



P.O. Box 2550  
Yellowknife, N.W.T. X1A 2P8

VIA FAX

December 2, 1993

Your file Votre référence

Our file **NIL3-0043**

Mr. Larry Connell  
Manager,  
Environmental and Metallurgical Services  
Royal Oak Mines Inc.  
2nd Floor - 1425 W. Pender St.  
Vancouver, B.C. V6G 2S3

Dear Mr. Connell;

Re: Giant Mine Analytical Laboratory

Further to our telephone conversation on December 1, 1993, this is confirm that officials of our department would like to meet with you and Royal Oak's Chemist(s) on December 15, 1993 to review and discuss the analytical methodologies and effluent quality results of the Giant Lab. Our representatives will include Erik Madsen, Industrial Coordinator, Kathleen Puznicki, Environmental Chemist, and the undersigned. It is suggested that a convenient time be scheduled following the T.A.C. meeting to meet at the Giant Lab.

Please find copies of the legal sample results that were collected by the undersigned on July 26 and September 23, 1993. If you have any questions or require clarification on the sample results, please feel free and call the undersigned at (403) 920 - 8591.

Sincerely

David S. Jessiman

Water Resource Officer  
Yellowknife District  
Northern Affairs Program

cc: E. Madsen, Water Resources, Yk.  
K. Puznicki, Water Lab.

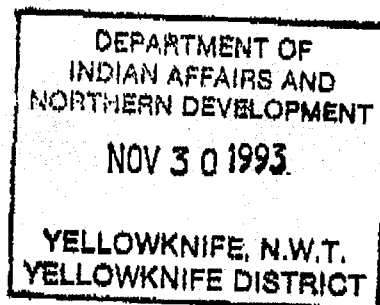
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Canada

Northern Laboratory  
NAP/DIAND  
Box 1500  
Yellowknife, NT.

Nov. 25, 1993.

David Jessiman  
Yellowknife District  
NAP/DIAND  
Box 2550  
Yellowknife, NT.



Subject: Royal Oak Mines Legal Samples - July 26, 1993.

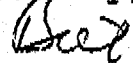
Results for the above case are now complete. Re-analyses for arsenic and copper were necessary as the results indicated poor agreement between replicates. Results for the repeats are in good agreement with values from the alternative technique of ICP-Mass Spec.

ARSENIC ug/L			COPPER ug/L	
Sample Id.	As Hydride	As ICP-MS	Cu AAS	Cu ICP-MS
931129	780	722	151	150
931130	765	744	148	148
931131	846	762	151	160
931132	711	674	69	64
931133	665	682	73	65
931134	620	610	62	65

Please note that we are not certified by CAEAL in the ICP-MS methodology. However, we feel that the ICP-MS technique provides comparable results.

If you have questions regarding the data for this report please call me at 920-8192.

Sincerely,

  
Bill Coedy  
Head. Lab Services

NORTHERN LABORATORY  
NAP/DIAND  
Box 1500,  
Yellowknife, NT.  
X1A 2R3  
Tel: 920-8129  
Fax: 873-9300

TO: DIAND  
YELLOWKNIFE DISTRICT  
Box 2550,  
Yellowknife, NT.  
X1A 2P8  
Attn: David Jessiman

-----  
SAMPLE INFORMATION

Our Lab # : WL931129  
Your Sample Id: 0043-1-1  
Sample Matrix : water

Account No. : N1L30043  
File: Royal Oak Mines  
Status: Legal

COLLECTION:

Location : 0043-1  
Date : July 26, 1993.  
By : David Jessiman

Report Date: Nov.25, 1993

Approved by :

  
William Coedy

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- SAMPLE ANALYSIS REPORT -

Lab #	Parameter	Results	Units	Det. Limit	Method Code
WL931129	Spec. Conductance	2070	uS/cm	0.1	2041
	Non Filt. Residue	3	mg/L	3	10406
	Ammonia - N	16.00	mg/L	0.002	7509
	pH	7.53	pH	0.05	10301
	T.Arsenic - Hyd.	780	ug/L	0.3	33011
	T. Cadmium -S/E	0.5	ug/L	0.2	48302
	Tot. Cyanide	0.049	mg/L	0.004	6613
	T. Cobalt -S/E	218	ug/L	1	27302
	T. Chromium -S/E	2	ug/L	1	24303
	T. Copper - DA	151	ug/L	5	29006
	T. Iron - DA	145	ug/L	20	26004
	T. Nickel -S/E	384	ug/L	1	28302
	T. Lead - S/E	L4	ug/L	4	82302
	T. Zinc - S/E	49.0	ug/L	1	30305

