

RD82
8C214
July '88

THE CANADIAN MINERAL INDUSTRY MONTHLY REPORT

JULY 1988

LIBRARY / BIBLIOTHÈQUE

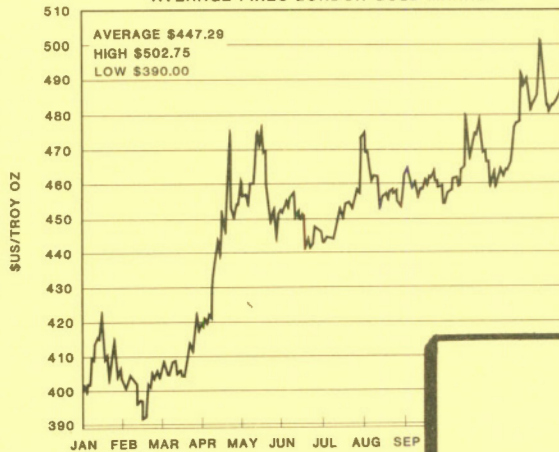
SEP 12 1988

GEOLOGICAL SURVEY
COMMISSION GEOLOGIQUE

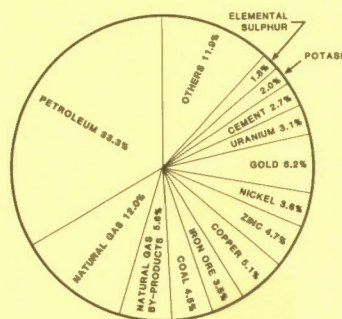
ANNUAL FIELD EXPENDITURES ON
OFF- AND ON-PROPERTY MINERAL EXPLORATION
IN CANADA



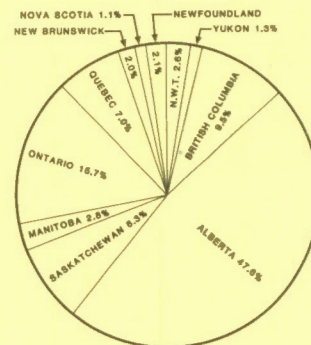
DAILY GOLD PRICES 1987
AVERAGE FIXES LONDON GOLD MARKET



CANADA, MINERAL PRODUCTION, 1987



% OF TOTAL BY COMMODITY



% OF TOTAL BY PROVINCE

This document was produced
by scanning the original publication.

Ce document est le produit d'une
numérisation par balayage
de la publication originale.

ISSN 0229-1908

THE CANADIAN MINERAL INDUSTRY

MONTHLY REPORT



Energy, Mines and
Resources Canada

Hon. Gerald S. Merrithew,
Minister of State
(Forestry and Mines)

Énergie, Mines et
Ressources Canada

L'Hon. Gerald S. Merrithew,
Ministre d'État
(Forêts et Mines)

PREFACE

This publication is prepared in the Mineral Policy Sector of the Department of Energy, Mines and Resources. It is compiled from many sources using the best information available to us. This report is intended to be a general review of the more important current developments that affect, or may affect the Canadian mineral industry. It should not be considered an authority for exact quotation or an expression of the official views of the Government of Canada.

Mineral Policy Sector
Department of Energy, Mines and Resources
580 Booth Street
Ottawa, Ontario K1A 0E4

CONTENTS

	Page
HIGHLIGHTS	1
ECONOMIC TRENDS	2
EMPLOYMENT TRENDS	21
METALLIC MINERALS AND PRODUCTS	23
Copper	23
SPECIAL ITEMS	25
Advanced Industrial Materials	25
The Canadian Mineral Outlook Conference	27
Prospectors and Developers Association of Canada (Seminar and Convention)	29
NEW PUBLICATIONS	30

LIST OF TABLES

1. Canada, Production of Leading Minerals	3
2. Canada, Real Gross Domestic Product at Factor Cost by Industry	4
3. Metal Prices, 1988	5
4. Canada, Principal Statistics of the Mineral Industry, 1986	6
5. Canada, Principal Statistics of the Mineral Industry by Region, 1986	7
6. Canada, Principal Statistics of the Mineral Industry, 1980-86	8
7. Canada, Consumption of Fuel and Electricity in the Mineral Industry, 1986	9
8. Canada, Cost of Fuel and Electricity Used in the Mining Industry, 1980-86	10
9. Canada, Employment, Salaries and Wages in the Mining Industry, 1980-86	11
10. Canada, Number of Wage Earners Employed in the Mining Industry (Surface, Underground and Mill), 1980-86	12
11. Canada, Mine and Mill Workers by Sex, 1986	13
12. Canada, Labour Costs for Metal Mines in Relation to Tonnes Mined, 1984-86	14
13. Canada, Person-Hours Paid for Production and Related Workers, and Tonnes of Ore Mined and Rock Quarried in Metal Mines and Other Mineral Operations, 1980-86	15
14. Canada, Average Weekly Wages and Hours Worked (Including Overtime) for Hourly-Rated Employees in Mining, Manufacturing and Construction Industries, 1981-87	16
15. Canada, Average Weekly Wages (Including Overtime) of Hourly-Rated Employees in the Mining Industry, in Current and 1981 Dollars, 1981-87	17
16. Western World Production of Certain Major Metals, 1983-87	18
17. General Exploration and Capital Expenditures by Mining and Exploration Companies, by Province, 1987-88	19
18. General Exploration and Capital Expenditures by Mining and Exploration Companies, Canada, by Industry Group, 1987-88	20

THE CANADIAN MINERAL INDUSTRY FOR JULY

The following constitutes a brief summary of the Canadian mineral industry based on information that became available in July.

HIGHLIGHTS

1. The Broken Hill Proprietary Company Limited announced the go-ahead of the Escondida copper project in Chile. The total project cost has been put at US\$1100 million, with production expected to begin in 1991. Escondida will produce about 320 000 t/y of copper in concentrates.
2. Copper prices averaged about US100.4 ¢/lb. on the LME during the month of July, while the COMEX price averaged about US99.1 ¢/lb.

ECONOMIC TRENDS

Table 1 provides a comparison of the volume of production of Canada's leading minerals for the months of April and May 1988 and the corresponding months last year, as well as the year-to-date totals. In the metals group, copper, gold, iron ore, silver and uranium showed gains in production during the first five months of 1988 compared to last year. Lead, molybdenum, nickel and zinc experienced decreases in production. All of the leading nonmetals showed increases over the same 5-month period, except clay products.

Table 2 provides information on Canada's Gross Domestic Product at factor cost at 1981 prices by industry. The data is also annualized and seasonally adjusted.

The annual rate shown for any given month is calculated by multiplying the figure for that month by twelve. It is important to note, however, that if a particular month has been influenced by special factors such as a strike, the annualized data will reflect this bias.

Factor cost refers to output which is valued exclusive of excise taxes and duties, and provincial and municipal sales tax. Factor cost does, however, include subsidies and other taxes which are not a function of the level of output or sale.

Seasonally adjusted data represent time series data from which the effects of repetitive and clearly defined seasonal fluctuations have been removed. Such a practice permits the isolation of trends in the economy which might otherwise be obscured. Seasonal factors include such items as climate, trade practices and social institutions such as Christmas and Easter.

The GDP data are subject to ongoing revision.

GDP at Factor Cost at 1981 prices increased 0.5% in May following a 0.9% gain in March and a 0.1% gain in April. Goods-producing industries and services-producing industries reported similar increases in May.

Table 3 shows the prices of selected metals for April and May.

Tables 4, 5 and 6 record historical principal statistics of the mineral industry by sector and by region. Principal statistics include number of establishments, the value of production and the costs associated with that production. Costs include salaries and wages, materials and supplies, and fuel and electricity.

Tables 7 and 8 give more detailed information on the consumption and cost of fuel and electricity in the mining industry.

Tables 9 through 15 provide various data on employment, salaries and wages.

Table 16 provides a summary of western world production of certain major metals for the period 1983 to 1987.

Tables 17 and 18 provide a summary of general exploration and capital expenditures for 1987 (preliminary) and 1988 (intentions), including the revised intentions for 1988.

