

# COASTECH

## RESEARCH INC.

520730

869 WEST THIRD STREET, NORTH VANCOUVER, B.C. CANADA V7P 1E2

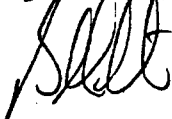
TELEPHONE: (604) 980-5992  
TELEX 04-352888

REPORT NO. I  
FOR  
TECK CORPORATION

ON  
PROJECT C.P.W.

PRELIMINARY CYANIDE AND FLOTATION TESTS

August 10, 1985

  
for Berte Wilson, Pres.  
Coastech Research Inc.

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ASSAY REPORTS

1.0 INTRODUCTION:

- 1.1 Five samples of crushed sample rejects were delivered to Coastech Research on 12 July 1985.
- 1.2 The project was designated "CPW" and our test number's are TCPW 785-1 to TCPW 785-8.
- 1.3 The five samples with assays supplied are shown below:

	oz/T Au
26061	0.10
26071	0.094
25507	0.171
26552	0.108
26550	0.062

- 1.4 An equal weighted composite was derived from the five samples for all of our tests.
- 1.5 Two of the samples had minor amounts of carbonaceous material, while the other three were coal black.
- 1.6 The ore ground to 88.2% minus 200 Mesh was screened on a 150 Mesh screen to find if sizing would show a variation in grade for the plus and minus 150 Mesh.

The following table indicates no significant grade difference between the fractions, but the calculated head grade is notably higher than the value given as average feed.

Screen Test:

	Wt %	oz/T Au	Units	Dist'n%
+150 Mesh	4.17	0.172	0.717	4.4
-150 Mesh	95.83	0.163	15.62	95.6
Calc Feed	100.	0.163	16.337	100.0
Average Feed		0.107		

- 1.7 Mr. C. Sibbald suggested that a series of exploratory tests should be conducted. Tests 1, 2, 3, and 6 were conducted to evaluate direct cyanidation and C.I.P. Test 4 employed flotation at natural ore pH of 8.2. Test 5 employed flotation at pH ranging from 3.2 to 3.5. Test 7 employed flotation with sulfidizing. The froth in test 7 was extremely voluminous and uncontrollable. No assays were specified because of the poor appearance. Test 8 was conducted at low pH. Cyanidation of the cleaned concentrate was included.

2.0 SUMMARY:

- 2.1 Direct cyanidation of the ore is unacceptable, at less than 0.2% recovery.
- 2.2 Carbon in pulp, at 80 Lbs/Ton, returned 45.8% recovery.
- 2.3 Flotation at the natural pH yeilds poor recovery and grade of concentrate.
- 2.4 Flotation at 3.3 pH returns a rougher concentrate of 0.97 oz/T Au with a recovery of 95.3% of the gold.
- 2.5 The best grade of flotation concentrate was 1.708 oz/T Au, at 68.2% Recovery.
- 2.6 Cyanidation of cleaned flotation concentrate returned 52.8% recovery of the concentrate. The third cleaner tailing contained a higher grade than the final concentrate and should have been included for cyanidation
- 2.7 The reagent consumption for acid and xanthate is high at 200 Lb/T  $H_2SO_4$  and 0.4 Lbs/T PAX.

3.0 RECOMMENDATIONS:

- 3.1 Additional testing is warranted based on the feed grade and preliminary flotation results. Optimization of the flotation step would probably follow conventional methods.
- 3.2 Sufficient concentrate should be produced to evaluate various alternatives for gold extraction from the concentrate.
- 3.3 Additional metallurgical information is required to valuate the marketability of the flotation concentrate as produced.

