Appendix 3

DRILLHOLE REPORT - NS3

NORTH SCAMANDER PROSPECT,

EL12/78, TASMANIA

Location:	*762W 1533N*		
Depression:	*69°*	*Commenced:*	*20 August 1980*
Bearing:	*229°*	*Completed:*	*6 September 1980*
R.L.:	*N.D.*	*Rig:*	*Jacro Top Drive*
Depth:	*201.6m*	*Drillers:*	*A Walker, I McCallum*
Surveys:	*50m (74°), 100m (73°);*	*Depth of Oxidation:*	*21m*
	150m (73°), 200m (72°).	*Depth of Water Table:*	*-24m*
		Core Size:	*NQ.*

Nature of Target:

As for NS1 and 2.

Reasons for Drilling:

To test Sn-in-Soil anomaly to north of NS1.

NS3 CORE LOG

0-12.20 Not cored, loose, broken rock.

12.20-18.80* Grey qzte c occasional dark grey sh interbeds, bedding at 35° to LCA. Up hole facings. Qtz-limonite vnlts, rarely vuggy, 5+/m, in various orientations, mainly 50-60° to LCA, perp to bedding, fracs 1-2mm in qzte, <1mm in shale. Minor shearing along shaley beds; qtz-limonite vnlts offset. Fine (<1mm) qtz vnlts 40° to LCA, offset by later 1-2mm qtz-chl-lim vnlts, ∦ to LCA approx 20° , below 16.7m. Generally broken oxidized rock. Barren.

18.80-20.95 Qzte c v. minor sh interbeds, bedding 60° to LCA. Flame structures indicate uphole younging. Qtz-limonite stringers, ~20° to core axis. Irregular, occasionally vuggy qtz-chl-sph-ga vnlt, 10° to LCA, 1-2mm wide cuts thin qtz vnlts, 20-30° to LCA at 19.1m. Irregular, patchy sph-ga in qtz-chl (pinite?) vnlt (sph:ga 10:1), 1-5mm wide. Minor brecciation and later qtz infilling of fracs trending 10-20° to LCA. No magnetite detected, total S^{2-} - trace.

20.95-23.1 Grey qzte cut by 20-50/m qtz-chl-sph-ga vnlts (sph:ga ~10:1 to 5:1), 1-4mm wide, 20° LCA. These xcut by qtz-sid-sph-ga vnlts, 1-3mm, oriented 40-70° to core axis. CO_3^{2-} bearing vnlts more common c depth. Trace py increasing in abundance c depth in both qzte and qtz vnlts below 21.0m; sporadic and rare in qzte to 22.2m, cubic, 1-2mm in qzte. First appears in vnlts at 22.3m. Large qtz-chl-py-sph-magnetite vein at 22.9m. Qtz-sid-chl-tm? vnlt at 22.0m. V. low total sulphide. Magnetite only in vein.

23.1-24.3 Gossanous, severely oxidized dark grey-black shaley(?) rock, cut by pyritic stringers 80-90° to LCA. Patchy magnetite. Broken rock at 24.15m. Qtz vnlts and stringers above and below broken zone, vuggy in places.

24.3-28.5 Grey qzte c v. minor shale at 27.25m; bedding 50° to LCA. Rare, disseminated py xstals in qzte, patchy chl(?) alteration. Thin anastomosing qtz-sid vnlts run parallel and sub-parallel to core axis; v. weakly mineralized - sph+ga. Most vnlts x fractured. 3 and 6mm wide qtz-sid-ga-sph (ga:sph 1:1) vnlts at 25.15 and 27.90m, both at 40° to LCA. Patchy qtz-chl-mag, c trace cpy, sph and rare ga (cpy:sph 1:1). Total S^{2-} in patches, 2-5%. Brecciated appearance to patches. Sid bearing vnlts post date larger qtz-sph-ga vnlts approx parallel to core axis.