DEPARTMENT OF  
INDIAN AFFAIRS AND  
NORTHERN DEVELOPMENT

NOV 30 1993

YELLOWKNIFE, N.W.T.  
YELLOWKNIFE DISTRICT

NORTHERN LABORATORY  
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YELLOWKNIFE DISTRICT  
Box 2550,  
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X1A 2P8  
Attn: David Jessiman

-----  
SAMPLE INFORMATION

Our Lab # : WL931130  
Your Sample Id: 0043-1-2  
Sample Matrix : water

Account No. : N1L30043  
File: Royal Oak Mines  
Status: Legal

COLLECTION:

Location : 0043-1  
Date : July 26, 1993.  
By : David Jessiman

Report Date: Nov.25, 1993

Approved by : W Coedy  
William Coedy

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- SAMPLE ANALYSIS REPORT -

Lab #	Parameter	Results	Units	Det. Limit	Method Code
WL931130	Spec. Conductance	2050	uS/cm	0.1	2041
	Non Filt. Residue	3	mg/L	3	10406
	Ammonia - N	16.10	mg/L	0.002	7509
	pH	7.50	pH	0.05	10301
	T.Arsenic - Hyd.	765	ug/L	0.3	33011
	T. Cadmium -S/E	0.4	ug/L	0.2	48302
	Tot. Cyanide	0.049	mg/L	0.004	6613
	T. Cobalt -S/E	216	ug/L	1	27302
	T. Chromium -S/E	6	ug/L	1	24303
	T. Copper - DA	148	ug/L	5	29006
	T. Iron - DA	156	ug/L	20	26004
	T. Nickel -S/E	388	ug/L	1	28302
	T. Lead - S/E	L4	ug/L	4	82302
	T. Zinc - S/E	27.0	ug/L	1	30305

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X1A 2P8  
Attn: David Jessiman

-----  
SAMPLE INFORMATION

Our Lab # : WL931131  
Your Sample Id: 0043-1-3  
Sample Matrix : water

Account No. : N1L30043  
File: Royal Oak Mines  
Status: Legal

COLLECTION:

Location : 0043-1  
Date : July 26, 1993.  
By : David Jessiman

Report Date: Nov.25, 1993

Approved by : W Coedy  
William Coedy

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- SAMPLE ANALYSIS REPORT -

Lab #	Parameter	Results	Units	Det. Limit	Method Code
WL931131	Spec. Conductance	2059	uS/cm	0.1	2041
	Non Filt. Residue	L3	mg/L	3	10406
	Ammonia - N	16.50	mg/L	0.002	7509
	pH	7.53	pH	0.05	10301
	T.Arsenic - Hyd.	846	ug/L	0.3	33011
	T. Cadmium -S/E	0.5	ug/L	0.2	48302
	Tot. Cyanide	0.050	mg/L	0.004	6613
	T. Cobalt -S/E	192	ug/L	1	27302
	T. Chromium -S/E	3	ug/L	1	24303
	T. Copper - DA	151	ug/L	5	29006
	T. Iron - DA	136	ug/L	20	26004
	T. Nickel -S/E	384	ug/L	1	28302
	T. Lead - S/E	L4	ug/L	4	82302
	T. Zinc - S/E	10.0	ug/L	1	30305

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7  
TO: DIAND  
YELLOWKNIFE DISTRICT  
Box 2550,  
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X1A 2P8  
Attn: David Jessiman

-----  
SAMPLE INFORMATION

Our Lab # : WL931132  
Your Sample Id: 0043-5-1  
Sample Matrix : water

Account No. : N1L30043  
File: Royal Oak Mines  
Status: Legal

COLLECTION:

