Paramount resources ltd.

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January 8, 2020

Via Email

Mackenzie Valley Land & Water Board
7th Floor, 4922 48th Street
P.O. Box 2130
Yellowknife, NT
X1A 2P6

Email: sjoseph@@mvlwb.com and permits@mvlwb.com

Attention: Sean Joseph

RE: MV2018A0022 and MV2018L1-0005
Celibeta Closure and Reclamation Plan Conformity Table

Dear Mr. Joseph,

Paramount Resources Ltd. ("Paramount") has received the correspondence from the Mackenzie Valley Land and Water Board ("MVLWB") sent via email regarding the Celibeta Closure and Reclamation Plan dated December 16, 2020. Paramount submits the information below and the attached as a response.

MVLWB Request of September 16,2020	Paramount Response	Reference Page(s) in the PDF Document (if applicable)
Rationale for undertaking closure and reclamation activities prior to submission and/or approval of the closure and reclamation plan;	As the MVLWB is aware Paramount became the operator of the Celibeta site in January 2018 via a corporate transaction in the fall of 2017. At that time, the site did not have a Land Use Permit ("LUP") or Water Licence ("WL"), further Paramount is unaware of the site ever having a LUP or WL. Paramount undertook the work necessary to apply for a new LUP and WL during 2018 and applied to the MVLWB in September of 2018. The LUP and WL were issued in December of 2018. The site had been identified by the Office of the Regulator for Oil and Gas Operations ("OROGO") to	Pages 3,4 and 5

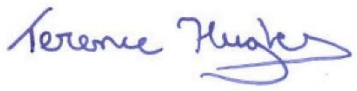
	require additional wellbore work to be compliant with the *Well Suspension and Abandonment Guidelines and Interpretation Notes* (Guidelines). To comply with these Guidelines Paramount was required to abandon the well in the 2019-2020 winter season. As the well was rig released in 1960 and never produced with overgrown vegetation on the site, reclamation was expected to be minimal. To limit the affects to the environment the decision was made, that if required and/or possible reclamation activities would take place during the same season. Given the limited background data on the site (due to never having an LUP and WL, plus the age of the initial development) producing a Closure and Reclamation Plan prior to accessing the site with the appropriate equipment was not possible.	
Complete information pertaining to post-closure environmental monitoring planned for the site including frequency, parameters, etc. for surface water, ground water, soil, and project components;	Monitoring is currently planned to occur annually for the next three years. Additional details are included in the attached updated Closure and Reclamation Plan.	Pages 7, 9 and 10
Timeline for providing a revised/updated financial security estimate for the project;	An updated security estimate is attached to this submission.	Not applicable.
Measure implemented/ proposed to manage site /surface water;	Surface water is not expected to remain on site as revegetation occurs. If surface water is observed during annual monitoring it will be reported on.	Page 7, 166 and 170
Details regarding the eventual fate of the project site's access road including pertinent consultations and engagement;	During the 2020 winter activity it was observed that community members from Fort Liard were using the temporary winter access. During the engagement on the project no affected party has come forward looking to take the access from Paramount. Paramount plans on allowing the temporary winter access to further vegetate	Not applicable.

	naturally, however vegetation growth could be stunted by road usage by other parties. During engagement it was communicated that the access would be temporary in nature, this is documented on the MVLWB public registry	
Details regarding Site Specific Remediation Guidelines developed for the site in 2019 and the results of sampling conducted prior to these guidelines development and remediation and reclamation activities being completed;	See Closure and Reclamation Plan	Site Specific Remediation Guidelines Pages 4, 5, 63,64, 69, 70, 92 and 174. Sampling results 98-163
Appropriately scaled, topographic map(s) or drawing(s) showing, relatively, the size, layout, and location of each project-related component including buried PHC soil, buried drill waste, wellhead, site water management structures, and any other relevant information;	See Closure and Reclamation Plan	Pages, 83, 84, 85, 197, 198, 199 and 200
Copies of Phases I, II, and III ESA results as appendices to the Plan;	See Closure and Reclamation Plan	Pages 12-249
Confirmation that Plan/design meets objectives in the Guideline for the Design, Operation, Monitoring, Maintenance and Closure of Petroleum Hydrocarbon-Contaminated Soil Treatment Facilities in the Northwest (2020);	Paramount does not consider the activities undertaken to fall within the Guideline for the Design, Operation, Monitoring, Maintenance and Closure of Petroleum Hydrocarbon-Contaminated Soil Treatment Facilities in the Northwest (2020).	Details pertaining to remediation techniques can be found on pages 166, 170, 174 and 176
Details pertaining to site-testing for contaminants of concern;	See attached updated Closure and Reclamation Plan.	Pages 56, 62-64, 69-74
Comprehensive information pertinent to revegetation plan for the site including measures proposed to address invasive species.	As can be seen in the site photos, the site was well vegetated prior to abandonment and reclamation activities occurring in the winter of 2020. Paramount anticipates that natural revegetation will occur again given the improved environmental condition of the site. Natural revegetation is preferable to reduce the risk of invasive species. Paramount's experience with northern seed mixes is that they often introduce invasive species inadvertently. If seeding is required, a northern	Pages 6, 7 and 9 Site Photos: Pages 45-54

	seed mix will be identified to affected parties and the MVLWB for review. Given reclamation activities occurred in winter months, under frozen ground conditions and utilizing Northern equipment, Paramount is of the belief that the risk of invasive species at the site is currently low. Paramount will monitor for invasive species as part of its annual monitoring and remove any species as they are identified.	

If you have any questions regarding the above or attached, please contact the undersigned.

