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CRAIGMONT MINES LIMITED

PROJECT SUBMISSION 627

FOR

THE DEVELOPMENT FOR MINING

OF

THE EAST END OF NO. 1 OREBODY

A. J. Petrina,
Senior Mine Engineer.

28 February 1964.

INDEX

Drawings

INTRODUCTION

High grade ore is required from the underground mine during the latter part of fiscal year three and the early part of fiscal year four to reduce the amount of low grade ore (0.58% Cu) fed to the mill by the open pit during that period, thereby increasing earnings.

The recommended source of underground ore additional to that already scheduled from No. 2 orebody is that portion of the No. 1 orebody bounded on the west by section 9615, on the east by section 9765, on the top by the 3250 horizon, and on the bottom by the 3060 horizon; the block contains 154,000 tons grading 2.78% copper.

This project submission (No. 627) is intended to cover only the costs incurred in preparing two stopes in the above mentioned ore block for production; estimates of operating costs and capital cost of additional equipment are mentioned, but a separate project would be submitted to cover the equipment purchases. The submission includes:

(i) the recommended mining method for the ore block described above

(ii) mining schedules, estimated cash flow, men and equipment requirements.

(iii) profitability of the project.

* * * * * *

FINDINGS

(Refer to Figure 1)

If the company undertakes the project described above, and if a contractor agrees to perform the development work at prices approximating the estimates in this submission, then the company with an expenditure of $188,420 can prepare two stopes for production. The two stopes should yield 1000 tons per day at an operating cost of $1.63 per ton plus an additional expenditure of $50,400 for equipment. By the end of fiscal year three, with a total expenditure of $333,470, an extra amount of concentrate worth $585,730* will have been produced for an increase in operating profit of $252,260.

SUMMARY OF FINDINGS

Development Ore		10,460		
Stoping Ore		96,000		
		106,460		
		Total	Per Ton Stoped	Per Ton Recovered
Development as per Project No. 627:				
Contractor's Fee	135,770			
Additional Expense	52,650			
	188,420	188,420	1.96	1.77
Operating Expense		156,650	1.63	1.47
Additional Equipment		50,400	.53	.47
TOTAL		$ 395,470		$ 3.71
Extra net smelter return realized by substituting U/G high grade for open pit low grade		$ 910,630		$ 8.55**
Extra operating profit		$ 515,160		

* This represents only the excess of concentrate over the amount which would be produced by mining an equivalent tonnage of open pit low grade (0.58% Cu) instead of executing this project.

** Refer to Appendix V

RECOMMENDATIONS

(1) It is recommended that the portion of the No. 1 orebody bounded on the west by section 9615, on the east by section 9765, on the top by the 3250 horizon and on the bottom by the 3060 horizon be mined as soon as possible by the following method (refer to figures 2 to 10):

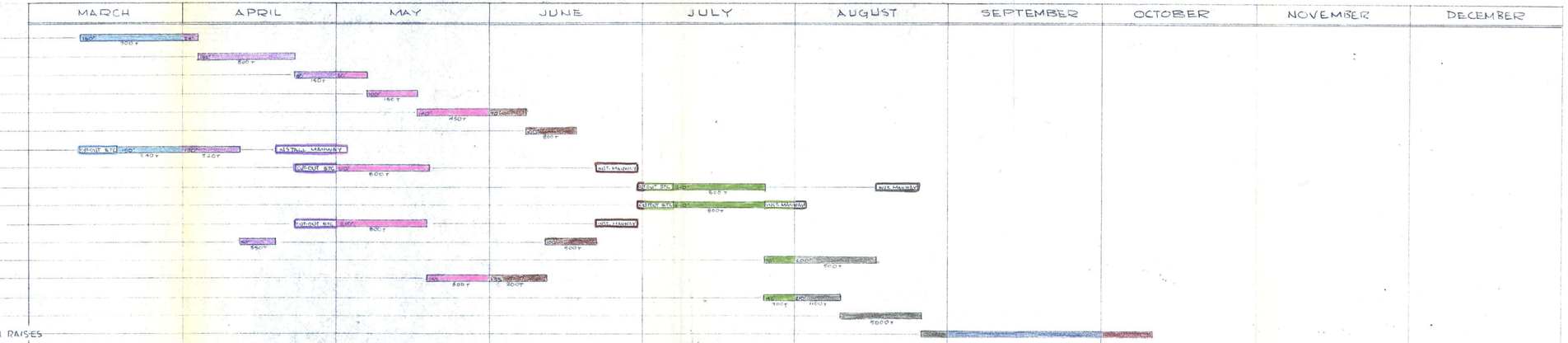
- longhole shrinkage stoping using horizontal holes drilled from perimeter raises.
- two transverse stopes, fifty feet wide separated by a fifty-foot wide transverse pillar.
- the ore will be gathered on 3060 level by Eimco 21 muckers sideloading into 90 cubic foot cars.
- the ore will be trammed on 3060 level to 751 ore pass, and again on 2400 level to the primary crusher.
- the two stopes proposed in this submission are compatible with the mining of the adjacent ore, to the east, to the west, and above the 3250 horizon (see figure 11). There is no significant ore below the 3060 level in these two stopes. Future stopes to the west in lower grade material will sill out above the 3060 level. Stopes to the east will sill out below the 3060 level and hence are dependent upon development from the service shaft. Pillars will be recovered either by the shrink-fill method as practised by Waite-Amulet, or by the undercut-and-fill method as practised by International Nickel.
- the stopes are planned for shrinkage mining, that is, they will remain full of broken ore until the last ring of longholes has been blasted; the stopes may then be drawn empty before introducing pit waste for backfill, or fill may be dumped on top of broken ore to minimize wall slough.

(2) An amount of money, $188,420, should be approved for project No. 627, the execution of the development work detailed herein.

(3) the development work should be done with a minimum of delay in order to partially off-set low grade mill feed from the pit, particularly in the tax free period.

(4) the development work should be done by a contractor if a reasonable price can be negotiated; recent experience at Craigmont indicated that a sufficient number of experienced miners to complete the development by August 1964 would probably not be available. At the present time the underground mine is short of miners, furthermore, an immediate start on this project would mean diversion of equipment from the number two orebody unless a contractor is employed who could supply most of his own equipment.