TABLE 1. CANADA, PRODUCTION OF LEADING MINERALS ('000 TONNES EXCEPT WHERE NOTED)

		1987			1988			Percentage Changes		
		April	May	Total 5 Months	April	May	Total 5 Months	May 1988 May 1987	May 1988 April 1988	1st 5 months 1988 1987
Metals										
Copper		65.5	61.1	310.6	60.8 ^r	63.8	324.3	4.4	5.0	4.4
Gold	kg	8 959.5 ^r	8 123.1 ^r	42 293.9	10 372.7 ^r	10 358.4	50 590.3	27.5	-0.1	19.6
Iron ore		3 165.0 ^r	3 120.9 ^r	12 464.6	3 250.8	3 647.8	13 950.9	16.9	12.2	11.9
Lead		37.3 ^r	27.5 ^r	149.5	29.3	24.4	145.0	-11.4	-16.7	-3.0
Molybdenum	t	999.0 ^r	1 092.4 ^r	5 584.0	960.0	1 083.6	4 972.0	-0.8	12.9	-11.0
Nickel		18.0	18.1	90.1	18.1	18.0	86.6	-0.3	-0.4	-3.8
Silver	t	110.2 ^r	107.1 ^r	466.8	127.3 ^r	105.4	599.4	-1.5	-17.2	28.4
Uranium ¹	t	903.9	950.0	5 535.9	1 002.1	919.7	5 731.4	-3.2	-8.2	3.5
Zinc		104.6 ^r	103.7 ^r	499.8	101.6	103.7	493.8	0.0	2.1	-1.2
Nonmetals										
Asbestos		54.0	53.6	254.4	60.2	60.7	274.9	13.2	0.8	8.1
Clay products	\$000	20 874.9	21 685.5	77 720.0	17 874.7	18 956.8	66 713.2	-12.6	6.1	-14.2
Gypsum		573.6 ^r	964.0 ^r	3 146.3	624.3	822.2	3 442.5	-14.7	31.7	9.4
Potash K ₂ O		824.9	686.5	3 576.1	861.7	803.5	3 814.2	17.1	-6.8	6.7
Cement		1 049.5 ^r	1 327.4 ^r	3 942.9	950.2	1 256.2	4 049.5	-5.4	32.2	2.7
Lime		192.1	197.6	941.3	214.7 ^r	222.7	1 020.2	12.7	3.7	8.4
Salt		632.0 ^r	834.9 ^r	3 825.7	747.5	840.4	4 124.2	0.7	12.4	7.8
Fuels										
Coal		4 501.0	4 694.9 ^r	23 606.2	5 781.1	..	..	..	..	..
Natural gas	million m ³	7.8 ^r	7.2 ^r	42.1	8.7	..	..	..	..	..
Crude oil and equivalent	000 m ³	7.4 ^r	7.8 ^r	37.7	8.0	..	..	..	..	..

¹ Tonnes uranium (1 tonne U = 1.2999 short tons U₃O₈).^r Revised; .. Not available.

**TABLE 2. CANADA, REAL GROSS DOMESTIC PRODUCT AT FACTOR COST BY INDUSTRY, IN 1981 PRICES, MONTHLY
(SEASONALLY ADJUSTED AT ANNUAL RATES)**

Industry Sector	1987	1988			Percentage Change
	May	March	April	May	May 1988 May 1987
(\$ million)					
Total Economy	376 202.8	391 246.3	391 453.7	393 277.5	4.5
Primary Industries					
Agriculture	11 789.4	11 109.6	11 188.8	11 125.2	-5.6
Forestry	2 398.9	2 668.8	2 742.0	2 642.4	10.2
Fishing and Trapping	421.1	627.6	650.4	628.8	49.3
Mines, Quarries and Oil Wells	21 198.2	23 496.0	23 558.4	23 605.2	11.4
Mining Industries	7 882.4	8 550.0	8 550.0	8 520.0	8.1
Gold Mines	1 122.1	1 441.2	1 501.2	1 484.4	32.3
Iron Mines	446.6	524.4	519.6	562.8	26.0
Other Metal Mines	4 216.8	4 178.4	4 087.2	4 062.0	-3.7
Nonmetal Mines	830.4	866.4	830.4	861.6	3.8
Asbestos Mines	162.3	159.6	165.6	164.4	1.3
Mineral Fuels					
Coal Mines	991.5	1 272.0	1 327.2	1 267.2	27.8
Crude Petroleum and Natural Gas	12 039.2	13 118.4	13 243.2	13 141.2	9.2
Secondary Industries					
Manufacturing	73 602.0	77 326.1	77 320.6	78 290.9	6.4
Non-durable Manufacturing	2 759.7	2 865.0	2 834.5	2 850.5	3.3
Durable Manufacturing	3 434.0	4 017.8	3 944.0	3 925.6	14.3
Primary Metal Industries	5 853.9	6 274.6	6 390.8	6 461.4	10.4
Primary Steel Industries	2 271.9	2 487.6	2 476.8	2 474.4	8.9
Steel, Pipe and Tube Industry	314.1	457.2	474.0	483.6	54.0
Iron Foundries	412.0	453.4	485.7	501.9	21.8
Smelting and Refining	2 210.4	2 220.0	2 262.0	2 295.6	3.9
Nonmetallic Mineral Products	2 347.4	2 449.7	2 486.8	2 404.1	2.4
Clay Products Industry	97.6	91.5	103.6	90.3	-7.5
Cement Industry	338.4	337.2	363.6	324.0	-4.3
Ready-mix Concrete Industry	440.3	446.1	430.4	421.6	-4.2
Construction Industry	27 176.4	28 122.0	28 456.8	28 494.0	4.8
Transportation and Storage	16 807.1	17 473.6	17 414.8	17 461.4	3.9
Communications	10 774.3	11 566.8	11 659.2	11 494.8	6.7
Other Utilities	11 307.1	11 504.4	11 451.6	11 341.2	0.3
Wholesale Trade	20 131.3	21 654.0	21 414.0	21 734.4	8.0
Retail Trade	24 974.5	26 262.0	25 885.2	26 218.8	5.0
Finance, Insurance and Real Estate	53 653.4	55 946.4	56 248.8	56 468.4	5.2
Community, Business and Personal Service	38 771.4	39 805.0	39 663.9	39 818.0	2.7

TABLE 3. METAL PRICES - 1988

	April	May
Copper		
Electrolytic, U.S. producer f.o.b. refinery, cents (U.S.)	102.241	102.973
Electrolytic, COMEX, 1st pos. plus 5¢, cents (C.)	126.602	128.970
Electrolytic, Standard, LME cash, cents (U.S.)	99.998	101.726
Lead		
New York, cents (U.S.)	34.000	34.800
Montreal, cents (C.)	43.000	43.600
LME cash, cents (U.S.)	29.414	30.267
Silver		
New York, cents (U.S.) per troy oz.	647.825	654.262
Toronto, cents (C.) per troy oz.	827.650	837.660
LME cash, cents (U.S.) per troy oz.	642.276	651.350
Zinc		
St. Louis, H.G., cents (U.S.)	51.501	56.036
Montreal, Electrolytic, cents (C.)	64.750	69.500
LME cash, cents (U.S.)	48.462	53.332
Tin		
New York, Straits, cents (U.S.)	319.143	321.571
Metals Week, composite, cents (U.S.)	422.954	424.996
Gold		
London, p.m., US\$ per troy oz.	451.560	451.068
Average, (Sharps Pixley) US\$ per troy oz.	451.553	451.194
High, (Sharps Pixley) US\$ per troy oz.	458.000	457.900
Low, (Sharps Pixley) US\$ per troy oz.	447.000	442.800
Mercury		
US\$ per flask	345.000	345.000
Nickel		
Major Producer Cathode, cents (C.)	-LPS-	-LPS-
Major Producer Cathode, cents (U.S.)	-LPS-	-LPS-
LME cash, US\$	8.170 ^r	7.722
Antimony		
New York, dealers, cents (U.S.)	108.250	108.000
Platinum		
New York, refined, US\$ per troy oz.	600.000	600.000
Cadmium		
New York, producers US\$	8.500	9.479
Aluminum		
LME cash, cents (C.)	140.527 ^r	167.651
LME cash, cents (U.S.)	113.777	135.541
Cobalt		
Shot/cathode/250 kg., US\$	7.500	7.500
U.S. spot cathode, US\$	6.950	6.950
Tungsten		
LMB ore, low, US\$/MTU	55.000	55.600
GSA domestic, US\$/MTU	-LPS-	-LPS-
Molybdenum		
M.W. dealer oxide, US\$	3.671	3.559
Uranium		
Nuexco, US\$ U ₃ O ₈	15.900 ^r	15.900

Average U.S. Exchange Rate for April = 1.235105, May = 1.2369.

