FINANCIAL INFORMATION

Institution: University of British Columbia

Project number: 7588

Descriptive title of infrastructure project (from p. 1 of Project Module):
Innovative Research for the Challenges of Mining in the 21st Century - the Canadian Environmental Mining Research Centre

OVERVIEW OF INFRASTRUCTURE PROJECT FUNDING

This table provides an overview of the total contributions for eligible costs for the project (from CFI and eligible partners)

Line No.	Eligible expenditures	Year 1	Year 2	Year 3	Year 4	Total Years 1-4
1	Total contributions from eligible partners	1,615,910	4,060,544	697,944		$6,374,398
2	Total requested from the CFI	1,077,273	2,707,029	465,296		$4,249,598
3	**Total eligible costs** (line 3 = lines 1 + 2)	$2,693,183	$6,767,573	$1,163,240		$10,623,996
4	CFI request as % of total eligible costs	40.00 %	40.00 %	40.00 %		40.00 %

OVERVIEW OF FUNDING FROM ELIGIBLE PARTNERS FOR ELIGIBLE COSTS

This table provides a breakdown of the total contributions from eligible partners (from line 1 above) by type of funding partner and indicates if the partner contributions are secured (S) and/or expected (E).

Line No.	Source of Eligible Contributions	Cash	In-Kind	Total	Secured (S) And/Or Expected (E)
5	Institutions, trust funds or foundations	30,000	416,722	$446,722	Secured
6	Federal government departments or agencies (not CIHR, NSERC, SSHRC)	566,674	20,000	$586,674	Secured / Expected
7	Provincial governments (departments or agencies)	4,249,598		$4,249,598	Expected
8	Other governmental sources (municipal or foreign)				
9	Corporations/firms	566,675	256,421	$823,096	Secured / Expected
10	Voluntary organizations		99,688	$99,688	Secured
11	Other		168,620	$168,620	Secured
12	**Total contributions from eligible partners (line 12 = line 1)**	$5,412,947	$961,451	$6,374,398	

The total on line 12 must equal the total on line 1.
For each year, the CFI request should not exceed 40% of the cumulative total eligible cost up to that year.

Institution and Infrastructure Project Title (from p. 1 of Project Module): Project number: 7588

University of British Columbia
Innovative Research for the Challenges of Mining in the 21st Century
- the Canadian Environmental Mining Research Centre

BUDGET

This table gives the totals for each type of expenditure. The costs of individual items, including reference to the line number are provided on page 13.

For 2003 Innovation Fund applications, Year 1 represents the year ending March 31, 2004 and Year 2, 3, and 4 every fiscal year thereafter. For applications other than Innovation Fund, Year 1 represents the year ending March 31 of the current fiscal year and Year 2, 3, and 4 every fiscal year thereafter. Costs incurred before Year 1 should be included in Year 1. Costs to be incurred after Year 4 should be included in Year 4.

Line No.	Type of Expenditure	Year 1	Year 2	Year 3	Year 4	Total Years 1-4
13	Purchase of equipment or facility (including shipping, taxes and installation)	433,655	2,710,789	304,343		$3,448,787
14	Lease of equipment or facility					
15	Personnel costs (for infrastructure acquisition & development only)	100,000	115,000	85,000		$300,000
16	Components		308,850			$308,850
17	Travel (Infrastructure related)	12,500	6,250	6,250		$25,000
18	Software			11,799		$11,799
19	Extended warranty		48,539			$48,539
20	Construction/renovation costs (research related)	2,127,028	3,548,145	745,848		$6,421,021
21	Initial training of infrastructure personnel	20,000	30,000	10,000		$60,000
22	Other, describe:					
23	**Total eligible costs (line 23 = line 3)**	$2,693,183	$6,767,573	$1,163,240		$10,623,996
24	Cash contributions from eligible partners	1,293,554	3,581,795	537,598		5,412,947
25	In-kind contributions from eligible partners	322,356	478,749	160,346		961,451
26	**Total contributions from eligible partners (line 26 = line 1)**	$1,615,910	$4,060,544	$697,944		$6,374,398
27	**Total requested from the CFI (line 27 = line 2)**	$1,077,273	$2,707,029	$465,296		$4,249,598

Institution and Infrastructure Project Title (from p. 1 of Project Module): Project number: 7588

University of British Columbia
Innovative Research for the Challenges of Mining in the 21st Century
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BUDGET - Cost of individual items

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1		**Construction Costs**						
2	20	Total Costs	1	6,132,829	6,132,829	357,917	BBHS/MWLAP/ AMEC/UBC	2004/11
3	20	Land Acquisition (in kind)	2	238,504	238,504	238,504	Macdonald Dev.	2004/11
4	20	Other Buildings (in kind)	2	49,688	49,688	49,688	BBHS(Museum)	2004/11
5		**1. ARD Testing Lab**						
6	13	Centrifuge	1	15,100	15,100	682	Sepor	2004/12
7	13	Glove Box & Ventilation Hood	1	19,389	19,389	877	Fisher	2004/12
8	13	Shakers	2	11,989	11,989	543	Fisher	2004/12
9	13	Conductivity & pH Meters	2	9,216	9,216	417	Fisher	2004/12
10		**2. ARD Pilot Plant**						
11	13	Bio-Reactors	2	43,529	43,529	1,970	Applikon	2004/12
12	13	Uni-Strut Platforms	1	22,078	22,078	998	Unistrut	2004/12
13	13	Geomembrane (100m x 100m)	1	236,578	236,578	10,272	Western Tank	2004/12
14	13	Wetlands Ancillaries (pumps, pipes, valves, etc.)	3	39,179	39,179	1,773	Sepor/MetPro	2004/12
15		**3. Phyto-Reclamation & Revegetation**						
16	13	Greenhouse (40' x 20')	1	38,092	38,092	1,724	Everlast	2005/12
17	13	Greenhouse Accessories	7	18,639	18,639	842	Yardiac/Fisher	2005/12
18	13	Centrifuge	1	15,100	15,100	683	Sepor	2005/12
19	13	Microwave	1	14,138	14,138	640	Sepor	2005/12
20	13	Ultra-High Speed Centrifuge	1	23,683	23,683	1,072	Sepor	2005/12
21	13	Shakers	2	11,989	11,989	543	Fisher	2005/12
22	13	Sample Preparation & Storage	1	12,715	12,715	575	Fisher	2005/12
23		**4. Geothermal Energy Lab**						
24	13	Heat pump & heat exchanger	1	20,525	20,525	928	Accutemp	2004/02

Total eligible costs: $10,623,996

Use additional pages as required Total In Kind: $961,451

Institution and Infrastructure Project Title (from p. 1 of Project Module): Project number: 7588

University of British Columbia

Innovative Research for the Challenges of Mining in the 21st Century

- the Canadian Environmental Mining Research Centre

BUDGET - Cost of individual items

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25	13	Pumps, valves, piping, & instrumentation	1	16,072	16,072	727	Accutemp	2004/02
26		**5. Instrumentation & Process Control**						
27	13	Wireless Network/GPS Satellite/Field Computer	1	23,188	23,188	1,050	Mainstay Comp.	2006/06
28	13	Control Instrumentation	20	14,306	14,306	646	Bay Instruments	2006/06
29	18	Software	1	11,799	11,799		ISA-Control	2006/06
30		**6. Solid Waste Management**						
31	13	Soil Mixer/Slump Tester/Sediment Sampler	1	11,479	11,479	519	Sepor/Fisher	2006/06
32	13	Fredlund Cells	3	37,663	37,663	1,704	GSTS/Hoskins	2006/06
33	13	Weather Station	1	12,252	12,252	836	Campbell Sci.	2006/06
34	13	Eddy Covariance Monitoring	1	69,393	69,393	4,727	Campbell Sci.	2006/06
35	13	Gas Flux Monitoring System	1	44,747	44,747	4,230	Nortech GSI/Columbia	2006/06
36		**7. Mineralogical Research**						
37	13	Scanning Electron Microscpe	1	265,476	265,476	12,012	Hitachi	2005/04
38	13	Specimen Preparation	1	17,619	17,619	797	Pelco	2005/06
39	13	Cyclosizer	1	46,742	46,742	2,115	Sepor	2005/04
40	13	Franz Isodynamic Separator	1	22,369	22,369	1,012	Franz	2005/04
41	13	Image Analysis System	1	155,618	155,618	7,042	DAB Microscope	2005/06
42	13	Sample Polishing & Mounting	1	9,061	9,061	410	Sepor	2005/06
43	13	Microscopes	2	13,785	12,697	724	PARCO /Meiji	2005/06
44		**8. Analytical Research Support Lab**						
45	13	Balances	3	11,304	11,304	512	Sepor	2005/04
46	13	AA spectrophotometer	1	51,190	51,190	2,315	Varian	2005/04