Location : 0043-5  
Date : July 26, 1993.  
By : David Jessiman

Report Date: Nov.25, 1993

Approved by : W. Coedy  
William Coedy

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- SAMPLE ANALYSIS REPORT -

Lab #	Parameter	Results	Units	Det. Limit	Method Code
WL931132	Spec. Conductance	1949	uS/cm	0.1	2041
	Non Filt. Residue	3	mg/L	3	10406
	Ammonia - N	14.70	mg/L	0.002	7509
	pH	7.50	pH	0.05	10301
	T.Arsenic - Hyd.	711	ug/L	0.3	33011
	T. Cadmium -S/E	1.4	ug/L	0.2	48302
	Tot. Cyanide	0.036	mg/L	0.004	6613
	T. Cobalt -S/E	163	ug/L	1	27302
	T. Chromium -S/E	6	ug/L	1	24303
	T. Copper - DA	83	ug/L	5	29006
	T. Iron - DA	169	ug/L	20	26004
	T. Nickel -S/E	348	ug/L	1	28302
	T. Lead - S/E	14	ug/L	4	82302
	T. Zinc - S/E	47.0	ug/L	1	30305

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YELLOWKNIFE DISTRICT  
Box 2550,  
Yellowknife, NT.  
X1A 2P8  
Attn: David Jessiman

-----  
SAMPLE INFORMATION

Our Lab # : WL931133  
Your Sample Id: 0043-5-2  
Sample Matrix : water

Account No. : N1L30043  
File: Royal Oak Mines  
Status: Legal

COLLECTION:

Location : 0043-5  
Date : July 26, 1993.  
By : David Jessiman

Report Date: Nov.25, 1993

Approved by : W Coedy  
William Coedy

-----  
- SAMPLE ANALYSIS REPORT -

Lab #	Parameter	Results	Units	Det. Limit	Method Code
WL931133	Spec. Conductance	1990	uS/cm	0.1	2041
	Non Filt. Residue	3	mg/L	3	10406
	Ammonia - N	15.00	mg/L	0.002	7509
	pH	7.48	pH	0.05	10301
	T.Arsenic - Hyd.	665	ug/L	0.3	33011
	T. Cadmium -S/E	1.6	ug/L	0.2	48302
	Tot. Cyanide	0.035	mg/L	0.004	6613
	T. Cobalt -S/E	168	ug/L	1	27302
	T. Chromium -S/E	23	ug/L	1	24303
	T. Copper - DA	82	ug/L	5	29006
	T. Iron - DA	183	ug/L	20	26004
	T. Nickel -S/E	349	ug/L	1	28302
	T. Lead - S/E	6	ug/L	4	82302
	T. Zinc - S/E	30.0	ug/L	1	30305

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 Box 2550,  
 Yellowknife, NT.  
 X1A 2P8  
 Attn: David Jessiman

### SAMPLE INFORMATION

Our Lab # : WL931134  
 Your Sample Id: 0043-5-3  
 Sample Matrix : water

Account No. : NIL30043  
 File: Royal Oak Mines  
 Status: Legal

### COLLECTION:

Location : 0043-5  
 Date : July 26, 1993.  
 By : David Jessiman

Report Date: Nov.25, 1993

Approved by : W. Coedy  
 William Coedy

### - SAMPLE ANALYSIS REPORT -

Lab #	Parameter	Results	Units	Det. Limit	Method Code
WL931134	Spec. Conductance	2000	uS/cm	0.1	2041
	Non Filt. Residue	3	mg/L	3	10406
	Ammonia - N	15.00	mg/L	0.002	7509
	pH	7.48	pH	0.05	10301
	T.Arsenic - Hyd.	620	ug/L	0.3	33011
	T. Cadmium -S/E	1.7	ug/L	0.2	48302
	Tot. Cyanide	0.040	mg/L	0.004	6613
	T. Cobalt -S/E	166	ug/L	1	27302
	T. Chromium -S/E	4	ug/L	1	24303
	T. Copper - DA	62	ug/L	5	29006
	T. Iron - DA	117	ug/L	20	26004
	T. Nickel -S/E	346	ug/L	1	28302
	T. Lead - S/E	12	ug/L	4	82302
	T. Zinc - S/E	34.0	ug/L	1	30305

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 YELLOWKNIFE DISTRICT



Northern Laboratory  
NAP/DIAND  
Box 1500  
Yellowknife, NT.