Note: Prices are per pound unless otherwise stated.

LPS List Price Suspended; ^r Revised.

TABLE 4. CANADA, PRINCIPAL STATISTICS OF THE MINERAL INDUSTRY¹, 1986

	Mining Activity										
	Production and Related Workers							Total Activity ²			
					Costs						
	Establishments	Employees	Person-hours Paid	Salaries and Wages	Fuel and Electricity	Materials and Supplies	Value of Production	Value Added	Employees	Salaries and Wages	Value Added
	(number)	(number)	(000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(number)	(\$000)	(\$000)
Metals											
Gold	46	6 598	13 976	251 446	72 598	340 459	1 388 382	975 326	8 562	331 166	975 348
Silver-lead-zinc	13	2 979	6 318	110 887	61 444	533 641	941 015	345 930	4 162	165 203	332 216
Nickel-copper-zinc	25	15 362	31 909	544 364	210 589	1 448 074	3 348 156	1 689 493	20 616	764 867	1 712 888
Iron	8	4 578	9 853	179 432	180 345	399 535	1 297 562	717 682	6 379	257 593	713 780
Uranium	5	4 586	9 742	192 631	60 171	175 172	1 044 537	809 195	5 608	237 234	801 962
Miscellaneous metal mines	7	838	1 795	30 197	12 576	36 549	105 044	55 919	1 160	42 294	54 508
Total	104	34 941	73 593	1 308 957	597 723	2 933 430	8 124 696	4 593 545	46 487	1 798 357	4 590 702
Industrials											
Asbestos	5	2 117	4 538	62 744	32 779	48 132	236 982	156 071	2 766	87 444	157 138
Gypsum	10	686	1 678	17 390	6 888	20 903	84 776	56 985	990	28 478	56 579
Peat	61	1 200	2 683	21 905	4 905	21 135	95 057	69 016	1 468	28 632	74 563
Potash	11	3 038	6 426	96 246	108 181	94 403	598 557	395 974	4 315	149 294	396 354
Sand and gravel	115	1 300	2 985	38 020	23 764	66 366	278 473	188 343	2 260	65 331	220 026
Stone	123	2 009	4 573	58 477	29 670	85 008	384 501	269 823	2 627	77 454	277 604
Miscellaneous nonmetals	49	2 026	4 476	66 257	33 827	56 344	378 389	288 218	2 837	93 643	289 082
Total	374	12 376	27 359	361 039	240 014	392 291	2 056 735	1 424 430	17 263	530 276	1 471 346
Fuels											
Coal	28	8 225	16 218	334 980	114 117	329 902	1 553 515	1 109 496	10 745	455 392	1 110 434
Oil, crude and natural gas	1 002	8 813	17 871	362 514	288 518	994 145	16 043 395	14 760 732	36 966	1 709 228	15 044 258
Total	1 030	17 038	34 089	697 494	402 635	1 324 047	17 596 910	15 870 228	47 711	2 164 620	16 154 692
Total mineral industry	1 508	64 355	135 041	2 367 490	1 240 372	4 649 768	27 778 341	21 888 203	111 461	4 493 253	22 216 740

¹ Cement manufacturing, lime manufacturing, clay and clay products (domestic clays) are included in the mineral manufacturing industry. ² Total activity includes sales and head offices.
Note: Totals may not add due to rounding.

TABLE 5. CANADA, PRINCIPAL STATISTICS OF THE MINERAL INDUSTRY¹ BY REGION, 1986

	Mines, Quarries and Oil Well Activity									
	Production and Related Workers				Costs				Total Activity ²	
	Establishments	Employees	Person-hours Paid	Salaries and Wages	Fuel and Electricity	Materials and Supplies	Value of Production	Value Added	Employees	Salaries and Wages
	(number)	(number)	(000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(number)	(\$000)
Atlantic Provinces ³	217	7 463	15 869	235 002	129 564	470 478	1 306 911	706 872	9 834	326 882
Quebec	189	10 372	22 164	350 893	176 973	583 752	1 792 604	1 031 880	14 303	500 736
Ontario	144	18 035	38 160	650 728	211 961	1 206 745	3 867 128	2 448 421	24 602	916 318
Prairie Provinces	622	17 030	34 914	639 232	477 560	1 430 890	17 205 859	15 297 407	47 604	2 070 719
British Columbia ⁴	186	9 193	18 697	383 371	188 670	710 025	2 795 474	1 896 779	11 854	521 275
Yukon and Northwest Territories ⁵	150	2 262	5 238	108 262	55 644	247 879	810 364	506 841	3 264	157 324
Canada	1 508	64 355	135 042	2 367 488	1 240 372	4 649 769	27 778 340	21 888 200	111 461	4 493 254

¹ Cement manufacturing, lime manufacturing, clay and clay products (domestic clays) are included in the mineral manufacturing industry. ² Total activity includes sales and head offices.

³ Includes eastern Canada offshore ⁴ Includes western Canada offshore ⁵ Includes Arctic Islands and offshore.

Note: Totals may not add due to rounding.

TABLE 6. CANADA, PRINCIPAL STATISTICS OF THE MINERAL INDUSTRY¹, 1980-86

	Mines, Quarries and Oil Well Activity										
	Production and Related Workers				Costs				Total Activity ²		
	Establishments	Employees	Person-hours Paid	Salaries and Wages	Fuel and Electricity	Materials and Supplies	Value of Production	Value Added	Employees	Salaries and Wages	Value Added
	(number)	(number)	(000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(number)	(\$000)	(\$000)
1980	1 322	80 066	166 427	1 779 388	706 406	3 802 062	27 566 272	23 057 804	126 422	2 979 470	23 252 708
1981	1 361	81 136	167 307	2 053 760	888 554	4 266 637	28 204 485	23 049 295	129 251	3 439 945	23 091 447
1982	1 247 ^r	74 178 ^r	141 070 ^r	2 008 439 ^r	956 296	3 768 771	29 101 618	24 376 549	123 486	3 648 004	24 427 308 ^r
1983	1 407	66 629	131 406	1 963 773	1 022 417	3 756 625	32 771 401	27 992 357	113 831	3 687 911 ^r	28 012 167
1984	1 381	69 650 ^r	140 567 ^r	2 295 256 ^r	1 204 008 ^r	4 290 972	37 976 019	32 481 039	115 790	4 106 049	32 545 525 ^r
1985	1 386	67 308 ^r	140 780 ^r	2 357 868 ^r	1 264 619	4 442 358	38 127 807	34 420 830	117 161 ^r	4 413 258 ^r	32 495 098
1986	1 508	64 355	135 041	2 367 490	1 240 372	4 649 768	27 778 341	21 888 203	111 461	4 493 253	22 216 740

¹ Cement manufacturing, lime manufacturing, clay and clay products (domestic clays) are included in the mineral manufacturing industry. ² Includes sales and head offices.

^r Revised.