Total eligible costs: $10,623,996

Use additional pages as required

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Institution and Infrastructure Project Title (from p. 1 of Project Module): Project number: 7588

University of British Columbia

Innovative Research for the Challenges of Mining in the 21st Century

- the Canadian Environmental Mining Research Centre

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47	13	ISP Optical Emission Spectrophotometer	1	167,960	167,960	7,600	Varian	2005/04
48	13	XRD Unit	1	186,786	165,119	9,339	Bruker AXS	2005/04
49	13	Leco Carbon Analyser	1	78,444	78,444	3,550	Leco	2005/04
50	13	Ion Chromatograph	1	94,975	94,975	4,298	Lachat	2005/04
51		**9. Mine and Plant Simulation Modeling Lab**						
52	13	Computer Network	1	13,757	13,757	622	Mainstay Comp.	2005/04
53	13	Hardware/Software Simulation Platform	1	99,174	99,174	563	Itasca/JK Tech/Mains	2005/04
54		**10. Telerobotics Lab**						
55	13	Telerobotic LHD		22,233	22,233	1,006	Nautilus Int.	2005/12
56	13	Robotic Shovel	1	25,182	25,182	1,138	P&H	2005/12
57	13	Hoisting Testbed	1	45,072	45,072	2,039	T&T Engineering	2005/12
58		**11. Hydrometallurgy & Heap Leach**						
59	13	Bioreactors	2	43,529	43,529	1,970	Applikon	2005/12
60	13	Incubator Shakers/Universal Platform	6	22,680	22,680	1,029	Diamed	2005/12
61	13	Waterbaths/circulators	2	9,390	9,390	425	VWR	2005/12
62	13	pH Meters	4	10,321	10,321	467	Fisher	2005/12
63	13	Ventilation Hood/Bottle Rolls	1	15,683	15,683	710	Fisher/Sepor	2005/12
64	13	Centrifuge	1	14,232	14,232	644	Fisher	2005/12
65		**12. Microbiology Lab**						
66	13	Shaking chamber	1	20,942	20,942	948	Fisher	2005/06
67	13	Anaerobic Glove Box	1	31,192	31,192	1,410	Fisher	2005/06
68	13	Centrifuge	1	14,232	14,232	644	Fisher	2005/06
69	13	Autoclaves	2	21,864	21,864	989	Fisher	2005/06

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70	13	Laboratory Incubator	1	35,222	35,222	1,594	VWR	2005/06
71		**13. Rock Fragmentation Research Lab**						
72	13	Microhardness Tester	1	155,464	155,464	7,816	Micro Photonics	2005/06
73	13	Grinding Mill/Sweco Sreens	1	19,982	19,982	903	Sepor	2005/06
74	13	Jet Mill Micron-Master	1	31,686	31,686	1,434	Jet Pulv. Ltd.	2005/06
75	13	Pendulum Impact Tester	1	32,682	32,682	1,479	Qualitest/Instron	2005/06
76	13	Cavity Monitor	1	50,167	50,167	2,270	Optec	2005/06
77	13	Borehole camera	1	8,138	8,138	368	Martin Design	2006/06
78		**14. Surface Chemistry Lab**						
79	13	Zetameter	1	59,921	59,921	2,710	Colloid Dyn.	2005/04
80	13	Contact angle measurement	1	42,031	42,031	1,902	Kruss	2005/04
81	13	Surface area analyser	1	79,008	77,008	3,475	Folio	2005/04
82	13	Solid/Liquid Adsorption Measurement	1	9,995	9,995	471	Fisher	2005/04
83	13	Surface Tension Tensiomat	1	39,891	37,891	1,705	Folio	2005/04
84		**15. Flotation Laboratory**						
85	13	Bench-scale Flotation Cell	2	22,404	22,404	1,014	Sepor	2005/06
86	13	Column Flotation Machine	1	26,139	26,139	12,417	Sepor/UBC	2005/12
87	13	pH Meters	1	9,216	9,216	417	Fisher	2005/12
88	13	Convection Oven	1	20,178	20,178	913	Fisher	2005/12
89		**16. Pre-Concentration Lab**						
90	13	Belt Magnetic Separator	1	24,131	24,131	1,091	MinPro	2006/04
91	13	Dense Media Separator	1	28,288	28,288	1,280	MinPro	2006/04
92	13	Automatic Sorter	1	38,896	38,896	1,760	Sepor	2006/04
93		**17. Landscape Architecture Research and Design Lab**						

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94	13	Workstations	4	14,210	14,210	642	Brooks-Corning	2005/06
95	13	Computer Hardware/Software	1	19,338	19,338	625	Mainstay/Bentley	2005/06
96		**18. Community, Social and Health Policy Research**						
97	13	Workstations	1	14,210	14,210	642	Brooks-Corning	2005/06
98		**19. Minerals and Materials Processing Laboratory**						
99	13	Low Intensity Mag. Sep.	1	12,376	12,376	560	Outokumpu	2005/12
100	13	High Intensity Mag. Sep.	1	19,757	19,757	894	Sepor	2005/12
101	13	Shaking Table	1	13,813	13,813	624	Outokumpu	2005/12
102	13	Electrostatic Separator	1	67,958	67,958	3,075	Outokumpu	2005/12
103	13	Centrifugal Separator	1	10,597	10,597	480	Knelson	2005/12
104		**20. Sample Reception, Preparation, and Storage**						
105	13	Sample Splitters	4	9,282	9,282	420	Outokumpu	2005/12
106	13	Dust Control System	1	19,669	19,669	890	Fisher	2005/12
107	13	Screens	1	17,479	17,479	790	Fisher	2005/12
108	13	Balances	3	13,536	13,536	613	Sepor	2005/12
109	13	Crushers/Pulverizers	3	22,763	22,763	1,030	MinPro	2005/12
110		**25. 3D Visualization Research System**						
111	13	Hardware & Software	1	50,852	45,696	2,301	IVS-UNB	2005/06
112		**26. Laboratory Workstations**						
113	13	Workstations	18	57,742	57,742	2,543	Brooks-Corning	2005/12
114	13	Computers	18	47,847	47,847	2,165	Mainstay Comp.	2005/06
115		**Components**						

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116	16	Components	23	308,850	308,850	146,721	UBC	2005/12
117		**Travel (re infrastructure)**						
118	17	Travel	20	25,000	25,000			2004/04
119		**Personnel**						
120	15	Research Eng. (installation)	1	195,000	195,000			
121	15	Technical Support	1	105,000	105,000			
122		**Warrantees**						
123	19	Extended Warrantees	18	48,539	48,539			2005/04
124		**Training of Personnel**						
125	21	Personnel Training (research)	1	60,000	60,000			2005/04
126		**23. Mechanical-Electrical**						
127	13	Fans, Circuit Breakers, Louvers, Switches, Pumps	1	23,979	23,979			2005/04

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Use additional pages as required

Total In Kind: $961,451

The list of facilities and equipment was developed beginning in the spring of 2002. Each of the 35 CERM3 researchers were asked to submit a list of the types of facilities and equipment needed at Britannia Beach to make the facility supportive of their research. A template was used to draw out this information including space requirements and projects.

Following collection of this information, meetings were held to examine ways to merge certain projects and facilities. The outcome of this exercise was the list of labs and equipment on the accompanying pages. A total of 60 separate facilities were submitted which were reduced to 21 individual labs. In Feb. 2003, UBC entered into an agreement with NRCan-CANMET to place all administrative office space in the NRCan Britannia Centre for Mining Innovation being planned for the site. Because of this agreement, 100% of the facilities in this CFI proposal are to support research activities directly. In exchange, NRCan will have access to the equipment and facilities to conduct their environmental research programs.

