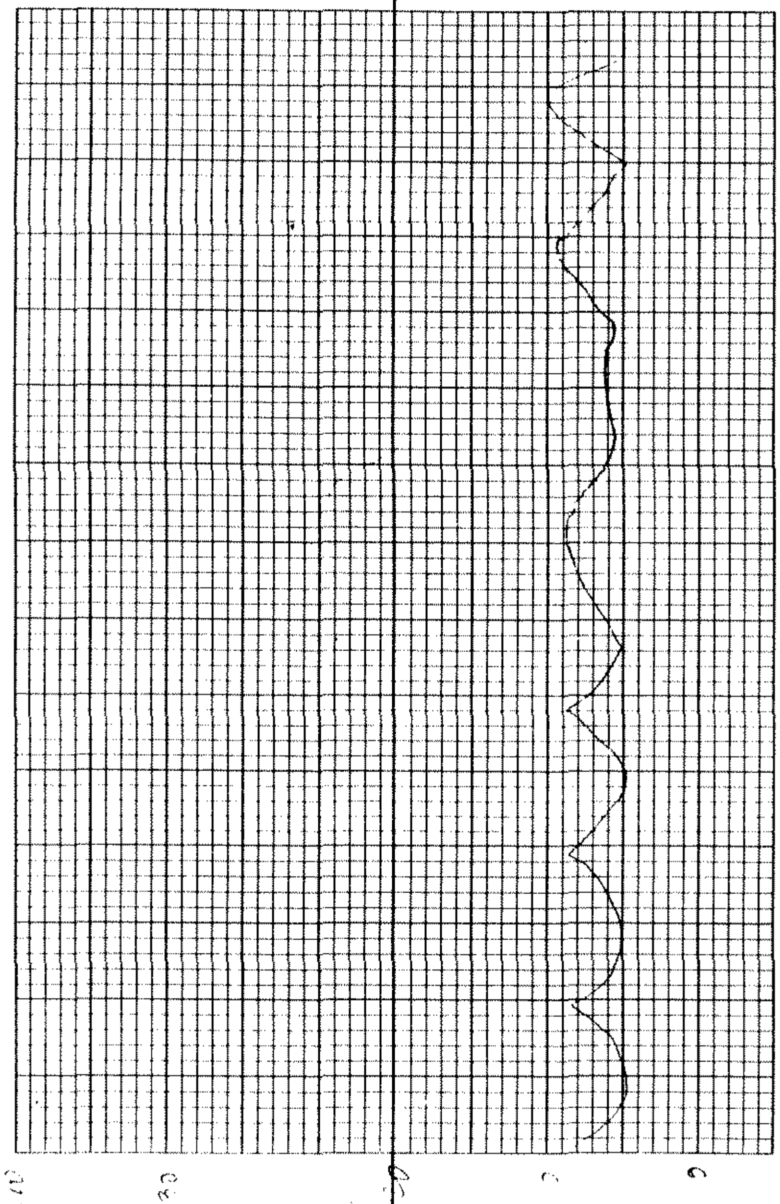
24m to top of exposure – Hill continues up - but graded extensively.

44m to top of Hill! –

Last Sample site is @ 38m

(42m top of pit - 38m base of pit)

[22+5 = 27 Wh Ch
+44
71m total!]



No. 362

0-6m - Talus Covered

6- Cobble-Pebble Gravel - variably ironstained & clean - color mod brown w/ orange ~~---~~ streaks to 30 cm + grey streaks to ± 1.5 m

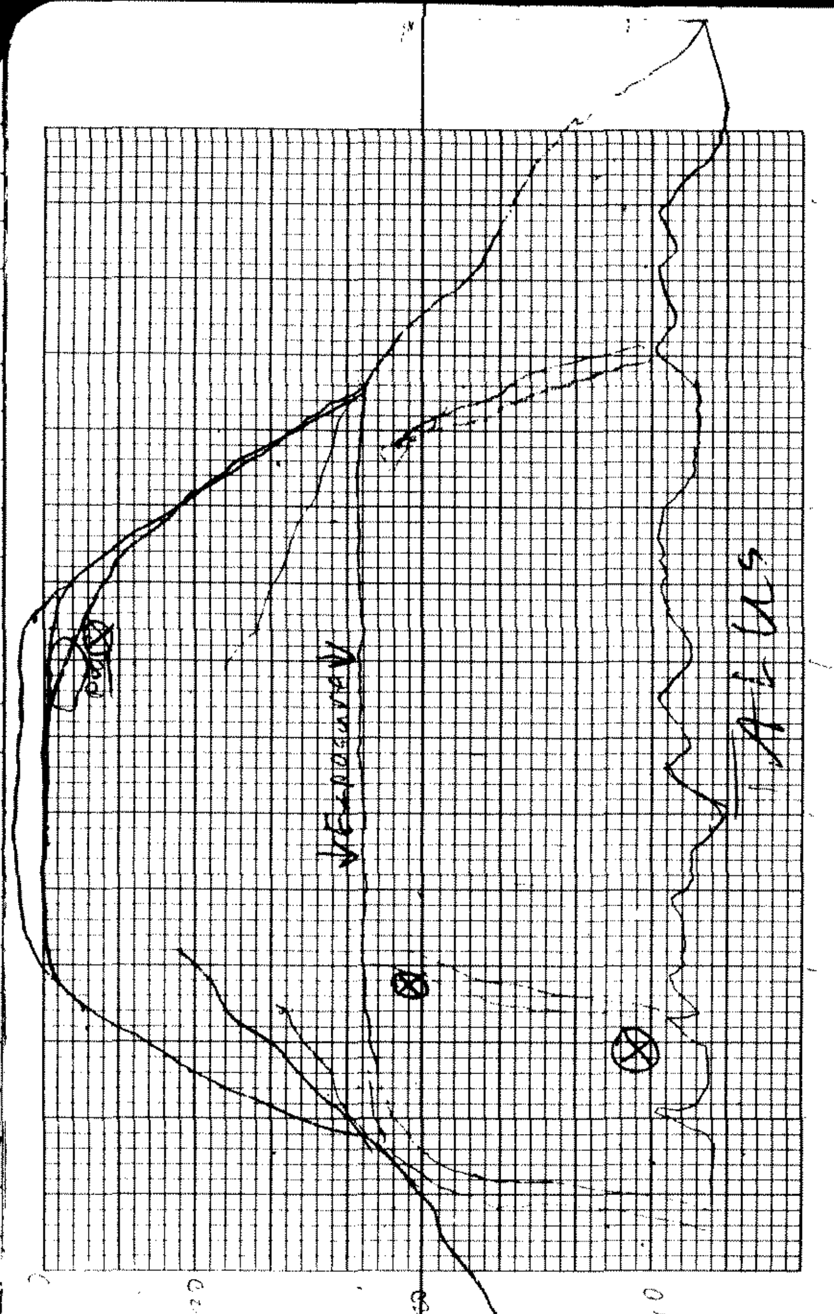
Cobbles polymict - rounded & concentrated @ 6-9m. Matrix mod - brown sand + black pebbles
~~@~~ Gravel clast supported + mostly matrix filled - bedded by cobble + pebble size.