SCHEDULE OF MINING AND CASH FLOW



	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
TONS OF WASTE	2160	1720	1900	900						
TONS OF ORE	540	1720	2800	1500	2300	1600 + 5000	23 000	30 000	30 000	8 000
MANPOWER REQUIRED	24	36	20	20	20	20	20	26	26	26
EQUIPMENT SUPPLIED BY CONTRACTOR	2 MUCKERS, 5 DRILLS	3 MUCKERS, 7 DRILLS, 2 ALIMAKS, 1 AIR SLUSHER	3 MUCKERS, 7 DRILLS, 2 ALIMAKS, 1 AIR SLUSHER	2 MUCKERS, 5 DRILLS, 2 ALIMAKS, 1 AIR SLUSHER	2 MUCKERS, 4 DRILLS, 2 ALIMAKS, 1 AIR SLUSHER	2 MUCKERS, 4 DRILLS, 4 LONGHOLE DRILLS, 1 AIR SLUSHER	4 LONGHOLE DRILLS	4 LONGHOLE DRILLS		
EQUIPMENT SUPPLIED BY COMPANY	2 LOCOS, 10 CARS	2 LOCOS, 10 CARS	2 LOCOS, 10 CARS	2 LOCOS, 10 CARS	2 LOCOS, 10 CARS	2 LOCOS, 10 CARS	2 DIESEL LOCOS, 4 LITTLE TRAMMERS, 24 CARS	2 DIESEL LOCOS, 4 LITTLE TRAMMERS, 30 CARS	2 DIESEL LOCOS, 4 LITTLE TRAMMERS, 30 CARS	2 DIESEL LOCOS, 4 LITTLE TRAMMERS, 30 CARS
CONTRACTORS FEE	$ 14 870	29 020	35 090	16 140	29 340	13 310				
OTHER EXPENSE	8 130	10 840	14 930	7 250	8 530	2 970 + 50 400 + 8 150 PROJECT EQUIPMENT OPERATING	37 500	49 060	49 060	13 000
EXTRA NET SMELTER RETURN REALISED BY SUBSTITUTING U/G HIGH GRADE FOR OPEN PIT LOW GRADE	4 600	14 700	24 000	12 800	19 700	56 430	197 000	256 500	256 500	68 400
TOTAL EXTRA PROFIT REALISED BY SUBSTITUTING U/G HIGH GRADE FOR OPEN PIT LOW GRADE — MONTHLY	- 18 400	-25 160	-24 020	-10 590	-18 170	-18 400	+ 159 500	+ 207 500	+207 500	+55 400
TOTAL EXTRA PROFIT REALISED BY SUBSTITUTING U/G HIGH GRADE FOR OPEN PIT LOW GRADE — CUMULATIVE	- 18 400	-43 560	-67 580	-78 170	-96 340	-114 740	+ 44 760	+ 252 260	+459 760	+ 515 160

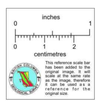


FIGURE 1

CRAIGMONT MINES LIMITED	
PROJECT SUBMISSION: No. 1 GIDDY EAST	
FIGURE 1	
SCHEDULE OF MINING & CASH FLOW	
DRAWN BY RJP	SCALE 1" = 40'
APPD'D JMD	DATE 24-FEB-64

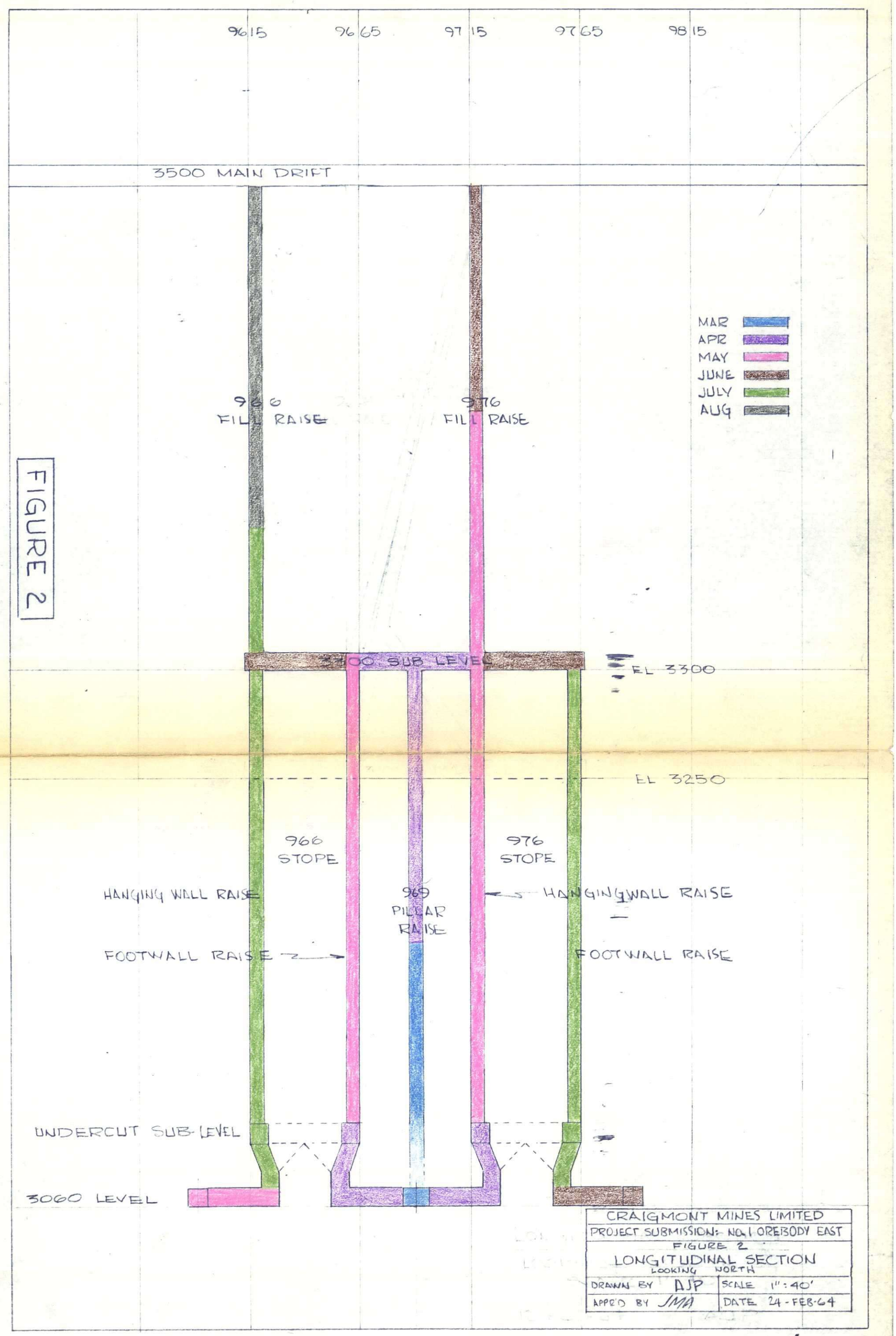


FIGURE 2

CRAIGMONT MINES LIMITED

PROJECT SUBMISSION: NO. 1 OREBODY EAST

FIGURE 2

LONGITUDINAL SECTION
LOOKING NORTH

DRAWN BY AJP	SCALE 1" : 40'
APP'D BY JMA	DATE 24-FEB-64

94 15

95 15

96 15

97 15

98 15

99 15

N

969 CROSSCUT

976 CROSSCUT

966 STOPE

976 STOPE

MAR
APR
MAY
JUNE
JULY
AUG

ACCESS TO 966 HANGING WALL RAISE

ACCESS TO 976 HANGING WALL RAISE

EXISTING DRIFT

COLLAR OF 969 PILLAR RAISE

PLAN VIEW

FIGURE 3

CRAIGMONT MINES LIMITED	
PROJECT SUBMISSION: NO. 1 OREBODY EAST	
FIGURE 3	
PROPOSED 3060 LEVEL WORKINGS	
DRAWN BY AJP	SCALE 1": 40'
APPR'D BY JMA	DATE 24-FEB-64

inches
0 1
0 1 2
centimetres

This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.

