

WILLOW CREEK FLACER - MARSHAL DISTRICT

by

R.M. Retherford

for

Calista Corporation, Land Department

November, 1987

Table of Contents

- I. Introduction
- II. Important Conclusions
- III. Location and Access
- IV. General Features
- V. History
- VI. Production
- VII. Field Program
- VIII. Conclusions
- IX. Recommendations
- X. Bibliography

Figures

- 1. Mineral Occurrence Map of the Lower Yukon Region
- 2. Sketch Map of Willow Creek Placer Mine, Marshal Alaska
- 3. Willow Creek Tailings Map
- 4. Willow Creek Sample Locations
- 5. Mining Style and Favorable Area Map of Willow Creek

Table

Table 1. Willow Creek Placer Sample Data

Introduction

Willow Creek, near the town of Marshal on the Yukon River, has produced over 85,000 ounces of gold at grades averaging .049 oz./yard. There is good evidence that large additional reserves exist downstream of the previously mined ground. The Willow Creek drainage also contains significant amounts of gold within the tailings of the previously mined valley. The following summarizes past mining activity and reports on field investigations completed by Calista during the 1987 season.

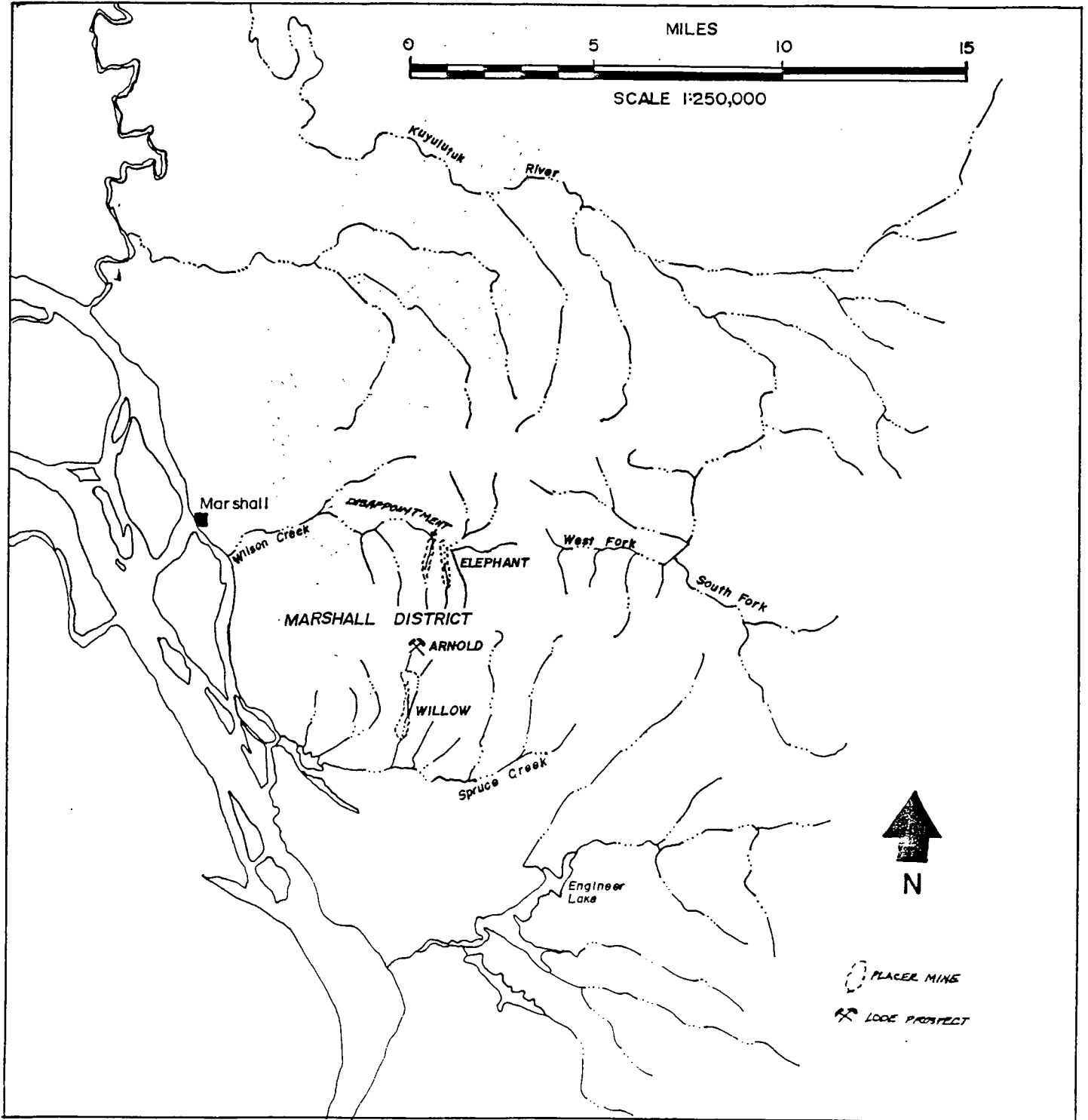
Important Conclusions

Potential reserve yardage in virgin ground is great. Conservatively at least 2-3 million yards of gold bearing gravels at depths of from 25 to 45 feet are very likely. Evidence from past mining suggests that grades within this block could range from a lower value of .015 oz./yard to a not unlikely upper value of .03 oz./yd. (or from 20-90,000 ounces of gold total). In addition, field work in 1987 indicates that 2-3,000 ounces of gold exist in tailings and "overburden" with recoverable concentrations of gold ranging from 0.005 to 0.01 oz./yard. A drilling program is recommended for the virgin ground reserves as well as some additional testing of the tailings and overburden.

Location and Access

The Willow Creek placer is located about 175 miles upstream from the mouth of the Yukon River and about 12 miles southeast of the town of Marshal (Fig. 1). Marshal, a town of about 500 inhabitants, has a 2500 foot airstrip with regularly scheduled flights, a post office, telephone system and a thriving fishing industry with innumerable watercraft. Willow Creek itself lies on the south flank of a low range of east-west trending mountains capped by Mt. Okumiak (1565 Ft.). About 5 miles of single lane dirt road connect the former mining camp at Willow Creek with The Landing, a boat and barge accessible landing on a slough of the Yukon River; from this point it is approximately 7 miles downriver to Marshal.