Matrix fine gr sand - 40% quartz
35% black lithics (chert or siliceous volcanics)
15% pink lithics + 10% green lithics.
well sorted; subround to sub-ang; little or no mica!

Cobbles - gray - white - rare pink
Max obs clast → 18 cm (v. rare green qtz schist)

Spl 6-1

- well imbricated - dip to ≈ 60 m 3-D exposure → i.e. current from NE!



@ 7.5m → Sample 6-2 - Matrix + cobbles from 20cm thick layer of ± Horizontal oriented cobbles (well sorted); clast supported matrix filled [poss. lag surface filled with later matrix].

@ 16 m - 25 cm coarse to med sd interbed - discontinuous lens - x-beds w/ west dip - planar set - coarsest @ base Sample 6-3 (sand)

4 discontinuous sd lenses from 16 to 23 m
- Sd is med to coarse + locally pebbly

~~Pebbles more abundant above~~

18-24 m Pebble gravel w/ scattered cobbles (including smoky qtz porphyry) Max cobbles to +15 cm (at 16-18 top)

[Braid channel - poss on alluvial fan - polymict ≠ glacial outwash]

No. 362

J. L. DARLING CORP
TACOMA, WA 98421

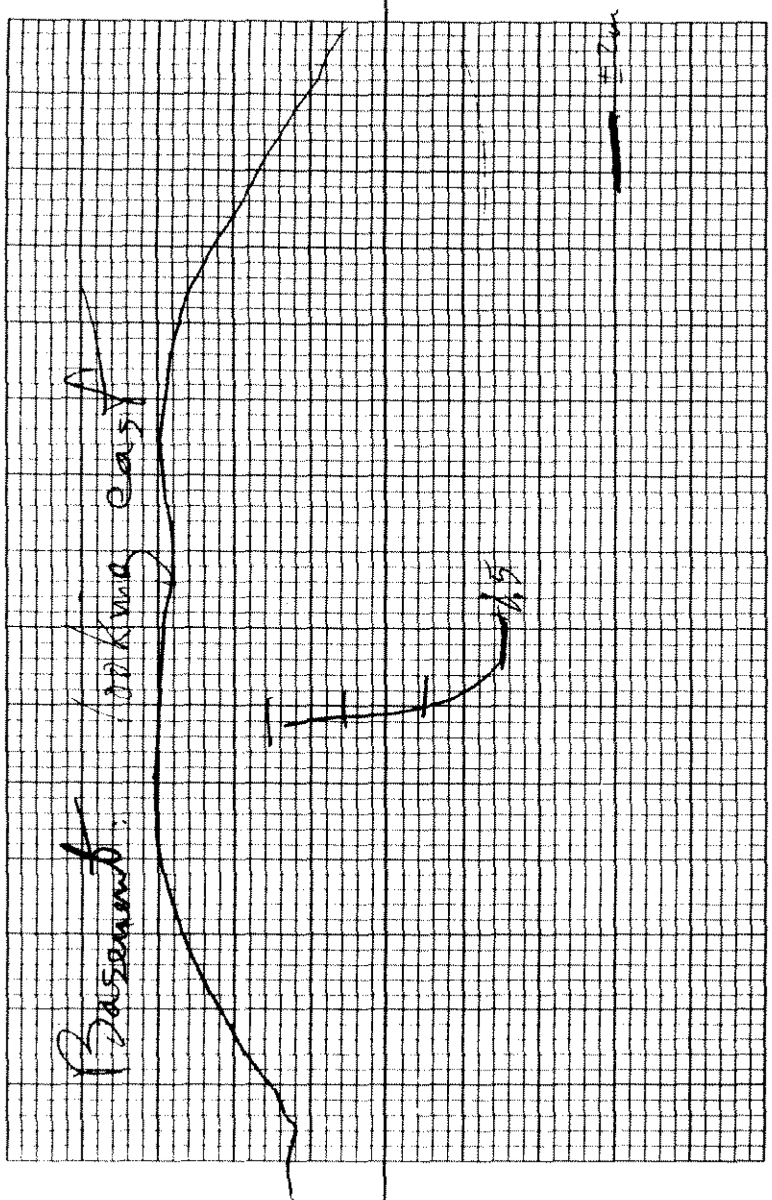
"Rite in the Rain"

42.44 m - Pebble gravel w/rare cobbles as below - but more black siliceous argillite pebbles: mostly flat + 1.5 to 3 cm long.

Imbrication appears to dip NE

Clasts mostly varied volcanics
- no qtz
- Very rare green micaceous schist (Klondike schist)

+ chert, argillaceous chert
+ siliceous argillite



No. 362

+6.5m
at North Flat!