BRITISH COLUMBIA GEOLOGICAL SURVEY

94 15 95 15 96 15 97 15 98 15 99 15

N

966 STOPE

976 STOPE

COLLAR OF 966 FOOT-WALL RAISE

COLLAR OF 976 FOOT-WALL RAISE

COLLAR OF 966 HANGING WALL RAISE

COLLAR OF 976 HANGING WALL RAISE

3060 LEVEL

MAR
APR
MAY
JUNE
JULY
AUG

FLOOR OF UNDERCUT AT ~~3090~~ 3082.4 ELEVATION

PLAN VIEW

FIGURE 4

CRAIGMONT MINES LIMITED	
PROJECT SUBMISSION: NO. 1 OREBODY EAST	
FIGURE 4. PROPOSED UNDERCUT SUB	
DRAWN BY AJP	SCALE 1" : 40'
APP'D JMA	DATE 24-FEB-64

200' SOUTH OF GEOLOGICAL REFERENCE LINE

94 15 | 95 15 | 96 15 | 97 15 | 98 15 | 99 15

3500 MAIN DRIFT

N

966 FILL RAISE

976 FILL RAISE

966 STOPE FOOTWALL RAISE

30-976 STOPE FOOTWALL RAISE

966 STOPE HANGING WALL RAISE

969 PILLAR RAISE

976 STOPE HANGING WALL RAISE

966 STOPE

976 STOPE

MAR
APR
MAY
JUNE
JULY
AUG

PLAN VIEW

FIGURE 5

CRAIGMONT MINES LIMITED	
PROJECT SUBMISSION: No. 1 OREBODY EAST	
FIGURE 5 PROPOSED 3300 SUB LEVEL	
DRAWN BY AJP	SCALE 1" : 40'
APPR'D BY JMA	DATE 24-FEB-64

inches
0 1
0 1 2
centimetres

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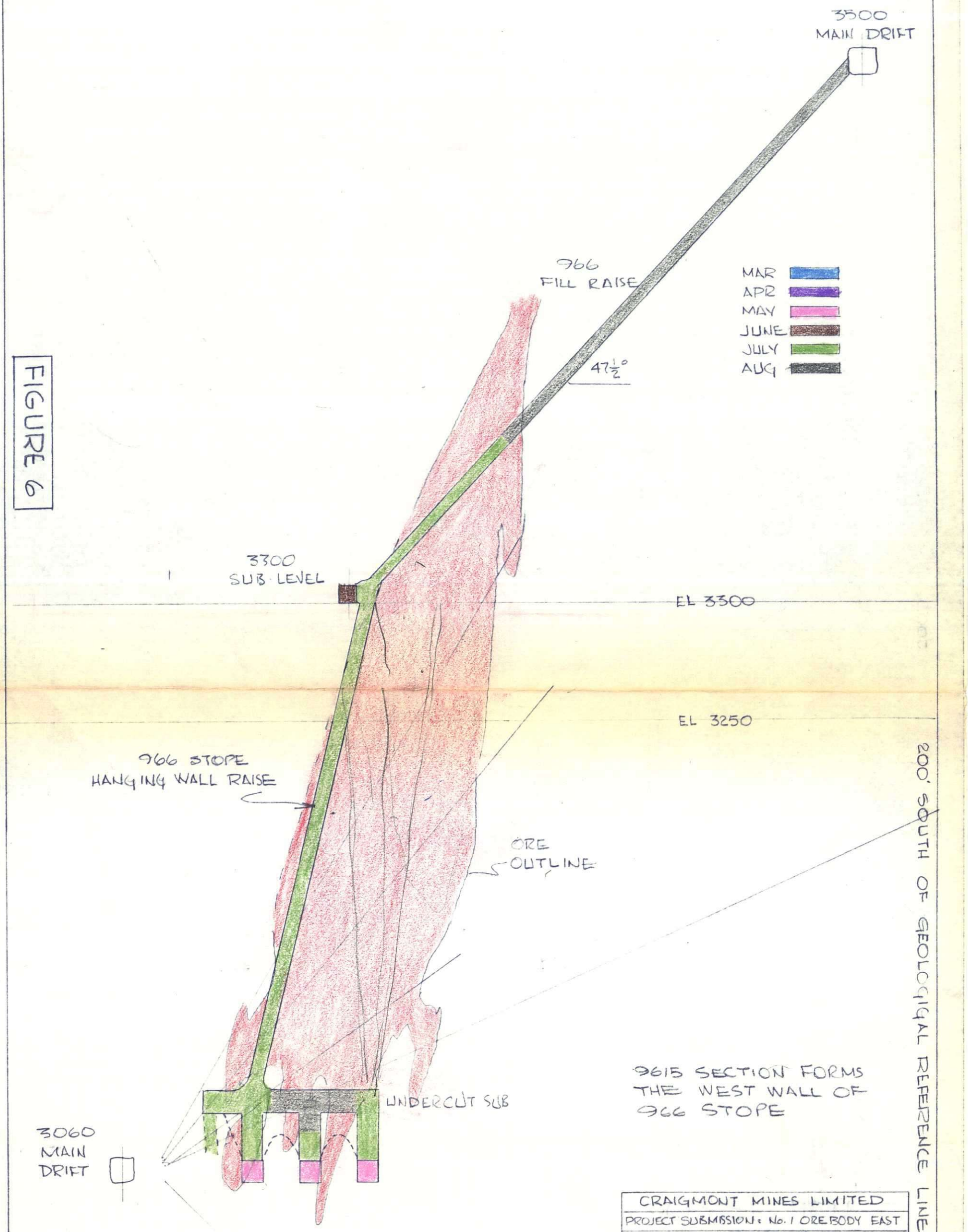
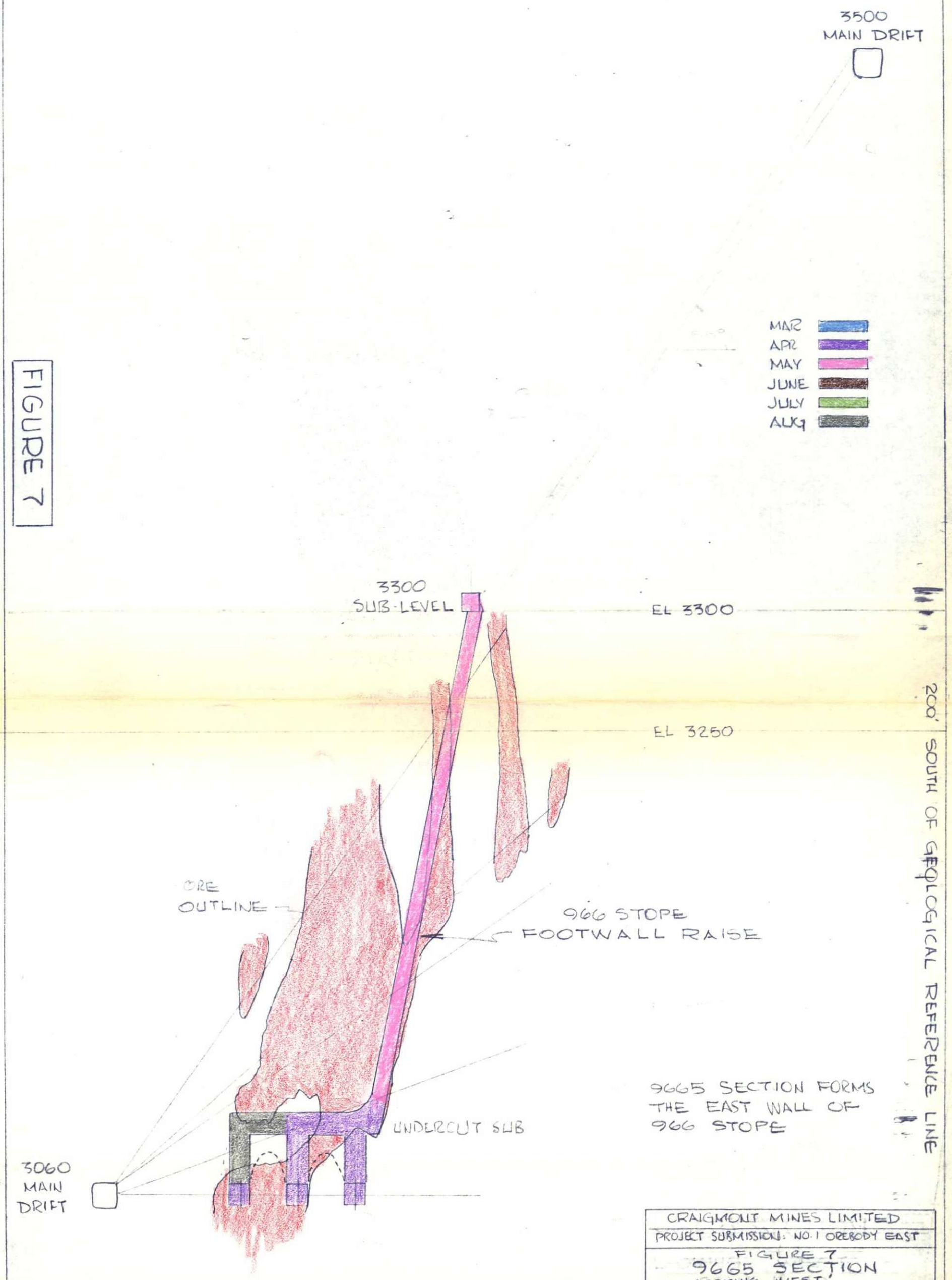
FIGURE 6