The CEMR Centre Building

The building footprint is ~800 sq. m. with a total useable area of 1692 sq. m. distributed on two floors, 30% of which is eligible unassignable space (corridors, stairwells, washrooms, maintenance). A preliminary design was put together following a "charrette" (architectural workshop) held in Dec. 2002. The facility is to be a "Green" Building that "mimics" the No. 3 Mill acting as a reflection of this heritage building and visually linking the present to the past. The No. 3 building is shown to the right. This enormous structure is still standing after more than 80 years of weathering and wear and tear – a testament to the construction abilities of our ancestors. Unfortunately it is in a sad state of disrepair and requires significant maintenance to make it safe to enter but the creation of the NRCan Innovation Centre will address such renovation. No other structure at Britannia Beach generates more interest or controversy than does the No.3 Mill with some people committed to keeping it as a derelict monument to the past, and others wanting it to come down as quickly as possible since its image "tarnishes the mining industry". Perhaps by having a new facility at the site that mirrors the past into the present, this will help resolve the issue. Research in the Landscape Architecture Design Lab (line 116) will focus part of its initial efforts on this debate among other community issues regarding living at Britannia Beach. The CEMR footprint was decided based on other building sizes at the site, on the total lab space required and on the amount of property available. A total of 1.8 hectares has been offered as an in-kind contribution by the landowners. Of this space, one hectare is to be used as a constructed-wetlands for research with the remaining land occupied by the centre.

Britannia Mine No. 3 Mill – A National Heritage Building.

Artist's Impression of the UBC CEMR Centre at Britannia Beach.

Line Item No. 1 - Construction Costs

The following preliminary feasibility breakdown details the cost to build this facility:

ITEM				ESTIMATED AMOUNT
Excavation and Backfill				$ 129,580
Concrete Structures				$ 565,000
Walls				
Masonry	3,600 sf	x $11	= $ 39,600	
Partitions	27,000 sf	x $ 4.25	= $114,750	
Interior railings	584 lf	x $50	= $ 29,200	
Exterior windows/glazing	3,000 sf	x $40	= $120,000	
Metal panels	500 sf	x $50	= $ 25,000	
Precast panels	8,500 sf	x $33	= $280,500	
Interior glazing	900 sf	x $15	= $ 13,500	
Wall tile	1,800 sf	x $10	= $ 18,000	$ 640,120

Floors			
Ceramic	4,000 sf x $10 = $ 40,000		
Concrete finish	1,352 sf x $ 0.80 = $ 1,082		
Vinyl composite	12,700 sf x $ 2.50 = $ 31,750	$	72,832
Doors			
Exterior	4 units x $1,000 = $ 40,000		
Hollow metal doors	12 units x $ 700 = $ 8,400		
Interior solid core wood	37 units x $ 700 = $ 25,900	$	38,300
Ceilings			
Tee bar	7,920 sf x $ 2 = $ 15,840		
Wood in corridor	4,500 sf x $12 = $ 54,000	$	69,840
Painting			
Ceiling	18,000 sf x $ 0.90 = $ 16,200		
Interior walls	28,000 sf x $ 0.75 = $ 21,000		
Corridor wood ceiling	4,500 sf x $12 = $ 3,825		
Exterior railings	500 lf x $ 1.65 = $ 825		
Doors & Frames	49 units x $100 = $ 4,900	$	46,750
Roofing			
Membrane & insulation	11,954 sf x $ 7.25 = $ 86,667		
Flashing	700 lf x $ 9.00 = $ 6,300		
Penthouse roof	3,000 sf x $ 7.25 = $ 21,750		
Solar panels	5,000 sf x $10.00 = $ 50,000	$	214,717
Millwork			
Laboratories	1174 lf x $275 = $322,850		
Raised Floors	1705 sf x $ 30 = $ 51,150	$	374,000
Mechanical (**see Note 1**)			
Site services	= $ 70,000		
Plumbing & drainage	= $103,000		
HVAC	= $410,000		
Control systems and sprinklers	= $175,000	$	758,000
Electrical (**see Note 1**)			
Site services/lighting	= $ 26,000		
Laboratories	= $287,000		
Corridors	= $ 52,000		
Mechanical/electrical rooms	= $ 20,000		
Hydro hook-up	= $ 54,788	$	439,788
Renovation of outbuilding (**see Note 2**)		$	250,000
Water Treatment Plant hook-up (**see Note 3**)		$	50,000
Site work			
Exterior front stairs/ramp	600 sf x $ 27 = $ 16,200		
Retaining walls	447 cy x $1000 = $446,000		
Landscaping	7,000 sf x $ 4 = $ 28,000		
Paving	1,200 sf x $ 8 = $ 9,600		
Trees, shrubs, etc.	15 units x $ 850 = $ 12,750		
Stairs/retaining wall	100 lf x $ 60 = $ 6,000		
Curb $ Sidewalk $750 +1000	units x $ 5 = $ 5,750	$	524,300
	Sub-total =	$	4,173,227
	Plus 5% General Conditions =	$	208,661
	Sub-total =	$	4,381,888
	Plus 10% Profit & Overheads =	$	438,189
	Sub-total =	$	4,820,077
	Plus Fees & Contingencies (see Note 4) =	$	1,312,752
	Total =	**$**	**6,132,829**

These costs reflect the knowledge of UBC Campus Planning personnel on recent construction experiences in the Lower Mainland and on the UBC campus with adjustments for inflation, and the off-campus nature of the proposal. The size of each lab was based on the type of equipment and the space requirements to conduct the research.

Schedule of Activities to Create the Canadian Environmental Mining Research Centre

Activity	Year and Month																											
	2004											2005												2006					
	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
Awarding of the Funds																													
CFI																													
BCKDF																													
Matching Funds																													
Land Acquisition																													
Permitting & site preparation																													
Detailed Design																													
- building																													
- wetlands (infrastructure)																													
- wetlands (research)																													
Construction																													
- buildings																													
- wetlands																													
Landscaping and surfacing																													
Equipment Installation																													
Official Opening (June 29, 2006)																													

Note 1: Green Building - The CEMR Centre will be designed as a "Green" Building. UBC has considerable experience with this type of construction as used for the Liu Centre and the C.K. Choi building. A "Green" Building has a number of unique features and targets designed into the plans adding about 10% to the up-front cost of construction, however, these features produce significant operating savings. According to the BC Government's Green Building Program, these facilities have the following features:

- more resource efficient,
- less energy to operate,
- better use of materials and consumption of less water,
- improved comfort for building occupants,
- significant cost savings, and,
- help foster the growth of a strategic industry in the province.

With this proposal, the last goal will demonstrate how these attributes can be incorporated effectively into designing a mine and mill; we intend for the building to exemplify the benefits of "Green" design principles to create the "Green Mine". The figures below show plan and side views of the CEMR building.

Note 2: Renovation of existing building – The BC Museum of Mining will donate a building as an in-kind contribution to this project. The building will support research to be conducted in the constructed wetlands by providing preparatory space and housing equipment and biota. The building has ~1000 sq.ft. of space. Renovations to convert the building to a research facility will cost $250,000. The Museum will make a $50,000 in-kind contribution in the form of equipment and labour.

Note 3: Coordination with MWLAP's Water Treatment Plant - It is intended to integrate the Centre with the new water treatment plant to be commissioned by the BC Ministry of Water, Land and Air Protection in 2004. Initial research will try to find methods to reduce the WTP costs and improve its efficiency. The research will be broadly based so as to develop generic solutions for other mine sites. To perform this research, it is necessary to install 2 pipelines between the pilot plant-constructed wetlands and the Acid Rock Drainage emanating from the mine. This will cost $50,000 with $20,000 being contributed as an in-kind contribution by MWLAP. This infrastructure is considered fundamental to support the Centre's research since it provides access to real ARD.

Note 4: - Fees and Contingencies

Site development & planning – UBC is contributing these costs = $270,000.

Architectural & design – Estimated architecture fees are $238,504 (~5%building costs).

Engineering & Professional - Professional fees are estimated as $208,334 (8.22% of structural, mechanical, and electrical costs). The engineering firm (AMEC) selected to perform this work will provide a 5% in-kind contribution.

Other designers - 6 specialists at $25,000 each (~300 hours each) include:

Green Building Consultant - optimally account for Green Building design.
Sustainability Expert - optimally include all aspects of site sustainability.
Laboratory Designer – for proper layout of lab space and equipment.
Environmental Engineer - ensure the unique environment of the site is preserved.
Geotechnical Engineer – ensure building foundations are adequate.
Landscape Architect - ensure the appropriateness of building and landscape.

Permits, insurance, etc. - The cost to acquire all permits and to insure UBC during the construction are estimated to be $35,000 including all legal costs, filing fees.