Regards,



Terence Hughes
Regulatory & Community Affairs Representative
Paramount Resources Ltd.
Direct: 403-206-3859
terence.hughes@paramountres.com

SUMMARY OF COSTS

CAPITAL COSTS	COMPONENT NAME	COST	LAND LIABILITY	WATER LIABILITY
WELLS AND FACILITIES		$0	$0	$0
BUILDINGS AND EQUIPMENT		$0	$0	$0
CHEMICALS AND CONTAMINATED SOILD MANAGEMENT		$0	$0	$0
SURFACE AND GROUNDWATER MANAGEMENT		$0	-	$0
INTERIM CARE AND MAINTENANCE		$0	-	$0
	SUBTOTAL: Capital Costs	**$0**	**$0**	**$0**
	PERCENT OF SUBTOTAL		**0%**	**0%**

INDIRECT COSTS		COST	LAND LIABILITY	WATER LIABILITY
MOBILIZATION/DEMOBILIZATION		$0	$0	$0
POST-CLOSURE MONITORING AND MAINTENANCE		$58,500	$0	$0
ENGINEERING	3%	$0	$0	$0
PROJECT MANAGEMENT	3%	$0	$0	$0
HEALTH AND SAFETY PLANS/MONITORING & QA/QC	1%	$0	$0	$0
BONDING/INSURANCE	1%	$0	$0	$0
CONTINGENCY	20%	$0	$0	$0
MARKET PRICE FACTOR ADJUSTMENT	0%	$0	$0	$0
	SUBTOTAL: Indirect Costs	**$58,500**	**$0**	**$0**

TOTAL COSTS	**$58,500**	**$0**	**$0**

1 **Wells and Facilities**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	% Land	Land Cost	Water Cost
OBJECTIVE: ABANDONMENT OF WELLS				#N/A					
All wells- Drilled / Cased	One well total	m	0	WELAs	$12,500.00	$0	50%	$0	$0
Sweet Well - Completed / Active / Inactive		m		#N/A	$0.00	$0		$0	$0
Sour Well (H2S>1%) - Completed / Active / Inactive		m		#N/A	$0.00	$0		$0	$0
Vent Flow / Gas Migration	One well total		0	VFGMs	$87,200.00	$0	100%	$0	$0
Additional Completion Zones				#N/A	$0.00	$0		$0	$0
OBJECTIVE: ABANDONMENT OF PRODUCTION FACILITIES				#N/A					
Oil / bitumen process or injection / disposal facility		m3/day		#N/A	$0.00	$0		$0	$0
Gas processing facility		m3/day		#N/A	$0.00	$0		$0	$0
Gas dehydration facility		m3/day		#N/A	$0.00	$0		$0	$0
Compressor station		KW		#N/A	$0.00	$0		$0	$0
Battery sites		m3/day		#N/A	$0.00	$0		$0	$0
Battery sites w/ separation, compression, injection and/or disposal equipment		m3/day		#N/A	$0.00	$0		$0	$0
Satellite batteries		m3/day		#N/A	$0.00	$0		$0	$0
Other stations		ha		#N/A	$0.00	$0		$0	$0
					Total	$0		$0	$0
					% of Total			#DIV/0!	#DIV/0!

1 **Building / Equip Name:** **Bldg / Equip #: 1**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	% Land	Land Cost	Water Cost
OBJECTIVE: DISPOSE MOBILE EQUIPMENT				#N/A					
Decontaminate and ship off-site		each		#N/A	$0.00	$0		$0	$0
Decontaminate, dispose on-site		each		#N/A	$0.00	$0		$0	$0
Other	10 units of consumables/wastes x 50 km	each		MHERI	$3.40	$0	50%	$0	$0
OBJECTIVE: BUILDING DECONTAMINATION & HAZ. MATERIAL REMOVAL				#N/A					
Decontaminate, oil, fuel and glycol systems		mandays		#N/A	$0.00	$0		$0	$0
Decontaminate, general		mandays		#N/A	$0.00	$0		$0	$0
Mechanical		mandays		#N/A	$0.00	$0		$0	$0
Electrical		mandays		#N/A	$0.00	$0		$0	$0
Decontaminate maintenance shop		each		#N/A	$0.00	$0		$0	$0
Decontaminate power plant		each		#N/A	$0.00	$0		$0	$0
Decontaminate bulk fuel storage		each		#N/A	$0.00	$0		$0	$0
Deontaminate offices/warehouse/accom		each		#N/A	$0.00	$0		$0	$0
Removal of asbestos siding on buildings		each		#N/A	$0.00	$0		$0	$0
Removal of friable asbestos on equipment		each		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
OBJECTIVE: REMOVE BUILDINGS - ALL BUILDING AREAS SCALED TO ACCOUNT FOR HEIGHT				#N/A					
Accomodation Complex		m2		#N/A	$0.00	$0		$0	$0
Process Facilities		m2		#N/A	$0.00	$0		$0	$0
Offices, Repair, Lab, Warehouse		m2		#N/A	$0.00	$0		$0	$0
Storage Facilites		m2		#N/A	$0.00	$0		$0	$0
Water and Wastewater Treatment Facilities		m2		#N/A	$0.00	$0		$0	$0
U/G Heating Plant		m2		#N/A	$0.00	$0		$0	$0
Emulsion Plant		m2		#N/A	$0.00	$0		$0	$0
AN Storage Facility		m2		#N/A	$0.00	$0		$0	$0
Warehouse, Shops and Other		m2		#N/A	$0.00	$0		$0	$0
Storage Facility at Laydown/Airstrip		m2		#N/A	$0.00	$0		$0	$0
Fuel tanks		m2		#N/A	$0.00	$0		$0	$0
Fuel Tanks		m2		#N/A	$0.00	$0		$0	$0
Freshwater intake		m2		#N/A	$0.00	$0		$0	$0
Reclaim pumps		m2		#N/A	$0.00	$0		$0	$0
Outfall & Diffuser		m2		#N/A	$0.00	$0		$0	$0
Airstrip lighting, navigation, electrician		mandays		#N/A	$0.00	$0		$0	$0
Airstrip lighting, navigation, mechanical		mandays		#N/A	$0.00	$0		$0	$0
Consolidate & dump boneyard debris		m3		#N/A	$0.00	$0		$0	$0
other				#N/A	$0.00	$0		$0	$0
OBJECTIVE: BREAK BASEMENT SLABS				#N/A					
Accomodation Complex		m2		#N/A	$0.00	$0		$0	$0
Process Facilities		m2		#N/A	$0.00	$0		$0	$0
Offices, Repair, Lab, Warehouse		m2		#N/A	$0.00	$0		$0	$0
Storage Facilites		m2		#N/A	$0.00	$0		$0	$0
Water and Wastewater Treatment Facilities		m2		#N/A	$0.00	$0		$0	$0
U/G Heating Plant		m2		#N/A	$0.00	$0		$0	$0
Emulsion Plant		m2		#N/A	$0.00	$0		$0	$0
Warehouse, Shops and Other		m2		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
OBJECTIVE: LANDFILL FOR DEMOLITION WASTE				#N/A					
Place soil cover		m3		#N/A	$0.00	$0		$0	$0
Vegetate		ha		#N/A	$0.00	$0		$0	$0
Landfill disposal fee		tonne		#N/A	$0.00	$0		$0	$0
OBJECTIVE: GRADE AND CONTOUR				#N/A					
Accomodation Complex		ha		#N/A	$0.00	$0		$0	$0
Process Facilities		ha		#N/A	$0.00	$0		$0	$0
Offices, Repair, Lab, Warehouse		ha		#N/A	$0.00	$0		$0	$0
Storage Facilites		ha		#N/A	$0.00	$0		$0	$0
Water and Wastewater Treatment Facilities		ha		#N/A	$0.00	$0		$0	$0
U/G Heating Plant		ha		#N/A	$0.00	$0		$0	$0
Emulsion Plant		ha		#N/A	$0.00	$0		$0	$0
Warehouse, Shops and Other		ha		#N/A	$0.00	$0		$0	$0
Place rock cover		m3		#N/A	$0.00	$0		$0	$0
Vegetate		ha		#N/A	$0.00	$0	50%	$0	$0
Other				#N/A	$0.00	$0		$0	$0
OBJECTIVE: LINED SUMPS				#N/A					
Puncture liner and place soil cover		m3		#N/A	$0.00	$0		$0	$0
OBJECTIVE: RECLAIM ROADS				#N/A					
Remove culverts		each		#N/A	$0.00	$0		$0	$0
Remove bridges		each		#N/A	$0.00	$0		$0	$0
Scarify and install water breaks		ha		#N/A	$0.00	$0		$0	$0
Scarify airstriip		ha		#N/A	$0.00	$0		$0	$0
Scarify laydown areas		ha		#N/A	$0.00	$0		$0	$0
Vegetate		ha		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
SPECIALIZED ITEMS				#N/A					
Dispose of misc. debris and laydown area refuse				#N/A	$0.00	$0		$0	$0
					Total	$0		$0	$0
					% of Total			#DIV/0!	#DIV/0!