CRAIGMONT MINES LIMITED	
PROJECT SUBMISSION: No. 1 OREBODY EAST	
FIGURE 6 9615 SECTION -LOOKING WEST	
DRAWN BY AJP	SCALE 1":40'
APPR'D BY JMA.	DATE 24-FEB-64

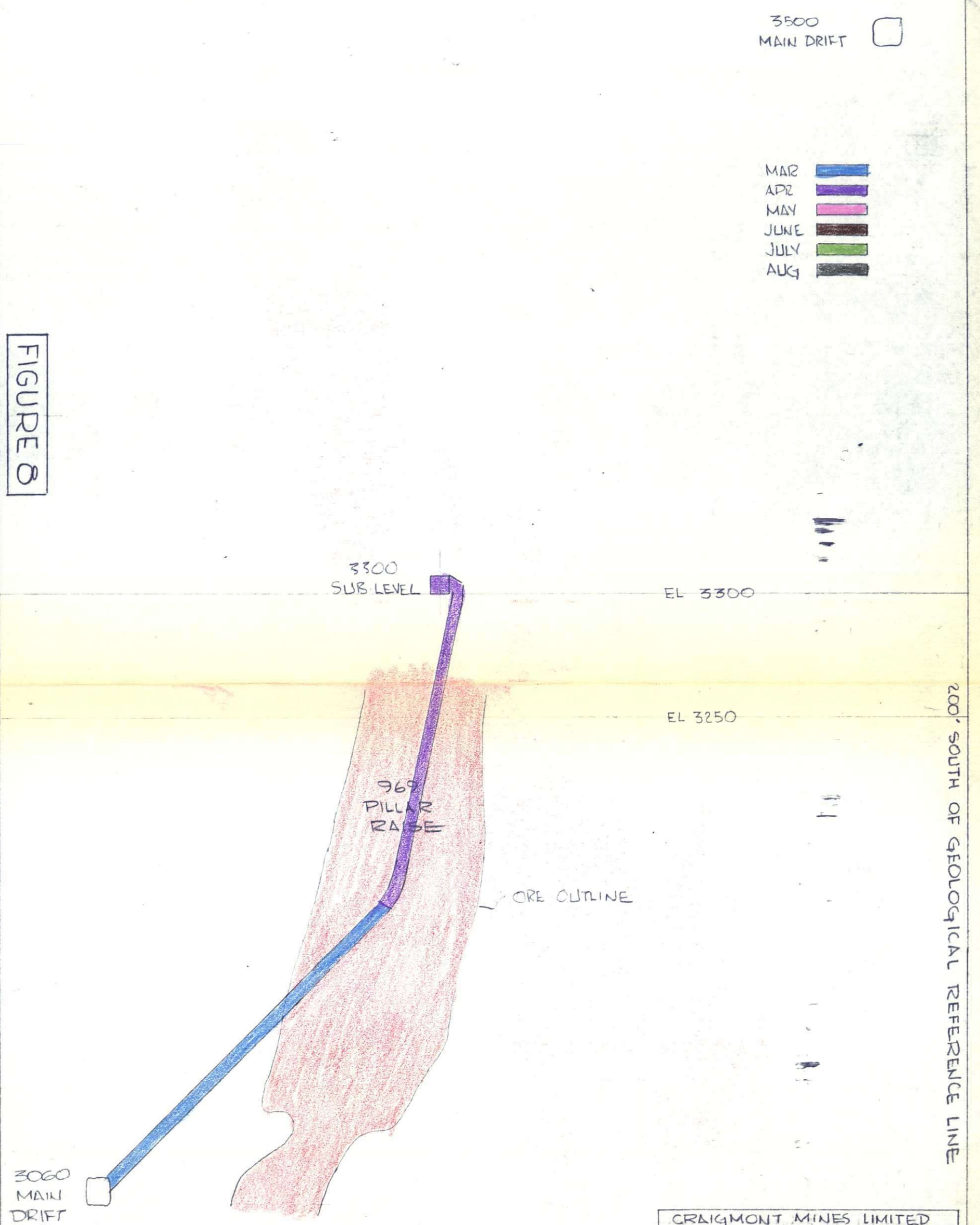
FIGURE 7



9665 SECTION FORMS
THE EAST WALL OF
966 STOPE

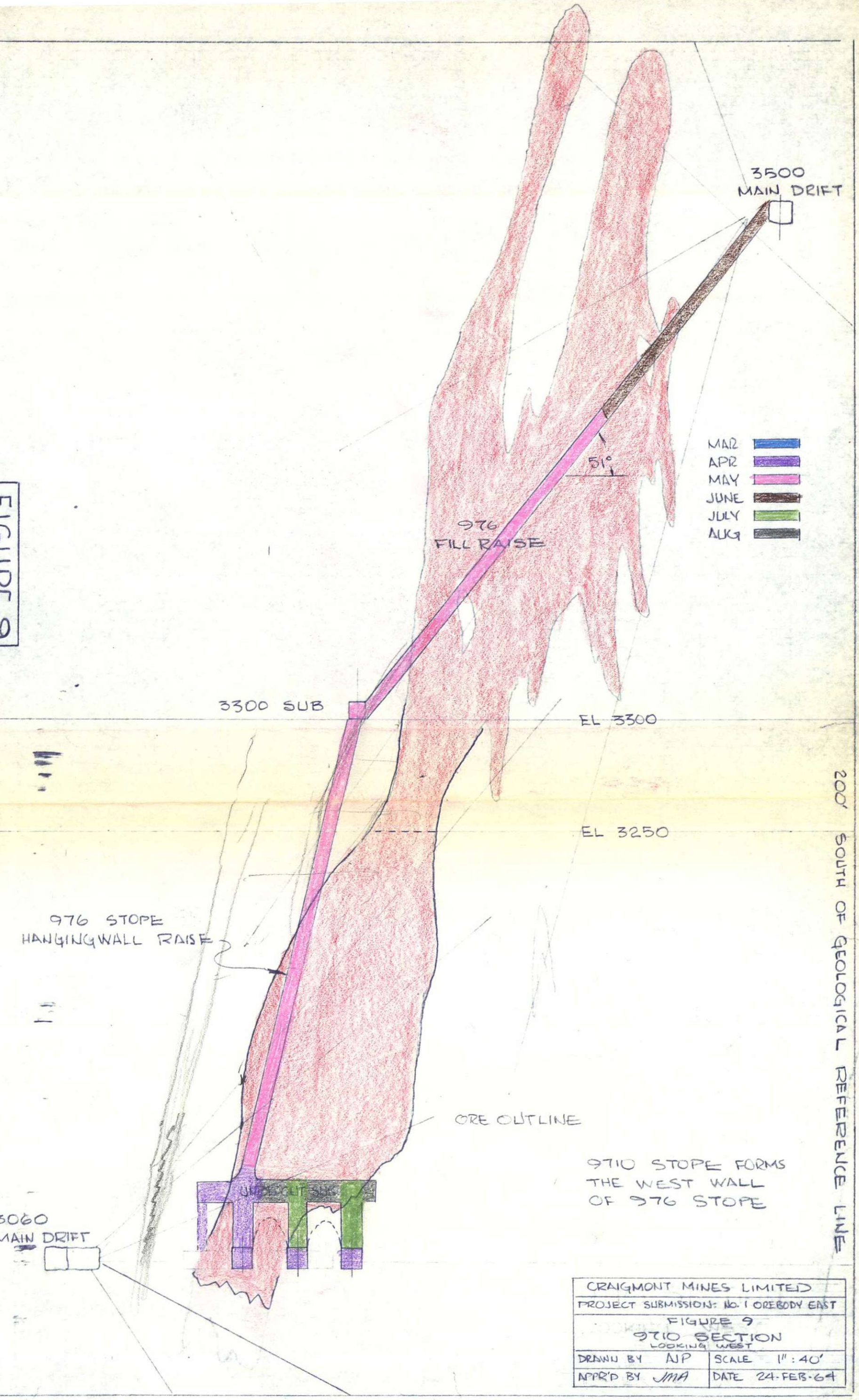
CRAIGMONT MINES LIMITED	
PROJECT SUBMISSION: NO. 1 OREBODY EAST	
FIGURE 7 9665 SECTION LOOKING WEST	
DRAWN BY AJP	SCALE 1" : 40'
APPR'D BY JMA.	DATE 24-FEB-64

FIGURE 8



CRAIGMONT MINES LIMITED	
PROJECT SUBMISSION: NO. 1 OREBODY EAST	
FIGURE 8 9690 SECTION LOOKING WEST	
DRAWN BY AJP	SCALE 1" : 40'
APPR'D BY JMA	DATE 24-FEB-64

FIGURE 9



CRAIGMONT MINES LIMITED	
PROJECT SUBMISSION: No. 1 OREBODY EAST	
FIGURE 9 9710 SECTION LOOKING WEST	
DRAWN BY AJP	SCALE 1" : 40'
APPR'D BY JMA	DATE 24-FEB-64