28.5-37.65 Interbedded grey qzte/slst/sh, bedding 60° to LCA decreasing to 50-45° at bottom of interval, flame structures indicate younging up hole. Shale interbeds v. common at top of interval, decreasing c depth. Qtz-sid-sph-ga vnlts in shale are sub-parallel to parallel c core axis or are parallel to bedding. In qzte, vnlts are parallel or sub-parallel (10-20° to LCA) to core axis. With increasing depth, qtz-chl-sph vnlts occur, 35-40° to LCA. These vnlts post date qtz-sid-sph vnlts. One vein, qtz-chl-sph-ga (sph:ga 1:1), 2cm wide at 33.5m, 40° to LCA. Six qtz-sid-sph-ga veins, 3-7mm, 40-50° to LCA occur at 30.45, 31.3, 32.8, 33.4, 34.65 and 36.6m. Rare, disseminated py in qzte. Some mineralized vnlts in qzte are discontinuous through shaley horizons. Ga-sph mineralization thin shale beds at 37.4m. Low total sulphide; no magnetite detected.

*N.B. Intervals: 12.56-13.28m, 13.78-16.70m, 17.00-18.20m and 18.45-18.80m were not cored; broken, loose, oxidized rock.

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37.65-39.1 *Interbedded shale/grey-green siltstone; bedding ∠ to LCA is 50°, decreasing to 40° c depth. Facings imply uphole younging. Strong development of microfracs, 20-30° LCA, occasionally infilled by qtz-sid. Vnlts weakly developed, 10-20° to LCA, qtz-sid c trace sulphide. Sph-ga mineralization restricted to 2-10mm vns, parallel to bedding at 38.3, 38.55, 38.65, 38.8m, c a qtz-chl-tm? gangue assemblage; sph:ga 15:1 to 10:1. S^{2-} in vnlts auges 10-30%, v. low total sulphide in interval.*

39.1-42.0 *Grey qzte c minor sh/slst horizons; bedding 40° to LCA. Qtz-sid vnlts have two distinct styles and orientations: irregular, discontinuous, 5-15° to LCA, 5-10/m, continuous, 15-30/m, 40-50° to LCA. Both sets apparently barren above 40.0m. Mineralization between 39.1 and 40.0m restricted to vnlts parallel to bedding, as for previous interval (37.65-39.1). Below 40.0m, vnlts are irregular and anastomosing rarely vuggy; sph-ga mineralization visible in irregular discontinuous stringers c qtz-sid-chl host; sph:ga 15:1. No magnetite detected; total sulphide <1%.*

42.0-45.5 *Interbedded qzte/slst c minor sh; bedding 60° to LCA. Intermixing (slumping?) of qzte and slst widespread, up hole younging indicated by flame structures and sole marks. Qtz-sid-sph vnlts, 5-15+/m, 30° LCA generally discont through shaley units (as at 43.45 and 43.55m). Sph-ga mineralization in qtz-chl-sid vnlts occurs at lower levels of interval. Vnlt density increases c depth as qzte predominates. 5-10mm shale unit at 43.45m hosts sph-ga-chl mineralization (sph:ga 5:1, 2% total sulphide in shale unit). Below 45.3m vnlts are more irregular, ∠'s to core axis vary, 10-60° , and sph-ga mineralization is more common. However total S^{2-} is v. low, no magnetite detected.*

45.5-48.0 *Mainly grey qzte c v. thin interbeds of grey-green shale, 70° to LCA. Thin stringers and vnlts of qtz and qtz-sid±sph, x cut and are cut by chl vnlts. Mineralized vnlts are irregular and parallel or sub-parallel to LCA, rarely up to 50° to core axis. Qtz-sid units at 47.0m implies up hole younging. Bedding angle to core axis is 50°. Trace chl in qtz-sid vnlts c mineralization. V. low total S^{2-}; no magnetite detected.*

48.0-50.55 *Grey qzte, shale and siltstone interbeds; bedding 60° to LCA; graded and cross bedding indicate up hole facing. Abdt microfracturing and later infilling by qtz-sid-py-sph-ga paragenesis. Vnlts tend to be irregular, angle to core axis varies between 10 and 45° . Slumping and soft sed deformations apparent in places (i.e. 50.1-50.2m). Py-sph-ga (20:10:1) in microfracs and infilling along bedding surfaces. Py disseminated throughout qzte. Chl in some sub vertical (parallel to LCA) vnlts. Irregular mineralized fracs often offset at bedding surfaces (shearing along surfaces?). No detectable magnetite; total sulphide approx 2%.*