1 Chemicals/Soil Area Name:

Note: The procedures, equipment and packaging for clean up and removal of chemicals or contaminated soils are highly dependent on the nature of the chemicals and their existing state of containment. Government guidelines should be consulted on an individual chemical basis. Any estimate made here should be considered very rough unless specific evaluations have been conducted.

ACTIVITY/MATERIAL		Units	Quantity	Cost Code	Unit Cost	Cost		Land Cost	Water Cost
HAZARDOUS MATERIALS AUDIT				#N/A					
Phase 1 audit	assessment of waste types and locations	each		#N/A	$5,000.00	$0	100%	$0	$0
Phase 2 audit		each		#N/A	$0.00	$0		$0	$0
CONSOLIDATE HAZARDOUS MATERIALS FOR REMOVAL				#N/A					
Waste oils		litre		#N/A	$0.00	$0		$0	$0
Fuel - Type 1, eg diesel dregs		litre		#N/A	$0.00	$0		$0	$0
Fuel - Type 1, eg gasoline dregs		litre		#N/A	$0.00	$0		$0	$0
Waste batteries		kg		#N/A	$0.00	$0		$0	$0
Assay & environmental lab reagents		kg		#N/A	$0.00	$0		$0	$0
Machine shop, paints, solvents etc		litre		#N/A	$0.00	$0		$0	$0
Contaminated soils - hydrocarbon	assumed 100 m3/well	m3		CSRh	$146.00	$0	100%	$0	$0
Metal contam. soil at conc. load-out		m3		#N/A	$0.00	$0		$0	$0
Glycol		litre		#N/A	$0.00	$0		$0	$0
Nuclear sources		each		#N/A	$0.00	$0		$0	$0
HAZARDOUS MATERIALS				#N/A					
Transportation to disposal facility	drill lubes and fluids, fuel, tanks and rig support wastes - trucked to British Columbia = $1000 / truck one way	allow		#N/A	$2,000.00	$0	100%	$0	$0
Disposal fees		allow		#N/A	$1,500.00	$0	100%	$0	$0
Other				#N/A	$0.00	$0		$0	$0
CONTAMINATED SOILS				#N/A					
Contam. soil investigation - technical	Site assessment and sampling	each		#N/A	$5,000.00	$0	100%	$0	$0
Contam. soil investigation - drilling & sampling		each		#N/A	$0.00	$0		$0	$0
CONTAMINATED SOIL REMOVAL				#N/A					
Contaminated soils - hydrocarbon		m2		#N/A	$0.00	$0		$0	$0
Metal contam. soil at conc. load-out		m3		#N/A	$0.00	$0		$0	$0
Load, haul, dump or doze		m3		#N/A	$0.00	$0		$0	$0
Reagents/stabilizing agent		m2		#N/A	$0.00	$0		$0	$0
Contour reclaimed area		m3		#N/A	$0.00	$0		$0	$0
Type 2, heavy fuel and oil		m3		#N/A	$0.00	$0		$0	$0
CONTAMINATED SOIL VERY LOW PERMEABILITY COVER				#N/A					
Supply geomembrame, HDPE, ES3, GCL		m2		#N/A	$0.00	$0		$0	$0
Upper and lower bedding layers		m3		#N/A	$0.00	$0		$0	$0
Install geomembrane, HDPE, ES3, GCL		m2		#N/A	$0.00	$0		$0	$0
Erosion protection layer		m3		#N/A	$0.00	$0		$0	$0
Vegetate		m2		#N/A	$0.00	$0		$0	$0
Install infiltration/seepage instrumentation		allow		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
OTHER				#N/A					
				#N/A	$0.00	$0		$0	$0
					Total	$0		$0	$0
					% of Total			#DIV/0!	#DIV/0!