Figure 1
Mineral Occurrence Map
of the
Lower Yukon River Region



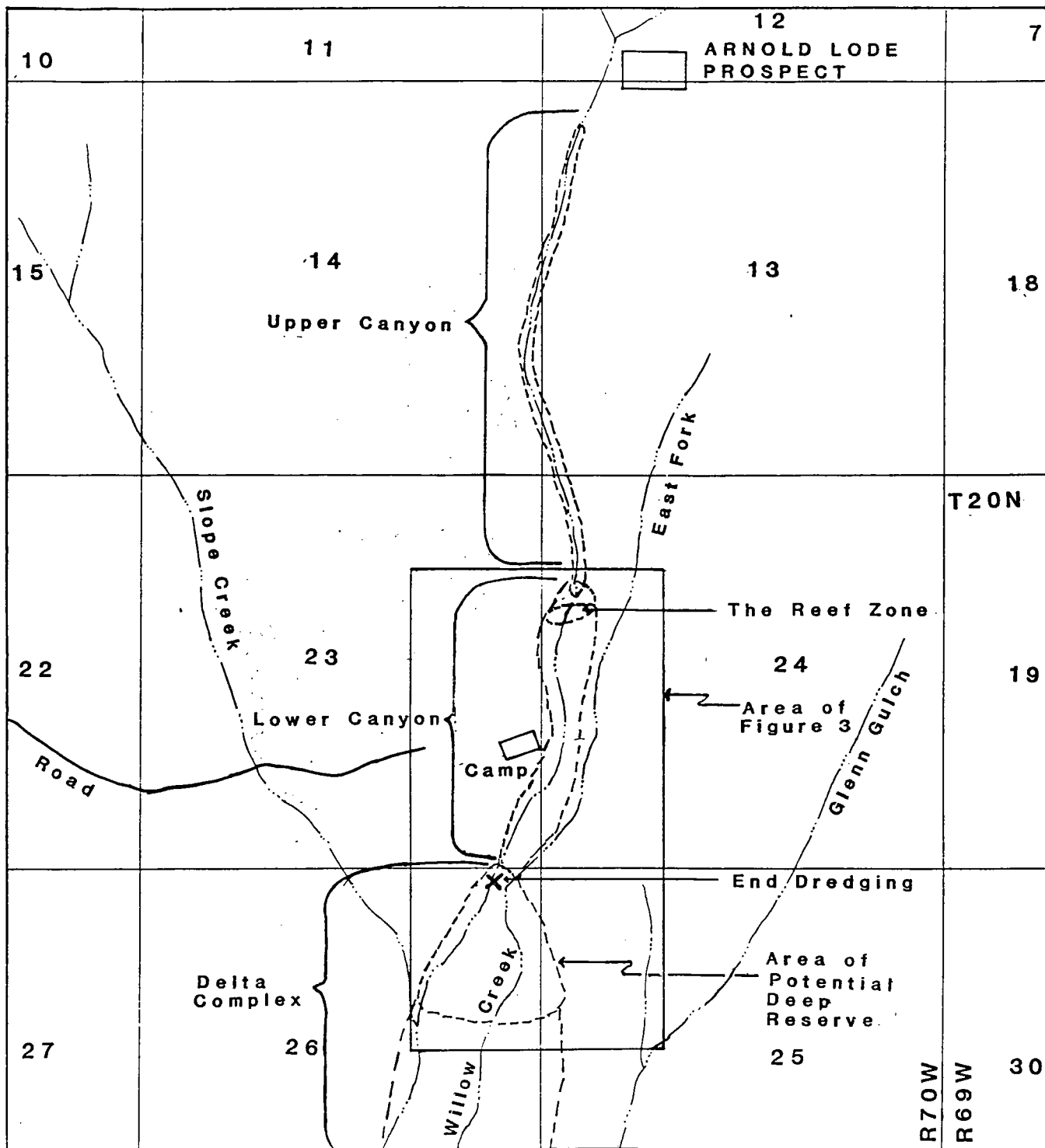
General Features

The drainage of Willow Creek may be divided into three characteristic geomorphic units (Fig. 2). The *upper canyon* area is a steep walled, narrow valley with alluvial fill ranging in depth from 5-15 feet. This section runs about one mile from the Arnold lode prospect (Elev.=1000') near the divide into Disappointment Creek, to the mouth of the canyon just above the Discovery claim (Elev.=450'). The *lower canyon* runs about 3500 feet from the Discovery claim downstream to about 2000 feet below the Willow Creek camp (Elev.= 200'). This portion of the drainage is characterized by a gradually broadening flood plain, rapidly decreasing stream gradient, less restrictive valley walls and rapidly increasing alluvial fill ranging from 15-35 feet in depth. At the bottom of the lower canyon, Willow Creek joins with East Fork and other minor tributaries and then begins to diverge into a birdsfoot deltaic complex. From here, downstream for about a mile, the drainage can be designated as the *delta complex*. The alluvial depth begins at 35 feet and probably increases very gradually downstream.

Although the upper canyon was worked extensively, especially in the early years, the lower canyon has been the big producer over the years. In its middle portions, the lower canyon stratigraphy may be generalized as follows; 15 feet of overburden with moderate to low gold values, a thin zone of clay "hardpan", and 15 feet of bouldery clayey pay zone. In general, placer gold values in the upper canyon and in the upper part of the lower canyon were found on bedrock whereas downstream the values tended to be scattered more equally throughout the lower pay zone and not on bedrock. Near the top of the lower canyon, a shallow bedrock zone crosses the creek locally known as the Reef. Here, a good deal of coarse gold was found beneath large boulders and in the bedrock fractures. The alluvium in the lower canyon and delta complex is composed primarily of greenstone with minor amounts of slate and graywacke. In the upper canyon and upper parts of the lower canyon, the alluvium also contains significant amounts of the albite rhyolites and dacites (referred to by Harrington as "soda granite") which occur at the head of the upper canyon.