Contingencies - A rate of 10% was chosen to account for uncertainties and inflation.

Item 3: Land Acquisition - The land on which the CEMR Centre will be built is 4 acres as an in-kind contribution by the landowners. Land tenure will be acquired as a 20-year contribution for an evaluated annual fee of $4073/acre. This equates to a Net Present Value of $238,504 at an interest rate of 3%. This plan is preferred to an outright purchase so UBC does not become liable for existing site contamination. The land on which the Centre will be located is classified as contaminated under the BC Contaminated Sites Act.

Item 4: Other Buildings - The building donation described in Note 1 above is also setup as a 20-year contribution to avoid UBC assuming liability for site contamination and to ensure the Museum maintains control of the heritage value of the building. The NPV of this contribution at a 3% interest rate and annual fee of $3,393 is $49,688.

Line Item No. 5 - ARD Testing Laboratory (19'x14')

This lab equipment lab is essential to perform both static and kinetic ARD tests. In addition to standard testwork, our researchers will develop new protocols: to study mineralogy changes during humidity cell kinetic tests; to examine microbiological changes that occur during the conduct of these tests; develop accelerated-weathering procedures.

Item 6: Centrifuge – required for liquid/solid separation of colloidal particles

Item 7: Glove Box/Ventilation Hood – required to support anaerobic testwork on ARD mediation processes and to protect researchers from potentially toxic gases

Item 8: Shakers – required to conduct static ARD testwork

Item 9: Conductivity & pH Meters – required to monitor Eh and pH continuously

Line Item No. 10 - ARD Pilot Plant Facility (25'x25')

The pilot plant is planned as a ~10 m high-head facility to allow erection of large-scale ARD continuous test columns. Both ARD facilities will support research into all aspects of ARD prediction, treatment, and elimination to be conducted by Meech, Lavkulich, Klein, Veiga, Wilson, Hall, Baldwin, Ghomshei, Lavkulich, Smith, and Mayer.

Item 11: Bio-Reactors – to run continuous tests on active and passive ARD processing.

Item 12: Unistrut Platform – to create levels for various process options.

Item 13: Geomembrane (100m x 100m)- An important feature of this facility is the creation of a highly-innovative, cellular constructed-wetlands to support research into Passive ARD treatment. A geomembrane protects the surrounding environment when untreated ARD is introduced to the cells and ponds. Suitable plants (native species) will be placed in individual cells to study their ability to remove metals and organic matter.

Item 14: Wetlands Ancillaries - assorted pumps, pipes, valves, instruments to support wetlands research into passive ARD treatment.

Line Item No. 15 - Phyto-reclamation and Revegetation Laboratory (24'x17')

UBC is working on a phyto-reclamation project in Brazil with researchers from Massey Univ., New Zealand. The equipment listed will provide laboratory research support for these field studies at other sites around the world as well as testwork in the Britannia constructed wetlands and waste dumps. A greenhouse for controlled-environment testwork on hyper-accumulating plants and soil species evolution is needed for pot-trials prior to field-tests. Key researchers include Lavkulich, K. Hall, Meech, Baldwin, Veiga, and Chris Anderson from Massey.

Item 16: Greenhouse (20'x40') – to support controlled-environment experiments on phyto-reclamation and passive treatment processes. This facility will support research on proto-soil transformations and the evolution of natural biota on reclaimed wastepiles.

Item 17: Greenhouse Accessories – benches, mats, controllers, ventilators, louvers, etc. to support the research operations to be conducted within the greenhouse facility.
Item 18: Centrifuge – required to prepare samples for analysis (solids and water).
Item 19: Microwave – required to sterilize soil samples prior to testwork.
Item 20: Ultra-high Speed Centrifuge – to separate nano-sized particles, particularly in microbiological studies.
Item 21: Shakers – necessary for testwork on microbiological aspects of soil chemistry.
Item 22: Biological Sample Preparation & Storage – consists of refrigerator, freezer, ovens and other biological and microbiological preparation and storage equipment.

Line Item No. 23 - Geothermal Energy Laboratory (34'x14')

Under the leadership of Dr. Mory Ghomshei, this lab will focus on heat pump technology to extract energy from mine effluents. A portion of this facility is being built in the summer of 2003 to demonstrate the feasibility of heat recovery from underground mine waters. The heat pump, heat exchanger, and ancillaries will support research aimed at developing a system with a payback of 2-3 years instead of the current 8-9 years. Instrumentation will also support field studies on the Meager Creek high-temperature geothermal project located 45 miles north of Pemberton. Researchers include Meech, Russell, R. Hall, Klein, Tromans, Scoble, and Pakalnis.

Item 24: Research Heat Pump and Heat Exchanger – to increase water temperature to distribute recovered heat. This unit will support research into increasing the COP of an extraction unit. The exchanger is necessary for use with acidic effluents.
Item 25: Pumps, valves, piping, instrumentation – assorted ancillaries to support research into heat extraction from mine waters.

Line Item No. 26 - Instrumentation and Process Control Laboratory (24'x15')

This lab will house a data-logger to receive and record data from instrumentation installed in Britannia valley (e.g., 2200 level) and at other sites. The focus is to develop ways to support remote-monitoring of the environment – aqueous, atmospheric, and solid waste stability. The wireless network has a satellite link to download data and upload control signals. The software includes several control packages to simulate and develop models for adaptive control. Remote monitoring is an accepted technology but integration of process control into such systems is still in its infancy and requires further work to establish systems that are reliable and robust. The research is led by R. Hall with collaboration by Meech, Lang, Pakalnis, Ghomshei, and Klein.

Item 27: Wireless Network/GPS Satellite Communication/Field Computer – for remote transfer and collection of data, a robust field unit is required.
Item 28: Control Instrumentation – consists of controllers, valves, final control elements, recorders, PLCs, and instrumentation to support remote-sensing and control.
Item 29: Control Software – simulation & design software for advanced control algorithms.

Line Item No. 30 - Solid Waste Management Laboratory (25'x30')

The Solid Waste Management group led by Ward Wilson and Les Smith intends to compare technologies to monitor climate, gas fluxes, evaporation/ transpiration, subsurface conditions, and net infiltration. The Britannia site provides the opportunity to conduct long-term controlled trials on real waste piles. A pilot-scale facility will examine how to perform large-scale strength and stability tests on waste material focusing on methods to mix materials of widely differing particle size (tailings and coarse waste rock). The site also provides unique access to subaqueous sediment that has been in place for over 100 years in Howe Sound. Research will examine chemical and physical stability using the deep-water sediment sampling system. Other researchers include Poling, Pederson, Meech, Ghomshei, Lavkulich, Dunbar, Baldwin, K. Hall, Mayer, Hungr and Klein.

Item 31: Soil Mixer, Slump Tester & Sediment samplers – to support research into codisposal of tailings and waste rock. The mixer provides a means to homogeneously mix these disparate materials while the slump tester measures the co-mingled material properties. The samplers will also be used to recover sediment samples from Howe Sound.

Item 32: Fredlund Cells – standard lab equipment to monitor unsaturated soil properties, with the ability to test under compressive stress. These cells are necessary for understanding the evolution of waste materials with weathering.

Item 33: Weather Station – to monitor climate for all field-based testwork carried out at the Britannia site. It will be deployed adjacent to test plots located on existing waste piles and will be supported by the remote-sensing laboratory.

Item 34: Eddy Covariance Monitoring – to monitor in real-time water evaporation and CO2 gas flux within waste piles. The system provides independent confirmation of existing methods of evaporation monitoring which need more rigorous testing. CO2 gas fluxes can be used to monitor CO2 production resulting from ARD neutralization.

Item 35: Gas Flux Monitoring System – to obtain direct measurement of oxygen and carbon dioxide fluxes at the soil-air interface. The system is designed for field use. It will also be available for kinetic testing of intrinsic oxidation rates in the lab.

Line Item No. 36 - Mineralogical Research laboratory (24'x14')

This lab is equipped with the essentials needed to characterize waste and soil samples: particle size and mineralogy, sample preparation and polishing, assorted microscopes, image analyser, and SEM. Veiga, Lavkulich, Klein, Pawlik, Meech, Dreisinger, Dixon, K. Hall, and Baldwin will be supported by this facility.

Item 37: Scanning Electron Microscope – Hitachi S3500N for soil characterization & assay.

Item 38: Microwave Specimen Preparation – for sterilization of soil specimens & biota.