Capital Expenditures and Short Term Water Treatment

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
OBJECTIVE: STABILIZE SEDIMENT PONDS/WATER MANAGEMENT PONDS				#N/A		
Place soil cover		m3		#N/A	$0.00	$0
Doze & spread excavated material		m3		#N/A	$0.00	$0
Vegetate spread material		ha		#N/A	$0.00	$0
Rip rap in channel base		each		#N/A	$0.00	$0
OBJECTIVE: REDIRECT RUNOFF/CONSTRUCT DIVERSION DITCHES				#N/A		
Excavate ditches -soil		m3		#N/A	$0.00	$0
Excavate ditches -rock		m3		#N/A	$0.00	$0
Stabilize side slopes		m3		#N/A	$0.00	$0
Rip rap in channel base		m3		#N/A	$0.00	$0
OBJECTIVE: BREACH DITCHES				#N/A		
Excavate breaches		m3		#N/A	$0.00	$0
Backfill/recontour		m3		#N/A	$0.00	$0
Install flow dissipation		m3		#N/A	$0.00	$0
Vegetate remainder of ditch		m2		#N/A	$0.00	$0
OBJECTIVE: FRESH WATER SUPPLY				#N/A		
Breach embankment		m		#N/A	$0.00	$0
Remove pump		LS		#N/A	$0.00	$0
Remove pipeline		m		#N/A	$0.00	$0
OBJECTIVE: WATER CONTROL IN RECLAMATION QUARRY				#N/A		
Install pumping system		LS		#N/A	$0.00	$0
Remove pumping system		LS		#N/A	$0.00	$0
OBJECTIVE: REMOVE WATER PIPELINES				#N/A		
Remove pipes		m		#N/A	$0.00	$0
Concrete plug deep pipes		m3		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
OBJECTIVE: GROUNDWATER COLLECTION SYSTEM				#N/A		
Excavate/install sumps		m3		#N/A	$0.00	$0
Install pumping wells		m3		#N/A	$0.00	$0
Install pumps/pipelines/power supply		LS		#N/A	$0.00	$0
OBJECTIVE: CONSTRUCT CONTAMINATED WATER STORAGE POND				#N/A		
Excavate pond		m3		#N/A	$0.00	$0
Doze & spread excavated material		m3		#N/A	$0.00	$0
Vegetate spread material		ha		#N/A	$0.00	$0
Bedding layer		m3		#N/A	$0.00	$0
Supply geomembrane		m2		#N/A	$0.00	$0
Install geomembrane		m2		#N/A	$0.00	$0
Erosion protection layer		m3		#N/A	$0.00	$0
OBJECTIVE: CONSTRUCT PASSIVE TREATMENT SYSTEM (e.g. Constructed Wetland)				#N/A		
Construct access roads		km		#N/A	$0.00	$0
install HDPE piping system from collection pond		m		#N/A	$0.00	$0
Inter-cell flow structures		allow		#N/A	$0.00	$0
Install liners		m2		#N/A	$0.00	$0
Install growth media		m3		#N/A	$0.00	$0
Wetland vegetation		ha		#N/A	$0.00	$0
OBJECTIVE: CONSTRUCT WATER TREATMENT PLANT				#N/A		
Build treatment plant		LS		#N/A	$0.00	$0
Build sludge containment facility		LS		#N/A	$0.00	$0
					Total	$0

For cost of long-term/post-closure water treatment see "WATER TREATMENT" Worksheet"

1 Post-Closure Water Treatment

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
OBJECTIVE: ADDITION OF REAGENTS TO WTP				#N/A		
H2O2		kg		#N/A	$0.00	$0
lime		kg		#N/A	$0.00	$0
ferric sulphate		kg		#N/A	$0.00	$0
ferrous sulphate		kg		#N/A	$0.00	$0
flocculents		kg		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
OBJECTIVE: LABOUR AND SUPPLIES				#N/A		
Annual fuel		litres		#N/A	$0.00	$0
Annual power		kW-h		#N/A	$0.00	$0
Electrician/mechanic to maintain treatment plant		allow		#N/A	$0.00	$0
Equipment maintenance and parts		allow		#N/A	$0.00	$0
Misc. supplies, hoses, tools		allow		#N/A	$0.00	$0
Communications		allow		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
OBJECTIVE: WTP WATER SAMPLING AND ANALYSES				#N/A		
Sampling equipment		allow		#N/A	$0.00	$0
Analyses		allow		#N/A	$0.00	$0
Shipping to laboratory		allow		#N/A	$0.00	$0
Reporting		allow		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
OBJECTIVE:SITE ACCESS				#N/A		
Road maintenance (incl. snow removal)		allow		#N/A	$0.00	$0
Winter road tariff		allow		#N/A	$0.00	$0
Truck rental		allow		#N/A	$0.00	$0
Air support		allow		#N/A	$0.00	$0
				Annual water treatment costs		$0
Number of years of water treatment		years	1			
				Total water treatment costs		$0

1 Interim Care and Maintenance

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
INTERIM CARE & MAINTENANCE				#N/A		
on-site caretaker		manmonths		#N/A	$0.00	$0
extra personnel		manmonths		#N/A	$0.00	$0
-electrician		manmonths		#N/A	$0.00	$0
-mechanic		manmonths		#N/A	$0.00	$0
annual fuel		litre		#N/A	$0.00	$0
misc. supplies		allow		#N/A	$0.00	$0
pick-up truck		each		#N/A	$0.00	$0
small dozer		allow		#N/A	$0.00	$0
small excavator		allow		#N/A	$0.00	$0
snow machine		allow		#N/A	$0.00	$0
communications		allow		#N/A	$0.00	$0
SNP/AEMP water sampling & reporting		each		#N/A	$0.00	$0
geotechnical assessment		each		#N/A	$0.00	$0
interim water treatment				#N/A	$0.00	$0
other		each		#N/A	$0.00	$0
				Annual	Interim C&M Cost	$0
Number of years of ICM		years	1		Total Cost	$0