inches
0 1
0 1 2
centimetres

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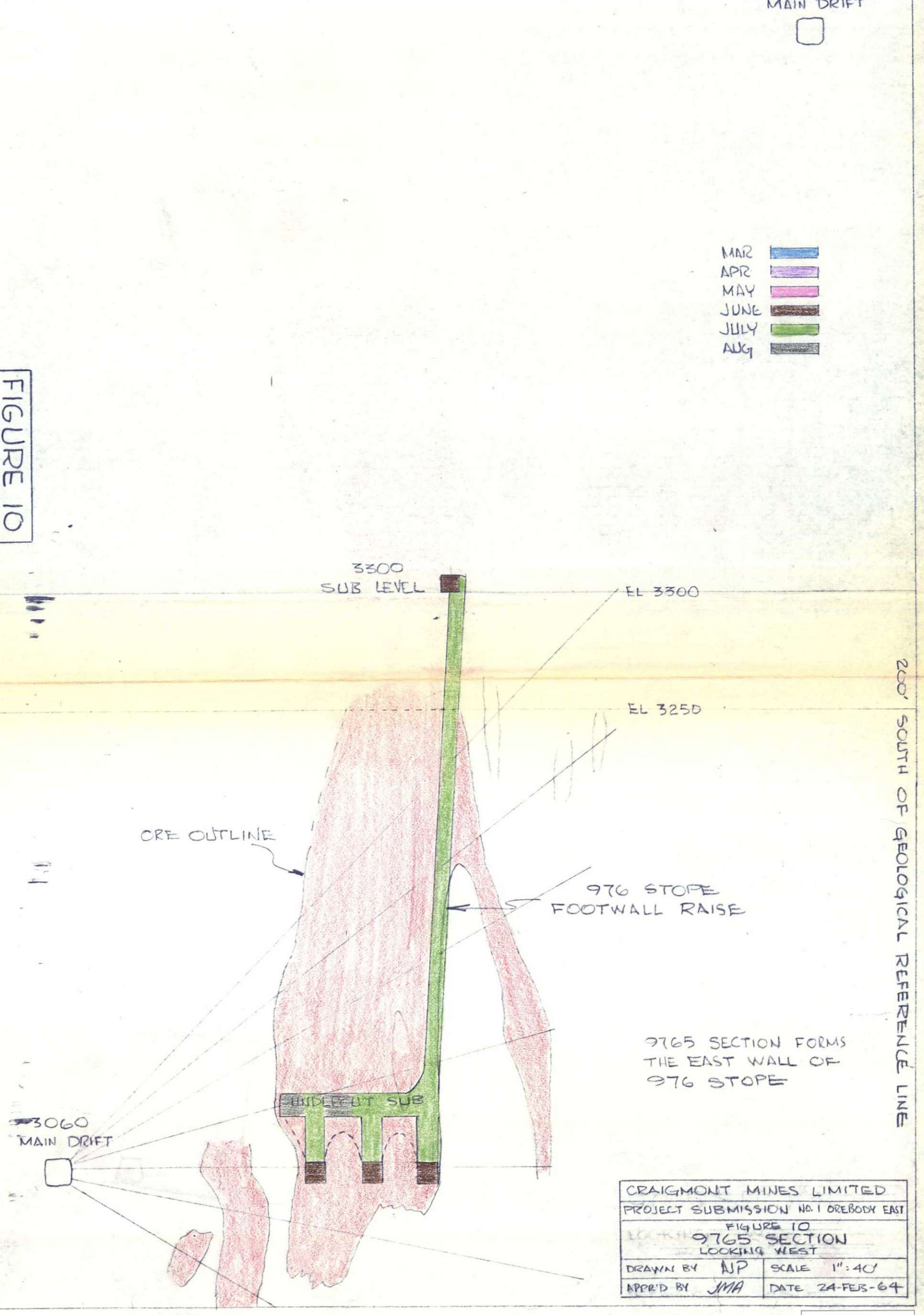
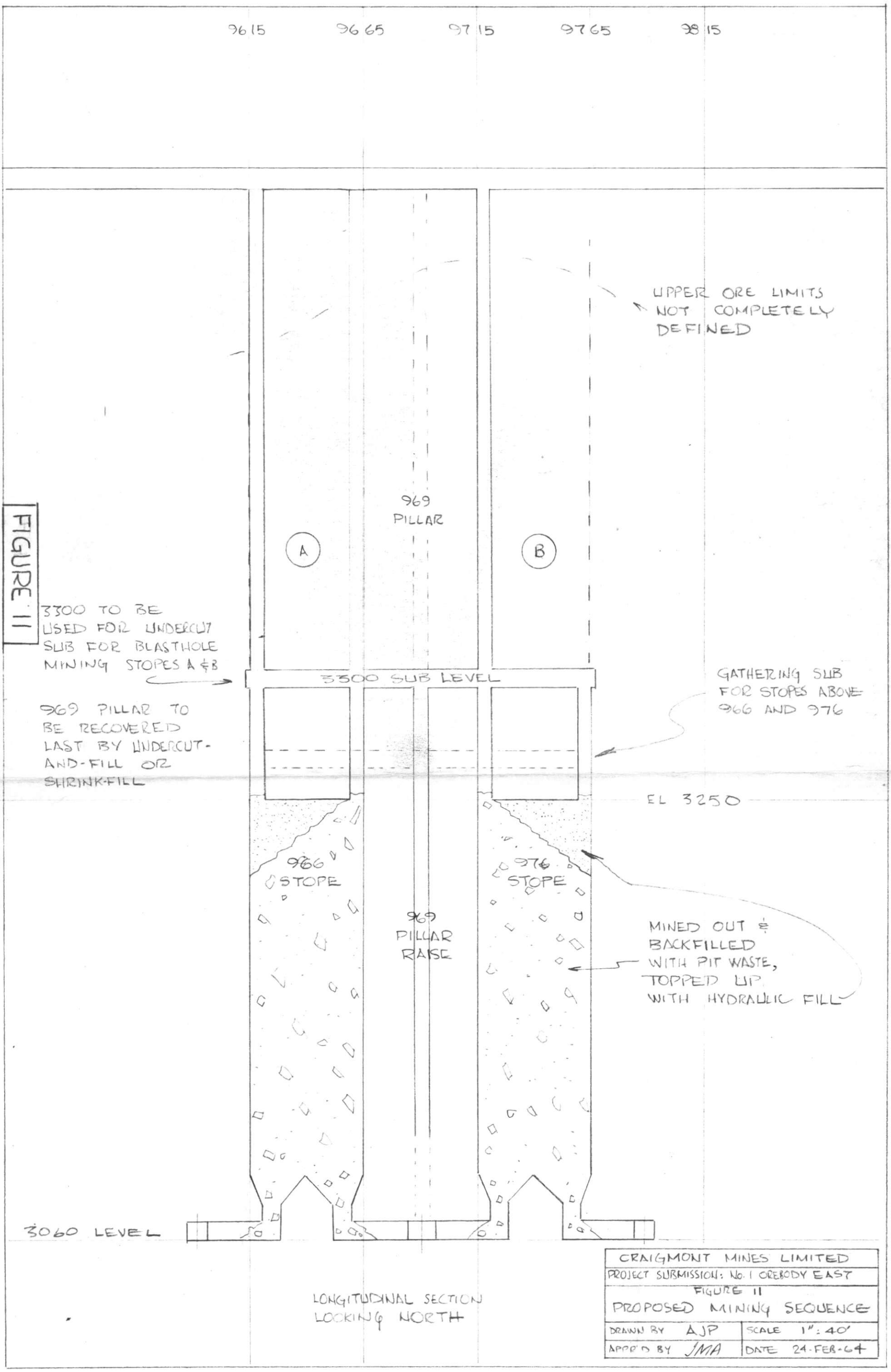
FIGURE 10



CRAIGMONT MINES LIMITED	
PROJECT SUBMISSION NO. 1 OREBODY EAST	
FIGURE 10 9765 SECTION LOOKING WEST	
DRAWN BY AJP	SCALE 1" : 40'
APP'D BY JMA	DATE 24-FEB-64

FIGURE 11



LONGITUDINAL SECTION
LOOKING NORTH

CRAIGMONT MINES LIMITED	
PROJECT SUBMISSION: No. 1 OREBODY EAST	
FIGURE 11 PROPOSED MINING SEQUENCE	
DRAWN BY AJP	SCALE 1" : 40'
APP'D BY JMA	DATE 24-FEB-64

APPENDIX I

ORE RESERVES

959 Pillar	Between 9565 and 9615 Above 3060, below 3250	67,160 T @ 1.63% Cu 23.18% Fe
*966 Stope	Between 9615 and 9665 Above 3060, below 3250	46,640 T @ 2.41% Cu 25.12% Fe
969 Pillar	Between 9665 and 9715 Above 3060, below 3250	47,080 T @ 3.01% Cu 21.83% Fe
*976 Stope	Between 9715 and 9765 Above 3060, below 3250	60,150 T @ 2.88% Cu 25.90% Fe
979 Pillar	Between 9765 and 9815 Above 3060, below 3250	72,040 T @ 3.16% Cu 32.82% Fe

* Stopes proposed in this project submission.

APPENDIX II

*ESTIMATE OF CONTRACTORS PRICES

8 x 9 Drift, untimbered	$ 32/ft.
8 x 9 Drift, timbered	37/ft.
14 x 9 Drift, timbered	44/ft.
6 x 6 Alimak raise	32/ft.
6 x 6 Alimak raise, cribbed	44/ft.
Installing manway in alimak raise	10.50/ft.
5 x 7 Standard raise	25/ft.
5 x 7 Standard raise, cribbed	38/ft.
7 x 7 Boxhole	25/ft.
7 x 7 Subdrift	25/ft.
Install switch	$ 200 each
Make raise cut-out and install alimak	$3000 each
Install rock bolts	$ 3 each

Rental of Equipment

Jackleg	$ 70/month
Stoper	$ 70/month
Mucking machine	$ 350/month
Tugger	$ 80/month
Slusher	$ 200/month

* Prices in excess of these should not be considered by the company.

