KENNECOTT CANADA EXPLORATION INC.
LEGEND JV DIAMOND DRILL LOGS

Drill Hole:	98DHPH-01	Azimuth:	N/A
Easting:	351 500 m E (NAD 27)	Dip:	-90° to -87° at EOH
Northing:	6 330 580m N (Z 12)	Depth (EOH):	225.9 (EOH)
Collar Elevation:	~ 738 m amsl (GPS)	Diameter(s):	NQ
Grid Location:	950 E, 5250 N	Geologist:	Ian Graham
Drill Contractor:	Aggressive Drilling	Geotech/Sampler:	Richard Beck
Contracted to:	Kennecott Canada	Project Geologist:	Theo Aravanis
Drill Type:	Boyles 25A	Date Collared:	26 September, 1998
Drill Foreman:	Mitch McLelland	Date Completed:	30 September, 1998

Summary Information

Drill-hole 98DH-PH-01 is the initial hole drilled on the Kennecott / Montello Resources Legend Joint Venture in northeast Alberta. The hole is sited to test an airborne geophysical target (magnetic) recognized as a potential kimberlite. The hole intersected kimberlite beneath ~ 100m of till sediment cover, and constitutes the discovery hole for the **Phoenix Kimberlite**.

NQ core recovered volcaniclastic kimberlite and xenoliths. The core has been split: half core has been sampled for detection of diamonds (by caustic fusion at Kennecott's micro-diamond facility in Thunder Bay, ON.) Samples have also been taken for indicator HM recovery / EPMA mineral chemistry, petrographic examination, geochronology and palynology (refer end of log). Visual logging has not identified any P or E -type indicator minerals / xenoliths (except olivine).

The kimberlite as logged appears to have few HM kimberlitic indicators, and is locally host to bituminous hydrocarbons in fractures and in altered crystals and xenoliths. Magnetism thought to be a result of locally prolific serpentine + magnetite alteration of the: some (particularly the smaller) olivine grains in more magnetic intervals appear to be mantled by a black magnetite bearing alteration rim.

Summary Log

APPENDICES

Detailed Log

0.0 - 97.5 m **Cased Overburden**

Drill timesheets indicate boulder tills encountered throughout tri cone drilling to set casing. Abundant boulders noted below ~ 36 m, with sand seams being common between 40 and 70 m. Tills become more `compact' below ~ 90 m.

97.5 -102.5 m **Cobble and Boulder Till**

Unconsolidated polymict tills, including

97.5 - 98.Om	Quartzite, Qz arenite and hornfels cobbles
98.0 - 98.4 m	Whole core pebble till, < 10% pebbles
98.4 - 102.0 m	Disaggregated pebble till
102.0 - 102.2 m	Carbonate veined macrocrystic intact kimberlite fragment with abundant m.g. olivine grains: contains cored & accretionary lapilli

102.5 -103.7 m **Kimberlite Mudstone**

Kimberlite fragment and xenocryst bearing, friable grey mudrock containing flat lying laminated mudstone xenoliths and arkosic sedimentary fragments. The interval could represent the in *situ* clay alteration of a flat lying, mud fragment rich volcaniclastic kimberlite.

103.7 -106.9 m **Massive Grey (Volcaniclastic) Kimberlite**

Grey, competent, matrix supported kimberlite containing dominantly m.g. (to locally c.g.) olivine macrocrysts (fresh and Fe-stained relics) in an aphanitic grey-green matrix. Fine - m.g. phlogopite (bleached and fresh) is common, with some macrocrysts observed. Xenolith fragments are typically small (<2 cm) grey or greenish mudstone fragments, some displaying local alteration haloes. Minor carbonate veins are developed locally. These are typically associated with narrow (1 - 4 cm) bands of brownish, Fe - stained alteration zones (e.g. @ 104.0 m, 104.8 m, 106.3 m).

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Fragment packing densities show subtle variation throughout the interval: steep bedding is locally suggested, e.g. @ 105.3 m.

106.9 - 109.7 m **Friable Grey (Volcaniclastic) Kimberlite**

The interval is compositionally and texturally similar to the overlying interval with increased carbonate veining and alteration. More oxidized olivines, bleached phlogopite, and more clay alteration in the matrix distinguish the unit. Recovery is reduced over the interval.