1 Post-Closure Monitoring & Maintenance

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
OBJECTIVE: MONITORING & INSPECTIONS				#N/A		
Annual geotechnical inspection		each	0	#N/A	$0.00	$0
Survey inspection	3rd party contract	each	1	RPTI	$10,000.00	$10,000
Site water monitoring (soil testing)	Soil testing and labour - 3rd party	Spec	1		$2,000.00	$2,000
- During pit flooding		each	0	#N/A	$0.00	$0
- Post pit flooding		each	0	#N/A	$0.00	$0
Air Quality Monitoring Program (AQMP)		each	0	#N/A	$0.00	$0
Wildlife Effects Monitoring Program (WEMP)		each	0	#N/A	$0.00	$0
Vegetation Monitoring		each	1	#N/A	$2,000.00	$2,000
Other - Site inspection following summer	Air access for inspection crew		1	MWI	$4,500.00	$4,500
OBJECTIVE: SITE MAINTENANCE				#N/A		
Repair erosion - infill gullies		allow		#N/A	$0.00	$0
Repair erosion - upgrade diversion ditches		allow		#N/A	$0.00	$0
Remove problem vegetation		allow	1	#N/A	$1,000.00	$1,000
Repair animal damage		allow		#N/A	$0.00	$0
Repair/upgrade access controls		allow		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
SPILLWAY MAINTENANCE				#N/A		
Repair erosion		m3		#N/A	$0.00	$0
Clear spillway		each		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
POST-CLOSURE WATER TREATMENT						
Annual water treatment cost, from "Water Treatment"				#N/A	$0.00	$0

Subtotal, Annual post-closure costs			$19,500
Discount rate for calculation of net present value of post-closure cost, %	0.00%		
Number of years of post-closure activity	3	years	
Present Value of payment stream			$58,500

1 Mobilization/Demobilization

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
MOBILIZE HEAVY EQUIPMENT				#N/A		
Excavators		each		#N/A	0	$0
Dump trucks		each		#N/A	0	$0
Dozers		each		#N/A	0	$0
Demolition shears		each		#N/A	0	$0
Crane		each		#N/A	0	$0
Loader		each		#N/A	0	$0
Compactor		each		#N/A	0	$0
Light duty vehicles		each		#N/A	0	$0
Other - program eqipment	Equipment list from LUP application @ $1000 each way				1000	$0
MOBILIZE MISC. EQUIPMENT				#N/A		
Pump shipping		each		#N/A	0	$0
Pipe shipping		m		#N/A	0	$0
Minor tools and equipment		allow		#N/A	0	$0
Truck tires		allow		#N/A	0	$0
Other				#N/A	0	$0
MOBILIZE CAMP				#N/A		
Reclamation activities	No camp	allow		#N/A	0	$0
Long term reclamation activities (eg pump flooding)		allow		#N/A	0	$0
MOBILIZE WORKERS				#N/A		
Reclamation activities - transport	5 workers - bused in daily 50 km by 15 days	each		MWs	100	$0
Reclamation activities - incl. travel time	Wages for 5 workers - 8 hr shifts for 15 days	ınhours		Lab-usl	43.98	$0
Long term reclamation activities (eg pump flooding) - transport		each		#N/A	0	$0
Long term reclamation activities (eg pump flooding) - travel time		each		#N/A	0	$0
Monitoring Airfare		each		#N/A	0	$0
WORKER ACCOMODATIONS				#N/A		
Reclamation activities	5 people for 15 days	ımonths		ACCMh	175	$0
Long term reclamation activities (eg pump flooding)		manmonths		#N/A	0	$0
MOBILIZE FUEL				#N/A		
Fuel freight - reclamation activities		litre		#N/A	0	$0
Fuel freight - long reclamation activities		litre		#N/A	0	$0
Fuel freight accomodations		litre		#N/A	0	$0
WINTER ROAD				#N/A		
Construction and operation		km		WRCl	2000	$0
Limited winter use		km		#N/A	0	$0
Winter road tarriff		km		#N/A	0	$0
DEMOBILIZE OTHER INFRASTRUCTURE AND SITE EQUIPMENT				#N/A		
Excavators		km		#N/A	0	$0
Dump trucks		km		#N/A	0	$0
Dozers		km		#N/A	0	$0
Demolition shears		km		#N/A	0	$0
Crane		km		#N/A	0	$0
Loader		km		#N/A	0	$0
Compactor		each		#N/A	0	$0
Light duty vehicles		km		#N/A	0	$0
Other - program eqipment	Equipment list from LUP application @ $1000 each way				1000	$0
DEMOBILIZE CAMP				#N/A		
		allow		#N/A	0	$0
DEMOBILIZE WORKERS				#N/A		
crew travel time		mandays		#N/A	0	$0
crew transportation	5 workers - bused out daily 50 km by 15 days	each		MWs	100	$0
WINTER ROAD				#N/A		
Construction and operation		km		#N/A	0	$0
Limited winter use		km		#N/A	0	$0
Winter road tarriff		km		#N/A	0	$0
				Mobilization/Demobilization Cost		**$0**

Unit Cost Table (for refining unit costs see "Estimator" worksheet)