50.55-52.75 *Grey qzte-siltstone occasionally interbedded (30° to LCA) c green-grey shale, weakly brecciated and network fractured. Mainly qtz-chl-sid fractures, 10-50° to LCA. Anastomose qtz-chl-sid-sph-ga vnlts up to 3mm. Py in some fractures and vnlts, especially those parallel to bedding. Sph:ga approx 15 to 20:1. Shearing and brecciation in green shale units (51.0, 51.2 and 52.1m). Abdt chl and tm(?) along bedding surfaces and fractures. Sideritic vnlts, 5-10/m, 55° to LCA, x fractured and offset in shale units. Abdt anastomosing chl vnlts in qzte c minor sph and sid. No magnetite, total sulphide 1-2%.*

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52.75-53.2 *Green-grey shaley unit c̄ gradational contact into qzte at base; sharp upper contact c̄ overlying qzte. Finely laminated, 80-90° to LCA, cut by thin qtz-chl-sph vnlts at 50-60° to LCA. Minor py in some vnlts. Fracture/vnlt intensity <5-10/m. No magnetite detected; v. low total sulphide.*

53.2-55.2 *Grey qzte, minor incipient chltzn along anastomose fractures. Qtz-sid vnlts, 1-5mm, 50-80° to LCA. Irregular stringers and patches of qtz-chl-sph-ga-sid at 53.8, 54.7, 54.9m. Minor brecciation of grey-brown qzte at 54.9m. Magnetite in qtz-chl-sph-ga c̄ trace py assemblage. Minor shale; bedding 50° to LCA. Qtz±chl vnlts, 20-30° to LCA, sporadic 15-20/m. Sulphide content up to 5% in places, total S^{2-} v. low.*

55.2-55.8 *Green-grey shale c̄ graded qzte interbeds; bedding at 60° to core axis; up hole younging. Chl-qtz vnlts, 1-2mm, 10-20° to LCA, locally abdt in siltstone-qzte horizons. Minor brecciation and/or slumping at 55.5 and 55.7m c̄ irregular qtz-chl-sph-ga-py (sph:ga:py 10:1:1) vnlts, sub-parallel to bedding. Rare siderite-qtz vnlts, <1-1mm, 10-40° LCA. No magnetite detected; v. low total sulphide.*

55.8-61.4 *Interbedded grey shale/slst/qzte, younging up hole; bedding to LCA approx 50°; sole markings and graded bedding common; qzte predom towards base of interval. Minor slumping? at 55.9 and 56.3m. Qtz-chl±sph±ga vnlts 10-30° to LCA, low S^{2-} content. Abdt irregular chltic alterations, esp in shaley units. Disseminated py throughout interval, more abdt below 58.6m, Qtz-chl-py-sph-ga vnlts common, mineralization irregular to patchy. 15-20% py; vnlts 10-40° to LCA, rarely parallel to bedding. Mineralization apparently post dates microfracs in silty-shaley units. Dark grey sh grades into green-grey shale at approx 60.7m. Abdt py-sph in qtz-chl vnlts, network of vnlts. Magnetite in qtz-pinite(?) diffuse vnlts and patches (at 61.35m). Total sulphide approx 2-4% - mainly py. Magnetite detected below 61.3m.*

61.4-67.8 *Grey qzte c̄ v. minor interbeds of green-grey shale/siltstone; locally brecciated (slumped?) and fractured throughout; bedding ∢ to LCA ~40-50°. Magnetite-chl (pinite?) assemblage commonly found in breccias; rarely along mineralized fractures. Dominant frac orientation, 40-50° to LCA; generally qtz-sid-py-sph-ga, up to 50% S^{2-} in some; py:sph:ga: 20:2:1, locally 20:5:3, fine pinite(?)-mag-qtz vnlts x cut qzte; generally 15-25/m, rarely up to 40/m, no definite age relationships between vnlt types - implying "syn-tectonic" mineralization(?). Local cpy in breccia (64.5m). Magnetite absent from shaley units; v. low S^{2-} content; qtz-sid vnlts generally more irregular "network-like", locally displaced at shale/qzte bedding surfaces. Total sulphide in interval ~1%, locally 5%; magnetite content ~.5%, higher than previous intervals.*