History

In 1913, gold was found on Wilson Creek to the north and just across the divide from Willow Creek. Following a rush into this area, some claims were staked on upper Willow Creek but it was not until 1914, that gold



Sketch Map of Willow Creek Placer Mine
Marshall, Alaska

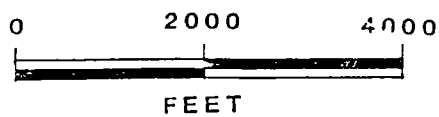


FIGURE 2

was discovered in paying quantities on Willow Creek itself. The first three valid claims staked were by W.C. and Ben Blanker and Robert Barr and were located at the mouth of the upper canyon and named Discovery, Bumblebee (No. 1 Below), and No. 2 Below. During the next few years Willow Creek production rapidly increased outstripping Wilson Creek's production quickly. The mining was all done by hand initially but soon slack-line scrapers were added and modified to work with the heavy boulders that were prevalent on Willow Creek. From observation of sloughed pits, from the activities shown in old photos, and local knowledge, many shafts were sunk along the lower reaches of Willow Creek, along adjacent tributaries and along the foot of the mountains both east and west of Willow Creek. We can presume that many of the shafts did not prove out, however, some of these shafts might have shown quite good values using today's methods and prices. The results of most of these early efforts however, are unfortunately gone forever. As ground was proven up on the lower creek, mechanized mining increased and the use of steam donkeys and ginpoles became common. This method and the modified slack-line or Bagley scrapers continued through at least the mid-twenties, as most of the upper Willow Creek drainage was worked and sections from the mouth of the upper canyon downward for about one-half mile were worked extensively. Somewhere in the mid to late twenties, activity on Willow Creek apparently slowed down. At least, there is very little historic information available.

