

A Placer Gold Investigation at Tangier, Nova Scotia

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Introduction

In the summer of 2003 an excavator levelling a hillside exposed an adit in till approximately 300 m south of the former mine workings at Tangier (NTS 11D/15; Fig. 1). This adit (Fig. 2), unsupported by timber, provides ingress to overburden that is very hard and well cemented. The sinuous tunnel was measured to be 53 m long. It exists at a till contact between 'drumlin-like' hybrid till and moraine, and an older till (Stea *et al.*, this volume, p. 101-115). It may not be the first such adit discovered in the area.

The indication that placer gold may have been mined in the Tangier vicinity led to an investigation by the Nova Scotia Department of Natural Resources in the 2004 field season, to sample till in the immediate vicinity of the adit and buried fluvial bar material close to the adit, as well as between the adit and the known lode-gold ore zone, to determine the status of these media as possible sources of placer gold.

Surficial Geology

Deposits of glacial till generally overlie the gold-bearing, Cambro-Ordovician Meguma Group strata. Gold and other minerals, enriched in arsenic, copper, lead, zinc, tungsten, bismuth, tellurium and iron, commonly characterize the bedrock mineralogy of these Nova Scotia gold districts (Kontak and Smith, 1993). Minerals such as these are commonly concentrated in surficial materials mechanically dispersed down-ice from known mineralized zones (Coker *et al.*, 1988). Dispersal distances vary in Nova Scotia from hundreds of metres to several kilometres down-ice from source (Stea and Finck, 2001).

History of Placer Mining at Tangier (from O'Reilly *et al.*, 2004)

Tangier was one of the most prolific, successful gold districts in Nova Scotia. It remains one of the province's best bets for underground development today. Coxheath Gold Holdings Ltd. drifted 5 km of tunnels and declines under the hill northwest and northeast of Copper Lake in the late 1980s, which corresponds to the hinge of the local Tangier anticline.

Tangier is the place primarily responsible for the first great Nova Scotian gold rush, as gold was first discovered here in commercial quantity when Peter Mason, a local farmer and part-time sea captain, stopped in 1861 to water some beasts of burden in a local stream and discovered yellow metal in the stream bed. This discovery was described in a letter by Joseph Howe to the Earl of Mulgrave and led to the development of the mining recorder's office and a Department of Mines (J. Howe, 1861). The discovery was described in Joseph Howe's letter as being in Tangier River. However, Tangier River is approximately 500 m east of this location. Conversations with local persons who are distant relatives of Peter Mason place the actual location of the discovery in a small stream running north of Rush Lake.

Placer deposition has been documented in this area in the past. In 1863, Copper Lake (Fig. 1) was drained completely and placer nuggets were mined on the bottom of the lake bed (Nova Scotia Department of Natural Resources, 1865). Malcolm (1921) described the largest placer nugget ever recovered in Nova Scotia to have been found, "in the vicinity of Rush Lake." This placer nugget was described to have weighed almost two pounds.