67.8-74.0 *Fractured qzte; 2 main frac orientations, 10-20° to LCA, 2-7mm, and 40-60° to LCA, (1-3mm). More vertical fractures may post-date more horizontal fractures; mainly qtz-sid giving way to py-qtz-chl locally, rarely to py vnlts. Anastomisingly fractured, pyrite dominated; locally brecciated c̄ qtz-pinite-mag infilling (62.5, 71.6m); sph-ga locally associated c̄ py vnlts. Two 7mm qtz-sid vnlts at 60-70° to LCA. Mag-pinite qtz-sph horizon, 8-10mm, at 71.1m, at 60° to LCA. Py:sph:ga ratios, v. high:low:v. low-trace; total S^{2-}, mainly py 4-5%, locally up to 40%, total magnetite 1-2%, locally high (10%) occurrences.*

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74.0-76.4 *Interbedded qzte/grey-green shale; minor slumping; uphole facings; network of fractures mainly qtz-sid c̄ minor chl + sph and trace ga; pyritic in places; vnlts vary from 20-65° to LCA; 30-40/m; minor incipient chltzn (halo) around some sph-ga mineralized fractures. Vnlts more abundant in qzte of shale. Bedding approx 60° to LCA; microfracturing parallel to bedding surfaces; 2cm wide qtz-sid vnlt, locally vuggy, at 75.0m; pyrite mineralization immediately below vnlt; v. thin py vnlts sporadic along bedding surfaces. No magnetite detected; total S^{2-} .5-1% overall, locally v. low.*

76.4-82.4 *Locally brecciated grey qzte c̄ anastomising vnlts, 1-5mm, 40/m+ of qtz-chl-ga-sph c̄ minor sid. Dominant qtz-sid vnlt orientation is 45° to LCA; most mineralized vnlts (sph-ga) tend to be more vertical, (0 LCA) 30° to LCA. Sulphide mineralization sporadic in occurrence in vnlts; generally ga sph, c̄ ga in greater abundance than in previous intervals. Minor pyritic qtz-sid vnlts, at high ∢ to LCA. Younging uphole indicated by graded bedding into green-grey shale unit at 79.6m. Most mineralized vnlts are microfractured, offset and some later infilled by qtz-sid vnlts. Some locally vuggy qtz vnlts. Overall sph:ga:1:1, minor py, total S^{2-}, approx 1%; no magnetite detected.*

82.4-86.15 *Interbedded dark grey shale/siltstone/qzte c̄ qzte dominating, and grey-green shale appearing, towards bottom of interval; uphole younging, weakly fractured, 10-20/m; cut by generally regular (parallel) qtz-sid vnlts, 60-70° to LCA, rarely 20°; v. minor sph c̄ trace ga in short sub-parallel stringers, 10° to LCA. Bedding ∢ to LCA is 45-50°. Occasional 3-5mm qtz-sid-chl-sph-py-ga vnlts in qzte beds, sph:py≈1:1. Mineralization rarely in small irregular patches, often offset at bedding surfaces (84.4m). V. minor, locally rich, py in vnlts. No magnetite detected, total S^{2-} low.*

86.15-89.60 *Grey qzte c̄ local chltzn, fractured ~20-40/m+; qtz-sid vnlts, 1-4mm, locally vuggy, generally 35-60° to LCA; pyritic mineralization commonly along these vnlts; also disseminated through qzte-sporadic. More irregular qtz-chl or chl vnlts carrying sph-ga-rarely py at angles of 10-20° to LCA; rarely at 30-40° to LCA. Total sulphide ~1-2%, mainly py c̄ minor sph and trace ga; sph:ga 15-20:1 rarely 5:1. No magnetite detected.*