Filter by unit

ITEM	Detail	COST CODE	UNITS	LOW $	HIGH $	SPECIFIED $	COMMENTS
Accomodation							
		ACCM	manday	100.00	175.00		
Buildings - Decontaminate							
	Asbestos	BDA	m2	25.60	51.20		Low: removal of asbestos siding & flooring; High: removal of insulated pipes, friable asbestos
Buildings - Remove							
	areas are per floor of 3 m average height						
	Wood	BRW	m2	27.50	41.00		
	Concrete	BRC	m2	40.00	65.00		
	Steel - teardown	BRS1	m2	45.00	65.00		
	Steel - for salvage	BRS2	m2	67.00	100.00		
Concrete work							
	Small pour	CSF	m3	426.50	639.75		Low: YK; High=1.5xLow
	Large pour	CLF	m3	353.50	530.25	2,130.00	Specified: concrete crown pillar
Contaminated Soils							
	Remediate on site	CSR	m3	47.00	146.00		
	Env. investigation Phase I/II	CSEI	each	25000.00			Low: small, "clean" site
Dozing							
	doze rock piles	DR	m3	1.05	2.40		Low cost: doze crest off dump
	doze overburden/soil piles	DS	m3	0.95	3.80		High cost: push up to 300 m
Excavate Rock; Low Spec's and QA/QC							
	drill/blast/load/short haul	RB1	m3	11.40	17.05		Low:quarry operations for bulk fill
	drill/blast/load/long haul	RB2	m3	12.05	17.80		
	RB1 + spread and compact	RB3	m3	12.05	17.80		
	RB2 + spread and compact	RB4	m3	12.70	30.75		
	Specified activity	RBS	m3				
Excavate Rock; High Spec's and QA/QC							(e.g. ditch/spillway excavation)
	drill/blast/load/short haul	RC1	m3				Low:foundation excavation;High:spillway excavation
	drill/blast/load/long haul	RC2	m3	12.70	18.40		
	RC1 + spread and compact	RC3	m3	12.70	18.40		e,g, cover construction
	RC2 + spread and compact	RC4	m3	13.50	19.20		e,g, cover construction
	Specified activity	RCS	m3			175.00	Specified-drift excavation
Excavate Rip Rap							
	drill/blast/load/short haul/place	RR1	m3	13.50	17.75		High: quarry & place rip rap in channel
	drill/blast/load/long haul/place	RR2	m3	13.50	20.65		
	source is waste dump/short haul	RR3	m3	5.20	7.00		
	source is waste dump/long haul	RR4	m3	5.70	7.60		
	specified rip rap source	RR5	m3				
Excavate Soil; Low Spec's and QA/QC							
	clear & grub	SBC	m2	3.40	5.00		
	excavate/load/short haul	SB1	m3	4.30	5.90		
	excavate/load/long haul	SB2	m3	4.30	7.30		
	SB1 + spread and compact	SB3	m3	4.50	6.50		Low: non-engineered; High:engineered
	SB2 + spread and compact	SB4	m3	5.50	11.00		Low: non-engineered; High:engineered
	Specified activity	SBS	m3	3.20	6.00		Low: rehandle waste rock dump by dozing; High:rehandle waste rock by hauling
	Tailings	SBT	m3	1.35	3.70	15.50	Low:doze frost heaves; High:contour surface - wet or frozen; Specified:haul/place wet infill
Excavate Soil, High Spec's and QA/QC							
	excavate/load/short haul	SC1	m3	6.80	9.30		
	excavate/load/long haul	SC2	m3	7.10	11.75		
	SC1 + spread and compact	SC3	m3	8.50	14.20		Low: non-engineered; High:engineered
	SC2 + spread and compact	SC4	m3	8.90	23.20		Low: non-engineered; High:engineered (e.g. complex covers, low volume dam construction)
	Specified activity	SCS	m3			18.80	Backfill adit with waste rock
Fence							
		FNC	m	13.55	203.00		
Fuel and Electricity							
	Fuel operating cost automative	FOA	litre	1.05			
	automative	FONA	litre	0.99	1.31		
	Fuel mobilization	FM	litre	0.22	0.42		High: winter road usage
	Electricity	FE	kW-h	0.17	0.19	0.49	Low and High:Yellowknife; Specified:diesel generator
Geo-Synthetics							
	geotextile	GST	m2	3.44			Supply and install
	geogrid	GSG	m2	5.75			
	liner, HDPE	GSHDPE	m2	7.95			Supply and install; large quantity
	liner, ES3	GSES3	m2	20.20			FOB Yellowknife
	geosynthetic installation	GSI	m2	3.16	14.00		Low:geotextile; High:ES3 or HDPE
	bentonite soil ammendment	GSBA	tonne	308.30	348.50		FOB Edmonton, add shipping & mixing
Grouting (/m3 of rock grouted)							
		grout	m3	236.55	286.75		High: cement, FOB Yellowknife
Labour & Equipment Rates							
	Manager	Sman	$/hr	125.00			
	Superintendant		$/hr	103.54			
	Registered engineer	Eng	$/hr	220.00			
	Environmental coordinator	Envco	$/hr	74.16			
	Electrician	Elec	$/hr	74.00			
	Journeyman - various	Jour	$/hr	71.79			
	Labour - skilled	Lab-s	$/hr	49.60			
	Labour - unskilled	Lab-us	$/hr	43.98	50.00		
	Equipment operator	oper	$/hr	65.00	80.00		

Unit Cost Table (for refining unit costs see "Estimator" worksheet)