Item 39: Cyclosizer – for preparation and characterization of sub-sieve size particles.

Item 40: Franz Isodynamic Separator – LB1: to separate magnetically susceptible minerals.

Item 41: Image Analyser – Zeiss Axioplan 2 Imaging Microscope and software to perform image analysis of polished sections, thin-sections and particulate materials.

Item 42: Sample Polishing & Monitoring – for preparation of polished and thin sections.

Item 43: Microscopes – video imaging system for biological specimens related to ARD, microscopic aspects of solid waste, soils, other materials, Parco VMS-3A video microscopy system, Leica Monozoom 7, and Meiji metallurgical microscope.

Line Item No. 44 - Analytical Support Laboratory (25'x26')

This facility is essential to support analytical requirements of our research.

Item 45: Balances – to support analysis of solid samples by weighing.

Item 46: AA Spectrophotometer – to support analysis of recovered materials.

Item 47: ICP Optical Emission Spectrometer – to provide environmental assay support.

Item 48: XRD Unit – to support mineralogical assessment of waste solids and soils.

Item 49: Leco Carbon Analyser – for carbon, nitrogen, & hydrogen analyses.

Item 50: Lechat Ion Chromatograph – for N, P & S analysis of water, soil and plants.

Line Item No. 51 - Mine and Plant Simulation Modeling Laboratory (25'x14')

Mine and Mill simulation is an important activity in the Centre. The network installed in this lab will support these modeling activities. The lab will interact with the Tele-robotics Lab as we intend take a Factory-Science approach to mining and processing. Agent-based software using state-of-the-art Artificial Intelligence software will be available in this lab to examine alternatives to integrate mine and mill operations. Researchers include R. Hall, Scoble, Klein, Dunbar, P. Lawrence, and Pakalnis.

Item 52: Computer network – interactive network for collaborative design and operation.

Item 53: Hardware & Software – Itasca Numerical Modeling software: FLAC & FLAC3D to model backfill strength in underground mines; UDEC & 3DEC to model discontinuous rock masses that affect stope stability; PFC2D & PFC3D to model rock mass interactions to determine ultimate failure geometries for given rock qualities. The software will couple field-test results with a numerical approach that models the dynamic interaction of particles modelled as individual continuum. The software can also be extended to study other particle interactions in grinding mills or tumbling tubes (dryers, pelletizers). Hardware include typical input/output devices for supporting such simulation modeling research.

Line Item No. 54 - Telerobotics Laboratory (25'x14')

Telerobotics and remote mining have been accepted at many mines around the world. It is important that such facilities be available for research at our centre as this field plays an important role in protecting the environment and providing a safer, healthier workplace. Our research will focus on 3 robotic systems to support research into the design and application of such equipment. Our goal is to use these systems to support process control research and to demonstrate proof-of-concept. Researchers include Scoble, R. Hall, P. Lawrence, Meech, Klein, Dunbar and Pakalnis.

Item 55: Telerobotic LHD – (Load-Haul-Dump) to test autonomous mine vehicle transport.
Item 56: Robotic Shovel – for automated digging of bulk materials.
Item 57: Hoisting Testbed – for novel hoisting systems based on capsule pipelines.

Line Item No. 58 - Hydrometallurgy and Heap Leaching Laboratory (21'x14')

Hydrometallurgy and heap leaching have become state-of-the-art allowing production of metal products at the mine contributed significantly to improving the environment next to metal recovery processing plants, especially atmospheric pollution. Our work with autoclaves will focus on applications to deal with mine related pollution and render sludges and other wastes inert. The ion chromatograph is to be used to study the chemistry of reagents such as thiosulfate to replace toxic reagents such as cyanide. The work is led by Dave Dreisinger and Dave Dixon with collaboration from John Meech, Bern Klein, Marcello Veiga, Susan Baldwin, Mory Ghomshei, Ulrich Mayer, and Ward Wilson.

Item 59: Bioreactors – to conduct testwork on biological leaching of ores.
Item 60: Incubator Shakers/Universal Platforms – to maintain an environment to support bacterial growth and static bioleaching tests.
Item 61: Waterbaths/circulators – to maintain control of temperatures of all reactors.
Item 62: pH Meters – to maintain pH control during pressure oxidation and bio-leaching
Item 63: Bottle Rolls/Ventilation Hood – to conduct cyanide-leaching of gold ores and to provide protection of researchers from noxious fumes.
Item 64: Centrifuge – to separate solid and liquids prior to analysis of samples.

Line Item No. 65 - Microbiology Laboratory (24'x14')

The laboratory will conduct research into the microbiological aspects of ARD generation, the application of Sulphate-Reducing Bacteria in processing ARD effluents, and passive treatment processes for ARD. Susan Baldwin will head up this research lab with collaboration from Suttle, Meech, Veiga, K. Hall, Lavkulich and Ghomshei.

Item 66: Shaking Chamber – to study reactions of bacteria and viruses in the environment.
Item 67: Anaerobic Glove Box – to establish controlled-environment conditions.
Item 68: Centrifuge – to separate colloidal particles and biological matter from liquids.
Item 69: Autoclaves – to sterilize instruments, specimens, and solid samples.
Item 70: Laboratory Incubator – for culturing bacteria and other related biota.

Line Item No. 71 - Rock Fragmentation Research Laboratory (25'x26')

The lab will focus on all aspects of rock fragmentation aimed at reducing the energy used to break rock. The microhardness tester and the pendulum tester will be used to study strength properties of minerals to confirm some recent fundamental predictions. To support studies within tunnels and underground openings accessible at the Britannia Mine a borehole camera and cavity monitor are essential for difficult-to-access parts of the mine to study open stopes and how they stand-up over time. The researchers in this lab include: Tromans, Meech, Klein, Pawlik, Veiga, Pakalnis, Lang, Wilson, Ghomshei, and Hungr.

Item 72: Microhardness Tester – Micro Photonics MHT unit with indentation software
Item 73: Grinding Mill/Sweco Screens – for lab grinding testwork and sample preparation.
Item 74: Jet Mill Micron-Master – to conduct research into ultra-fine grinding.
Item 75: Pendulum Impact Tester – to characterize impact strength of ceramic materials.
Item 76: Cavity Monitor – to measure the volume of underground openings.
Item 77: Borehole Camera – to see into inaccessible locations.

Line Item No. 78 - Surface Chemistry Laboratory (24'x12')

The Surface Chemistry Lab will complement and support the Flotation Lab by providing full characterization of the mineral surfaces in grinding/beneficiation operations. Relevant equipment for measurements such as zeta potential, contact angle, adsorption, and surface area measurement (BET) is available.

Item 79: Zetameter – An electro-acoustic zetameter (Zeta Probe) to be used to investigate interactions between grinding aids and particles in concentrated slurries.

Item 80: Contact angle measurement – An automated goniometer for 3-phase dynamic contact angle measurements to study additives effects on the floatability of mineral surfaces.

Item 81: Surface Area Analyser – BET Surface Area/Porosity Analyzer to characterize particles in terms of specific surface area, pore volume and pore size distribution.

Item 82: Solid/Liquid Adsorption Measurement – consists of shakers and a UV-vis Spectrophotometer to conduct measurements of liquid/solid adsorption interactions.

Item 83: Surface Tension Tensiomat – A dynamic tensiometer to assess interfacial activity of different surfactants and polymers.

Line Item No. 84 - Flotation Laboratory (24'x14')

No environmental mining research facility should be without a flotation lab – the separation process that is fundamental for virtually all ore types around the world. Reagent use in flotation will be studied to develop less-toxic chemicals.

Item 85: Bench-scale Flotation Cells – for performing conventional flotation testwork.

Item 86: Column Flotation Machine – for environmental work on ion/precipitate flotation.

Item 87: pH Meters – for control of pulp pH during flotation testwork.

Item 88: Convection Oven – to dry flotation testwork samples in preparation for assay.

Line Item No. 89 - Pre-concentration Laboratory (24'x15')

Generally used with very coarse material, pre-concentration reduces grinding costs and risks associated with waste storage. Sorting technology based on color, S.G., magnetism, or size can be attractive ahead of conventional processing. We intend to conduct research into sorting fundamentals with ores such as diamond, base-metals, coal, and gold. The method also applies in recycling and metal recovery from municipal waste.

Item 90: Belt Magnetic Separator – for removal of scrap magnetic metal.

Item 91: Dense Media Separator – for pre-sorting of heavy, coarse minerals.