89.60-92.20 *Grey qzte c̄ minor interbeds of green grey shale, locally disrupted. Bedding 30° to LCA. Severely fractured, generally 30-50/m+, c̄ anastomosing qtz-chl and qtz-sid-chl vnlts, 1-3mm, generally 20-40° to LCA. Minor S^{2-} mineralization in vnlts, ~5-15% (of vnlt); mainly py, however sph dominant in some vnlts; py:sph and sph:ga ≈high. Local brecciation c̄ minor sulphides associated. Total sulphide ~1%, no magnetite detected. V. poor core recovery 91.0-92.20m, loose, broken rock.*

92.20-93.05 *Loose, broken rock; mainly qzte c̄ minor grey-green shale. No mineralization or magnetite. Sludge and fragments obtained from 15cm interval 92.2.-92.35m. Rock fragments and chips suggest chlitic and qtz-chl vnlts present - possible at low ang to LCA (10-20°). Bedding ang to LCA ~60° (??).*

93.05-98.7 *Mainly grey qzte c̄ rare interbedded grey-green shale, bedding 20° to LCA. Anastomose qtz-sid vnlts cut qzte, generally 40-50° to LCA, avge density 20-25/m, locally 40/m+. Qtz-pinite-sid-py stringers at 5-15° to LCA, rarely c̄ sph and trace ga. Locally brecciated c̄ infilling qtz-chl-py ± sph ± ga and local occurrences of cpy; py dominant sulphide.*

98.7-105.25 *Grey qzte cut by abundant irregular stringers and vnlts of qtz-py, sid-pinite-py and sid-mag-pinite-py. Vnlt density v. high, generally 40/m+; anastomose vnlts; two dominant vnlt directions: fine qtz-sid± py vnlts 50-70° to LCA, py-qtz vnlts 20-40° to LCA. Irregular stringers of py-qtz-sid, 1-5mm, parallel to sub-parallel to core axis (0-15° to LCA). Occasional mag-pinite-sid vns (4-8mm), 65° ∢ to LCA; these apparently post-date qtz-py-sid vnlts. In general, however, vnlt timing relationships are unclear. Total S^{2-} is approx 5-10% however below 102.7m (102.7 - 105.2m), S^{2-} auges <1%. Py only sulphide definitely observed, trace ga?*

105.25-109.3 *Interbedded sh/slt/qzte; qzte dominant at top of interval, decreasing to shale dominant; locally brecciated and bedding occasionally lensoidal however flame structures and sole marks indicate uphole younging; bedding angle to core axis is 45° increasing to 70° c depth. Abdt qtz-sid vnlts, 1-3mm, 40 to 70° angle to LCA, where qzte-shale locally brecciated, these vnlts infill carrying sph and ga. Local qtz-chl, or chl vnlts and stringers, generally low in abundance, at low ang to core axis, 5-10° rarely 20°+; generally barren although trace py or sph/ga observed. Incipient carbonate alt^{n} in qzte. 1-1½cm vn of qtz-pinite-sid-ga-sph at 108.65m, 55° to LCA. Pinite becoming more obvious in vnlts below approx 106.7m, especially in mineralized vnlts and stringers. No magnetite detected; total S^{2-} low, ½-1%; sph:ga 1:1 to 2:1.*

109.3-122.5 *Mainly grey qzte, locally interbedded c shale dark grey slt; shale/slt units commonly deformed (slumping?) and locally brecciated; facings indicate uphole younging; bedding erractic between 40 and 50° to LCA, Minor incipient carbonate alteration of qzte, also sparse disseminated py in qzte. Network of qtz-sid or sid vnlts, <1-2mm, generally 30-50° to core axis - sub-parallel to bedding surfaces. Abdt stringers 5-30° to LCA, 2-8mm, of qtz-chl-pinite-sph-ga-py, usually irregularly dispersed, mineralization commonly restricted to vnlts in qzte beds - vnlts at their widest, sph:ga:py≈20:5:1; best minlzn tends to occur in areas of slumping and/or brecciation. Pinite common in vnlts in this interval, magnetite-pinite-sid-qtz-py-sph-ga vnlts x cut core at 40° to core axis, vnlts-stringers of this type, 3-8mm wide. Magnetite occurrences are sporadic and patchy between 118.6 and 119.9m. Minor chl observed in vnlts below 120m especially in veinlets in shaley horizons. Long continuous fracture (fault?) parallel to LCA between 120.4 and 121.7m; minor brecciation associated, sph:ga mineralization in qtz-chl-carb filling at 120.5-120.6m and c py at 121.4-121.6m. Abdt sph, trace ga in qtz-chl vnlts, 10-20° to LCA. Mineralized vnlts (stringers) cut by later qtz-siderite vnlts ie at 122.2m, at angles of 30-35° to the core axis. Small fault? between 122.3-122.7m. Total sulphides moderately high, up to 10% - mainly sph c minor ga (sph:ga≈5:1) and trace py, best mineralization observed this far. Sporadic magnetite occurrences.*