+5

Cut= 1

+1.5

0 ±2

No. 362

J. L. DARLING CORP
TACOMA, WA 98421

Sept 25 - Cold & Sunny

Sample day

Start Sampling @ Top of
Australian Hill Pit @ ~42m

1st sample @ 36-38 m - in open
work pebble gravel (30cm) + med sand
x-bed (to 45cm) + matrix-filled
clast-supported cobble gravel to
1.5m

unlabel

2nd #06502 @ 22-23.5 m
Fresh cut bank - 2 buckets
@ Top of Section 6

3rd #06503 - ~30m - dug hole
into graded hill surface. Extra sample,
~2m channel w/ pebble, cobbles +
sand layers (mixed, tiny clast support
matrix filled gravel

No. 362

4th - 06504 - Base of exposure
section 6 - 5-6.8m fresh
cut face by B'hoe
I[illegible] open work (75%) +
gray (fresh) matrix filled (25%)

5th - 00714 CHEMEY SIEVED
SAMPLE @ 6 M [illegible] of Section 6
Cobble-Pebble gravel

6th - 06505 - 19-20 m of which
gravel - Top 30cm sand w
"oil" streaks (2) + bright orange
layers <6cm

DSS

from westend of 2nd cut area
7th 06506 - ≈22m - 23m -
interbedded fine-med sd + clast-
supported pebble gravel
- oil streaks in sand
- very near top a light brown

DSS

8th 06507 - 4-6 m altered - Bright
orange - cobble-pebble qtz gravel

DSS

9th 06508 Basement ~~one~~ to 1m
- local schist + qtz cobbles
altered zone
DJS
- Basement - soil? zone
or paleo-weathered surface
at least - green m. schist
- smoky qtz porphyry clasts w/a
+ volcani? clast (Boulder in
? older soil ? -
10th 00717 CHEMEX SPECIAL -
Screened sample from
3 to 5m Wh Ch gravel
[00716 - Russ took a hardrock sample]
11th 06509 - South Face west
of Hatie's Gulch - Basement
to 1m - on western edge
of South face
Basement Graphitic Black
schist to +3m (extracurricular dig)
Wh. Ch. Gr. grey w/orange
streaks - not as altered as 06508
- Oily streak at 2.5 m
12th 06510 - east edge Basement to
1m - Basement green m. schist

No. 382

13th 06511 - 5-8 m Grey & Rusty
Weathered gravel - South Face west
of Hatie's Gulch. Above + 20m
west of 06509

14th 06512 - 16-18 m - Top of
South Face w/ Hatie's Gulch - Pebble
cobble gravel - ?foreset 2M -
grey to orange weathered.

15th 06513 - top of light Brown
Wh. Ch. gravel - ≈25-27m
Dug west of South Face - went below
brown Klondike - good sharp
contact w/ qtz gravel - pebble w/
some schist & matrix-filled - clast supported

16th 06514 - West Side of Hatie's Gulch
Basal 2 m of Wh Ch gr @ 1.5 m
high erosional remnant of blk graphite
schist.

18th 06515 8-10 m - Wh ch peb-cob
gravel

17th 06516 - 10-12 m - channel All deposit. pebble gravel w/ oily streaks + sand layers - x-beds dip north.

19th 06517 0-2m - basement contact excavated → clayey green schist w/ sharp cobble contact; yellow green clays in cobble gravel, East side Hattie's Gulch
[Russ took a screened sample here]

20th 06518 - 8 m - East wall Hattie's Gulch

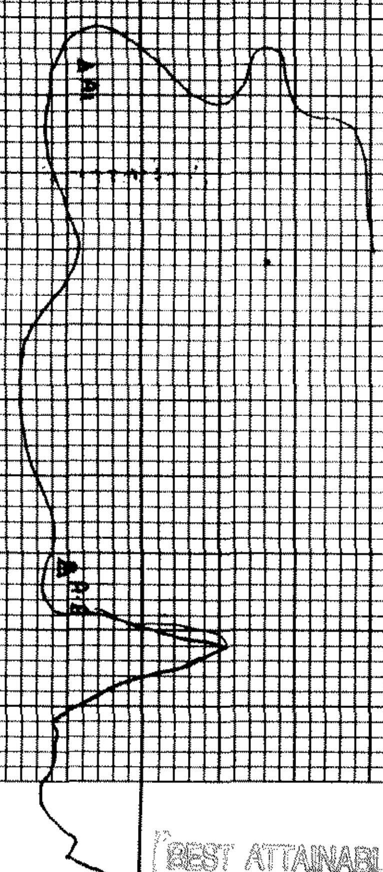
PIT

21th 06519 } shellow @ Top of fan Apron ~~Pit - top of fine coarse layer~~

22nd 06520

23 ~~065~~ ? Sand from 2 layers at next well sorted fan.

06521 separate bucket - same sand place as 06520, but different level



No. 362

J.L. DARLING CORP. TACOMA, WA

"Rite in the Rain"

Sept. 26-1993 3-4 in snow - cloudy & flurries.

Survey Day - establish points AM

A-1 — @ South Face SW corner (Dave Johnson's Ukys)

Notes from Gary LEE - SURVEYOR
- He ~~keeps~~ the transcription copy to avoid error.

Sept. 27 1993 -

Current Direction Quantification
- Dave Johnson's workings (Sections)
- South Face - Trend 285-295 (E-W)
- rollers to disk

Bed #/m	# Clasts	Dip E-W / A-B	Size Range
0-1m 1/1m @ Base Sph	~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ 1	E/? E/A E/A E/A E/A E/A E/A E/A E/A E/A E/A E/B E/A E/B E/A E/A E/A E/A E/A E/A E/A E/A E/A E/A E/A E/A E/A E/A E/A E/? E/A E/B E/A	large pebbles - small cob. Max: 11cm
			F. TREND 93°
	32 E :	19 E/A ; 4/E/B ; 3/?	
4-5m	E/A-B-? E/A E/A E/A E/A E/B E/? E/? E/B E/A E/A E/A E/A E/B E/A E/? E/B E/A E/A E/A E/A E/A E/A E/? E/A E/A E/? E/A E/B	W/A-B-? W/B W/B	Max. 10cm pebbles/cobbles (W/B's in thin (<20cm) layer)
			FACE TREND 84°
30	28 E (16 E/A ; 9 E/B ; 3 E/?)	2 W/B	

R = round in AB plane
? = undetermined

SE/A-B-R-? NW/A-B-R-? Clast Size

@ ~15m
bed 3/1.5m th
(Frozen Face!)

E/B E/R E/R E/A
E/B E/A E/A E/A
E/A E/A E/A E/A
E/? E/A E/A E/?
E/A E/A E/A E/B
E/B E/B E/A E/R
E/A E/B E/A E/A
E/B E/?