Item 92: Automatic Sorter – for "ores" with values that liberate at coarse sizes.

Line Items No. 93 - Landscape Architecture Research Design Laboratory (15'x21')

A suite of networked computers with plotters and other peripherals are at the heart of this lab. The focus is to devise mine closure plans using principles of landscape architecture. A software suite called Microstation will be used for layout drawings and design. The lab will support the central project on design of the "Green Mine" to be led by Patrick Condon, with collaboration from Scoble, Meech, Veiga, Lang, Pakalnis, Lavkulich, Ghomshei, Klein, Teschke, and Baldwin.

Item 94: Workstations – part of a networked design lab for landscape research design.

Item 95: Hardware & Software – Bentley's **Microstation ver.8.1** supports research into landscape design for generating plots and printouts of design drawings.

Line Item No. 96 - Community, Social, and Health Policy Research Laboratory (15'x21')

Equipment required includes a computer and several workstations. UBC-Mining has taken the bold step of organizing a group of social scientists to conduct research into community and social issues associated with a mine operation. The members of this group will collaborate with the landscape architecture team as well as with the local Britannia community and First Nations. M. Scoble leads this research with collaboration from Meech, Veiga, Teschke, R. Hall, Klein, Dunbar, Baldwin, Lavkulich, and K. Hall.

Item 97: Workstations – collaborative environment for sustainable communities research.

Line Item No. 98 - Minerals and Materials Processing Laboratory (31'x13')

This lab will apply common mineral processing operations to recycling to demonstrate how metals, plastics, and other values can be separated from municipal waste materials. Examples of feedstock include computer circuit boards, insulated electrical wiring,

building materials, etc. Both low and high intensity mag-sep testwork will be performed to extract metals. Electrostatic separation will be used to separate plastics and industrial minerals. Gravity separators will also be employed. Municipal waste and other potentially recyclable materials can be treated as orebodies and the principles of mining engineering can be applied to increase recycling applications. The research will be led by Meech with the collaboration of Lavkulich, Klein, Ghomshei, Pawlik, and Veiga.

Item 99: Low Intensity Magnetic Separator – for recovery of ferromagnetic materials.
Item 100: High Intensity Magnetic Separator – for recovery of paramagnetic materials.
Item 101: Shaking Table – for gravity separation of coarse particles.
Item 102: Electrostatic Separator – to separate materials using an electrostatic field.
Item 103: Centrifugal Separator – for separation of fine particles with differing SGs.

Line Item No. 104 - Sample Reception, Preparation, and Storage Facility (12'x60')

A sample reception and preparation facility is needed for our research. Solid and liquid samples need special handling and storage depending on chemistry. Proper sub-sample splitting is necessary and materials often must be crushed or pulverized prior to testwork. Cool or freezing conditions are needed with control of humidity, pressure, and temperature. The equipment requested is essential to maintain the integrity of samples.

Item 105: Sample Splitters – to separate bulk materials into representative sub-samples.
Item 106: Dust Control System – to provide protection for workers.
Item 107: Screens – to characterize size distribution of ores and solid samples.
Item 108: Balances – to weigh samples and sub-samples.
Item 109: Crushers/pulverizers – to reduce particle size prior to sub-sampling.

Line Item No. 110 - 3D Visualization Research Laboratory (24'x24')

This facility supports research into 3D visualization to design different applications: orebody modeling, plant design, environmental topology, data visualization, structural & process modeling, factory-science, etc. The work is led by Scoble and R. Hall with collaboration from Dunbar, Meech, Klein, Wilson, Lavkulich, Pakalnis, and Veiga.

Item 111: Hardware and Software - Fledermaus 3D Visualization Package – (from UNB) to support 3D visualization and animation of many different types of environmental and geographical applications. The hardware includes design display units for two types of applications: with and without the use of 3D glasses: CRT Projection Zscreen (Stereographics Corporation); SG 321 Synthgram 42" Plasma Monitor (stereo glasses required); SG 182 3D Monitor (no glasses required).

Line Item No. 112 - Laboratory Workstations (18)

Item 113: Workstations (18) – to provide a workplace to conduct the research.
Item 114: Computers (18) – to provide a computer for each workstation.

Line Item No. 115/116 - Components (19)

The components include apparatus in each of the labs to conduct specific projects:

	Facility	Total	In-Kind (UBC)	
1.	ARD Testing	10,760	5,100	Bench-scale kinetic testing apparatus
2.	ARD Pilot Plant	31,922	15,165	Large-scale kinetic testwork columns
3.	Phytoreclamation	16,097	8,643	Controlled atmosphere for Hg recovery
4.	Geothermal	18,051	9,575	Laboratory demonstration system
5.	Process Control	12,188	6,790	Fiber optic Fabry-Perot sensors
6.	Solid Waste	37,643	6,286	Soil monitoring stations (2)
7.	Mineralogical	10,799	5,755	Differential light interferometry unit
8.	Analytical	21,076	11,013	Air Curtain & automated assay station
9.	Simulation	10,252	5,495	Process model simulator
10.	Telerobotics	10,320	5,528	Control system for hoisting testbed
11.	Hydrometallurgy	10,541	5,008	Large-scale Heap Leach Columns
12.	Microbiology	13,946	7,525	Air Curtain
13.	Rock Fragmentation	15,003	7,128	Drop-weight and Brazilian Testers
14.	Surface Chemistry	10,882	5,171	Rheological testbed
15.	Flotation	19,761	12,280	Attrition cell and pumping circulation

16. Pre-concentration	14,241	7,375	Tri-flow separator testbed
17. Minerals & Materials	13,394	6,785	Corrosion protection (potash).
18. Sample Reception	15,893	7,450	Sample prep., rolling, & splitting
19. 3D Visualization	16,310	8,650	Interactive feedback control system
TOTAL	$308,850	$146,722	

Line Item No. 117/118 - Travel re Infrastructure – ~10 trips/mon. ($3600) to Britannia Beach from UBC will be required during Years 1 and 2 and the first half of Year 3 to discuss and supervise the design and construction. Several trips to visit suppliers and installations to review infrastructure purchase decisions are planned. Estimated cost: $8,900 in year 1 (8 trips), $2,650 in year 2 (2 trips) and $4,450 in year 3 (4 trips).

Line Item No. 119 - Personnel

Item 120: Research Engineer (for installation)

Item 121: Technical Support (MINE Department Personnel)

A research engineer will coordinate equipment purchases and component construction, and supervise the installation. Annual salary including benefits is $65,000. UBC-Mining staff will build and install the components. Costs are $35,000, $50,000 and $20,000 in years 1, 2, and 3 respectively based on estimated hours and charge rates.

Line Item No. 122/123 - Extended Warrantees

The following items will have 3-year extended warrantees: all computer equipment, SEM, Image Analyser, AA Spec., ICP-OES, XRD Unit, Carbon Analyser, Ion Chromatograph, Microhardness Tester, Surface tensiomat, Surface area analyser, and Zetameter.