4.0 DETAILS OF TESTWORK:

CYANIDATION

- 4.1 Test 1 Grind 88.2% minus 200 Mesh  
NaCN Consumption 0.16 Lbs/T  
CaO Consumption 3.68 Lbs/T  
Reducing Power 70  
Agitation Time 4 Hours  
Calculated Head 0.114 oz/T Au  
Recovery in Preg 0.17%
- 4.2 Test 2 Grind 88.2% minus 200 Mesh  
NaCN Consumption 0.2 Lbs/T  
CaO Consumption 3.76 Lbs/T  
Reducing Power 80  
Agitation Time 24 Hours  
Calculated Head 0.117 oz/T Au  
Recovery in Preg 0.09%
- 4.3 Test 3 Grind 88.2% minus 200 Mesh - Carbon in Pulp  
NaCN Consumption 0.4 Lbs/T  
CaO Consumption 4.0 Lbs/T  
Charcoal 28 Lbs/T  
Reducing Power 50  
Calculated Head 0.147 oz/T Au  
Recovery in Barren Sol'n 0.05%  
Recovery in Charcoal 29.78%
- 4.4 Test 6 Grind 88.2% minus 200 Mesh - C.I.P.  
NaCN Consumption 0.4 Lbs/T  
CaO Consumption 3.9 Lbs/T  
Charcoal 80 Lbs/T  
Reducing Power 60  
Calculated Head 0.101 oz/T  
Recovery in Barren Sol'n 2.9%  
Recovery in Charcoal 45.8%

FLOTATION

4.5 Test 4

A 2000 gram sample was floated at the natural pH of 8.3 with Potassium Amyl Xanthate and Aero 241 and Dowfroth 250. Copper Sulfate was used in the scavenger stage plus additional collectors and frother. The total reagents were 0.35 Lbs/T PAX, 0.12 Lbs/T A241, 0.2 Lb/T D250, and 1.2 Lbs/T CuSO<sub>4</sub>. The flotation time was 20 minutes for roughing and 30 minutes for scavenging.

4.6 Test 4B Reflotation of tailing from Test 4

As the recovery and grade in test 4 were poor a quick test using high H<sub>2</sub>SO<sub>4</sub> consumption at pH 3.0 to 3.3 was done on the tailing using collector and frother as required.

The results indicated that this could be the system to follow.

Metallurgical Balance  
For Reflotation of Tailing

	Wt%	oz/T Au	Units	Dist'n%
Reflot Con.	9.6	0.374	3.59	78.4
Reflot Tail	90.4	0.011	0.99	21.6
Calc Head=Test4 Tail		0.046	4.58	100.0
Assayed Head		0.055		

4.7 Test 5 Flotation at low pH

0.25 Lbs/T of PAX, 0.04 Lbs/T A241, 0.16 Lbs/T D250 and 137 Lbs/T of H<sub>2</sub>SO<sub>4</sub> to maintain the pH at 3.2 to 3.5 was used in the rougher circuit. The cleaner used 0.16 Lbs/T PAX, 0.08 Lbs/T D250, and 15 Lbs/T of H<sub>2</sub>SO<sub>4</sub>. The rougher required 35 minutes and the cleaner required 10 minutes. See Table II

4.8 Test 7 Flotation plus Sulfidizing

Once the sodium sulfide was added to the test the froth became uncontrollable. No assays were done on this test.

4.9 Test 8 Combined Flotation and Cyanidation of Concentrate

The test was done at a low pH using 200 Lbs/T of H<sub>2</sub>SO<sub>4</sub> in the roughers plus similar quantities of collectors as in Test 5.

4.9 There seemed to be a problem with depressing the (con't) graphite in the roughers. It was not until the third cleaner that it was discovered that the xanthate must be added before the acid to effect good graphite depression. The pH of the roughers was obtained before any xanthate was added and this produced some difficulty.

The final concentrate from this test was sent directly to cyanidation without regrinding. See Table III.