109.7 - 112.6 m **Graded Crystal Rich Kimberlite**

Grey-brown, typically altered kimberlite with abundant matrix supported coarse -
m.g. crystic fragments (olivine macrocryst relics
and m.g. phlogopites). Small sub-angular mudstone xenoliths are ubiquitous, but comprise < 2% of the rock.

112.6 -115.6 m **Massive `welded' Kimberlite (Crystal) Tuff**

Dark grey, hard, m.g. macrocrystic tuff containing abundant fresh olivine and phlogopite and numerous (to 4%) small, green marl and argillaceous country rock xenoliths (CRX's)

113.5 - 113.7 m Coarsely macrocrystic / xenolithic interval, gradational within finer materials. Sub-horizontal attitude suggested.

115.6 - 117.8 m **Coarse Fragmental (bituminous) Kimberlite**

Coarse olivines, phlogopite and abundant CRX's (mud fragments and sub-angular marls) gradational with adjacent units. Bitumen is ubiquitous on fractures, and on olivine and mica grains (though generally not on xenolith fragments).
At least three colour variants are recognized in the mudstone fragments in light brown - light green colours.

115.9 - 116.9 m Most coarsely fragmental interval characterised by **common** sub-rounded - rounded **autolithic fragments**

117.8 - 133.9 m **Massive Kimberlite (Tuff?)**

A massive, dominantly dark grey, matrix supported hard kimberlite with local slight gradations in fragmental component size and packing density. Fragments comprise variably altered olivine macrocrysts, typically fresh phlogopite (< 2 %), variable amounts of CRX's (1 - 5%), including sub-angular laminated argillites (up to 4 cm), lesser leucocratic arenites (typically < 1 cm)and abundant sub angular green marls. Green fragments include both marls and some green argillites: some may represent epidotised feldspars. Notably, green fragments of similar appearance may represent a variety of parageneses.

117.8 - 118.5 m	`Welded' appearance and some bitumen in fractures
119.0 - 119.7 m	Broken zone, ochreous alteration of olivines
120.8 - 121.0 m	Fe-stained fracture
122.3 - 122.6 m	Broken zone
126.8 - 127.2 m	Broken zone
128.1 - 128.7 m	Rubble zone
129.2 - 129.8 m	Broken zone
130.3 m	Black mudstone xenolith (1 cm) - a unique type
132.4 - 132.9 m	Coarse, closely packed rounded autolith and xenolith fragment rich interval, gradationally bounded.

133.9 -139.3 m **Bedded Kimberlite Tuff**

Coarse to finely fragmental and variably well-bedded to locally laminated kimberlite. Major components are as for previous intervals, with a locally significant rounded autolithic component. The rock is generally hard, with alteration affecting only those areas containing abundant coarse fragments / xenoliths.

133.9 - 134.2 m	V.f.g., finely bedded interval
134.8 - 135.0 m	V.f.g., finely bedded interval
137.8 - 138.4 m	Well bedded interval

139.3 -153.6 m **Coarse Graded Kimberlite Tuff**

Light grey, matrix supported coarse fragment, xenolith and lapillus rich kimberlite. The unit appears to be crudely reverse graded, grading into the underlying finer grained bedded tuff (refer below).

Grading is reflected in a subtle decrease in fragment packing density below 144 m.

140.1 - 144.2 m	Massive, coarse, xenolith rich unit with abundant angular and rounded mudclasts. Elongate mud fragments do not suggest any systematic preferred orientation (or any marked flattening). Cored and accretionary lapilli are recognised; some autolithic lapilli, including some juvenile types are observed.
143.8 m	5 cm mud seam (possible mud clast)
144.0 m	5 cm mud seam (possible mud clast)
144.1 m	7 cm mud seam (possible mud clast)
145.4 m	5 cm mud seam (possible mud clast)
146.0 - 146.2 m	Disaggregated zone
146.5 - 146.7 m	Disaggregated zone
147.4 - 147.9 m	Broken zone
148.9 m	10 cm mud seam (possible mud clast)
149.5 - 149.8 m	Rubble zone
150.2 - 150.4 m	Rubble zone
151.2 - 151.9 m	Rubble zone
151.9 m	10 cm mud seam (possible mud clast)
152.0 - 152.7 m	Characterised by f. g. ferruginised olivines and some small olivine-cored lapilli
152.7 - 153.6	Rubble zone