TABLE 7. CANADA, CONSUMPTION OF FUEL AND ELECTRICITY IN THE MINERAL INDUSTRY¹, 1986

	Unit	Metals	Industrials ²	Fuels	Total
Coal	000 t	285	-	-	285
	\$000	18 967	-	-	18 967
Gasoline	000 litres	20 514	16 899	11 366	48 779
	\$000	8 558	6 782	3 934	19 274
Fuel oil, kerosene, diesel oil	000 litres	784 433	233 872	208 540	1 226 845
	\$000	183 559	69 094	53 649	306 302
Liquefied petroleum gas	000 litres	98 914	10 779	17 646	127 339
	\$000	19 579	2 687	3 012	25 278
Natural gas	000 m ³	251 590	655 133	111 122	1 017 845
	\$000	36 416	74 879	12 831	124 126
Other fuels ³	\$000	9 815	-	-	9 815
Total value of fuels	\$000	276 894	153 442	73 426	503 762
Electricity purchased	million kWh	12 066	2 107	7 183	21 356
	\$000	320 828	86 571	329 208	736 607
Total value of fuels and electricity purchased, all reporting companies	\$000	597 722	240 013	402 634	1 240 369

¹ Cement manufacturing, lime manufacturing, clay and clay products (domestic clays) are included in the mineral manufacturing industry. ² Includes structural materials. ³ Includes wood, manufactured gas, steam purchased and other miscellaneous fuels.

- Nil.

Note: Totals may not add due to rounding.

TABLE 8. CANADA, COST OF FUEL AND ELECTRICITY USED IN THE MINING INDUSTRY¹, 1980-86

	Unit	1980	1981	1982	1983	1984	1985	1986
Metals								
Fuel	\$000	220 052	293 979	275 205	270 098	331 231	337 445	276 894
Electricity purchased	million kWh	11 024	10 494	9 891	9 659	11 672	11 504	12 066
	\$000	174 837	209 316	232 137	238 458	272 932	281 373	320 828
Total cost of fuel and electricity	\$000	394 889	503 295	507 342 ^r	508 556	604 163 ^r	618 818	597 722
Industrials²								
Fuel	\$000	112 672	142 169	143 393	157 872	169 486	165 665	153 442
Electricity purchased	million kWh	2 269	2 100	1 782	1 928	2 120	2 122	2 107
	\$000	48 336	56 297	57 567	64 052	76 884	82 114	86 571
Total cost of fuel and electricity	\$000	161 008	198 466	200 960	221 924	246 370	247 779	240 013
Fuels								
Fuel	\$000	32 582	46 991	70 484	68 800	89 237	101 049	73 426
Electricity purchased	million kWh	3 504	3 740	5 780	4 958	5 840	6 569	7 183
	\$000	117 927	139 802	176 911	223 136	264 233	296 973	329 208
Total cost of fuel and electricity	\$000	150 509	186 793	247 395	291 936	353 470	398 022	402 634
Total mining industry								
Fuel	\$000	365 306	483 139	489 082 ^r	496 770	589 954 ^r	604 159	503 762
Electricity purchased	million kWh	16 797	16 334	17 453	16 545 ^r	19 632	20 195	21 356
	\$000	341 100	405 415	466 615 ^r	525 646	614 049	660 460	736 607
Total cost of fuel and electricity	\$000	706 406	888 554	955 697 ^r	1 022 416	1 204 003 ^r	1 264 619	1 240 369

¹ Cement manufacturing, lime manufacturing, clay and clay products (domestic clays) are included in the mineral manufacturing industry. ² Includes structural materials.

^r Revised.

TABLE 9. CANADA, EMPLOYMENT, SALARIES AND WAGES IN THE MINING INDUSTRY¹, 1980-86

	Unit	1980	1981	1982	1983	1984	1985	1986
Metals								
Production and related workers	Number	47 592	49 586	44 261	37 270	39 181	36 618	34 941
Salaries and wages	\$000	1 091 848	1 265 547	1 180 485	1 110 308	1 296 157	1 288 990	1 308 956
Annual average salary and wage	\$	22 942	25 522	26 671	29 791	33 081	35 201	37 462
Administrative and office workers	Number	18 526	19 126	17 242	14 924	13 502	12 054	11 546
Salaries and wages	\$000	504 316	585 120	585 249	533 517	518 644	487 398	489 402
Annual average salary and wage	\$	27 222	30 593	33 943	35 749	38 412	40 435 ^r	42 387
Total metals								
Employees	Number	66 118	68 712	61 503	52 194	52 683	48 672	46 487
Salaries and wages	\$000	1 596 164 ^r	1 850 667	1 765 734	1 643 825	1 814 801	1 776 388	1 798 358
Annual average salary and wage	\$	24 141	26 934 ^r	28 710	31 495	34 448 ^r	36 497	38 685
Industrials								
Production and related workers	Number	16 645	15 666	12 848	12 768	13 008	12 535	12 376
Salaries and wages	\$000	343 004	352 302	309 736	329 201 ^r	356 828	354 460	361 039
Annual average salary and wage	\$	20 607	22 488	24 108	25 783	27 431	28 278	29 173
Administrative and office workers	Number	4 795	4 908	4 323	3 805	4 250	4 380	4 887
Salaries and wages	\$000	116 932	128 852	129 116	115 378 ^r	138 012	148 090	169 237
Annual average salary and wage	\$	24 386	26 253	29 867	30 323	32 473	33 811	34 630
Total industrials								
Employees	Number	21 440	20 574	17 171	16 573	17 258	16 915	17 263
Salaries and wages	\$000	459 936	481 154	438 852	444 579 ^r	494 840	502 550	530 276
Annual average salary and wage	\$	21 452	23 387	25 558	26 825 ^r	28 673	29 710	30 717
Fuels								
Production and related workers	Number	15 829	15 884	17 069 ^r	16 591	17 461 ^r	18 155 ^r	17 038
Salaries and wages	\$000	344 537	435 911	518 217 ^r	524 264	642 271 ^r	714 418 ^r	697 494
Annual average salary and wage	\$	21 766	27 443	30 360 ^r	31 599	36 783 ^r	39 351 ^r	40 938
Administrative and office workers	Number	23 035	24 081	27 743 ^r	28 473	28 388 ^r	33 419 ^r	30 673
Salaries and wages	\$000	578 832	672 213	925 201 ^r	1 075 245 ^r	1 154 137 ^r	1 419 903 ^r	1 467 126
Annual average salary and wage	\$	25 128	27 915	33 349 ^r	37 764	40 656 ^r	42 488 ^r	47 831
Total fuels								
Employees	Number	38 864	39 965	44 812	45 064	45 849 ^r	51 574 ^r	47 711
Salaries and wages	\$000	923 369	1 108 124	1 443 418	1 599 509 ^r	1 796 408 ^r	2 134 321 ^r	2 164 620
Annual average salary and wage	\$	23 759	27 727	32 211	35 494	39 181 ^r	41 384 ^r	45 369
Total mining								
Production and related workers	Number	80 066	81 136	74 178 ^r	66 629	69 650 ^r	67 308 ^r	64 355
Salaries and wages	\$000	1 779 389	2 053 760	2 008 438 ^r	1 963 773 ^r	2 295 256 ^r	2 357 868 ^r	2 367 489
Annual average salary and wage	\$	22 224	25 313	27 076 ^r	29 473	32 954 ^r	35 031 ^r	36 788
Administrative and office workers	Number	46 356	48 115	49 308 ^r	47 202	46 140 ^r	49 853 ^r	47 106
Salaries and wages	\$000	1 200 080	1 386 185	1 639 566 ^r	1 724 140 ^r	1 810 793 ^r	2 055 391 ^r	2 125 765
Annual average salary and wage	\$	25 888	28 810	33 252 ^r	36 527 ^r	39 246 ^r	41 229 ^r	45 127
Total mining								
Employees	Number	126 422	129 251	123 486	113 831	115 790 ^r	117 161 ^r	111 461
Salaries and wages	\$000	2 979 469	3 439 945	3 648 004	3 687 913 ^r	4 106 049 ^r	4 413 259 ^r	4 493 254
Annual average salary and wage	\$	23 568	26 614	29 542	32 398 ^r	35 461 ^r	37 668 ^r	40 312

¹ Cement manufacturing, lime manufacturing, clay and clay products (domestic clays) are included in the mineral manufacturing industry.
^r Revised.

Note: Totals may not add due to rounding.