TABLE I

## CYANIDE TESTS

	WT or VOL	oz/T Au	g/t Au	UNITS Au	DIST'N%
<u>TCPW 785-1 Met Balance for 4Hr Cyanide Leach</u>					
Pregnant Sol	1.086 L		0.004	0.004	0.17
Residue	0.586 K	0.114	3.91	2.291	99.83
Calc Head	0.586 K	0.114	3.914	2.295	100.
<u>TCPW 785-2 Met Balance for 24Hr Cyanide Leach</u>					
Pregnant Sol	1.088 L		0.002	0.002	0.09
Residue	0.5425 K	0.117	4.02	2.181	99.91
Calc Head	0.5425 K	0.117	4.022		100.
<u>TCPW 785-3 Met Balance for 24Hr CIP Leach(28 Lbs/T C)</u>					
Charcoal	7.0 gm			0.825	29.78
Barren Sol'n	1.25 L		0.001	0.001	0.05
Residue	0.549 K	0.103	3.54	1.944	70.17
Calc Head	0.549 K	0.147	5.046	2.770	100.
<u>TCPW 785-6 Met Balance for 24Hr CIP Leach(80 Lbs/T C)</u>					
Charcoal	20.0 gm			0.80	45.8
Barren Sol'n	1.181 L		0.04	0.047	2.9
Residue	0.502 K	0.052	1.78	0.895	51.3
Calc Head	0.502 K	0.101	3.476	1.742	100.



TABLE II

TEST TCPW 785-5:

METALLURGICAL BALANCE  
FOR FLOTATION

	WT gm	WT%	oz/T Au	UNITS	DIST'N
Concentrate	111.2	5.7	1.708	9.736	68.2
Cleaner Tail	161.65	8.3	0.464	3.851	27.0
Final Tail	1673.7	86.0	0.008	0.688	4.8
Calculated Head	1946.5		0.143	14.275	
Rougher Concentrate		14.0	0.970	13.587	95.2

TEST CONDITIONS:

Grind 88.2% Minus 200 Mesh  
Flotation 35 Min Ph 3.2 to 3.5  
Potassium Amyl Xanthate 0.25 Lbs/T  
Aero 241 0.04 Lbs/T  
Dow 250 0.16 Lbs/T  
H<sub>2</sub>SO<sub>4</sub> 137.0 Lbs/T  
Cleaning 10 Min 0.06 PAX, 0.08 D250, 15.0 Lbs/T H<sub>2</sub>SO<sub>4</sub>

TABLE III

METALLURGICAL BALANCE FOR  
COMBINED FLOTATION AND CYANIDATION OF CONCENTRATE

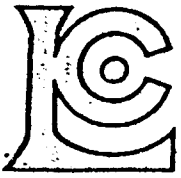
CYANIDATION OF CONCENTRATE:

	WT or VOL	GRAMS/t		UNITS		DIST'N %	
		Au	Ag	Au	Ag	Au	Ag
Preg Sol'n	0.472 L	8.1	4.6	1.804	2.17	52.8	64.0
Residue	0.1009 K	15.97	12.1	1.611	1.22	47.2	36.0
Calc Head	0.1009 K	33.84	33.59	3.415	3.39	100.	100.
CN Calc Head(oz/T)		(0.987)	(0.979)				

FLOTATION OF CONCENTRATE:

	WEIGHT%	OZ/T		UNITS		DIST'N%	
		Au	Ag	Au	Ag	Au	Ag
Con=CN head	5.19	0.987	0.979	5.123	5.08	68.6	53.8
#3 Cl Tail	1.22	1.019	0.639	1.243	0.78	16.6	8.3
#2 Cl Tail	1.63	0.168	0.297	0.274	0.48	3.7	5.1
#1 Cl Tail	6.67	0.048	0.172	0.32	1.15	4.3	12.2
Flot Tail	85.29	0.006	0.023	0.512	1.96	6.8	20.6
Calc Head	100.	0.075	0.095	7.472	9.45	100.0	100.0
Con+#3Cl Tail	6.41	0.993	0.914	6.366	5.86	85.2	62.1
Rougher Con	14.71	0.473	0.51	6.96	7.49	93.2	79.4

1  
8  
1



# Chemex Labs Ltd.

Analytical Chemists • Geochemists • Registered Assayers

212 Brooksbank Ave.  
North Vancouver, B.C.  
Canada V7J 2C1  
Telephone: (604) 984-0221  
Telex: 043-52597

## CERTIFICATE OF ASSAY

TO : COASTECH RESEARCH INC.