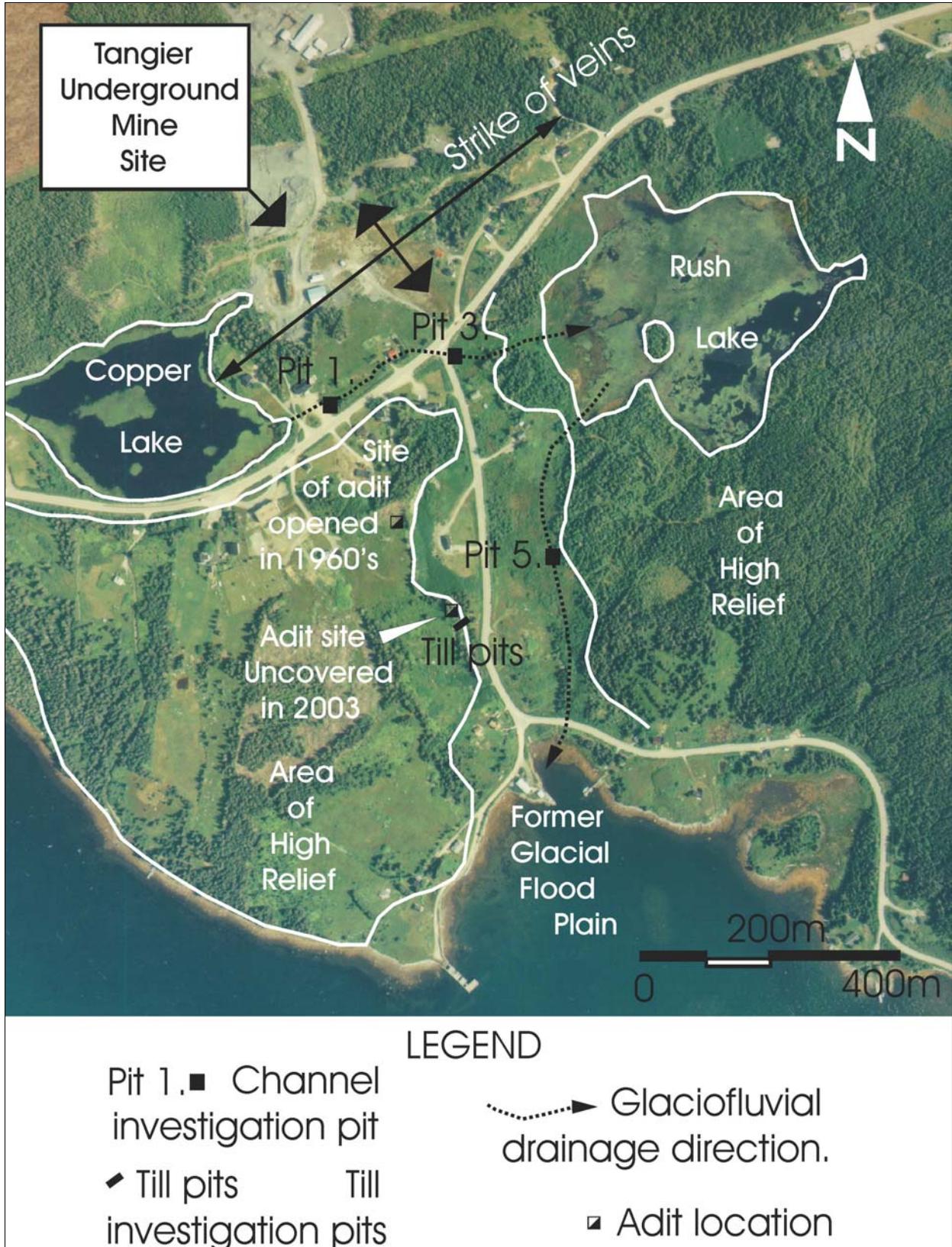


Figure 1. Air photo of the Tangier site, with labels to show features of interest.



Figure 2. Photograph of the adit discovered during excavation in 2003.

Little is documented about these early placer discoveries in the Tangier vicinity. At the time, the newly created Department of Mines, and the royalties due to be paid to the same, probably contributed to a lack of reporting on the part of many of these early miners. There was no other known placer development history for the Tangier area until the 2003 adit discovery.

Local landowner Graeme Cooper described what may have been a second adit only a few tens of metres north of this location. This other adit was opened in the 1960s and was quickly re-buried.

Methodology

Five pits were dug as close to bedrock as possible, in some cases to bedrock, at sites that followed the direction of glacio-fluvial drainage south of the former Tangier mine site. This included two pits

between Copper Lake and Rush Lake, and a third pit downstream from the Rush Lake outflow to investigate fluvial channel and bar material for gold content (Fig. 1). Material from two of the pits, pit 1 and pit 5, was sluiced as part of the 2004 field program. These two pits, together with pits investigating tills overlying these deposits, form a continuous section from bedrock to the soil horizon, and form a rectangle approximately 500 m long and 200 m wide, oriented north-south from the southern extremity of the Tangier hard-rock ore zone in the north (pit 1 - Hall; pit 3 - John Towill property), to the newly discovered placer adit in the southwest corner (Cooper property till excavation), and the vicinity of interpreted glacio-fluvial egress from Rush Lake toward Tangier Harbour (pit 5 - Horgan Property). Two other pits were dug and sampled (pits 2 and 4) but those samples were not investigated as part of the 2004 field program.