Line Item No. 124/125 - Training of Research Personnel

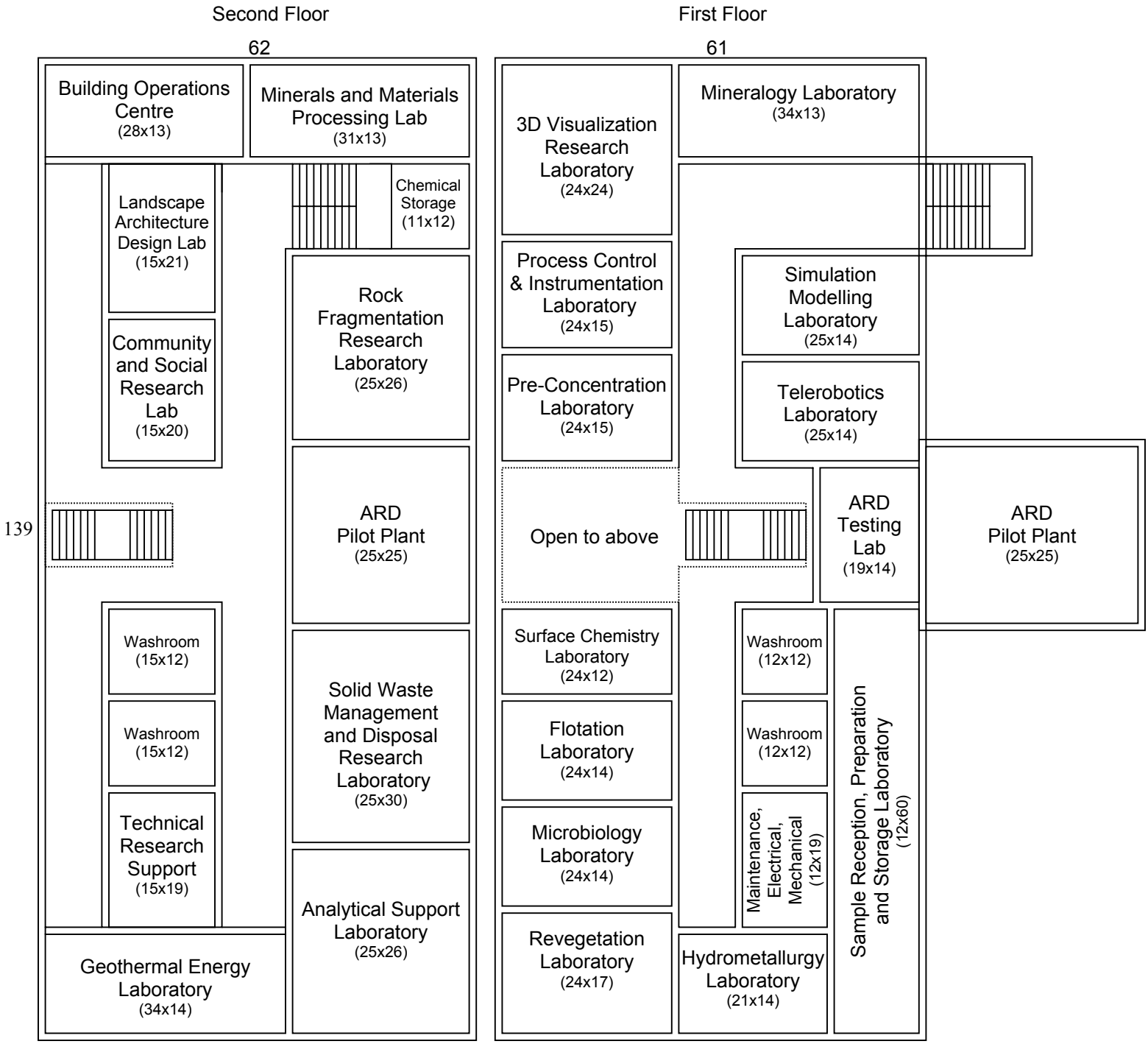
The research technician and/or chemist will be trained to use the following equipment: AA Spectrophotometer, ISP-OES, SEM, Surface Area Analyser, Image Analyser, Lechat Ion Chromatograph, XRD Unit, Microhardness Tester. Software training on Itasca's simulation software, the Fledermaus 3D visualization package, Bentley's Microstation system, and the ISA Control software will also be scheduled for one person each. These individuals will train all other researchers. The costs listed include personnel training time, travel to training sites, and training fees.

Eligible Unassignable Space:

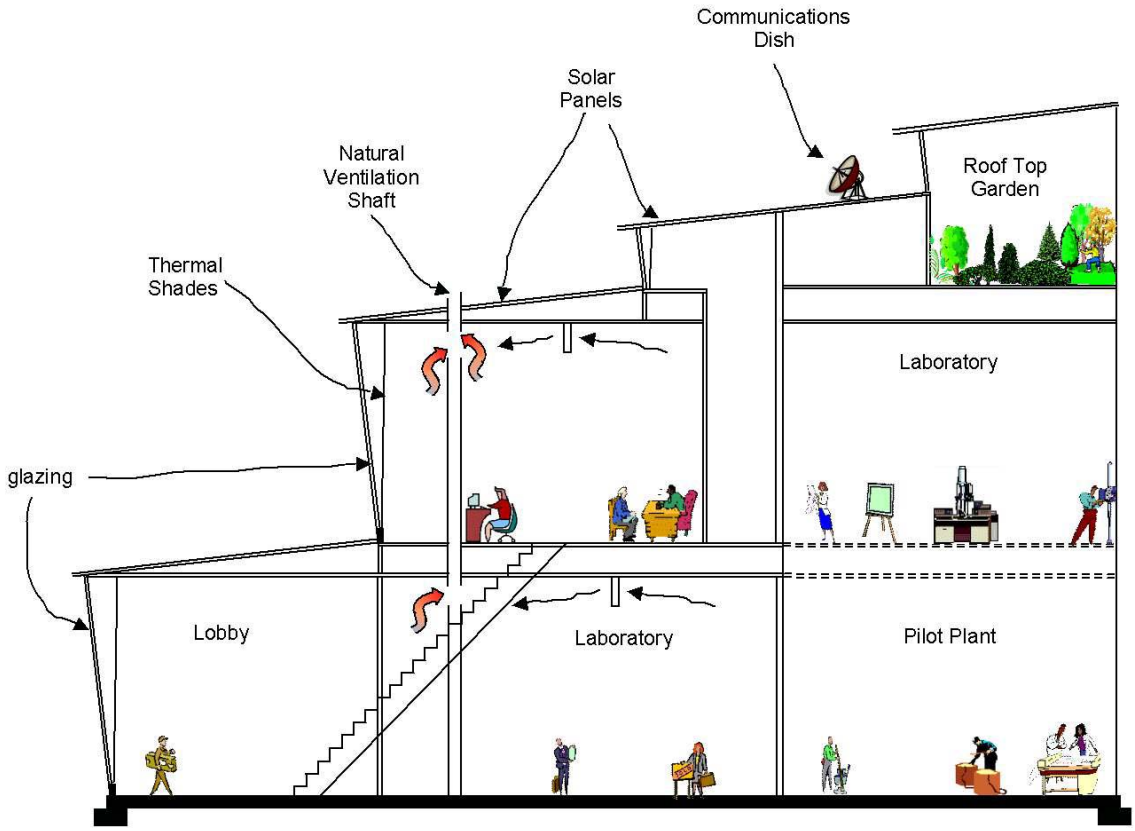
Corridors (4217 ft^2) – width selected to accommodate natural lighting and ventilation.
Washrooms (640 ft^2) – two washrooms on each floor – one for females, one for males.
Stairwells (219 ft^2) – two stairwells – at building entrance and at one end of building.
Chemical Storage (11' x 12') – for safe storage of chemicals used in the research labs.
Research Technical Support (15' x 19') – for technician to support research projects.
Building Operations Centre (28' x 13') – central system to operate the building.

Item No. 126 - Maintenance, Electrical, Mechanical Room (12'x 19')

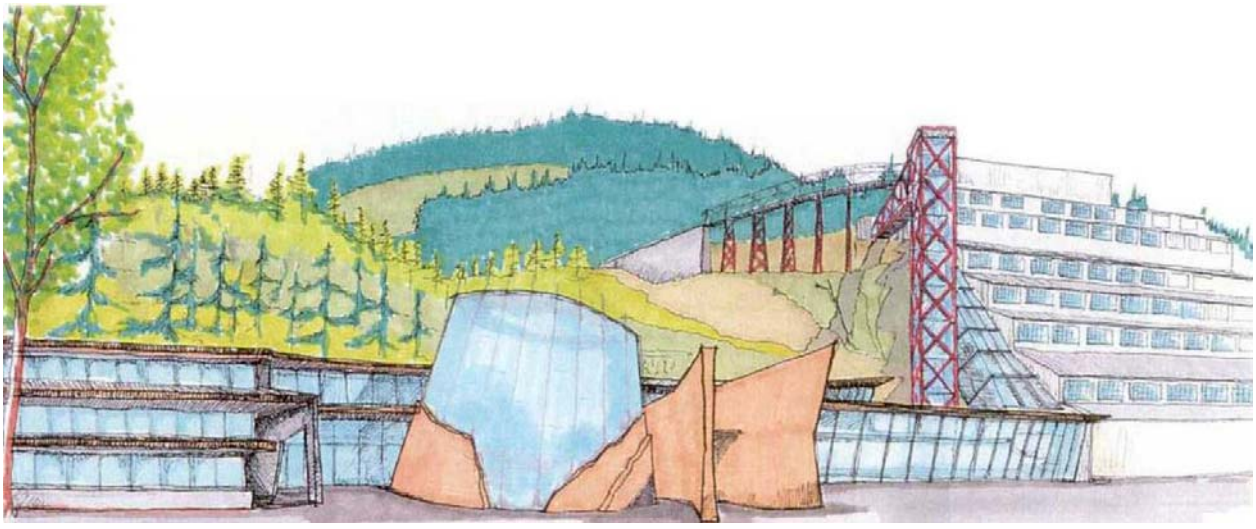
Item 127: Fans, Circuit Breakers, Louvers Switches, Pumps – equipment to control climate conditions in the Centre's labs including solar energy, geothermal heat generation and distribution, grey-water treatment, and natural ventilation control. Each lab has its own automated system that responds to the presence of a human.