TABLE 10. CANADA, NUMBER OF WAGE EARNERS EMPLOYED IN THE MINING INDUSTRY (SURFACE, UNDERGROUND AND MILL), 1980-86

	1980	1981	1982	1983	1984	1985	1986
Metals							
Surface	14 347	14 043	12 133	9 970	9 724	10 093	9 674
Underground	19 308	19 784	18 673	15 861	16 668	14 798	13 982
Mill	13 937	15 759	13 455	11 439	12 789	11 727	11 285
Total	47 592	49 586	44 261	37 270	39 181	36 618	34 941
Industrials							
Surface	6 510	6 015	4 833	4 951	4 948	4 921	5 396
Underground	2 550	2 606	2 055	2 192	2 487	2 337	2 112
Mill	7 585	7 045	5 960	5 625	5 573	5 277	4 868
Total	16 645	15 666	12 848	12 768	13 008	12 535	12 376
Fuels							
Surface	10 550	11 429	13 283 ^r	12 190	14 392 ^r	15 101 ^r	14 165 ^e
Underground	2 900	2 926	3 226	2 896	1 818	1 626	1 602 ^e
Mill	2 379	1 529	560 ^r	1 505	1 251	1 428	1 271
Total	15 829	15 884	17 069 ^r	16 591	17 461 ^r	18 155 ^r	17 038
Total Mining Industry							
Surface	31 407	31 487	30 249 ^r	27 111	29 064 ^r	30 115 ^r	29 235
Underground	24 758	25 316	23 954	20 949	20 973	18 761	17 696
Mill	23 901	24 333	19 975 ^r	18 569	19 613	18 432	17 424
Total	80 066	81 136	74 178 ^r	66 629	69 650 ^r	67 308 ^r	64 355

^r Revised; ^e Estimate.

Note: Totals may not add due to rounding.

TABLE 11. CANADA, MINE AND MILL WORKERS BY SEX, 1986

	Mine Workers							
	Underground		Surface		Mill Workers		Total	
	Male	Female	Male	Female	Male	Female	Male	Female
Metallic minerals								
Nickel-copper-zinc ¹	6 978	14	4 497	96	3 625	152	15 100	262
Gold	3 532	7	1 041	40	1 937	41	6 510	88
Iron ore	104	2	1 194	8	3 204	66	4 502	76
Uranium	1 922	11	1 828	35	717	73	4 467	119
Silver-lead-zinc	1 278	6	487	30	1 143	35	2 908	71
Miscellaneous metal mines ²	128	—	415	3	277	15	820	18
Total	13 942	40	9 462	212	10 903	382	34 307	634
Industrial minerals								
Asbestos	45	—	816	3	1 203	50	2 064	53
Potash	1 425	9	82	1	1 487	34	2 994	44
Miscellaneous nonmetals	470	—	419	10	1 096	31	1 985	41
Stone	5	—	1 804	14	184	2	1 993	16
Peat	—	—	582	17	580	21	1 162	38
Sand and gravel	—	—	1 192	14	94	—	1 286	14
Gypsum	158	—	441	1	86	—	685	1
Total	2 103	9	5 336	60	4 730	138	12 169	207
Fuels								
Coal	1 602 ^e	—	5 261 ^e	91 ^e	1 243	28	8 106	119
Mining total	17 647	49	20 059	363	16 876	548	54 582	960

¹ Includes copper-zinc and nickel-copper mines. ² Includes molybdenum mines.

— Nil; ^e Estimate.

TABLE 12. CANADA, LABOUR COSTS FOR METAL MINES IN RELATION TO TONNES MINED, 1984-86

Type of Metal Mine	Number of Wage Earners	Total Wages	Average Annual Wage	Tonnage of Ore Mined	Average Annual Tonnes Mined per Wage Earner	Wage Cost per Tonne Mined
		(\$000)	(\$)	(kilotonnes)		(\$)
1984						
Uranium	3 885	139 466	35 899	7 608	1 958	18.33
Gold	4 800	161 233	33 590	11 225	2 339	14.36
Silver-lead-zinc	2 057	81 269	39 509	10 084	4 902	8.06
Miscellaneous metals ¹	519	17 088	32 925	3 627	6 988	4.71
Nickel-copper-zinc ²	13 575	425 836	31 369	124 683	9 185	3.42
Iron ore	1 556	56 874	36 551	89 210	57 333	0.64
Total	26 392	881 766	33 410	246 437	9 338	3.58
1985						
Uranium	4 024	158 110	39 292	7 183	1 785	22.01
Gold	4 507	162 094	35 965	11 997	2 662	13.51
Silver-lead-zinc	1 982	73 202	36 933	9 970	5 030	7.34
Miscellaneous metals ¹	532	18 412	34 609	4 068	7 647	4.53
Nickel-copper-zinc ²	12 335	415 630	33 695	117 169	9 499	3.55
Iron ore	1 511	58 147	38 482	94 588	62 600	0.61
Total	24 891	885 595	35 579	244 975	9 842	3.62
1986						
Uranium	3 796	161 248	42 478	6 933	1 826	23.26
Gold	4 620	181 873	39 366	14 072	3 046	12.92
Silver-lead-zinc	1 801	68 971	38 296	12 084	6 710	5.71
Miscellaneous metals ¹	546	19 674	36 033	8 360	15 311	2.35
Nickel-copper-zinc ²	11 585	416 818	35 979	126 658	10 933	3.29
Iron ore	1 308	51 760	39 572	88 231	67 455	0.59
Total	23 656	900 344	38 060	256 338	10 836	3.51

¹ Includes molybdenum mines. ² Includes copper-zinc and nickel-copper mines.

TABLE 13. CANADA, PERSON-HOURS PAID FOR PRODUCTION AND RELATED WORKERS, AND TONNES OF ORE MINED AND ROCK QUARRIED IN METAL MINES AND OTHER MINERAL OPERATIONS, 1980-86

	Unit	1980	1981	1982	1983	1984	1985	1986
Metal mines¹								
Ore mined	million t	290.1	301.5	238.4	219.0	246.4	245.0	256.3
Person-hours paid ²	million	97.5	100.6	80.4	71.8	78.2	77.1	73.6
Person-hours paid per tonne mined	number	0.34	0.33	0.34	0.33	0.32	0.31	0.29
Tonnes mined per person-hour paid	t	2.98	3.00	2.97	3.05	3.15	3.18	3.48
Other mineral operations³								
Ore mined and rock quarried	million t	106.6	110.5	93.2	101.6	132.3	138.2	127.4
Person-hours paid ²	million	41.4	38.6	34.8	32.2	34.0	31.3	28.9
Person-hours paid per tonne mined	number	0.39	0.35	0.37	0.32 ^r	0.26	0.23	0.23
Tonnes mined per person-hour paid	t	2.57 ^r	2.86	2.68	3.16 ^r	3.89	4.42 ^r	4.41

¹ Excludes placer mining. ² Person-hours paid for production and related workers only. ³ Includes asbestos, potash, gypsum and coal.

^r Revised.

TABLE 14. CANADA, AVERAGE WEEKLY WAGES AND HOURS WORKED (INCLUDING OVERTIME) FOR HOURLY-RATED EMPLOYEES IN MINING, MANUFACTURING AND CONSTRUCTION INDUSTRIES, 1981-87

	1981	1982	1983 ¹	1984	1985	1986	1987
Mining							
Average hours per week	40.4	39.6	38.8	39.3	39.6	39.7	40.0
Average weekly wage (\$)	494.62	551.68	552.79	664.56 ^r	697.90 ^r	711.05	726.40
Metals							
Average hours per week	40.2	39.0	38.3	38.8	39.1	39.6	39.6
Average weekly wage (\$)	485.03	535.92	565.64 ^r	610.77 ^r	639.89 ^r	657.62	678.84
Mineral fuels							
Average hours per week	41.3	42.1	39.7	40.6	40.8 ^r	40.9	41.6
Average weekly wage (\$)	553.71	631.91	627.26 ^r	672.95 ^r	716.79 ^r	711.40	729.26
Nonmetals							
Average hours per week	38.7	37.2	37.7 ^r	38.7	39.2	39.6	39.7
Average weekly wage (\$)	445.02	479.44	503.58 ^r	536.20 ^r	554.88 ^r	581.84	595.98
Manufacturing							
Average hours per week	38.5	37.7	38.4	38.5	38.8	38.8	38.8
Average weekly wage (\$)	352.08	384.79	504.76	465.66 ^r	488.17 ^r	504.04 ^r	519.54
Construction							
Average hours per week	38.9	38.1	36.9	37.4 ^r	37.8	37.9 ^r	38.4
Average weekly wage (\$)	531.54	564.33	512.26	491.24 ^r	505.07 ^r	510.40 ^r	539.37

¹ Ten-month average: new time series.