W/B
W/A

F. TREND 153°
Cob/Peb
max 11 cm

Total 32 30 SE (16EA; 7EB; 2ER; 5E?) 2 NW (1WA; 1WB)

(The high-overhead pogo prism measure on SW side of D-J's wkgs was at top of highest DJ sample: ~~06506 [= 22-23 m] "very near top of lith[illegible]"~~
[at top of white wh[illegible] = base of ~~light brown wh[illegible]~~]

06505 = 19-20 m of wh[illegible] gravel
~~[illegible]~~
close!
~~[illegible]~~

06506 = 20.53 + 2 = 22.53

~17 m
(more S than E)

SE/A-B-R-?
E/B E/B E/B E/R
E/B E/A E/B E/?
E/A E/A E/A E/A
E/A E/A E/?

NW/A-B-R-?
W/A
W/A
W/A W/A

Face Trends 153
gravel lenses - grade up to pebby sand x-beds

~18 m Same as Above 17 m - F. TREND 153

E/B E/A E/B E/B E/?
E/R E/A E/B E/A E/A
E/?

SW/B
SW/B
SW/B
SW/B

WB's are [illegible] touching)
WB are [illegible]

South Face West of Hatie's Gulch - F. Trend 053 SW/NE

Imb. Dir → NE/A B ? R SW/A B ? R Clast size

1.5 - 3 m

Cobble lag layer @ 2.3 m (50 cm th.)

NE/A NE/B NE/B
NE/A NE/B NE/B
NE/B NE/B NE/A
NE/A NE/B

SW/B SW/A SW/B
SW/B SW/B SW/A
SW/B SW/A
SW/B

} 8A 11B 11NE/15SW

2.72 @ 3.0 m

17B/12A

29 SW
0 NE

SW/B SW/B SW/B SW/B SW/B
SW/B SW/B SW/B SW/B
SW/B SW/B SW/B SW/B
SW/B SW/B SW/B
SW/B SW/B SW/B SW/B SW/B
SW/B SW/A SW/A SW/B
SW/A SW/B SW/A SW/A

1.5 to 2.0 m 10B/11A { NE/B NE/B NE/B
3NE/9SW

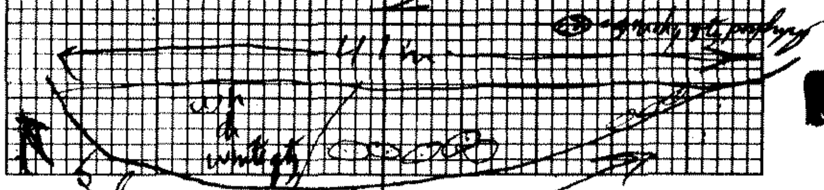
SW/B SW/B SW/A SW/B
SW/B SW/B SW/B → max clast = +22 cm
SW/B SW/B

AGGRAGATE ≈ SE Dip

Back of Dago Hill - Pre-wh ch. gr. channel - It is cut by small White channel

Pre which channel is 41 m wide (115° trend across channel) - Channel ≈ Bundeys

Imbrication Dips mostly to SW (???), but variable + likely - local channel effect



[00719 - Russ took sample of porphyry boulder]

Sample 06522 - 12-13.5 m

East side Hatie's Gulch oily layer + openwork pebble gravel + matrix filled peb. gravel + peb-cob ~~clast~~ gravel. All clast supported

Sample 06522 A - "oily Sand?"

Sample 06523 - 2 buckets at ~16.5 to 17.5 m East side Hatie's Gulch

1st Bucket gravel from channel fill lens

2nd Bucket dark gray gravel, mud layer and blackish oily pebbly sand beneath mud layer. Also orange ~~matrix~~ pebble-cobble gravel.

Mud layer Sample 06523A → bag for pollen

[00718 - Russ took sieved sample here.]

R. D. PENHALL LTD. MADE IN VANCOUVER CANADA DUKSBAK WATERPROOF

LEVEL (S)

Sept 28, 1993

Callison Hill - South of Klondike Highway - east of Dawson. North side of Trail Creek - Lovett Hill

White Channels est 40-45 m thick -> green micaceous schist + wh. qtz cobbles - imbrication dips SE ∴ current to NW [like Trail Creek Side]

Position schist on top of AUS. HILL: 1855'

Sample 06524 -

~ 5-8 m above basement near ridge line west of Bergaman Gulch.

Imbrication dips east - ∴ current to the west - above adit (closed)

Higher green micaceous schist (a bit) than west on AUSH - questionable, but ~~possible~~ probable

North side at 15 Above PUP "South of Last Chance Creek"

Wh. ch gravel - basement / wh ch contact @ 570 m (map). Imbrication dips to 150 - current to NW - basement is graphitic schist

[Cont] was took sample of porphyry

mostly disk shaped - Foliated clasts + lesser qtz

laminated silty mud - to 30 cm thick within wh ch. - soft sed deformation in local areas in this facies

R.D. PENHALL LTD., MADE IN VANCOUVER, CANADA DUKSBAK WATERPROOF

LEVEL (S)

YUKON PRODUCING MINES:

QUARTZ

There is now one producing hard rock mine in the Yukon Territory this year. Anvil Range Mining Corp. at Faro started producing again from this mine in early August, 1995.

The Sa Dena Hes mine near Watson Lake now the property of Cominco Ltd and Teck Corp. remains closed. No report on its reopening date.

As noted earlier there are several new mines on the horizon so the future of mining looks good for the Yukon Territory.

PLACER

The 1994 placer activity was up at 214 active operations with 387 water licences. This is an 18% increase over past year.

MAJOR CHANGES - Amendments to Legislation:

LAND CLAIMS: - The final agreement has now received final parliamentary assent and became law on 14 February, 1995.

SURFACE RIGHTS ACT: - Is also law with the Land Claims Agreement. Has required several amendments to the Mining Legislation.

MINING LAND USE REGULATIONS: - Two sets of regulations are in the final stages for presentation to Parliament in this fall's session and when passed will greatly change our method of operation. Has required major amendments to the present Mining Legislation.

CANADIAN ENVIRONMENTAL ASSESSMENT ACT: - Is now law and results in the screening requirement of all major development projects.

Based on the results of the sample processing program, Kennecott has decided not to conduct further work on the Australian Hill property. Kennecott will therefore not now participate in the Australian Hill option agreement. Should you require clarification of any of these matters, please do not hesitate to call.

Yours sincerely,
KENNECOTT CANADA INC.

Eric J. Finlayson
Regional Exploration Manager

Attach.

MAP NO: 116B/3

ASSESSMENT REPORT: X

PROSPECTUS:

CONFIDENTIAL: X

OPEN FILE:

DOCUMENT NO: 093357

MINING DISTRICT: Dawson

TYPE OF WORK: Evaluation

REPORT FILED UNDER: Kennecott Canada Inc.