122.5-124.9 *Interbedded grey-brown shale/qzte; shale dominant at top, qzte dominate at base of interval. Bedding angle to LCA is approx 20-30°, erratic bedding surfaces poss due to slumping. Carbonate disseminated throughout qzte and shale matrices, sporadic py xstal, 1-3mm, in qzte. Sporadic (low density) vnlts and stringers of qtz-chl±sid, 20-40° to LCA, <1-2mm. V. minor localized occurrences of sph-ga-py in stringers, sub-parallel to core axis. Locally brecciated, particularly in qzte between 124.3 to 124.9m; anastomising qtz-sid and qtz-chl vnlts and stringers, sometimes sulphide bearing; generally 40° to LCA, rarely 60°+. Sph-ga (sph:ga 20:1 to 10:1) scattered along vnlts; two large, 4-7mm, qtz-sid vnlts post dating brecciation, cut core at 124.75 and 124.8m. No magnetite detected, v. low total S^{2-}.*

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124.9-129.0 *Grey to pale brown qzte cut by anastomising qtz-chl and qtz-sid vnlts; qtz-chl vnlts, <1-1.5mm, 30-50° to LCA, also as irregular stringers at low angles to LCA (5-15°), qtz-sid vnlts, ≈1mm, 50-60° to LCA and post date qtz-chl vnlts and stringers. Carbonate present in qzte matrix. Minor sph:ga mineralization in qtz-sid-pinite stringers, 20-30° to LCA; sph:ga 2:1 to 1:2. v. low total sulphide and no magnetite detected.*

129.0-133.1 *Grey qzte c̄ minor 5-20cm grey sh interbeds; bedding 45° to LCA, uphole facing. Most bedding surfaces irregular implying some soft sed deformation. 1-3mm py xstals sporadically scattered throughout qzte. Core cut by numerous 20-30/m qtz vnlts, occasionally fractured, 40-50° to LCA. Qtz vnlts cuty by qtz-chl stringers, 10-20° to LCA, rarely 40°+, in turn post dated by qtz-sid vnlts, 1-2mm, 60-80° to LCA. Sph-py mineralization restricted to the qtz-chl±sid stringers; sph:py 5:1 c̄ trace ga and po. v. low sulphide in interval; no magnetite detected.*

133.1-135.1 *Interbedded dark grey sh/slst/qzte - shale dominant, graded bedding indicates younging uphole; bedding angle to core axis is 35-50°; qtz-sid vnlts parallel and sub-parallel to bedding, 10-20/m, rarely offset by fractures. Occasional qtz-chl-sid vnlts, 1mm, parallel to bedding surfaces. Some vnlts, 10-20° to LCA, truncated and/or offset at qzte/sh bedding surface, implying movement along surfaces. Qtz-py vns, 3-7mm, at 133.3 and 134.1m, c̄ sid selvidges. V. sporadic occurrences of sph or ga along thin qtz-chl stringers, 20-30° to LCA, v. low S^{2-}, no magnetite detected.*

135.1-143.3 *Interbedded qzte/sh/slst, locally brecciated and/or slumped. Bedding varies between 30-50° to LCA, facings imply uphole younging. Abdt fracturing and veining especially in qzte beds. Thin qtz vnlts, <1-2mm, 30-60° to LCA, anastomose in places, 20-50/m+, x fractured and offset by later qtz-sid vnlts, 50-70° to LCA, and qtz-chl vnlts and stringers, 30-50° to LCA. Sparse disseminated euhedral py xstals, 1-2mm, in qzte sph-ga mineralization in qtz-sid±chl and trace py vnlts; sph-ga content v. low. Po becoming more frequent in the irregular qtz stringers, rarely c trace ga. In general total sph:ga:po≈2:1:2 but varies locally from 5:1:0 to 0:0:1. Total S^{2-} content ≤0.5%, no magnetite detected.*