APPENDIX III

ESTIMATED AMOUNT OF DEVELOPMENT*

9 x 14 Drift, timbered	184'
8 x 9 Drift, timbered	317'
8 x 9 Drift, untimbered	325'
7 x 7 Sub Drift (undercut and 3300)	400'
7 x 7 Boxhole (12 @ 30')	360'
Alimak Raise cribbed	270'
Alimak Raise raw	850'
Standard Raise cribbed	145'
Standard Raise raw	405'
	3256'

* It is estimated that approximately 50% all 8 x 9 drift will be timbered, and 25% of all raising will require cribbing.

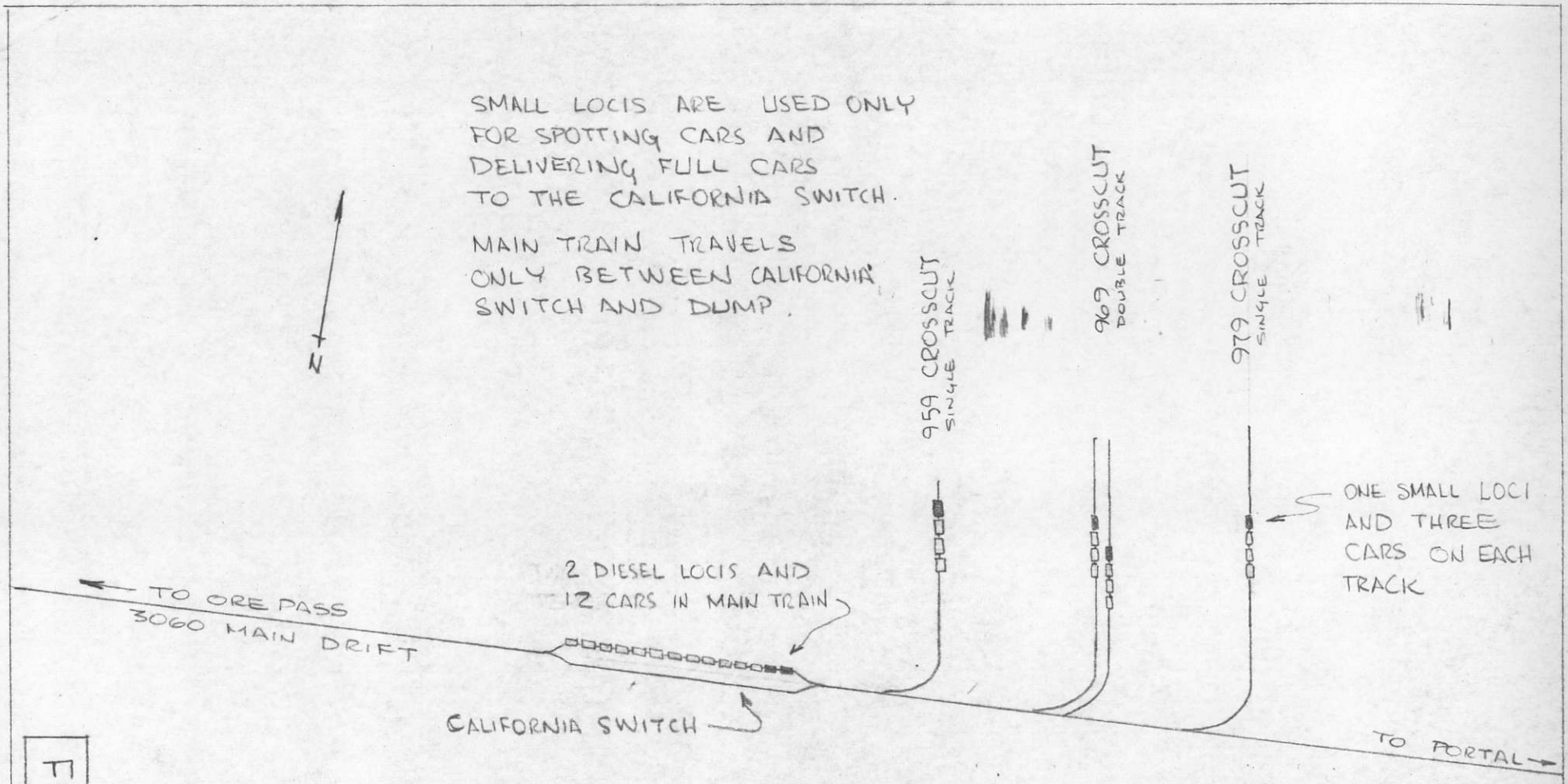


FIGURE 12

SCHEMATIC DRAWING ONLY

CRAIGMONT MINES LIMITED	
PROJECT SUBMISSION: No. 1 OREBODY EAST	
FIGURE 12 3060 LEVEL HAULAGE SETUP	
DRAWN BY AJP	SCALE 1": 100'
APP'D JMA	DATE 24-FEB-64

APPENDIX IV

ESTIMATED OPERATING COSTS

		Per Ton of Ore Mined
(1)	Longhole drilling	0.25
(2)	Blasting	0.25
(3)	Mucking machine R & M	0.12
(4)	Mucking labour	0.20
*(5)	Tramming labour, 3060 level	0.10
(6)	3060 level Tramming (except labour)	0.15
(7)	2400 Tramming	0.15
(8)	Backfilling	0.18
(9)	Services	0.23
	Total Operating Cost	1.63

Explanation:

(1) Based on an average of 2 tons broken per foot drilled at a cost of 50¢ per foot.

(2) & (3) Based on past experience at Craigmont.

(4) Based on 150 tons per mucking machine shift.

(5) Based on 500 tons per tramming shift, two men.

(6) (7) (8) & (9) Based on past experience at Craigmont.

* See figure 12 for explanation of tramming and gathering procedure.

APPENDIX V

ESTIMATE OF NET SMELTER RETURNS

Average grade of ore from proposed stoping = 2.68% Cu
Assuming 15% dilution, grade mined would be 2.33%.
If the n.s.r. is 25¢/lb. copper, and mill recovery is 95%, then the value of the ore would be:

$$0.95 \times 0.0238 \times 2000 \times 0.25 = \$11.30/\text{ton}$$

Average grade of open pit low grade to be replaced by U/G ore above would be 0.58% Cu. The value of this ore would be:

$$0.95 \times 0.0058 \times 2000 \times 0.25 = \$\ 2.75/\text{ton}$$

n.s.r. of underground high grade	$11.30/ton
n.s.r. of open pit low grade	2.75/ton
Difference	$ 8.55/ton

APPENDIX VI

ADDITIONAL EQUIPMENT TO BE PURCHASED BY THE COMPANY

8	90 ft.^{3} Cars @ $2,500	20,000
4	Small battery locomotives @ $6,000	24,000
1	Eimco Tugger @ $1400	1,400
1	Eimco 21 @	5,000
	TOTAL	$ 50,400

APPENDIX VII

DETAIL OF MONTHLY COST ESTIMATES

Assumed Controls:

(1) Job will take 5 months.

(2) Wages of engineer in charge will be charged to administration.

(3) Company supplies one train of cars, and diesel locis.

(4) Company will supply timber, rails, pipe, rockbolts.

(5) Contractor will supply explosives (purchased from company).