DATE PERFORMED: September 17-28, 1993

LATITUDE: 64 02

LONGITUDE: 139 08

DATE FILED:

AREA: Australia Hill

VALUE: $

CLAIM NAME AND #: Australian Hill

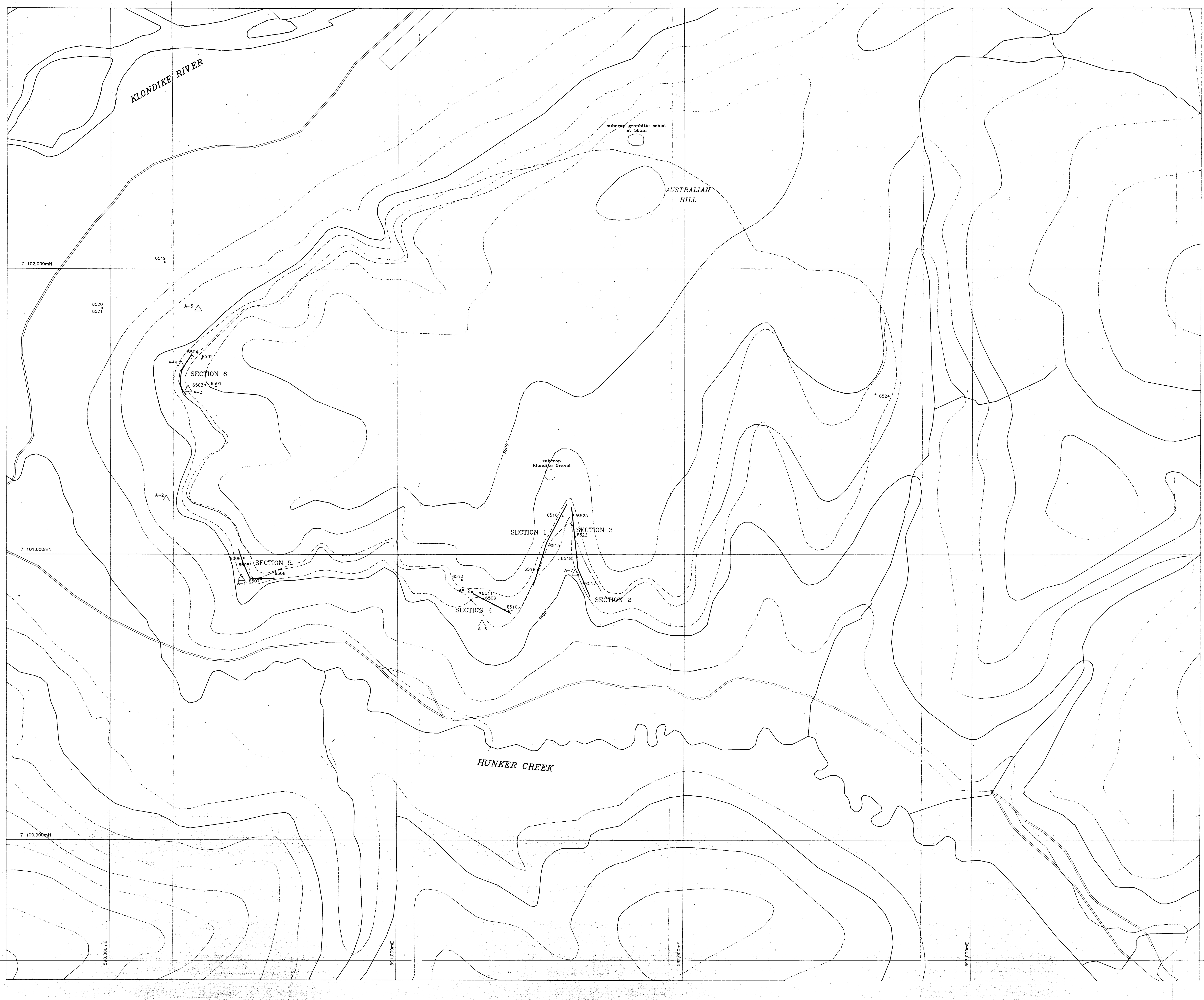
WORK DONE BY: Harrison Cookenboo

WORK DONE FOR: Kennecott

Claims in Good Standing	

Remarks: Sedimentology, stratigraphy, and depositional history of high bench gravels on Australian Hill, Kondike Placer District, Implications for Placer and Lode Gold Exploration.

Open report submitted by Jim McFaull for general reference.



- KLONDIKE GRAVEL
- WHITE CHANNEL GRAVEL
- BASEMENT (NASINA SERIES)
- CONTACT
- INFERRED CONTACT
- SURVEYORS STATION
- MEASURED SECTIONS
- 50kg GRAVEL SAMPLE LOCATION