Then, in about 1934, when the price of gold increased, two men, Lars Ostnes and Jim Johnson moved into Willow Creek bringing with them a walking dragline and eventually several kinds of bulldozers. Their work concentrated mostly on the section of the creek from the reef zone downstream of the main camp. As part of this operation, a specially designed open or sieve-like dragline bucket with grizzly bars was used. The suspended bucket filled with pay ground would be blasted with a hydraulic nozzle, allowing the fines, including the gold, to fall back to the ground in a stockpile area. The remaining rinsed boulders were then stacked. After completing a cut in virgin ground and thus classifying it, the fine material would be scooped up from its stockpile and fed into the washing plant. This method was probably employed by earlier mining efforts as there are many piles of these washed rocks on the old claims. Ostnes and Johnson continued working until about 1954.

The area known as the reef zone was worked over extensively in the 30's and 40's by a man named Crabtree. Here, shallow bedrock riffles had concentrated coarse gold. In earlier days, because of the large boulders

and pieces of fractured bedrock, the ground was considered too difficult to work and was passed over for more easily mined ground. Crabtree used a dragline/ginpole arrangement along with a lot of hand labor including crow bars to pick up individual rocks and stack them into an immense pile on the right limit of the reef zone. He mined successfully within this small area for many years. The operations during the thirties and forties, then, included Ostnes and Johnson's cat/dragline operation, Crabtree's dragline/ginpole, and a few smaller short lived operations such as Gene Tetineks Insley dragline on the Discovery claim which he used to rework some of the old tailings. In the early 1950's a man from the Kugarok District near Nome brought in a dry land dredge and operated for a few seasons. The dredging was apparently not highly successful as the dredge was sold within a few years to the Strandbergs for their operation at Candle near McGrath. Comments by Tetinek and Turner of Marshal suggest that the wash plant system on the dredge had a problem with both feed rate and adequate washing of the "clays" and thus may have had substantial losses. Since this attempt at dredging, only desultory sniping using small equipment has taken place. The above was taken in part from U.S.G.S. Bulletins 683 and 1374, and in part from discussions with Gene Tetinek and Don Turner both currently residing in Marshal and both formerly employed at various times with operations at Willow Creek as early as 1931.

Production

Approximately 85,000 ounces of gold were recovered through 1961, mostly from the mining activities described above. This figure (USGS Bull. 1374) recognizes that the bulk of the reported gold production of 120,000 ounces which was mined in the two districts, Anvik and Marshal, came from Marshal and of that amount 85-90% was derived from operations on Willow Creek itself. Using this number and dividing it by estimated total yardage mined at Willow Creek (1.7 Million yds.) we arrive at a grade of .049 oz./yd. This figure is, in part, confirmed by reported values from Willow Cr. in the late thirties of 80-90 cents/bf from ground averaging 12-15 ft in depth.

These figures indicate that in comparison to most placer ground in Alaska this was exceedingly rich ground. Tetinek and Turner of Marshal both agree that the ground did pay very well, and accept for generally poor mine planning, and the dual difficulties of a poor source of water and boulder-rich ground, the operations at Willow Creek would probably have

continued. Today, these problems would be considerably lessened by the scale and capacity of modern equipment and through well-designed tailings management and water recycle.

1987 Field Program

During late June of 1987, mapping and sampling of the Willow Creek drainage was carried out by B.D. Hickok and R.M. Retherford. Using air photo interpretation to support field work; a map of the mined and unmined deposits on Willow Creek was compiled. A walking tour of the area with Gene Tetinek was invaluable in helping unravel the various mine deposits and their ages. Eight sluice samples, taken mainly from tailings and overburden piles (one or one-half yard in size) were processed through a small vibrating screen sluice. In addition, several pan concentrates were taken in the upper canyon, in the lower portion of the lower canyon and in the upper part of the delta complex. The locations of these samples are shown on Figures 3 and 4 and the results of this testing are shown in Table 1. At \$450 gold, pay varied from a few cents up to \$26/yard, with average values of perhaps \$4-5/yard. By looking at the kind of deposits that paid well, a selective mining program could probably reprocess tailings and overburden at average values closer to \$6 or \$7/yard. An estimate of the potential of various kinds of deposits and an estimate of the total yardage available is shown on Figure 5.