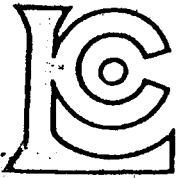
869 WEST THIRD ST.  
NORTH VANCOUVER, B.C.  
V7P 1E2

CERT. # : A8514281-001-  
INVOICE # : 18514281  
DATE : 1-AUG-85  
P.O. # : 446  
TCPW 785-6

Sample description	Prep code	Au FA mg	Au FA mg/L	Au oz/T			
CARCOAL	225	0.800	--	--	--	--	--
BARREN SOL'N	221	--	<0.040	--	--	--	--
RESIDUE	225	--	--	0.052	--	--	--

.....  
Registered Assayer, Province of British Columbia





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Telex: 043-52597

## CERTIFICATE OF ASSAY

TO : COASTECH RESEARCH INC.

869 WEST THIRD ST.  
NORTH VANCOUVER, B.C.  
V7P 1E2

CERT. # : A8514188-001-A  
INVOICE # : 18514188  
DATE : 31-JUL-85  
P.O. # : 445  
TCPW 785

Sample description	Prep code	Au oz/T					
ROUGHER CON	207	0.976	--	--	--	--	--
#1 SCAV CON	207	0.432	--	--	--	--	--
#2 SCAV CON	207	0.578	--	--	--	--	--
REFLOT CON	207	0.374	--	--	--	--	--
#1 SCAV TAILS	207	0.052	--	--	--	--	--
REFLOT TAILS	207	0.011	--	--	--	--	--
ROUGHER TAILS	207	0.064	--	--	--	--	--
FINAL TAILS	207	0.055	--	--	--	--	--

.....  
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NORTH VANCOUVER, B.C.  
V7P 1E2

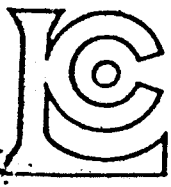
CERT. # : A8514105-001-A  
INVOICE # : I8514105  
DATE : 23-JUL-85  
P.O. # : 444  
TCPW 785-5

Sample description	Prep code	Au con oz/T						
CON	225	1.708	--	--	--	--	--	--
CL TAILS	225	0.464	--	--	--	--	--	--
FINAL TAILS	225	0.008	--	--	--	--	--	--

*[Handwritten Signature]*

.....  
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Telex: 043-52597

## CERTIFICATE OF ASSAY

TO : COASTECH RESEARCH INC.

869 WEST THIRD ST.  
NORTH VANCOUVER, B.C.  
V7P 1E2

CERT. # : A8514542-001-A  
INVOICE # : I8514542  
DATE : 1-AUG-85  
P.O. # : NONE  
TCPW 785-5

Sample description	Prep code	Fe total %	S % (Leco)				
CONS	225	37.67	46.00	--	--	--	--
CL TAILS	225	6.07	5.99	--	--	--	--
FINAL TAILS	225	1.58	1.18	--	--	--	--

.....  
Registered Assayer, Province of British Columbia



C E R T I F I C A T E O F A S S A Y

COMPANY: COASTFISH RESEARCH  
PROJECT: TCPW 785 - P.O. 441  
ATTENTION: BERT WILSON

FILE: 5-357  
DATE: JULY 18/85.  
TYPE: PULP ASSAY

We hereby certify that the following are the results for samples submitted.

	AO G/TONNE	AO OZ/TON
TCPW 785-1: 4HR RESIDUE	3.91	0.114
TCPW 785-2: 24HR RESIDUE	4.02	0.117
TCPW 785-3: CIP RESIDUE	3.54	0.103
+150M HEAD	5.89	0.172
-150M HEAD	5.60	0.163



MIN-EN Laboratories Ltd.  
Specialists in Mineral Environments  
145 WEST 151st STREET NORTH WILLOW SP. B.C. CANADA

PHONE: (604) 969-5814 DP 694-189 1-11

1985-07-18

CERTIFICATE OF ASSAY

COMPANY: COASTECH RESEARCH  
PROJECT: TCPW 785 - P.O. 441  
ATTENTION: BERT WILSON

FILE: 5-357  
DATE: JULY 18/85.  
TYPE: CHARCOAL

We hereby certify that the following are assay results for samples submitted.