scale: 1:5000
0 50 100 150 250
metres

093357 DWG 1

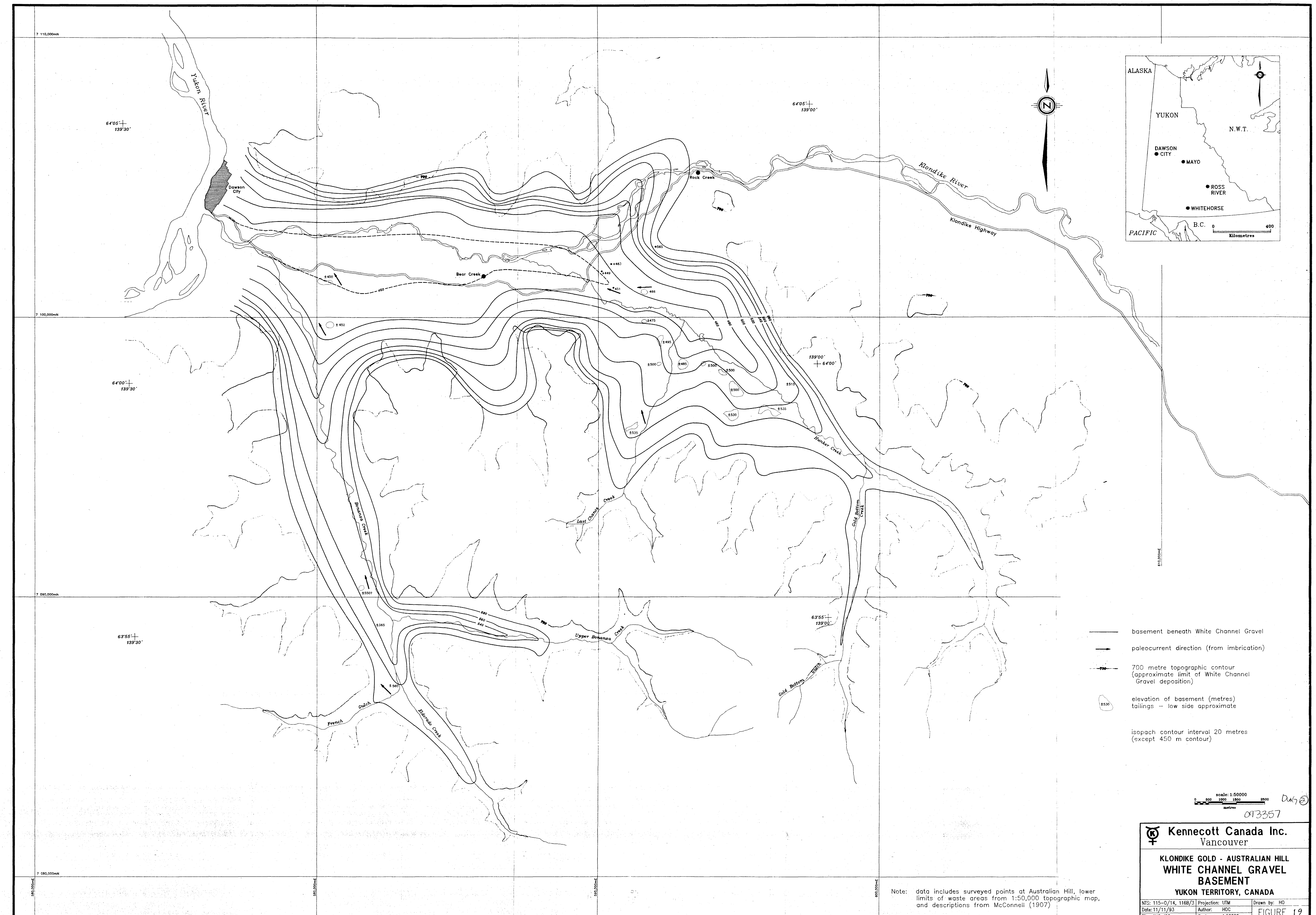
Kennecott Canada Inc.
Vancouver

KLONDIKE GOLD - AUSTRALIAN HILL

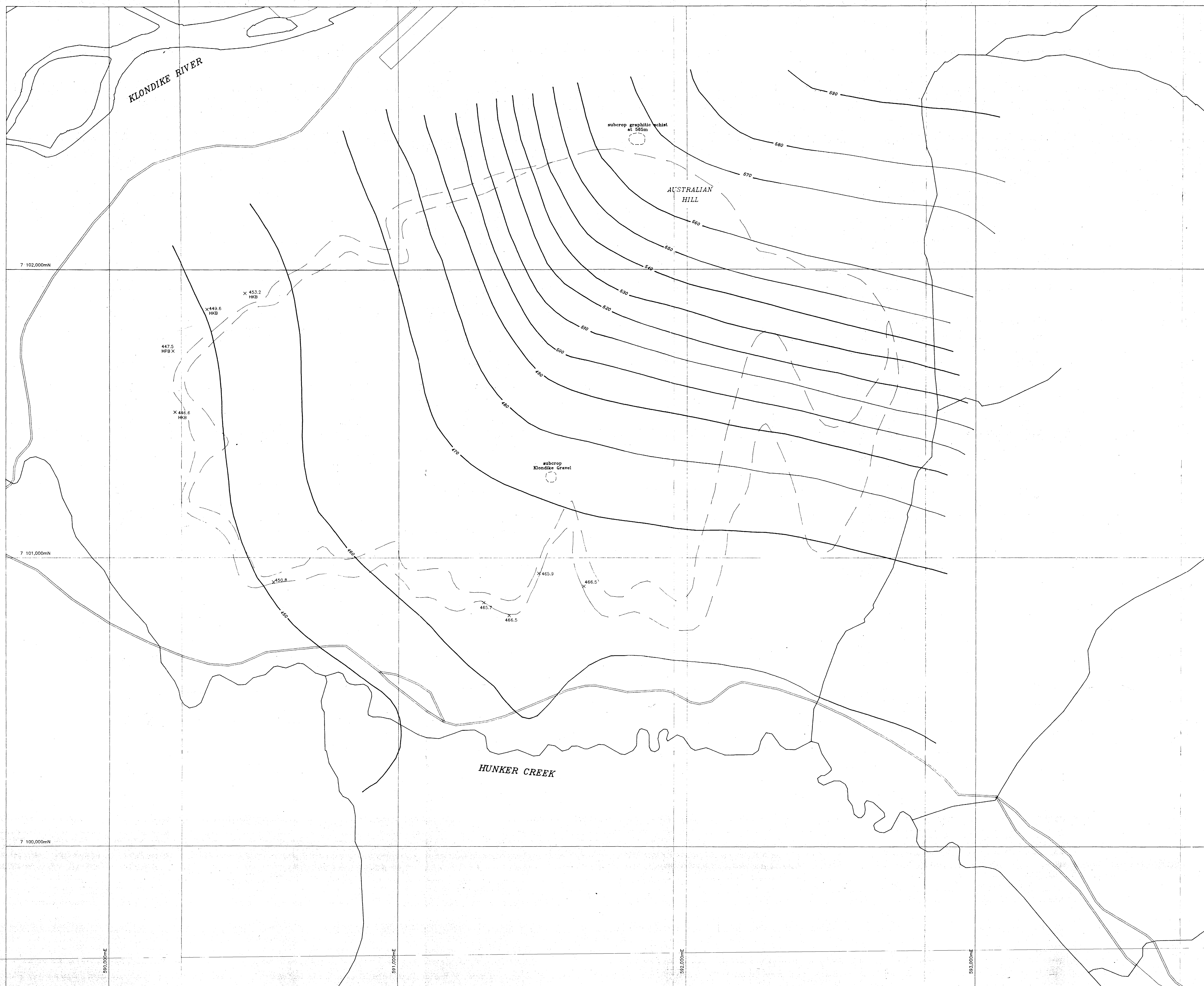
GEOLOGY

YUKON, CANADA

NTS: 116B/2	Projection: UTM(NAD83)	Drawn by: MJD
Date: 10/11/93	Author: H.C./A.D.	Figure 4
File: AUS-GEO	Scale: 1:5000	