^r Revised.

TABLE 15. CANADA, AVERAGE WEEKLY WAGES (INCLUDING OVERTIME) OF HOURLY-RATED EMPLOYEES IN THE MINING INDUSTRY, IN CURRENT AND 1981 DOLLARS, 1981-87

	1981	1982	1983	1984 ¹	1985	1986	1987
Current dollars							
All mining	494.62	551.68	552.79	664.56 ^r	697.90 ^r	711.05	726.40
Metals	485.03	535.92	565.64 ^r	610.77 ^r	639.89 ^r	657.62	678.84
Mineral fuels	553.71	631.91	627.26 ^r	672.95 ^r	716.79 ^r	711.40	729.26
Coal	485.03	567.44 ^r	564.18	653.42 ^r	697.30 ^r	718.82 ^r	729.54
Industrial minerals	445.02	479.44	503.58 ^r	536.20 ^r	554.88 ^r	581.84	595.98
1981 dollars (CPI)							
All mining	494.62	497.90	471.66	543.39	548.66 ^r	537.05 ^r	525.62
Metals	485.03	483.68	482.59	499.40 ^r	503.06 ^r	496.69	491.20
Mineral fuels	553.11	570.32	534.23	550.25 ^r	563.51 ^r	537.31	527.68
Coal	485.03	507.33	481.38	534.28 ^r	548.19 ^r	542.92	527.89
Industrial minerals	445.02	432.71	430.68	438.43 ^r	436.23 ^r	439.46	431.24

¹ Ten-month average: new time series.

CPI Consumer Price Index - all items. ^r Revised.

TABLE 16. WESTERN WORLD PRODUCTION OF CERTAIN MAJOR METALS, 1983-87¹

	1983	1984	1985	1986	1987
	(000 t)				
Primary Aluminum					
Europe ²	3 585	3 814	3 642	3 716	3 752
Asia ²	981	1 184	1 153	1 066	949
Africa	424	413	473	548	572
North and South America	5 390	6 367	5 946	5 791	6 381
Australia and Oceania	695	998	1 095	1 113	1 276
Western World Total	11 075	12 775	12 308	12 234	12 931
Lead (refined production)³					
Europe ²	1 527	1 594	1 603	1 607	1 608
Asia ²	443	507	538	562	573
Africa	148	126	157	145	158
North and South America	1 554	1 595	1 700	1 576	1 607
Australia and Oceania	229	226	222	175	222
Western World Total	3 901	4 048	4 218	4 065	4 168
Copper (refined production)					
Europe ²	1 507	1 478	1 540	1 584	1 548
Asia ²	1 378	1 327	1 406	1 430	1 473
Africa	988	921	907	877	891
North and South America	3 245	3 263	3 292	3 373	3 535
Australia and Oceania	203	197	194	186	190
Western World Total	7 321	7 186	7 340	7 450	7 636
Zinc (smelter production)					
Europe ²	1 862	1 941	1 965	1 987	2 083
Asia ²	875	940	1 002	982	1 006
Africa	214	221	216	197	200
North and South America	1 383	1 478	1 518	1 379	1 445
Australia and Oceania	299	302	289	303	310
Western World Total	4 632	4 881	4 990	4 848	5 044
Tin (smelter production)					
Europe ²	23	25	26	24	24
Asia ²	104	96	91	90	88
Africa	7	6	6	3	4
North and South America	30	40	43	40	38
Australia and Oceania	3	3	3	1	1
Western World Total	167	170	169	158	154

Source: Metallgesellschaft AG, Metallstatistik (preliminary issue) Western World 1983-1987, May 1988.

¹ Preliminary data. ² Excluding Eastern countries. ³ Includes secondary lead.
Totals may not add due to rounding.

TABLE 17. GENERAL EXPLORATION AND CAPITAL EXPENDITURES BY MINING AND EXPLORATION COMPANIES, BY PROVINCE, 1987 and 1988¹

Province	Capital Expenditures	General Exploration
Newfoundland		
1987	129.7	7.3
1988 Forecast	109.3	6.7
1988 Revised Forecast	127.2	6.1
Prince Edward Island		
1987	—	—
1988 Forecast	—	—
1988 Revised Forecast	—	—
Nova Scotia		
1987	141.0	15.2
1988 Forecast	90.5	19.4
1988 Revised Forecast	81.9	20.1
New Brunswick		
1987	69.5	9.0
1988 Forecast	55.7	13.6
1988 Revised Forecast	59.4	17.1
Quebec		
1987	393.2	432.7
1988 Forecast	414.1	478.8
1988 Revised Forecast	448.6	452.8
Ontario		
1987	653.2	171.4
1988 Forecast	771.7	151.4
1988 Revised Forecast	942.1	186.1
Manitoba		
1987	93.1	17.3
1988 Forecast	91.4	21.8
1988 Revised Forecast	91.9	18.0
Saskatchewan		
1987	169.9	36.7
1988 Forecast	203.3	38.5
1988 Revised Forecast	204.6	44.2
Alberta		
1987	39.9	4.0
1988 Forecast	75.2	4.9
1988 Revised Forecast	72.2	5.1
British Columbia		
1987	437.9	105.3
1988 Forecast	395.6	118.7
1988 Revised Forecast	571.9	131.1
Yukon		
1987	19.0	16.8
1988 Forecast	22.9	15.1
1988 Revised Forecast	23.7	8.5
Northwest Territories		
1987	49.9	33.9
1988 Forecast	117.6	21.9
1988 Revised Forecast	95.7	24.3
CANADA		
1987	2 196.2	849.6
1988 Forecast	2 347.6	891.0
1988 Revised Forecast	2 719.2	913.7

Source: Statistics Canada, Capital Expenditures Section.

¹ Preliminary actual 1987, intentions 1988, revised intentions 1988.

— Nil or zero.

TABLE 18. GENERAL EXPLORATION AND CAPITAL EXPENDITURES BY MINING AND EXPLORATION COMPANIES, CANADA, BY INDUSTRY GROUP, 1987 and 1988¹

	Capital Expenditures	General Exploration
Gold		
1987	737.0	95.2
1988 Forecast	742.7	86.5
1988 Revised Forecast	1 026.8	113.3
Uranium		
1987	106.3	17.8
1988 Forecast	158.8	x
1988 Revised Forecast	173.3	x
Iron		
1987	116.7	x
1988 Forecast	123.1	x
1988 Revised Forecast	126.9	x
Copper-gold-silver		
1987	229.7	20.8
1988 Forecast	193.7	15.3
1988 Revised Forecast	285.1	16.4
Silver-lead-zinc		
1987	118.3	16.9
1988 Forecast	97.1	21.7
1988 Revised Forecast	123.0	19.8
Other Metal		
1987	172.1	x
1988 Forecast	266.6	x
1988 Revised Forecast	290.4	x
Total Metal Mines		
1987	1 480.1	156.6
1988 Forecast	1 582.0	154.7
1988 Revised Forecast	2 025.0	183.0
Coal		
1987	355.0	8.4
1988 Forecast	368.2	10.4
1988 Revised Forecast	366.7	5.0
Asbestos		
1987	51.2	-
1988 Forecast	28.4	-
1988 Revised Forecast	15.0	-
Other Nonmetal Mines		
1987	255.0	3.0
1988 Forecast	248.3	5.4
1988 Revised Forecast	273.6	2.2
Total Nonmetal Mines		
1987	661.2	11.4
1988 Forecast	644.9	15.8
1988 Revised Forecast	655.3	7.2
Metal and Nonmetal Exploration Companies		
1987	54.9	681.6
1988 Forecast	120.7	720.5
1988 Revised Forecast	38.1	723.6
TOTAL MINING		
1987	2 196.2	849.6
1988 Forecast	2 347.6	891.0
1988 Revised Forecast	2 718.5	913.8

Source: Statistics Canada, Capital Expenditures Section.