	Filter by unit					
Heavy duty mechanic	mech	$/hr	72.85			
Water treatment plant operator	oper-wt	$/hr	59.86			
Security / first aid	safety	$/hr	66.97			
Administative staff	admin	$/hr	57.89			
Equipment rates include operator and fuel unless specified						
Loader - 4 cu.yd (3.06m3)	load-s	$/hr	175.00			
Loader - 7 cu.yd (5.35m3)	load-l	$/hr	315.00			
Excavator - 26.76-30.84 tonnes	exc-s	$/hr	190.00			
Excavator - 68.95+tonnes	exc-l	$/hr	420.00			
Grader	grad	$/hr	190.00			
Dump truck off hwy 30-50 tonnes	truck-s	$/hr	225.00			
Dump truck off hwy 55-75 tonnes	truck-l	$/hr	300.00			
dozer, small	dozers	$/hr	205.00	260.00		
dozer, large	dozerl	$/hr	490.00	565.00		
smooth drum compactor	comp	$/hr	155.00			
scooptram, 6 yd3 bucket	scoop	$/hr	170.00			
flat bed truck with hiab	hiab	$/hr	155.00			
fuel truck	ftruck	$/hr	150.00			
water truck	wtruck	$/hr	150.00			
Mobilize Heavy Equipment						
Road access	MHER	kmtonne	3.40	10.25		
Air access	MHEA	kmtonne	12			cargo rate>500lb
Mobilize Camp						
Road access	MCR	each	50000			refurbish existing camp
Mobilize Workers						
flight	MW	each	4500.00	9100.00		Low:e.g. 8 passenger; High: Dash 7
Oil Removal						
oil removal	OR	litre	0.43	1.20		Low:waste oil heater; High: ship offsite
PCB Removal						
Remove from site	PCBR	litre	40.20	46.90		Low: shipping, handling & disposal from Yellowknife
Pipes, small (<6in dia.)						
remove/dispose on site	PSR	m	1.00	24.00		Low: remove/dispose on site; High: remove/re-use
supply	PSS	m	6.10	11.10		Low:supply; High:supply and ship
install	PSI	m	25.00			
Pipes, large (>6in dia.)						
remove/dispose on site	PLR	m	22.00	72.00		Low: remove/dispose on site; High: remove/re-use
supply	PLS	m	129.00	143.00		Low:supply; High:supply and ship
install	PLI	m	50.00			
Power Lines						
remove/dispose on site	POWR	each	25.50			
Process Chemicals						
Remove from site	PCR	kg	0.45	2.50		
Pumps						
Pump capital cost	PCR	each	########			
Pump shipping	PS	each	2500.00			
Pump maintenance	PM	each	20000.00			
Pump sand BackFill						
	BF	m3	85.00	300.00		
Scarify - road/mine site						
	SCFY	ha	4300	6030	2150	
Shaft, Raise & Portal Closures						
Shaft & Raises	SR	m2	645	2132		Low:pre-cast concrete slabs, little site prep. Area=shaft+>1m all around
Portals	POR	m3	18.8	250	1200.00	Low:unit cost code SCS;High:excavate & backfill collapsed portal;Spec: installed pressure plug
Site Inspection Report						
	RPT	each	10000.00	20000.00		
SpillWay - Clear						
	CSW	each	3000.00	7000.00		
Survey/Instrumentation						
	SI	each	1800	3600		2 person crew
Treatment Plant - Construct						
Small (< 1000 m3/d)	BTPS	lump sum	1218600	2437300		
Large (> 1000 m3/d)	BTPL	lump sum	2437300	42650200		
Treatment Plant - Operate						
	OTP	m3	0.35	2		
Vegetation						
Hydroseed, Flat	VHF	ha	4000.00			
Hydroseed, Sloped	VHS	ha	6000.00			
veg. Blanket/erosion mat	VB	ha				
Tree planting	VT	ha				
Wetland species	VW	ha	50000.00		47.72	Specified= /m3, Wetland Growth Media Substrate mixed and installed (sand-local, biochar and fertilizer, woodchips-local)
Water Sampling/Analysis/Reporting						
	WS	each	7000.00	10000.00		
Water Treatment Chemicals						
ferric sulphate	ferric	kg	1.19			
ferrous sulphate	ferrous	kg	1.32			
lime	lime	kg	0.51			
hydrogen peroxide, 35%	hperox	kg	1.50			
Sodium Metabisulfate	Nametab	kg	1.18			
Caustic soda, 50%	caustic	kg	0.74			

Unit Cost Table (for refining unit costs see "Estimator" worksheet)

	Filter by unit					
Sulfuric acid, 93%	sulfuric	kg	0.31			
flocculant	flocc	kg	6.00			
copper sulphate	copper	kg				
shipping	shipping	kg	0.20			
Winter Road						
Construction	WRC	km	2000.00	11500.00		
Usage	WRU	kmtonne	0.29			
Well Abandonment						
All wells - Drilled / Cased	WL	m			12500	-
Sweet Well - Completed / Active / Inactive	SWWL1	m			56600	0 - 1000 m
	SWWL2	m			71200	1000 - 2000 m
	SWWL3	m			88000	2000 - 3000 m
	SWWL4	m			104900	>3000 m
Sour Well (H2S > 1%) - Completed / Active / Inactive	SRWL1	m			74700	0 - 1000 m
	SRWL2	m			94400	1000 - 2000 m
	SRWL3	m			116500	2000 - 3000 m
	SRWL4	m			138600	>3000 m
Source Water Well	WWL1	m			5000	0 - 150 m
	WWL2	m			10000	151 - 300 m
	WWL3	m			30000	>300 m
Vent Flow / Gas Migration	VFGM	each			87200	-
Additional Completion Zones	ACZ	each			Add 30% per zone	-
Facility Abandonment						
Oil / bitumen processing or injection / disposal facility	OBP1	m3/day			50000	0 - 50 m3/d
	OBP2	m3/day			100000	>50 m3 < 500 m3/d
	OBP3	m3/day			200000	>50 m3 < 3000 m3/d
	OBP4	m3/day			400000	>3000 m3/d
Gas processing facility	GPF1	m3/day			192900	0 - 999 e3m3/d
	GPF2	m3/day			372200	1000 - 2999 e3m3/d
	GPF3	m3/day			500700	3000 - 4999 e3m3/d
	GPF4	m3/day			638700	>5000 e3m3/d
Gas dehydration facility	GDF1	m3/day			53000	0 - 299 e3m3/d
	GDF2	m3/day			132500	300 - 1499 e3m3/d
	GDF3	m3/day			238700	>1500 e3m3/d
Compressor stations	CST1	KW			46600	0 - 599 KW
	CST2	KW			113600	600 - 2999 KW
	CST3	KW			210500	>3000 KW
Battery sites	BAT1	m3/day			46600	0 - 49 m3/d
	BAT2	m3/day			136400	50 - 499 m3/d
	BAT3	m3/day			244300	500 - 1500 m3/d
	BAT4	m3/day			353100	>1500 m3/d
Battery sites w/ separation, compression, injection and/or disposal equipment	BATS1	m3/day			71900	0 - 49 m3/d
	BATS2	m3/day			158800	50 - 499 m3/d
	BATS3	m3/day			296900	500 - 1500 m3/d
	BATS4	m3/day			406200	>1500 m3/d
Satellite batteries	SBAT1	m3/day			49600	0 - 99 m3/d
	SBAT2	m3/day			74400	>100 m3/d
Other stations	OST	each			39900	
H2S premium (>1%)	H2S	each			Add 10%	
Legacy premium (Pre 1990)	LEG	each			Add 20%	