Nov. 30, 1993.

David Jessiman  
Yellowknife District  
NAP/DIAND  
Box 2550  
Yellowknife, NT.

DEPARTMENT OF  
INDIAN AFFAIRS AND  
NORTHERN DEVELOPMENT  
  
NOV 30 1993  
  
YELLOWKNIFE, N.W.T.  
YELLOWKNIFE DISTRICT

Subject: Royal Oak Mines Legal Samples - Sept. 23, 1993.

Results for the above case are now complete. Samples were re-analyzed for arsenic and copper by the alternative technique of ICP-Mass Spectrometry. The results for arsenic by the Hydride technique represent an average of three replicates.

ARSENIC ug/L		COPPER ug/L		
Sample Id.	As Hydride	As ICP-MS	Cu AAS	Cu ICP-MS
932073	939	953	145	154
932074	954	922	161	196
932075	952	947	152	248
932076	961	899	56	32

Please note that we are not certified by CAEAL in the ICP-MS methodology. However, we feel that the ICP-MS technique provides comparable results. Information on analytical performance against quality control references is available.

If you have questions regarding the data for this report please call me at 920-8192.

Sincerely,



Bill Coedy  
Head. Lab Services

30/11/93

INDIAN & NORTHERN AFFAIRS  
WATER RESOURCES LABORATORY  
Box 1500  
Yellowknife, NT. X1A 2R3  
Tel. (403) 920-8129  
Fax. (403) 873-9300

To: Royal Oak Mine  
c/o DIAND  
Yellowknife District Office  
Box 2550  
==> Yellowknife NT X1A\_2P8  
Dave Jessiman

### SAMPLE INFORMATION

Our Lab # : WL932073  
Your Sample ID: 0043-1A  
Sample Matrix : mine effl.

Account No.: N1L30043

Collection:  
Location: 0043-1  
Date: 09/23/93  
By: D.Jessiman

Report Date: 11/30/93

Approved by: *W. Jessiman*

### - SAMPLE ANALYSIS REPORT -

Lab#	Parameter	Result	Units	Detect Limit	Method Code
WL932073	Sp. Conduct	2090.0	uS/cm	0.100	2041
	Non-Filt Res.	9	mg/L	3.000	10406
	Ammonia-N	17.910	mg/L	0.002	7509
	pH	6.86	pH	0.050	10301
	T.Arsenic-Hyd.	939.0	ug/L	0.300	33011
	T.Cadmium-S/E	10.2	ug/L	0.200	48302
	Tot. Cyanide	0.080	mg/L	0.004	06613
	T.Cobalt-S/E	231	ug/L	1.000	27302
	T.Chromium-S/E	11	ug/L	1.000	24303
	T.Copper-S/E	145	ug/L	1.000	29305
	T.Iron_DA	227	ug/L	50.000	26304
	T.Nickel-S/E	612	ug/L	1.000	28302
	T.Lead-S/E	10.7	ug/L	0.700	82302
	T.Zinc-S/E	69.0	ug/L	1.000	30305

DEPARTMENT OF  
INDIAN AFFAIRS AND  
NORTHERN DEVELOPMENT

NOV 30 1993

YELLOWKNIFE, N.W.T.  
YELLOWKNIFE DISTRICT

INDIAN & NORTHERN AFFAIRS  
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Dave Jessiman

### SAMPLE INFORMATION

Our Lab # : WL932074  
Your Sample ID: 0043-1B  
Sample Matrix : mine effl.