153.6 -159.5 m **(Steeply) Bedded Kimberlite Tuff**

The interval is characterised by frequent muddy rubble zones broken by competent, well bedded / laminated intervals displaying text-book pyroclastic textures.
The competent, well bedded intersections comprise the previously recognised common fragments (autoliths, crystic fragments [ol & phlog] and CRX's in 1 - 3cm pyroclastic beds. These are typically defined by gradations in clast size and packing with darker coloured fine ash laminae demarcating successive beds. An instance of imbrication and xenolith mantling suggestive of a base surge is also observed.
A few instances of lapilli impact structures are observed in split core, and some evidence of rotation (through ~ 30°) in an angular mud fragment lapillus suggests minor pyroclastic creep in one area (~ 155.8 m)

The autolith component increases downward, suggesting a compositional gradation toward the underlying autolith rich unit.

153.6 - 154.3 m	Rubble zone, with one 15 cm intercept of intact bedded kimberlite
154.3 - 155.7 m	Blocky, broken zone of m.g. fragmental massive to crudely bedded kimberlite
155.7 - 156.7 m	Pyroclastic layered kimberlite tuff (textbook), with carbonate matrix replacement in areas of abundant coarse fragments (typically the coarser base of each bed). Bedding is steep at 25° to 30° to core axis.
156.7 - 157.3 m	Broken zone, kimberlite fragments are of bedded type
157.3 - 158.8 m	Bedded tuff: bedding is less well-defined than in previous intervals (ash laminae are less conspicuous). Autolith lapilli exceed CRX's.

159.5 -184.5 m **Graded Coarse Autolithic Kimberlite Tuff**

Light to dark grey, coarse to very coarse fragment and lapilli rich graded kimberlite comprising previously recognised matrix supported components. This unit is discriminated from the underlying unit by a decrease in the autolith component among fragments, which occurs gradationally from below 183.0 m. Locally the rock is very lapillus rich, with lapilli frequently in greater abundance than discreet matrix supported olivines. Autolithic lapilli are generally dark grey and rounded, and appear to represent juvenile material in most cases (petrography required). These dark grey / blackish lapilli typically contain f.g. -m.g. olivines and micas in an aphanitic dark matrix: the matrix may contain primary carbonates (acid test). In some cases the lapilli are olivine macrocryst `cored' lapilli; xenolith cores are also observed. A large (3 cm) zoned autolith occurs at 174.4m.
The `autoliths' are NOT recognized as 'pelletal lapilli' *sensu* Clement & Skinner (though they have pelletal form), but rather as sub-rounded - rounded autoliths. Samples have been submitted for independent petrographic confirmation (in particular sample VR31085A).
Carbonate replacement of the matrix typically in the most coarsely fragmental intervals, especially where fragments are close packed.

Planar carbonate veins are absent where carbonate matrix replacement is well developed, which is generally in the coarser fragmental beds.
The CRX's are dominated by green marls and argillites (glauconitic?). The brown argillites observed higher in the hole are common, but are subordinate to the green types. Fractures in the lower part of the intersection are commonly filled with a grey mud akin to that observed in mud seams.