¹ Preliminary actual 1987, intentions 1988, revised intentions 1988.

- Nil or zero; x Confidential.

EMPLOYMENT TRENDS

Tables A, B and C provide updated information on employment in the mineral industry, by occupation and province.

TABLE A. Canada, Employment by Mineral Industry¹

	January 1986	January 1987	November 1987 ('000 persons)	December 1987	January 1988
Metal mines	46.3	45.5	46.4	46.3	46.1
Nonmetal mines	11.4	10.8	11.4	11.3	10.9
Coal mines	12.5	11.7	10.7	10.7	10.7
Total mines	70.2	68.0	68.5	68.3	67.7
Primary metal industries ²	100.5	95.6	99.9	100.4	99.0

Source: Statistics Canada 72-002: Employment, Earnings and Hours.

¹ Includes salaried and hourly paid employees in all provinces and territories. ² Includes iron and steel mills; steel pipe and tube mills; iron foundries; smelting and refining; aluminum rolling, casting and extruding.

TABLE B. Canada, Unemployment Rate by Occupation¹

	January 1986	January 1987	November 1987	December 1987	January 1988
Unemployed as percent of labour force					
Mining and quarry- ing occupations	9.9	14.7	7.9	10.6	12.4
All occupations	10.7	10.6	7.8	7.9	8.9

Source: Statistics Canada 71-001: The Labour Force.

¹ Unemployment in the Yukon and Northwest Territories is not included.

TABLE C. Canada, Employment by Province, January 1988

	Metal Mines	Nonmetal Mines ('000 employees)	Mines, Quarries, Oil Wells
Newfoundland	..	..	3.1
Nova Scotia	..	..	5.2
New Brunswick	..	..	3.2
Quebec	9.2	3.1	19.6
Ontario	19.5	1.5	29.9
Manitoba	3.3	..	3.9
Saskatchewan	..	3.6	8.2
Alberta	..	..	63.2
British Columbia	6.6	..	15.0
Yukon	..	..	..
Northwest Territories	..	..	..
Total Canada	46.1	10.9	154.4

Source: Statistics Canada 72-002: Employment, Earnings and Hours.

.. Not available.

METALLIC MINERALS AND PRODUCTS

Copper

W. McCutcheon (613) 992-4404

Metal Prices - US Cents/lb.

	London Metal Exchange (LME) Grade A Cash Settlement July 1-29	Commodities Exchange, Inc. (COMEX) 1st Position July 1-28
High	109.7	103.5
Low	95.7	93.8
Average	100.4	99.1
Year to date average	109.0	104.6
Year to date average cents (C)	135.5	130.0

Between June 24 and July 29, the combined LME and COMEX stocks rose 31 387 t, or 30%, from 103 690 t to 135 067 t. The LME 3-month backwardation ended July 12. Thereafter, the market varied between a small contango and a small backwardation that reached a maximum of US 1.1 ¢/lb. for the period July 12 to July 29.

The Broken Hill Proprietary Company Limited (B.H.P.) announced the go-ahead of the Escondida project. B.H.P. and the other owners have succeeded in securing non-commercial financing for the project. Commercial banks are not participating in the loans to Escondida. The total project cost has been put at US\$1100 million.

Non-recourse loans to Minera Escondida Limitada total US\$680 million, repayable over 12.5 years. Of the US\$680 million, US\$537 million is import financing linked to sales of copper concentrate to smelters. The import financing loans are:

- \$350 million from Export-Import Bank of Japan and other Japanese institutions;
- \$140 million from Federal Republic of Germany's Kreditanstalt Fuer Wiederaufbau (KFW); and
- \$47 million from Kansallis-Osake-Pankki (KOP) of Finland.

Export and supplier credits are being extended by the Export Development Corporation (EDC) of Canada, KFW, and an affiliate of Mitsubishi Metal Corporation.

The International Finance Corporation (IFC) will take a 2.5% interest in Escondida from B.H.P., reducing B.H.P.'s stake to 57.5%.

Production should commence in 1991, producing an average of 800 000 t of concentrate containing 320 000 t of copper. There will be by-product gold, silver and molybdenum. Reserves of the pit are 662 Mt at 2.21%, sufficient for 52 years of operation. Operating costs are put at 40¢/lb. by B.H.P.

Concentrate sales contracts extending to 2002 have been negotiated for:

380 000 t/y conc to 7 Japanese companies,
150 000 t/y conc to Norddeutsche Affinerie AG,
51 000 t/y conc to Outokumpu Oy.

Shorter-term arrangements will be made for the 25% of the production not sold under long-term contracts.

B.H.P. does not see Escondida causing an oversupply of copper. B.H.P.'s long-term price forecast for copper is an average US\$83¢/lb. (in 1988 dollars) for the next 10-15 years, based on a projected consumption growth rate of 1.4-1.6%/yr.

However, from the Canadian perspective, the start-up of Escondida will have a definite impact on the Canadian copper industry. Canada is the largest exporter of copper concentrates at present, with an output slightly more than the projected rate of Escondida. Canada also imports some concentrates. Escondida's announced output at this time amounts to over 20% of the present international trade of copper in concentrates. Thus, the impact of Escondida will be significant, having a negative impact on western Canadian exporters and a positive impact on the eastern Canadian custom smelters.

In Papua New Guinea, Ok Tedi Mining Limited's copper output is scheduled to increase as the gold cap is mined out this year. By October the gold circuit in the mill will be switched over to process copper, doubling the copper ore capacity from 35 000 t/d to 70 000 t/d. OTML is owned by B.H.P. (30%), Amoco Minerals (PNG) Co. (30%), PNG government (20%) with minor shares owned by Metallgesellschaft AG, Degussa AG, and Deutsche Finanzierungsgesellschaft fuer Beteiligungen in Entwicklungslaender GMBH.

SPECIAL ITEMS

Advanced Industrial Materials
A. Werner (613) 992-7613

European Research in Advanced Materials (EURAM)

In Europe, a series of cost-shared projects are being carried out under the aegis of the research and development action program on "Raw Materials and Advanced Materials" (1986-89), which was adopted by the Council of the European Communities on June 10th, 1986. The program is administered by the Technological Research Directorate of the Commission's Science, Research and Development Directorate-General located in Brussels, with the help of a management and coordination advisory committee. Areas now being investigated under "EURAM 1" are:

- **Metals**, with topic areas on aluminum alloys, magnesium alloys, titanium alloys, electrical contact materials, magnetic materials, coating and tooling materials, and thin-walled castings;
- **Ceramics**, with topic areas on the optimization of engineering ceramics, metal/ceramic interface, ceramic matrix composites, and high-temperature ceramics; and
- **Composites**, with topic areas on organic composites, metallic composites, and other materials.

A sample project in the metals area is a three-year investigation of "Rapid Solidification of Magnesium Alloys"¹ aimed at developing "new magnesium-based alloys with mechanical properties competitive with the best aluminum alloys at room and elevated temperatures and with better corrosion resistance than conventional magnesium alloys". This investigation is being run as a joint project between Pechiney Electrometallurgie of Paris, France, and Norsk Hydro AS, based in Porsgrunn, Norway.

In the area of ceramics, one of the three-year studies being carried out under contract² by the Université de Caen, France; Stuttgart Universitaet, West Germany; and Elektroschmelzwerk, Kempten, West Germany, is focussed on the "Improvement of the Reliability of Different Silicon Carbide Grades for Automotive Applications" by forecasting the failure of components on the basis of experimental and theoretical modelling in conjunction with computational work.

In the area of composites, a 30-month study³ on the "Optimization of Ceramic Fibres Reinforced Aluminum Alloys" is being coordinated by the auto maker RENAULT-REGIENOV of Paris, France; in partnership with the University of Surrey, Surrey, England; the Universidade do Porto, Porto, Portugal; and Senter for Industriforskring, Oslo, Norway. The project aims to develop an optimal alloy composition and process technology to provide aluminum alloys reinforced by short ceramic fibres to be used in the fabrication of load-bearing components, such as connecting rods.