Yukon River
Dawson City
Klondike River
Klondike Highway
Rock Creek
Bear Creek
Bonanza Creek
Last Chance Creek
Bunker Creek
Gold Bottom Creek
Upper Bonanza Creek
French Gulch
Eldorado Creek
64°05'
139°30'
64°05'
139°00'
64°00'
139°30'
139°00'
64°00'
63°55'
139°30'
63°55'
139°00'
7 110,000mN
7 100,000mN
7 090,000mN
7 080,000mN
610,000mE
ALASKA
YUKON
N.W.T.
DAWSON CITY
MAYO
ROSS RIVER
WHITEHORSE
B.C.
PACIFIC
Kilometres
basement beneath White Channel Gravel
paleocurrent direction (from imbrication)
700 metre topographic contour (approximate limit of White Channel Gravel deposition)
elevation of basement (metres) tailings – low side approximate
isopach contour interval 20 metres (except 450 m contour)
scale: 1:50000
0 500 1000 1500 2500
metres
Note: data includes surveyed points at Australian Hill, lower limits of waste areas from 1:50,000 topographic map, and descriptions from McConnell (1907)
Kennecott Canada Inc.
Vancouver
KLONDIKE GOLD - AUSTRALIAN HILL
WHITE CHANNEL GRAVEL
BASEMENT
YUKON TERRITORY, CANADA
NTS: 115-0/14, 116B/3
Projection: UTM
Drawn by: HO
Date: 11/11/93
Author: HOC
File: AUS-ISO
Scale: 1:50000
FIGURE 19