159.5 - 163.1 m	Rubble zone with regular 5 - 10 cm sections of competent, autolith rich whole core. Carbonate replacement of part of the matrix is ubiquitous in the most coarsely fragmental parts (i.e. where autolithic lapilli are abundant)
162.8 m	10 cm bedded fragment (~ 2 cm bedding)
163.8 - 164.4 m	Broken zone
165.2 - 166.0 m	Broken zone
166.0 - 166.1 m	10 cm mud seam
166.2 - 166.4 m	15 cm bedded zone, with bed interruption indicative of deformation and / or de-watering structures
166.9 m	1 cm accretionary lapillus, with f.g. olivine relics centrally clustered
167.1 - 167.5 m	Rubble zone
167.6	1Ocm mud seam
168.3 - 168.6 m	Broken Zone
168.6 m	10 cm mud seam
169.9 - 170.2 m	Rubble zone
170.8 m	Well preserved mud seam with ~ 5mm alteration banding affecting the lower contact (a 1 mm carbonate vein on the upper contact). This example suggests that the mud seams observed are generally in *situ* features (not drilling induced).
172.5 - 173.0 m	Rubble / broken zone
174.4 m	Zoned lapillus, round, 3 cm
176.4 - 176.7 m	Broken zone, fragments display bedding-like chemical alteration `fronts': carbonate replacement is varied in these bands
178.6 - 179.2 m	Blocky broken zone
179.2 -180.4 m	Very coarse fragmental rock
181.9 m	10 cm mud seam
182.5 - 183.9 m	Broken zone
184.0 - 184.4 m	Broken zone

184.5 - 204.0 m **Graded Kimberlite**

Similar to the overlying graded autolithic kimberlite except for a decline in the abundance of rounded `autolithic' lapilli and less prolific carbonate replacement of the inter-fragmental matrix. In general olivine + mica exceeds the dark autolithic fragments.

The interval has a dark greenish grey colour (slightly darker than the overlying owing to less carbonate replacement). Mud seams are common in the lower part of the interval, and mud-squeeze infill of the hole occurred on pullback of the rods in the 198.4 - 200.5 interval.

187.6 m	2 cm in situ grey mud seam
189.2 - 189.7 m	Mud-rich rubble zone
189.7 - 190.0 m	Broken / rubble zone
190.8 m	~ 10 cm mud seam
191.9 m	Carbonate veinlet (1 mm). These appear to occur in the finer fragmental rocks where groundmass replacement is not occurring
193.9 m	10 cm mud seam
195.4 m	Small mud seam
196.9 m	10 cm mud seam / possibly owing to mud squeeze
198.6 - 200.5 m	Mud dominated zone (possibly including re-cored mud ingress material entering the hole during rod pullback) - with broken 5 - 10 cm kimberlite fragments similar to rest of interval
200.5 - 203.0 m	Massive hard kimberlite with remarkably few large fragments
203.0 - 204.5 m	Intermittent broken zones

204.5 - 225.9 m **Graded Coarse Autolithic Kimberlite Tuff**

This unit is essentially identical in all compositional and textural respects to the graded autolithic kimberlite tuff in the 159.5 - 184.5 m interval, though locally gradations between very coarse fragmental and finer sub-units may occur more rapidly in this deeper unit. The unit is gradational from the overlying autolith-poor tuff The dark grey-black autoliths show reaction to acid suggesting carbonate replacement may affect their matrices, or that they are autoliths of juvenile calcite - serpentine kimberlite.

205.8 - 206.2 m	Broken zone, with possible 10 cm mud seam from 206.1 m
207.1 - 207.5 m	Broken zone
208.6 m	Large autolith - a good example for petrography
211.4 - 211.6 m	Broken Zone
212.3 m	Coarse graded layer suggests bedding at > 60° to core axis
218.0 - 218.2 m	Rubble zone
218.2 - 219.8 m	Very coarse fragmental intersection with large (to 4 cm) autoliths
222.8 m	5 cm sparry calcite replacement of a major mud xenolith or seam? (over 3cm of core): visible porosity in excess of l0 between calcite rhombs.
222.9 - 223.4 m	Broken / rubble zone