(6) Contractor supplies mucking machines, alimaks, drills, slushers.

(7) Project will be charged with all U.G mining services charges except:

- supervisory wages
- lubricants
- tools and minor equipment
- general operating supplies

(8) Project will be charged with:

- waste disposal at 3060 portal
- R & M of locis and cars on 3060
- tramming costs of ore transferred to 2400

(9) 50% of drifting will be timbered,
25% of raising will be cribbed.

MARCH 1964 COSTS

Contractor's Charges:

969 cross-cut 160' @ $44 + 400 for switches	7,440	
Install alimak for 969 pillar raise	1,200	
969 pillar raise 110' @ $32, 40' @ $44	5,280	
Equipment rental 2 muckers @ 350	700	
5 drills @ 50	250	
	$ 14,870	$ 14,870

Additional Expense:

General services	3,100	
Timber and rockbolts 160' @ $11 = 1,760		
40 @ 6 = 240	2,000	
Track and pipe 160' @ 3 = 480		
160' @ 6.40 = 1,020		
2 switches @ 400 = 800	2,300	
3060 tramming and waste disposal 2160 T @ 30¢	650	
2400 tramming 540 T @ 15¢	80	
	$ 8,130	$ 8,130
March Total		$ 23,000

APRIL 1964 COSTS

Contractor's Charges:

969 cross-cut 24' @ $44	1,060	
969 drawpoints 100' @ $32, 92' @ $37	6,600	
959 cross-cut 40' @ $32, 40' @ 37, + $200 for switch	2,960	
969 pillar raise, 100' @ $32, 30' @ $44	4,520	
969 pillar raise, 280' of manway @ 10.50	2,940	
Cut-out and alimak installation 966 f.w. raise	3,000	
Cut-out and alimak installation 976 h.w. raise	3,000	
3300 sub-level 50' @ $25	1,250	
Rockbolts 280 @ $3	$40	
Equipment rental:- 3 muckers @ 350	1,050	
7 drills @ 50	350	
2 alimaks @ 600	1,200	
1 air slusher and scraper @	250	
	$ 29,020	$ 29,020

Additional Expense:

General services			$ 4,800	
Timber and rockbolts	24' @ $11	260		
	132' @ $ 9	1190		
	30' @ $ 6	180		
	280' @ $ 2	560		
	280' @ $1.50	420	2,610	
Track and pipe	24' @ $6.40	150		
	272' @ 3.20	870		
	410' @ 3.00	1230		
	1 switch @	400	2,650	
3060 level tramming and waste disposal	1720 T @ 30¢		520	
2400 tramming 1720 @ 15¢			260	
			10,840	$ 10,840
		April Total		$ 39,860

MAY 1964 COSTS

Contractor's Charges:

959 cross-cut 30' @ $32, 30' @ $37		2,070	
959 drawpoints 50' @ $32, 50' @ $37		3,450	
979 cross-cut 70' @ $32, 70' @ 37 plus 1 switch @ $200		5,030	
966 f.w. raise 160' @ $32, 50' @ $44		7,320	
976 h.w. raise 160' @ $32, 50' @ $44		7,320	
976 fill raise 105' @ $25, 40' @ $38		4,150	
Rockbolts 300 @ $3		900	
Equipment rental	3 muckers @ 350	1,050	
	7 drills @ 50	350	
	2 alimaks @ 600	1,200	
	1 air slusher and scraper @	250	
		33,090	$ 33,090

Additional Expense:

General services		$ 8,600	
Timber and rockbolts	300 @ $2 = 600		
	150' @ 9 1350		
	140 @ 6 840	2,790	
Track and pipe	300' @ 3.20 960		
	1 switch @ 400		
	300' @ 3.00 900		
	145' @ 2.00 290	2,550	
3060 tramming and waste disposal			
	1900 T @ 30¢	570	
2400 tramming	2800 T @ 15¢	420	
		14,930	$ 14,930
		May Total	$ 48,020

JUNE 1964 COSTS

Contractor's Charges:

979 crosscut	35' @ $32, 35' @ $37	2,410	
966 f.w. raise	210' manway @ 10.50	2,200	
976 h.w. raise	210' manway @ 10.50	2,200	
3300 sub-drift	100' @ $25	2,500	
976 fill raise	100' @ $25, 35' @ $38	3,830	
Rockbolts, 200 @ $3		600	
Equipment rental	2 muckers @ 350	700	
	5 drills @ 50	250	
	2 alimaks @ 600	1,200	
	1 air slusher and scraper	250	
		16,140	$ 16,140

Additional Expense;

General services		3,600	
Timber and rockbolts	35' @ $9	320	
	200 @ 2	400	
	420' @ 1.50	630	
	65' @ $6	390	
Track and pipe	555' @ $2	1,110	
	100' @ $3	300	
3060 tramming and waste disposal			
	900 T @ 30¢	270	
2400 tramming	1500 T @ 15¢	230	
		7,250	7,250
		June Total	$ 23,390

JULY 1964 COSTS

Contractor's Charges:

966 h.w. raise cut-out and alimak installation		$ 3,000	
966 h.w. raise 50' @ $44, 160' @ $32		7,320	
976 f.w. raise cut-out and alimak installation		3,000	
976 f.w. raise 50' @ $44, 160' @ $32		5,120	
976 f.w. raise 210' manway @ $10.50		2,200	
Boxhole and undercut sub, 140' @ $25		3,500	
966 fill raise, 20' @ $38, 50' @ $25		2,010	
Rockbolts 280 @ $3		840	
Equipment rental	2 muckers @ $350	700	
	4 drills @ $ 50	200	
	2 alimaks @ 600	1,200	
	1 air slusher and scraper	250	
		29,340	$ 29,340

Additional Expense:

General services		5,600	
Timber and rockbolts	280 @ $2 = 560		
	120' @$6 = 720		
	210' @$1.50 = 320	1,600	
Track and pipe	490' @ $2 = 980	980	
2400 tramming 2300 @ 15¢		350	
		8,530	8,530
		July Total	$37,870

AUGUST 1964 COSTS

Contractor's Charges:

966 fill raise 50' @ $38,150' @ $25		5,650	
Boxhole and undercut sub, 210' @ $25		5,250	
Rockbolts, 420 @ $3		1,260	
Equipment rental	2 muckers @ 350	700	
	4 drills @ 50	200	
	1 air slusher and scraper	250	
		13,310	$ 13,310

Additional Expense:

U/G mining services	2,100	
Timber, pipe, 50' @ $6, 200' @ $2	700	
2400 tramming 1100 T @ 15¢	170	
	2,970	2,970

NOTE: Costs from here on are not part of this project but are capital equipment and operating.

Additional Equipment:

See Appendix	50,400

Operating:

5,000 T @ 1.63	8,150
August Total	74,830

SEPTEMBER 1964 COSTS

Operating - 23,000 T @ 1.63	$ 37,500

OCTOBER 1964 COSTS

Operating - 30,000 T @ 1.63	49,000

NOVEMBER 1964 COSTS

Operating,- 30,000 T @ 1.63	49,000

DECEMBER 1964 COSTS

Operating - 8,000 T @ 1.63	13,000

See figure 1 for a summary of the above costs.