DESCRIPTION	AD TOTAL MG
TCPW 785-3 CIPCHARCOAL	0.825





**MIN-EN Laboratories Ltd.**

*Specialists in Mineral Environments*

705 WEST 15th STREET NORTH VANCOUVER, B.C. CANADA V7M 1T2

PHONE: (604) 980-5814 OR (604) 988-4524

TELEX: 04-352828

WATER ANALYSIS CERTIFICATE


COMPANY: COASTECH RESEARCH  
PROJECT: TCPW 785- P.O. 441  
ATTENTION: BERT WILSON

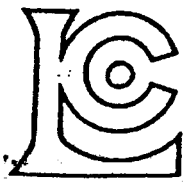
FILE: 5-357  
DATE: JULY 18/85.  
TYPE: CN SOLUTION

*We hereby certify that the following are the results of the water analysis made on 3 samples submitted.*

SAMPLE NUMBER	AU MG/L
TCPW 785-1:4HR PREG SOL.	.004
TCPW 785-2:24HR PREG SOL.	.002
TCPW 785-3:C1P BARREN SOL.	.001

Certified by





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\*\*\* INVOICE \*\*\*

To : COASTECH RESEARCH INC.

Invoice # : 18514281

869 WEST THIRD ST.  
NORTH VANCOUVER, B.C.  
V7P 1E2

Date : 1-AUG-85

Quantity	Description	Unit price	Amount
----------	-------------	------------	--------

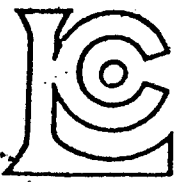
P.O. #446  
Project TCPW 785-6

1	448 - Au FA mg	QUOTE	\$31.50	\$31.50
1	450 - Au FA mg/L	QUOTE	\$15.00	\$15.00
1	398 - Au oz/T	QUOTE	\$15.00	\$15.00

Please pay this amount -----> \$61.50  
=====

TERMS -- NET 30 DAYS  
1.5% per month (18% per annum) charged on overdue accounts





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To : COASTECH RESEARCH INC.

Invoice # : 18514188

869 WEST THIRD ST.  
NORTH VANCOUVER, B.C.  
V7P 1E2

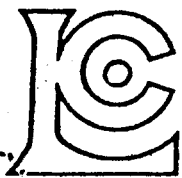
Date : 1-AUG-85

Quantity	Description	Unit price	Amount
P.O. #445 Project TCPW 785			
9	398 - Au oz/T QUOTE	\$15.00	\$135.00
9	207 - Preparation	\$ 3.75	\$ 33.75

Please pay this amount -----> \$168.75  
=====

TERMS -- NET 30 DAYS  
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Telex: 043-52597

\*\*\* INVOICE \*\*\*

To : COASTECH RESEARCH INC.

Invoice # : 18514542

869 WEST THIRD ST.  
NORTH VANCOUVER, B.C.  
V7P 1E2

Date : 2-AUG-85  
P.O. # : NONE  
Project TCPW 795-5

Invoice for analytical work reported on certificate(s) A8514542-001

Quantity	Analysed for code description	unit price	amount
3	325 - Fe total %		
	390 - S % (Leco)	16.00	48.00

Sample preparation and other charges :

3	225 - no sample prep done	0.00	0.00
---	---------------------------	------	------

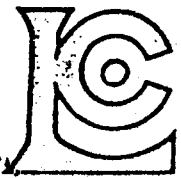
TOTAL \$ 48.00

Please pay this amount ----> \$ 48.00

TERMS -- NET 30 DAYS

1.5 % per month (18 % per annum) charged on overdue accounts





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Telephone: (604) 984-0221  
Telex: 043-52597

\*\*\* INVOICE \*\*\*

To : COASTECH RESEARCH INC.

Invoice # : 18514105

869 WEST THIRD ST.  
NORTH VANCOUVER, B.C.  
V7P 1E2

Date : 23-JUL-85

Quantity	Description	Unit price	Amount
Re: A8514105			

Project TCPW 785-5  
P.O. #444

3	401 - Au con oz/T QUOTE	\$22.50	\$67.50
			-----

Please pay this amount -----> \$67.50  
=====

TERMS -- NET 30 DAYS  
1.5% per month (18% per annum) charged on overdue accounts