Conclusions

Potential reserves at Willow Creek are of two types; 1.) values remaining in previously mined tailings and overburden, and 2.) values remaining in virgin ground. The first type represents a relatively small reserve generally on the surface in easily accessed piles and berms. To mine will probably require a small, very mobile plant to process the material efficiently. The second type represents a much more substantial reserve in generally deeper ground but with potentially much higher grades. Considering only the blocks as shown in Figure 5, the reserve in virgin ground could be on the order of 90,000 ounces. If the pay is limited to only a few small zones within the delta complex and is restricted to much lower grades than previously encountered, there is still room for 20,000 ounces of gold at economic grades. Below the block of virgin ground in the delta complex, there is also some potential for economically mineable gold.

WILLOW CREEK TAILINGS MAP

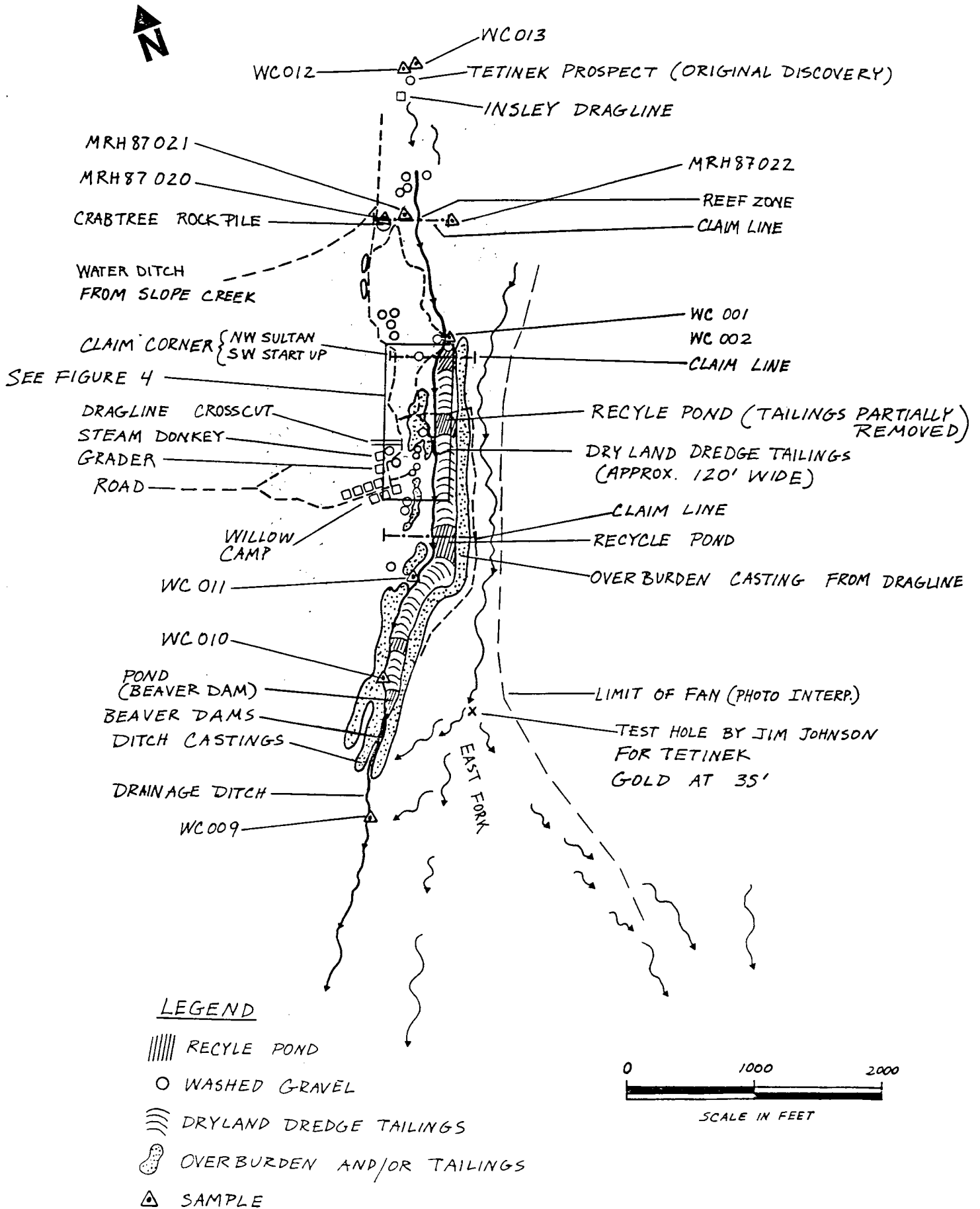
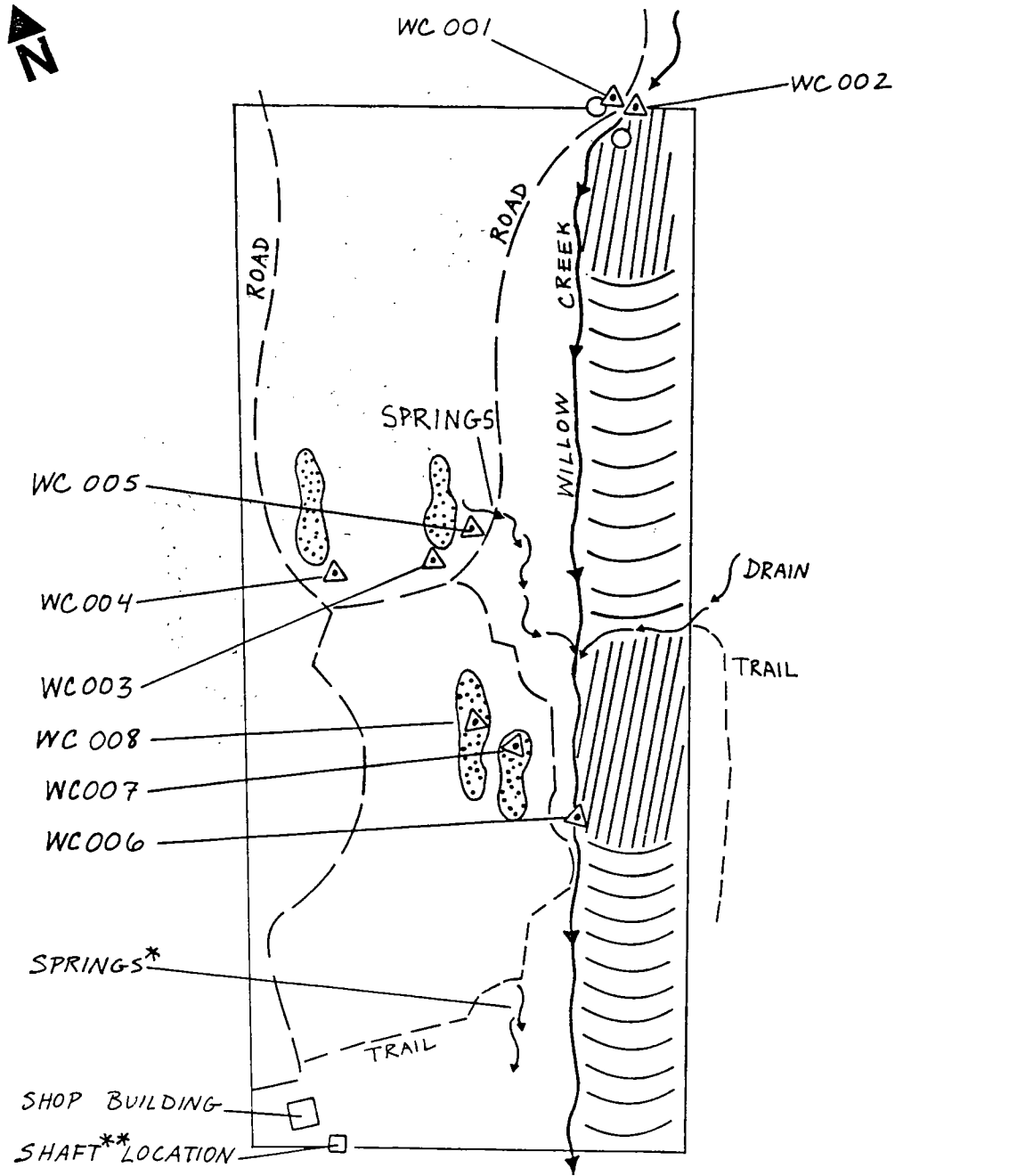
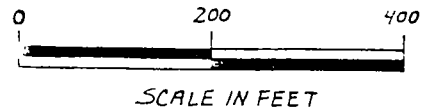