143.3-149.9 *Brecciated qzte c̄ v. minor sh/slst interbeds, also brecciated; angular to sub-rounded qzte fragments in a commonly shaley, chlitic matrix. Breccia infilling comprises mainly chl and/or pinite c̄ minor sid-qtz± magnetite, or po, + py, S^{2-} content generally low. Local development of small S^{2-} rich patches of sph-ga-py or po, sph:ga:py 2:1:5. In severely fractured areas, anastomising qtz-sid-pinite vnlts c̄ varying angles to LCA (10-80°) x cut core often c̄ po, avging 10%, rarely 90%, of vnlt. Local preferential development of qtz-sid vnlts parallel or sub-parallel to LCA. Mineralization sporadic but may auger up to 3% of core interval, minor magnetite detected. Interval possesses two main areas of brecciation 143.3-145.3m and 147.6-150.1m. A 1-2cm wide barren qtz-sid vnlt at 148.9m, 75° to LCA and itself fractured and offset.*

149.9-160.0 *Grey qzte c̄ minor chl alteration, and one shaley interbeded, 15cm at 153.1m. The qzte is cut by numerous qtz-chl or chl stringers and vnlts at 10-30° to core axis, rarely 40°+, larger stringers sub-parallel to LCA, comprise pinite qtz c̄ minor chl and po; po occurrences sporadic although frequent in irregular siringers and patches i.e. at 156.2m. Occasional, 4-8mm, qtz-pinite-py±sid vnlts c̄ rare po and cpy (at 159.7m), 25-30° to LCA. One pinite-sid-qtz-mag-ga vn at 155.55m. Minor carbonate in qzte matrix. Magnetite only detected in one vein; total sulphide*

<1-2%, mainly po c trace ga, sph and cpy. Vnlt density low, <25/m, rarely 40+/m. Occasional qtz-sid-py vnlts, 1-1½mm, at 70-80° to LCA.

160.0-167.65 Grey qzte c incipient CO_3^{2-} alt^n in matrix; cut by 1-4mm qtz, qtz-chl or qtz-po vnlts, 20-40° to LCA, these vnlts fractured and offset by later chl or chl-po vnlts, 1-2mm, 20-30° to LCA, rarely containing pinite and/or siderite, po up to 80% in some vnlts, generally 10-20%. Wide irregular pinite - magnetite - siderite - qtz vns, 10-40° to LCA carry sph-ga-cpy mineralization (sph:ga:cpy≈5:3:1), sometimes 30% of vein mtl, rare po adjacent to vn-stringer but not in the vein. Local development of irregular pinite-qtz-po±ga±cpy stringers, at 10-20° to LCA; trace sph associated. Total sulphides in core interval 3-4%, with locally rich 10-20% S^{2-} areas. Vnlt paragenesis:qtz±po vnlts post-dated by pinite-qtz-po and chl-qtz vnlts, in turn post dated by occasional qtz-siderite-py vnlts, 1-2mm, at 70-80° to LCA.

167.65-178.0 Grey qzte c rare disseminated py xstals and incipient carbonate altn of matrix. Qzte cut by anastomosed vnlts and stringers of qtz, qtz-sph, qtz-po, po and qtz-sid. Dominant orientations:vnlts 40-50° to LCA, 20-50+/m, and stringers 0-20° to LCA, 5-10+/m. Po dominant sulphide, varying from 10-90% in vnlts, avging 30-40%, minor sph and/or ga commonly associated, po:sph≈v. high, sph:ga≈1:1 to 2:1, trace py also in vnlts and stringers. Qzte locally brecciated, c qtz-po-sid-chl matrix±py±cpy. Chl and/or pinite generally only occurring in breccias. One, 3cm, pinite-mag-sph-ga-cpy vn at 176.5m, 30° to LCA, sph:ga:cpy≈ × 10:5:1. 1-2mm qtz-sid±py vnlts, 60° to LCA, post-date po bearing vnlts and stringers. Magnetite only detected in one vein; total sulphides ~5-10%, locally 15%, mainly po.