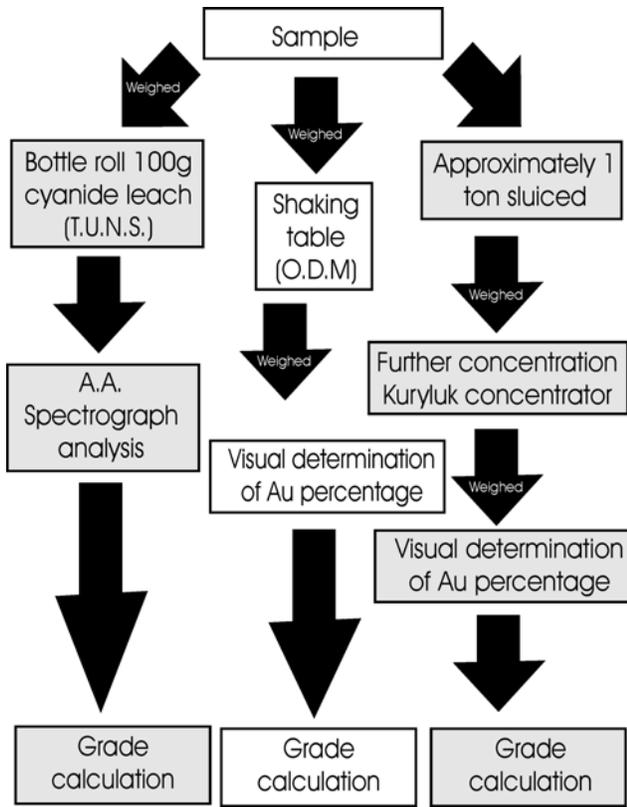


Figure 3. Flow chart showing the methods of sample processing used in this study.

A flow chart is presented in Figure 3 to outline sample processing methods. The (channel investigation) pits were profiled by the excavator, by laying the section out in piles as the excavator dug deeper. The geology of the section was recorded during this exercise. Piles from the excavation were put through a ‘long tom’ sluice, 0.35 m wide with a ten foot run, which was set up with a rise to run of approximately 1%. The sluice had no riffles, but consisted of a bed of 2 cm aluminum expanded metal over ‘v’ ribbed rubber matting. This was used to produce a concentrate from approximately 1.0 m³ of material taken from the pit profiles, starting at the bottom, as close to bedrock as possible. Measurements for sluice input were taken using the excavator bucket, which was 1.25 m³.

Concentrates were visually examined on site. They were then weighed and further concentrated in Sackville, Nova Scotia, by Kuryluk Enterprises. These were visually examined for gold content and weighed for grade calculation per m³ by weight. Raw (unconcentrated) samples were also sent to Overburden Drilling Management in Ottawa, Ontario, for visual analysis and assay to compare to calculated grades. Analyses were done at the

Table 1. Results from analysis of heavy mineral concentrates (HMC).

	Bulk Input kg	HMC weight (grams)	grams HMC/ton	Au analysis (ppm)**	g Au/ton	*\$13.69 US	ore (>\$3 ton)
T1-1Hall_Till (-60+100)	95.2	2.076	21.81	1999	0.04359	\$.596 ton	sub-ore grade
T1-1Hall_Till (-20+60)	1250 estimate	11.925	9.54	4579	0.0436	\$.596 ton	sub-ore grade
Tan_Horgan (-20+60)	1000 estimate	5.561	5.561	944	0.0052	\$.07 ton	sub-ore grade
Tan_Cooper adit_profile	40.2	7.757	192.96	2424	0.4677	\$6.40 ton	ore grade

*Gold valued at \$13.69 US per gram (\$425.80 US per ounce).