FIGURE 3

WILLOW CREEK SAMPLE LOCATIONS



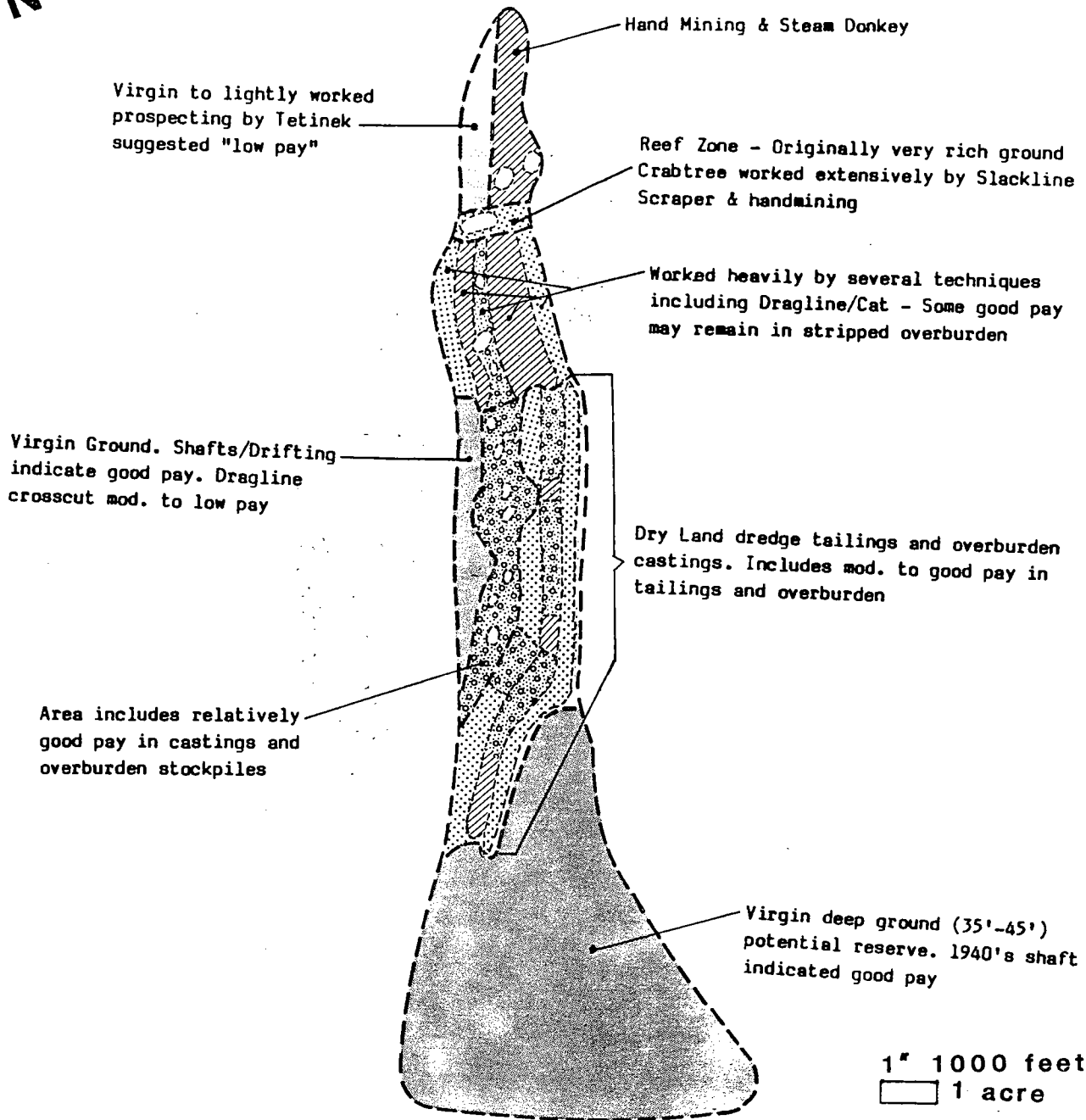
- * SPRINGS - NUGGETS FOUND IN CLAY ABOVE BEDROCK
- PAY ABOVE BEDROCK IN THE CEILING OF DRIFT
- ** SHAFT - BEDROCK RISES ABOVE CAMP
- DEPTH OF SHAFT 30'-35'
- BEDROCK MAY RISE BELOW
- GOLD FOUND