093357



OUTLINE OF WHITE CHANNEL GRAVEL

BASEMENT CONTOURS

× 466.5 BASEMENT ELEVATION POINT

HKB HIGHEST KNOWN BASEMENT

HPB HIGHEST PROBABLE BASEMENT

scale: 1:5000

0 50 100 150 250

metres

093357 DWG (3)

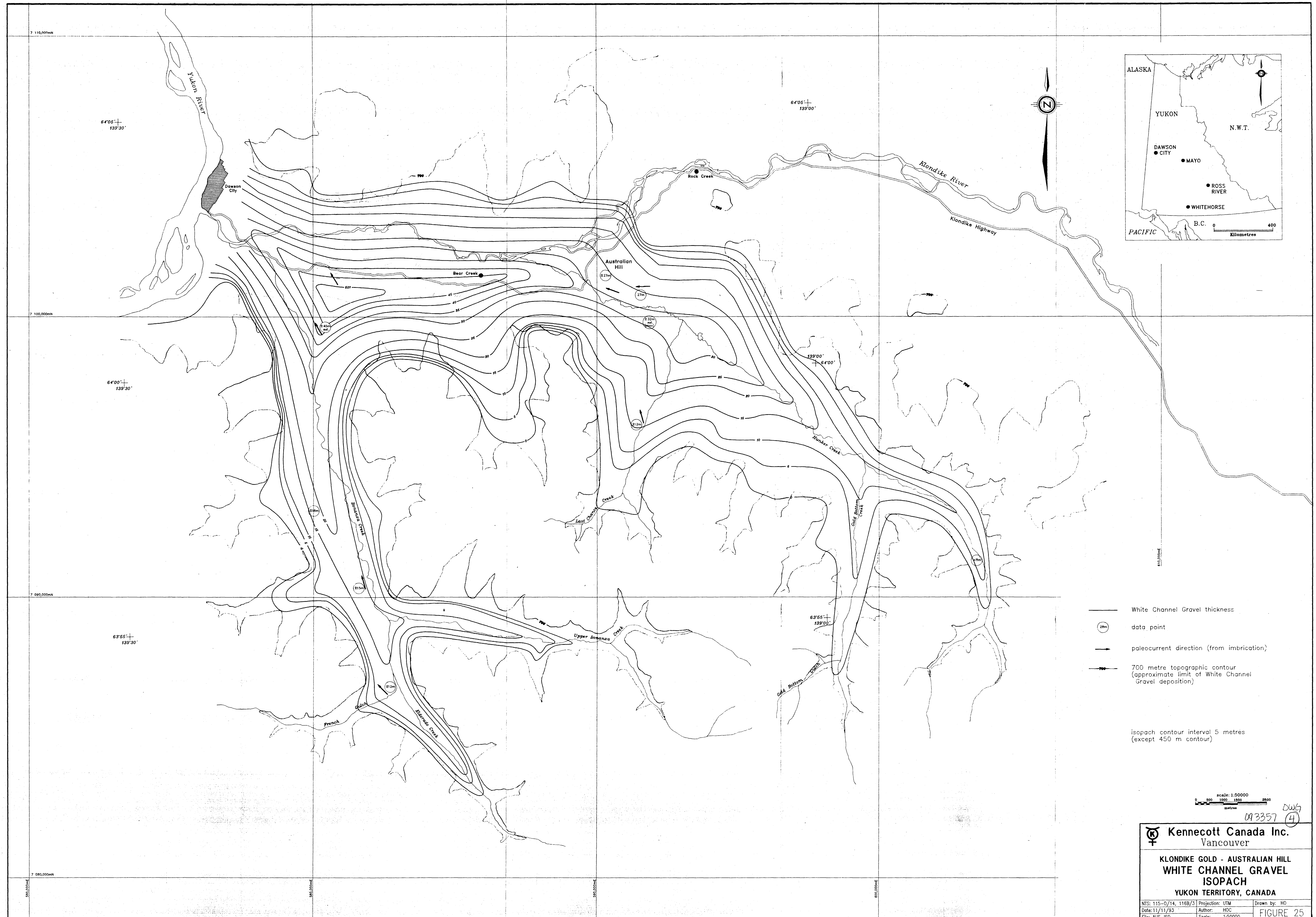
Kennecott Canada Inc.
Vancouver

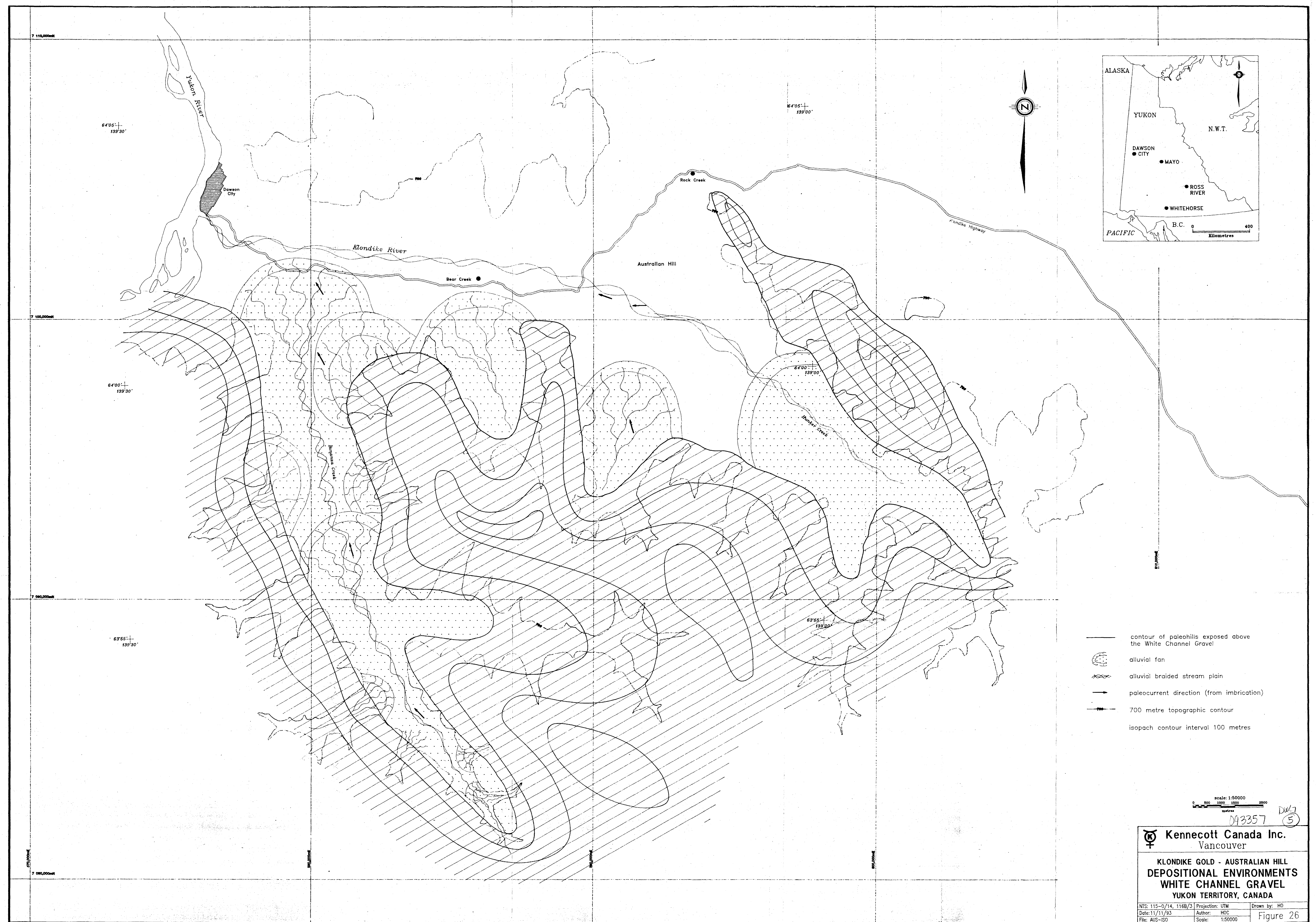
KLONDIKE GOLD - AUSTRALIAN HILL

BASEMENT BENEATH WHITE CHANNEL GRAVEL

YUKON, CANADA

NTS: 116B/2	Projection: UTM(NAD83)	Drawn by: MJD
Date: 10/11/93	Author: H.C./A.D.	Figure 21
File: AUG-BSMT	Scale: 1:5000	


Yukon River
Dawson City
Klondike River
Klondike Highway
Rock Creek
Australian Hill
Bear Creek
Bonanza Creek
Last Chance Creek
Hunker Creek
Gold Bottom Creek
Upper Bonanza Creek
Eldorado Creek
French Gulch
Gold Bottom Gulch
ALASKA
YUKON
N.W.T.
DAWSON CITY
MAYO
ROSS RIVER
WHITEHORSE
PACIFIC
B.C.
Kilometres
White Channel Gravel thickness
data point
paleocurrent direction (from imbrication)
700 metre topographic contour (approximate limit of White Channel Gravel deposition)
isopach contour interval 5 metres (except 450 m contour)
scale: 1:50000
metres
093357
DWG 4
Kennecott Canada Inc.
Vancouver
KLONDIKE GOLD - AUSTRALIAN HILL
WHITE CHANNEL GRAVEL
ISOPACH
YUKON TERRITORY, CANADA
NTS: 115-0/14, 116B/3
Projection: UTM
Drawn by: HD
Date: 11/11/93
Author: HDC
File: AUS-ISO
Scale: 1:50000
FIGURE 25



Yukon River
Dawson City
Klondike River
Bear Creek
Rock Creek
Australian Hill
Bonanza Creek
Klondike Highway
ALASKA
YUKON
N.W.T.
DAWSON CITY
MAYO
ROSS RIVER
WHITEHORSE
B.C.
PACIFIC
Kilometres
contour of paleohills exposed above the White Channel Gravel
alluvial fan
alluvial braided stream plain
paleocurrent direction (from imbrication)
700 metre topographic contour
isopach contour interval 100 metres
scale: 1:50000
0 500 1000 1500 2500
metres
093357
DWG 5
Kennecott Canada Inc.
Vancouver
KLONDIKE GOLD - AUSTRALIAN HILL
DEPOSITIONAL ENVIRONMENTS
WHITE CHANNEL GRAVEL
YUKON TERRITORY, CANADA
NTS: 115-0/14, 116B/3
Projection: UTM
Drawn by: HO
Date: 11/11/93
Author: HOC
File: AUS-ISO
Scale: 1:50000
Figure 26