**Analyses by Minerals Engineering Center - Dalhousie University.

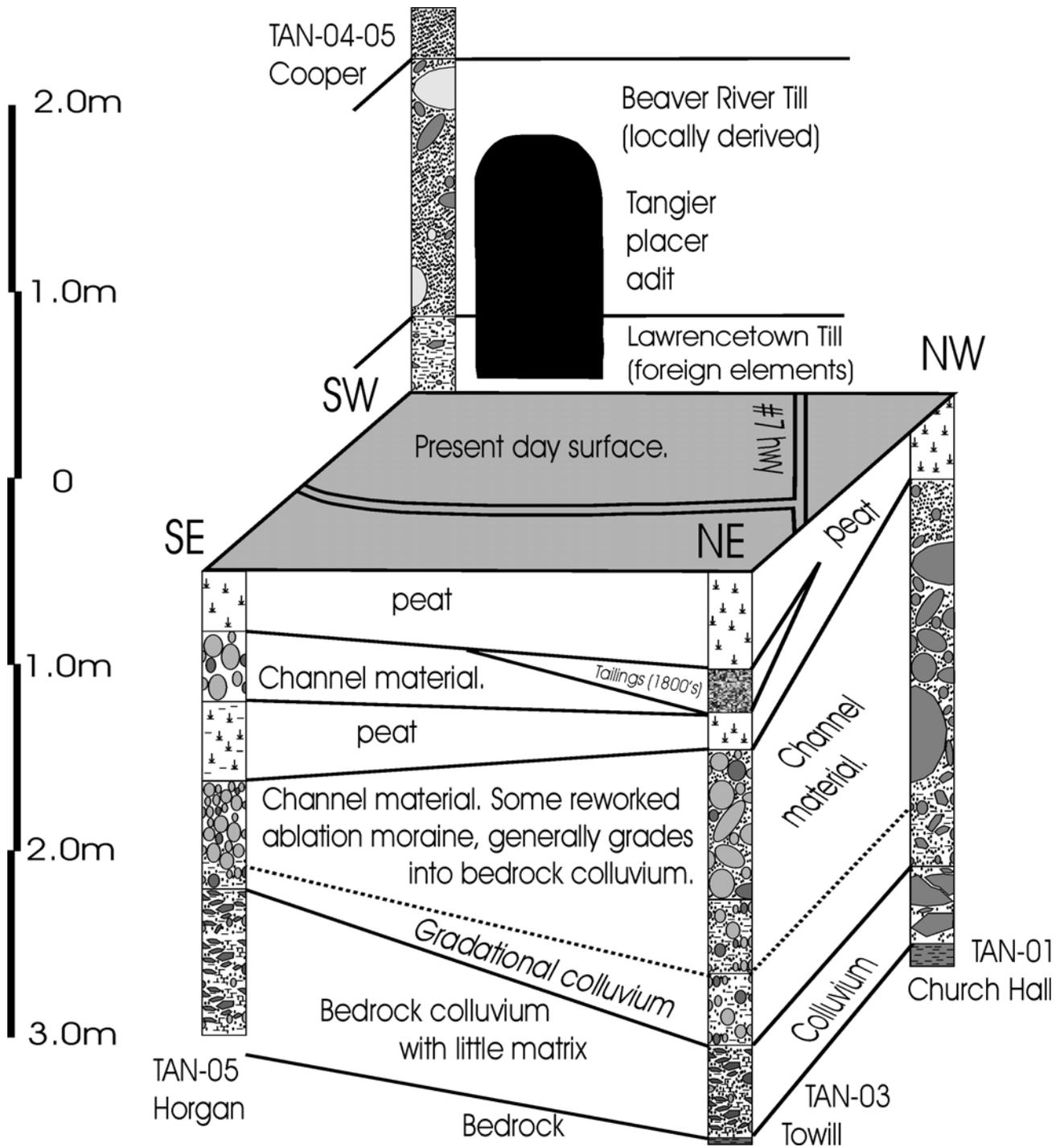


Figure 4. Correlation diagram of surficial deposits revealed in the three till investigation pits, and in the till section where the adit is located.

Dalhousie University Minerals Engineering Centre by atomic adsorption spectroscopy, after a dissolution by cyanide leach.

Results

The sluicing runs for samples taken from the pits revealed that braided stream, channel and bar material did not contain gold in any quantity that would make them candidates for placer development (Table 1).

Sections

The channel sections are all buried beneath a modern peat layer (Fig. 4). When this top layer was removed in pit number TAN-03 it revealed a layer of 1860s- to 1880s-vintage tailings overlying an older peat layer. Under this layer is a sequence of braided to meandering bar material. This sediment consists mainly of poorly sorted, sub-rounded to well rounded clasts, from sand and small gravel size to large boulders the size of pianos. This part of the section was usually marked at the top by what may be interpreted as ablation material, consisting of a framework of predominantly large rounded boulders without much matrix. The framework is composed of almost entirely Goldenville Formation meta-psammite (greywacke) but a few granitoid clasts are present, as well as rare foreign clasts consisting of well rounded, very hard volcanics, presumed to be derived from the Antigonish Highlands. The stratigraphy in TAN-03 is essentially repeated in hole TAN-05 (Horgan property), with minor differences.

The section at the Church Hall (TAN-01) consisted of a peaty layer over a thick layer of very large ablation boulders (up to piano size) grading into colluvium boulders with very little matrix, which graded into a broken colluvium to local (slatey coloured) till, hybrid toward the bottom.

Samples taken from the Cooper property are discussed in detail by Stea *et al.* (this volume, p. 101-115).

Discussion

Development close to the stream between Copper Lake and Rush Lake, both residential and from past

mining, has filled much of the original stream bed with broken muck and tailings. Underlying this, however, is very coarse angular colluvium mixed with till down to bedrock. Quartz clasts from known gold-bearing quartz veins are commonly found closer to bedrock.

The channel bar material samples did not return gold. This could be due to a number of circumstances, including the following. (1) The sluice was set up at a relatively aggressive angle. Sluices are operator dependant, and the sluicing performed in this case was by relatively inexperienced operators, new to the task. (2) The till in pits TAN-01, TAN-03 and TAN-05 were Meguma-derived tills, but pits were caving in wet ground so little of the material returned by the excavator was very locally derived bedrock material, close to the bedrock-overburden interface. The sample sizes at the deepest parts of the pits were too small to return reliable results. (3) It is possible there is no coarse gold in the channel bar material.

The till section on the Cooper property returned anomalous gold concentrations in excess of ore-grade levels.

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