△ SAMPLE LOCATIONS

FIGURE 4

MINING STYLE AND FAVORABLE AREA MAP OF WILLOW CREEK



FAVORABLE AREAS






	<u>Description</u>	<u>Potential</u>	<u>Acres</u>	<u>Depth</u>	<u>Factor</u>	<u>Volume</u>	<u>Est. Grade (oz/yd.)</u>
	Tailings & Overburden	Good	15	15'	.6	218,00	.012
	Castings & Overburden	Good	14	10'	.8	168,000	.010
	SUBTOTAL					386,000	
	Low Value Tailings	Mod.	7	10'	.9	95,000	.008
	Washed Rock	Poor	-	-	-	0	
	Virgin Ground	Very Good	51	33'	1.0	2,715,000	.020

FIGURE 5

TABLE 1
WILLOW CREEK PLACER SAMPLE DATA

Sample *	Description	Colors	Pans	Bkts.	Yards	Mg. Au	Oz. Au	Oz./yd.	\$/yd.@400	\$/yd.@450	\$/yd@500
WC001	Dragline tails	12 #3, 70fs		33	0.97	9.50	0.0003	0.0003	0.13	0.14	0.16
WC002	Mod. alluvium	3 #3, 50fs		33	0.97	15.00	0.0005	0.0005	0.20	0.22	0.25
WC003	O.B./Fine tails	many #3		36	1.06	360.00	0.0116	0.0109	4.37	4.92	5.47
WC004	Fine tailings	2 #1, 10 #2, 15 #1		36	1.06	287.00	0.0092	0.0087	3.49	3.92	4.36
WC005	O.B./fine tails	12 #3, many fs		18	0.53	42.00	0.0014	0.0026	1.02	1.15	1.28
WC006	Dredge tails/bldrs	1 #1, 12 #2, #3, +		36	1.06	270.00	0.0087	0.0082	3.28	3.69	4.10
WC007	O.B.-strip	1 #1, 10 #2, 20 #3+		20	0.59	140.00	0.0045	0.0077	3.06	3.44	3.83
WC008	O.B.-strip	1 #1, 10 #2, 20 #3+		19	0.56	78.00	0.0025	0.0045	1.79	2.02	2.24
WC009	Mod. alluvium	11fs	5		0.03	0.00	0.0000	0.0000	0.00	0.00	0.00
WC010	Dredge tails	2fs	4		0.02	0.00	0.0000	0.0000	0.00	0.00	0.00
WC011	O.B./strip	7 #3, 30fs	4		0.02	11.40	0.0004	0.0165	6.60	7.42	8.25
WC012	4' into stream bot.	8 #3, 25fs	4		0.02	8.90	0.0003	0.0129	5.15	5.79	6.44
WC013	O.B./strip	1 #1, 1 #2, 12 #3,	6		0.03	61.40	0.0020	0.0592	23.69	26.65	29.61
WC013+		16hfs, 84fs									

* Pans = large 16" Buckets = 0.8 ft³

Recommendations

Potential reserves at Willow Creek are substantial enough to justify a additional testing of the tailings and overburden and more importantly the virgin ground. A drilling program should use reverse circulation methods preferably, and the drill itself should be of sufficient size to handle the boulder rich ground and equipped so that thawed, water saturated ground is not a problem. The budget should allow exploration of the entire block of virgin ground in the delta complex as well as the smaller blocks in the lower canyon area. Once the program is initiated, however, it should be flexible enough to move or break off entirely at critical decision points. The drilling pattern should be gridded with lines 4-500' apart and holes at 100' spacings. As information is gathered, the grid can be modified or filled in with more holes in the pay zones. An experienced placer geologist/mining engineer should direct the program to insure that sampling is neither biased nor uncontrolled and that a final report is prepared to detail the efforts of the program and to calculate the size and disposition of reserves.

Additional sampling should be also be carried out in the tailings and overburden preferably using large enough equipment to bulk sample or actually mine a portion of the different materials. Alternatively, additional sampling can be done with hand tools and a sluice as was carried out in 1987.

Bibliography

- Cobb, E.H., 1973, Placer Deposits of Alaska, U.S.G.S. Bull. 1374, p. 107-108 and 162.
- Harrington, 1918, The Anvik-Andreafski Region Alaska, U.S.G.S. Bull. 683 p. 60-62
- Hoare, J.M. and Coonrad, W.L., 1959, Geology of the Russian Mission Quadrangle, Alaska, U.S.G.S. Map I-292
- Tetinek, Eugene, 1985 and 1987, personal communications
- Turner, Don, 1985 and 1987, personal communications