Unit Cost Estimator

1 Equipment Productivity Figures and Graphs have been reproduced from Caterpillar Performance Handbook - Edition 32

EXCAVATION

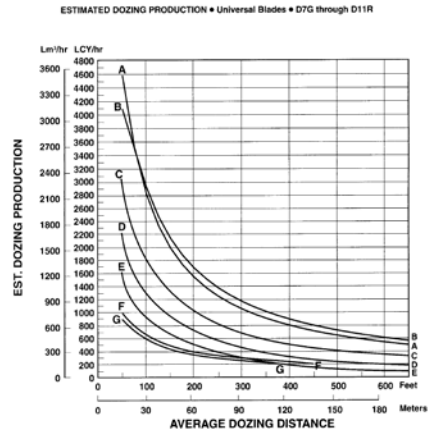
Productivity		
Machine	Cat 345 B	
bucket capacity	2.4	m3
fill factor	75%	%
cycle time	45	seconds
operator skill	80%	%
machine availability	83%	%
altitude adjustment	100%	%
Hourly productivity	95.62	m3/hr
Operating Costs		
- Contractor		
Contractor hourly rate	$150.00	$/hr
Excavation cost - contractor rate	1.57	$/m3
- Owner		
ownership, daily		$/day
maintenance		$/hr
fuel		$/hr
consumables (cutters, tires)		$/hr
operator		$/hr
Owner hourly rate	$0.00	$/hr
Excavation cost - owner rate	$0.00	$/m3
Excavation cost - select contractor or owner rate (D22 or D31)		$/m3

HAUL AND DUMPING

Productivity		
Machine	769 rock truck	
truck capacity	24	m3
fill factor	80%	%
load time	6.0	min.
haul distance	1.5	km
average velocity	20.0	km/hr
haul time + return time	9.0	min.
wait time	0.5	min.
dump time	1.0	min.
cycle time	16.5	min.
machine availability	83%	%
altitude adjustment	100%	%
	13.7	re. min/cycle
Hourly productivity	84.1	m3/hr
Operating Costs		
- Contractor		
Contractor hourly rate	$140.00	$/hr
Haul and Dump - contractor rate	1.66	$/m3
- Owner		
ownership, daily		$/day
maintenance		$/hr
fuel		$/hr
consumables (cutters, tires)		$/hr
operator		$/hr
Owner hourly rate	$0.00	$/hr
Haul/Dumping Cost - owner rate	$0.00	$/m3
Haul/Dumping Cost - select contractor or owner rate (I22 or I31		$/m3

SPREADING/DOZING

Productivity		
Machine	Cat D8	
Estimate production using example curves provided or	600	m3/hr
equivalent from other supplier		
Correction factors (see table provided)		
operator skill	0.75	
material type, see table	0.80	
slot dozing	1.00	
side by side dozing	1.00	
visibility	1.00	
job efficiency	0.83	
altitude adjustment	1.00	
slope adjustment	1.00	
Hourly productivity	298.8	m3/hr
Operating Costs		
- Contractor		
Hourly rate - contractor supplied	$190.00	$/hr
Dozing - contractor rate	0.64	$/m3
- Owner		
ownership, daily		$/day
maintenance		$/hr
fuel		$/hr
consumables (cutters, tires)		$/hr
operator		$/hr
Owner hourly rate	$0.00	
Spreading/Dozing Cost - owner rate	$0.00	$/hr
Spreading/Dozing Cost - select contractor or owner rate (N22 or N31)		$/m3



KEY
A — D11R-11U
B — D11R CD
C — D16R-10U
D — D9R-9U
E — D8R/D8R Series II-8U
F — D7R Series II-7U
G — D7G-7U

NOTE: This chart is based on numerous field studies made under varying job conditions. Refer to correction factors following these charts.

Excavator

	Cat 320	Cat 325B	Cat 375
heaped bucket capacity, m3	1.5	2.2	5.4
	Typical Cycle Times (seconds)		
easy digging, shallow digging, sma	16	18	20
med. to hard digging, rocky soil, s	23	23	25
tough digging, sandstone, caliche,	27	29	35

Material	Fill Factor (% of heaped bucket capacity
Moist loam or sandy clay	100 - 110
sand and gravel (not till)	95 - 110
hard tough clay	80 - 90
rock - will blasted	60 - 75
rock - poorly blasted	40 -60

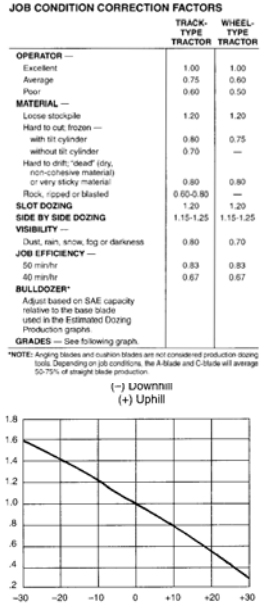
Operator Skill	poor	average	good
Correction factor	0.6	0.75	1

Machine availability	poor	average	good
Correction factor	0.9	0.95	1

Trucking

	Cat 771 D	Cat 777D	Cat 789C
Truck capacity - heaped, m3	27.5	60.5	137

Dozing



The functi

ons in this worksheet serve as a back up in the event that the menu item "Add-Ins" is

Save file before clearing all data

Shows both active worksheet as well as table of Unit Costs in a separate wi

Prints all worksheets except unit costs

Prints all worksheets

not shown

ndow

in Excel menu bar