Account No.: N1L30043

Collection:  
Location: 0043-1  
Date: 09/23/93  
By: D.Jessiman

Report Date: 11/30/93

Approved by: W. Jessiman

### - SAMPLE ANALYSIS REPORT -

Lab#	Parameter	Result Units	Detect Limit	Method Code
WL932074	Sp. Conduct	2070.0 uS/cm	0.100	2041
	Non-Filt Res.	7 mg/L	3.000	10406
	Ammonia-N	15.600 mg/L	0.002	7509
	pH	6.85 pH	0.050	10301
	T.Arsenic-Hyd.	954.0 ug/L	0.300	33011
	T.Cadmium-S/E	10.2 ug/L	0.200	48302
	Tot. Cyanide	0.078 mg/L	0.004	06613
	T.Cobalt-S/E	235 ug/L	1.000	27302
	T.Chromium-S/E	11 ug/L	1.000	24303
	T.Copper-S/E	161 ug/L	1.000	29305
	T.Iron DA	232 ug/L	50.000	26304
	T.Nickel-S/E	624 ug/L	1.000	28302
	T.Lead-S/E	2 ug/L	0.700	82302
	T.Zinc-S/E	92.0 ug/L	1.000	30305

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Dave Jessiman

### SAMPLE INFORMATION

Our Lab # : WL932075  
Your Sample ID: 0043-1C  
Sample Matrix : mine effl.

Account No.: NIL30043

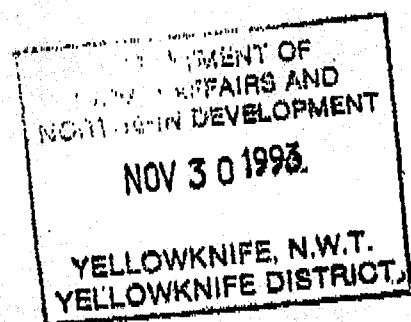
Collection:  
Location: 0043-1  
Date: 09/23/93  
By: D.Jessiman

Report Date: 11/30/93

Approved by: W. Jessiman

### - SAMPLE ANALYSIS REPORT -

Lab#	Parameter	Result Units	Detect Limit	Method Code
WL932075	Sp. Conduct	2070.0 uS/cm	0.100	2041
	Non-Filt Res.	4 mg/L	3.000	10406
	Ammonia-N	17.163 mg/L	0.002	7509
	pH	6.92 pH	0.050	10301
	T.Arsenic-Hyd.	952.0 ug/L	0.300	33011
	T.Cadmium-S/E	LO.2 ug/L	0.200	48302
	Tot.Cyanide	0.079 mg/L	0.004	06613
	T.Cobalt-S/E	227 ug/L	1.000	27302
	T.Chromium-S/E	L1 ug/L	1.000	24303
	T.Copper-S/E	152 ug/L	1.000	29305
	T.Iron_DA	309 ug/L	50.000	26304
	T.Nickel-S/E	585 ug/L	1.000	28302
	T.Lead-S/E	LO.7 ug/L	0.700	82302
	T.Zinc-S/E	32.0 ug/L	1.000	30305



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Dave Jessiman

SAMPLE INFORMATION

Our Lab # : WL932076  
Your Sample ID: 0043-5  
Sample Matrix : effluent

Account No.: N1L30043

Collection:  
Location: 0043-5  
Date: 09/23/93  
By: D.Jessiman

Report Date: 11/30/93

Approved by: Wood

- SAMPLE ANALYSIS REPORT -

Lab#	Parameter	Result Units	Detect Limit	Method Code
WL932076	Sp. Conduct	2050.0 uS/cm	0.100	2041
	Non-Filt Res.	9 mg/L	3.000	10406
	Ammonia-N	14.840 mg/L	0.002	7509
	pH	7.48 pH	0.050	10301
	T.Arsenic-Hyd.	961.0 ug/L	0.300	33011
	T.Cadmium-S/E	10.2 ug/L	0.200	48302
	Tot.Cyanide	0.077 mg/L	0.004	06613
	T.Cobalt-S/E	242 ug/L	1.000	27302
	T.Chromium-S/E	11 ug/L	1.000	24303
	T.Copper-S/E	56 ug/L	1.000	29305
	T.Iron DA	217 ug/L	50.000	26304
	T.Nickel-S/E	525 ug/L	1.000	28302
	T.Lead-S/E	10.7 ug/L	0.700	82302
	T.Zinc-S/E	65.0 ug/L	1.000	30305