225.9 m **E.O.H.**

Representative (`Rep') Samples

#	Depth in Hole	Geological Unit	#	Depth in Hole	Geological Unit
1	104.1 m	Kimberlite Mudstone	13	150.8 m	Coarse Graded Kimberlite Tuff
2	106.2 m	Massive Grey (Volcaniclastic) Kimberlite	14	155.8 m	(Steeply) Bedded Kimberlite Tuff
3	113.8 m	Massive `welded' Kimberlite (Crystal) Tuff	15	161 m	Graded Coarse Autolithic Kimberlite
4	116.1 m	Coarse Fragmental (bituminous)	16	166.4 m	Graded Coarse Autolithic Kimberlite
5	118.6 m	Massive Kimberlite (Tuff?)	17	171.7 m	Graded Coarse Autolithic Kimberlite
6	121.2 m	Massive Kimberlite (Tuff?)	18	177.3 m	Graded Coarse Autolithic Kimberlite
7	124.8 m	Massive Kimberlite (Tuff?)	19	187 m	Graded Kimberlite
8	130.4 m	Massive Kimberlite (Tuff?)	20	193.7 m	Graded Kimberlite
9	134.3 m	Bedded Kimberlite Tuff	21	198.2 m	Graded Kimberlite
10	137.8 m	Bedded Kimberlite Tuff	22	202.6 m	Graded Kimberlite
11	140.9 m	Coarse Graded Kimberlite Tuff	23	212.3 m	Graded Coarse Autolithic Kimberlite
12	144.3 m	Coarse Graded Kimberlite Tuff	24	222.1 m	Graded Coarse Autolithic Kimberlite

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Heavy Mineral / Micro-diamond Sample List

Sample No.	From	To	Interval	Mass	Shipped
	(m)	(m)	(m)	(kg)	
VR87802A	102.5	103.7	1.2	2.5	1 October, 1998
VR87803A	103.7	109.5	5.8	10.0	1 October 1998
VR87804A	109.5	113.8	4.3	10.0	1 October, 1998
VR87805A	113.8	118.3	4.5	10.0	1 October 1998
VR87806A	118.3	122.8	4.5	10.0	1 October, 1998
VR87807A	122.8	127.3	4.5	10.0	1 October, 1998
VR87808A	127.3	132.6	5.3	10.0	1 October, 1998
VR87809A	132.6	238 9	6.3	10.0	1 October, 1998
VR87810A	138.9	143.8	4.9	10.0	1 October. 1998
VR87811A	143.8	147.3	3.5	10.0	1 October, 1998
VR87812A	147.3	152.8	5.5	10.0	1 October, 1998
VR87813A	152.8	158.3	5.7	10.0	1 October, 1998
VR87814A	158.5	162.4	3.9	10.0	1 October, 1998
VR87815A	162.4	167.9	5.5	10.0	1 October, 1998
VR87816A	167.9	172.7	4.8	10.0	1 October. 1998
VR87817A	172.7	73.3	4.6	10.0	1 October, 1998
VR87818A	177.3	182.2	4.9	10.0	1 October, 1998
VR8789A	T82.2	287 3	5.1	10.0	1 October, 1998
VR87820A	187.3	191.8	4.5	10.0	1 October. 1998
VR87821A	HM	Composite		15.0	1 October, 1998
VR87822A	191.8	196.0	4.2	10.0	3 October, 1998
VR87823A	196.0	201.4	5.4	10.0	3 October, 1998
VR87824A	201.4	205.8	4.4	10.0	3 October, 1998
VR87825A	205.8	210 1	4 5	10.0	3 October, 1998
VR87826A	210.3	215.3	5.0	10.0	3 October. 1998
VR87927A	215.3	220.9	5.6	11.5	3 October, 1998
VR87828A	220.9	225.9	5.0	12.0	3 October, 1998

Notable Mantle Nodules

No mantle nodules or their xenocrysts were recognised during logging. A composite sample for indicator mineral chemistry has been submitted (VR8780xA).

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Petrology Samples

Petrographic Samples

Sample No.	Depth	Sampled by	Submitted to
VR31079A	140.0	Buddy Doyle	Roger Mitchell (30 September, 98)
VR31080A	144.5	Buddy Doyle	Roger Mitchell (30 September, 98)
VR31081A	117.0	Buddy Doyle	Roger Mitchell (30 September, 98)
VR31085A	217.4	Ian Graham	Roger Mitchell (6 October, 98)

Palynology Samples

Sample No.	Depth	Sampled by	Submitted to
VR31083A	144.0	Ian Graham	Graham Dolby (6 October, 98)
VR31084A	174.4	Ian Graham	Graham Dolby (6 October, 98)

Geochronology Samples

Sample No.	Depth	Sampled by	Submitted to
VR31082A	113.9	Ian Graham	ROM (6 October, 1998)

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