In an address to a meeting of the Interdepartmental Working Group on Advanced Industrial Materials held in Ottawa on July 11, 1988, Dr. J.G. Wurm, who was visiting Canada from Belgium, pointed out that EURAM 1 is now drawing to a close and that the Commission had issued a

¹ Contract No: MAIE/0053, p. 9. ² Contract No: MAIE/0072/C, p. 47. ³ Contract No: MAIE/0051/C, p. 75.

call for research and development proposals from EURAM 2, the principal areas of which are likely to be:

- light metal alloys;
- magnetic materials;
- superconductors;
- engineering ceramics;
- polymers; and
- biomaterials.

Participation in these projects is currently limited to organizations in member countries of the European Community. There may, however, be opportunities for Canadian companies to perform sub-contract work in some of these future projects.

Further information on EURAM and its programs may be obtained from S. Wilson, Department of External Affairs (613-966-0684).

Source: Commission of the European Communities, Directorate General for Science, Research and Development, 1988, European Research on Advanced Materials: Programme, EURAM (1986-1989), X11/289/88-EN, 84 pages.

The Canadian Mineral Outlook Conference
J. Zwartendyk (613) 992-6406

The one-day sixth annual Outlook Conference held in Ottawa on May 25, co-sponsored by Energy, Mines and Resources Canada and The Mining Association of Canada, drew about 450 attendees.

The morning session, dedicated to "Mineral Trade into the 1990s", was summarized by its chairman, Ron R. Sully, Assistant Deputy Minister (Mineral Policy), EMR, approximately as follows:

The Honourable Donald S. Macdonald (formerly Minister of Defence; of Energy, Mines and Resources; and of Finance) opened by reminding us that the Canada-U.S. Free Trade Agreement is really the culmination of more than 50 years of trade negotiations between Canada and the United States. He highlighted five elements of the Agreement for minerals and metals: tariff elimination; the creation of trading rules on services; the rules on investment; the rules on energy and the importance of means to resolve trade disputes.

The second speaker, Mr. Herzstein, a Washington lawyer, confirmed that the Free Trade Agreement will help Canada's mineral industry directly through the removal of tariffs and the elimination of restrictions on processing uranium. He used the softwood lumber case to explain how the Agreement will benefit Canadian mineral exporters that are currently vulnerable to U.S. contingency protection measures. Mr. Herzstein cited three different articles and chapters of the Agreement that could have come into play had the Agreement been in place: 1) Article 1902, the "watchdog provision", 2) Article 904, the binational panel mechanism, and 3) Chapter 18 for consultation and dispute resolution. Canadian exporters in the audience were pleased to hear Mr. Herzstein's view that the Agreement brings new discipline to U.S. countervail procedures, even though new rules on antidumping and subsidized countervail have yet to be negotiated.

Mr. Phillip Crowson (Economic Advisor, RTZ Corporation PLC, London) spoke on evolving international investment and trade patterns. He had two strong messages for Canada's mining community. First, while the Canada-U.S. Free Trade Agreement is good, it should not be regarded as the ultimate objective, which is to be profitable and to remain internationally competitive. Second, he reminded Canadians not to focus too heavily on North American markets, but to look towards Pacific Asia and China where economic activity and mineral demand are rising most rapidly. He warned that if existing mining companies don't seize emerging opportunities, new companies will.

Dr. Klaus Goeckmann, Vice-President, Marketing and Sales, Cominco Metals, shifted attention to evolving international organizational changes in world mining. He highlighted the industry's operating environment as one of low return and profit margin volatility, and he noted the profound importance of international currency exchange movements. He went on to review organizational changes: 1) the growth of government ownership in the 1960s and 1970s; 2) the entry of oil companies into the metals business in the late 1970s and early 1980s; 3) diversification of metal companies into coal mining and other businesses; and 4) the rationalization of smelting industries, particularly in aluminum and zinc.

Dr. Norman Keevil, Jr., President and CEO, Teck Corporation, completed the morning session with a stimulating discourse on Canadian mineral resource prospects for the future. He examined changes in Canada's ore reserves since 1979 and effectively contrasted rising reserves for gold with declining reserves for base metals. Dr. Keevil revealed that domestic feedstocks for the Trail smelter will drop precipitously, from 91% in 1987 to less than 10% by 1998. He cited other examples where Canadian smelters would become more dependent on imported feedstocks unless new base-metal orebodies are discovered and developed in Canada very soon. We must undertake

more and better exploration in Canada for base metals. This concern about future domestic supplies of base metals is recent and it is a subject we should spend more time thinking about.

The afternoon session was dedicated to "Socio-economic challenges for the 1990s". The first paper, giving a labour perspective on technology and international competitiveness, was prepared by Gérard Docquier, National Director, United Steelworkers of America; the paper was delivered by Gérard Pelletier, Canadian Labour Congress, who observed that technological change committees of management and labour at the plant level are now much more common than they used to be, although there is still room for improving worker input on this issue. USWA concerns about the Canada-U.S. Free Trade Agreement were freely brought forward as well.

On the subject of health, safety, and environment, Christian Bozec, of Société ERAMET-SLN, France, focused among other things on the "tyranny of the lists" of conceivably toxic substances. Such cautionary lists, issued by various organizations, are steadily proliferating. For many of the listed substances, merely the possibility of toxicity is suggested, which is easier than to disprove that possibility. Mr. Bozec urged industry to prepare itself to deal rationally with long-term toxicity questions, which are likely to come up more frequently and which are difficult to handle.

The final speaker, Elise Lavigne-Bruchet of Dimensions Planning, pointed out that the priority placed by Canadians on environmental issues is increasing, and suggested that the idea of an Environmental Code of Practice, along the lines of the one adopted by the Canadian Petroleum Association, is worthy of serious consideration by The Mining Association of Canada.

The chairman of the afternoon session, George Miller, President of The Mining Association, observed that Canadians are going to have to work together whatever the outcome of the Free Trade Agreement. That will call for accommodation, better communication and cooperation, and that applies as well to socio-economic issues and health and environment issues where views tend to diverge. A final message that Dr. Miller extracted from the afternoon's presentations was the need for proactive measures: we can not sit back and wait for events to overtake us.

Individual papers, as well as the entire proceedings, may be obtained from Dorothy Fyfe, EMR/MPS, 6th Floor, 580 Booth Street, Ottawa, Ontario, K1A 0E4 (telephone 613-996-7788).

PROSPECTORS AND DEVELOPERS ASSOCIATION OF CANADA

Suite 1002 - 74 Victoria Street
Toronto, Ontario, Canada M5C 2A5
Telephone: (416) 362-1969

Seminar

**The Finding, Development and Financing of Canadian Mines
Explained for Brokers and Market Watchers
November 7&9, 1988**

This seminar will be of special interest to Registered Representatives in brokerage companies, accountants, bankers, lawyers, investors and officers of junior mining companies.

The seminar will consist of two evening sessions given by senior mining and financial executives. It will be held in the Visitors' Centre Auditorium, The Toronto Stock Exchange, 2 First Canadian Place, Toronto.

57th Annual Convention

**Prospectors and Developers Association of Canada
March 5-8, 1989
Royal York Hotel
Toronto, Ontario, Canada
For info call PDAC (416) 362-1969**

For further information contact Cary McLeod (416) 362-1969.

NEW PUBLICATION

The following publication was published by Energy, Mines and Resources Canada and copies can be obtained from:

Canadian Government Publishing Centre
Supply and Services Canada
Ottawa, Canada
K1A 0S9

Mineral Bulletin

MR 218 – Metallurgical Works in Canada
Primary Iron and Steel 1988

This is a detailed list of the facilities, productive capacities, products and other data of companies that comprised the primary iron and steel industry of Canada as of January 1, 1988. Separate sections cover the steel pipe and tube industry and the iron powder and ferrite industry.

Reference: Cat. No. M38-2/218
ISBN 0-660-54177-7
\$8.50