178.0-184.2 Locally brecciated qzte-sh/slst interbeds, qzte dominant, angular to subrounded qzte fragments intermixed c shale fragments, c a po-cpy infilling, po:cpy 20:1. In non-brecciated areas a network of po-cpy, qtz-po and po-sph-cpy vnlts and stringers exists, vnlt density often >80/m. Qtz vnlts, 45-60° to LCA, predate po mineralization. Dominant po vnlt orientation is 30-40° to core axis. Sph more obvious in larger areas of po especially in zones of brecciation, po:sph≈5:1 to 10:1. Po mineralization cuty by qtz-sid vnlt, 70° to LCA. No magnetite detected; total sulphides ≈15-20%, locally 40%, c sph+ga+cpy ≤1%.

184.2-185.3 Disrupted and deformed sh/slst/qzte interbeds, bedding at 40-60°(??) to LCA, uphole younging. Irregular development of stringers and vnlts, mainly sub-parallel to core axis, filled c qtz-po±cpy. Minor siderite in vnlts and disseminated throughout silty units. Locally rich py bearing vns. Mineralization appears to post date deformation of interbeds and predates qtz-siderite vnlts, 60-80° to LCA. No magnetite detected; low total S^{2-} ~1%. Dominant fracture orientation, 5-15° to LCA, c minor vnlts parallel and sub-parallel to bedding.

185.3-193.55 Grey qzte c interbedded slst grading into shale, locally slumped and brecciated. Facings indicate younging uphole (ie flame structures at 191.1m). Euhedral py disseminated through qzte. Bedding angle to LCA is 50° at 187.7m; 85° at 188.5, 75° at 190.75, 60° at 193.5m. Qtz-po vnlts at 20-35° to LCA, 10-20/m; sporadic occurrences of sph c the po, sph:po~1:10. Sulphide mineralization occurs mainly as irregular, angular patches in areas of irregular veining and/or brecciation, Po dominant S^{2-} c minor cpy, sph and trace ga, commonly associated c a qtz±chl±sid. gangue assemblage; minor py in some areas; no magnetite detected. Total sulphides generally <1-2%, up to 50-60% in breccias. Mineralization post dated by thin 1-2mm qtz-siderite vnlts at high angles (60-70°) to core axis.

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193.55-198.5 *Interbedded sh/slst/qzte c̄ sparse disseminated py xstals. Bedding varies between 50-80° to LCA, due to severe deformation - both soft sed "bending" and fracturing. Discontinuous po-qtz-cpy stringers trend at 45-60° to LCA, parallel and perpendicular to bedding, most mineralization occurs in angular disrupted patches of qzte, less commonly in shaley horizons. Large, 1cm, vn of po-cpy c̄ qzte fragments at 194.7m, at 70° to core axis. No magnetite detected. Total sulphides, mainly po c̄ minor cpy and py, ≈5-10%. Fine carbonate disseminated in sediments.*

198.5-201.4 *Grey qzte c̄ v. minor shale interbeds, bedding 70° to LCA, facings indicate uphole younging. Fine carbonate throughout qzte and shale matrix. Generally low density veining, 5-15/m, rarely 40+/m, po-qtz± cpy vnlts, occasionally anastomose, 30-50° to LCA, rarely 70°+. Po predominant, also trace sph, py and rare chl in vnlts. Locally brecciated and cut by thin, <1mm, qtz-sid vnlts, at 60-70° to LCA. Total S^{2-} between 2-5%; no magnetite detected.*

201.4-201.6 *Green shale, bedding contact c̄ overlying qzte is at 30° to LCA. Po-chl vnlts at 20-30° cut shale, minor cpy in vnlts; irregular discontinuous vertical (parallel to LCA) stringers of po. No magnetite detected; total sulphides approximately 2-4%.*

201.6 *End of hole.*