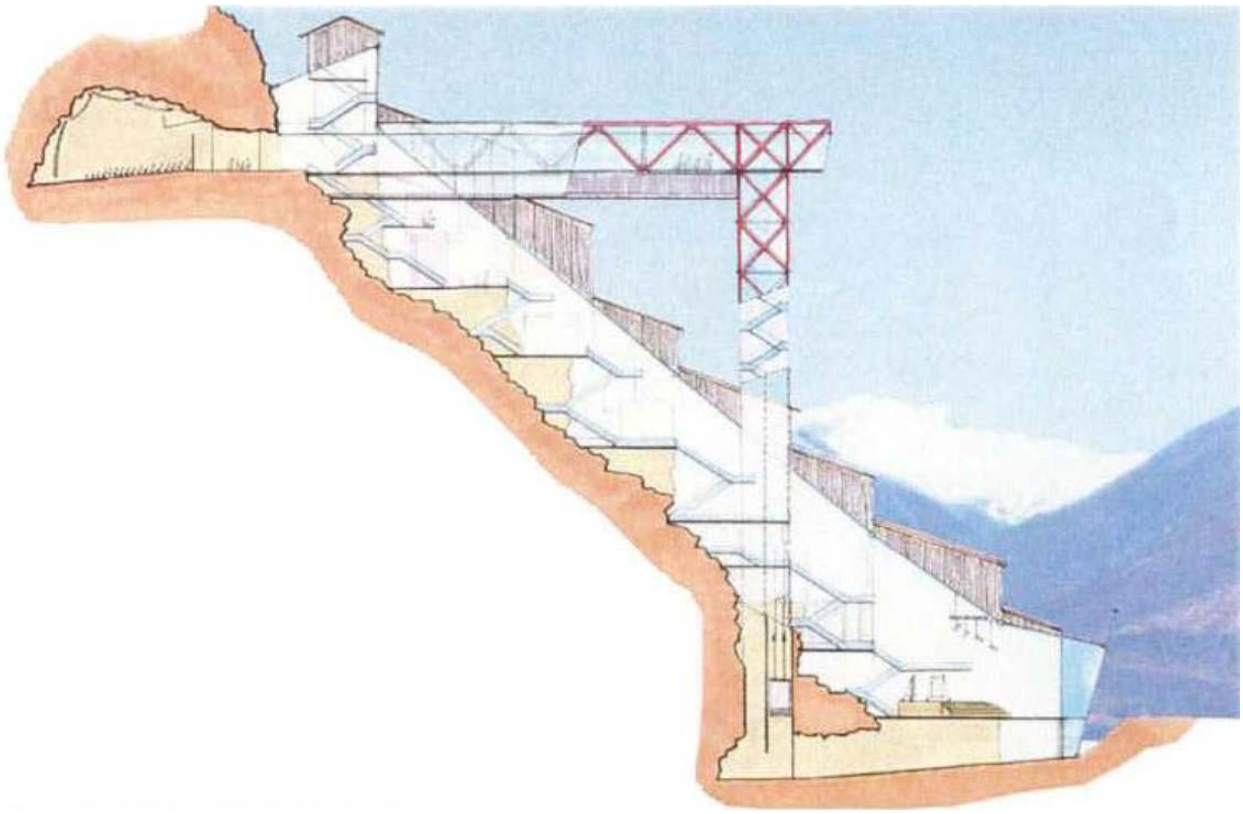
Layout Drawing of the Canadian Environmental Mining Research Centre at Britannia Beach



Side view of the UBC Canadian Environmental Mining Research Centre at Britannia Beach.



Perspective view of the NRCan Britannia Centre for Mining Innovation.
(to the left is the UBC CEMR Centre)
(to the right is the No. 3 Mill Building with the elevator to the exhibit area at the 4100 Level.



Section view of the NRCan Britannia Centre for Mining Innovation with exploration access to the exhibit area at the 4100 level.

Plan view of the Britannia Beach fan area showing the new site layout with

1. **The NRCan International Dialog and Conference Centre.**
2. **The UBC Canadian Environmental Mining Research Centre.**
3. **The MWLAP Water Treatment Plant.**
4. **The new Community Commercial area.**
5. **The Research Wetlands.**
6. **Potential Waterfront Development.**

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DETAILS OF FUNDING FROM ELIGIBLE PARTNERS - (Including the institutions)

List all funding from eligible partners. Add additional pages if required. Refer to line number 5 to 11 (as per page 11) for a description of the type of funding partner.

Eligible Partner	Type of Partner	Cash	In-Kind	Total	Secured (S) or Expected(E)
NRCan-CANMET	6	566,674		$566,674	Secured / Expected
Mining Companies	9	566,675		$566,675	Secured / Expected
Macdonald Dev.Corp.	9		238,504	$238,504	Secured
BCKDF	7	4,249,598		$4,249,598	Expected
BBHS	10		99,688	$99,688	Secured
MWLAP	6		20,000	$20,000	Secured
Vendors - discounts	11		168,620	$168,620	Secured
UBC	5	30,000	416,722	$446,722	Secured
AMEC-Canada	9		17,917	$17,917	Expected
Totals		$5,412,947	$961,451	$6,374,398	

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PARTNER CONTRIBUTIONS YET TO BE SECURED

This section is required for applications for which some of the partner contributions are expected but have yet to be secured.

Indicate plans for securing funds that are expected but have not yet been secured.

At this point (May 2003), about 47% of the required matching funds are secured either as cash or as in-kind contributions.

NRCan-CANMET through the Minerals and Metals Research Laboratory (MMRL) and the Minerals Policy Branch are actively supporting our cooperative involvement at Britannia Beach. Roy Sage Director-General of CANMET-MMRL is extremely supportive of this research initiative and has already opened an office at Britannia Beach in which revegetation research is underway. He is doubling the number of staff working at the site this April. This has taken place as a direct result of our encouragement and the opportunity for the Government of Canada to work together with UBC on Mining and the Environment research.

The Policy Branch has a team located in Vancouver led by Michael McPhie, who reports directly to Denis Legace, Director-General. The group is working on plans to create the Britannia Centre for Mining Innovation a proposal initiated by the Minister of Natural Resources Canada, the Honorable Herb Dahliwal.

We have entered into an agreement to unite our two projects so that savings can ensue regarding development of exhibits and administration facilities. This allows us to make a common approach to industry as we begin the process to raise funding for both Centres. In the fall of 2003, UBC and NRCan together with the BC Museum of Mining will sponsor a Design Charrette (architectural workshop) to engage all stakeholders at the site in the best siting of all facilities and the best way to generate positive interaction between all of the planned projects. The landowner (Macdonald Development Corporation) is also funding this workshop because of his interest commercial retail opportunities at Britannia Beach. BC MWLAP is also providing funding as they wish to integrate the Water Treatment Plant into the overall site development. The workshop is being hosted by the Museum of Mining.

CANMET has offered to fund the Geothermal lab ($120,000) this summer and we expect to have a field station in place by August to demonstrate that energy can be recovered from the mine effleunt. The remaining funds from NRCan ($446,674) are to be approved during the next year as the NRCan Innovation Centre plans come into focus. Minister Dahliwal has written to us expressing his support for our project.

At a meeting held in Sidney, Australia in August, 2002, Rio Tinto, the world's largest mining corporation expressed strong support for our proposal. During that meeting it was indicated that our facility may become the home of the MMSD program (Minerals and Metals Sustainable Development). Recently Rio Tinto agreed to fund a joint project between the Australian CSIRO-Minerals Branch and UBC-CERM3 aimed at energy use in comminution and so they have become the first corporate sponsors of our research centre. Molycorp, a US firm operating in Questa, NM, have also become corporate members through a 5-year project aimed at studying the influence of ARD on clay formation in waste dumps.The remaining funds ($516,675) will be raised through a Corporate Membership drive over the next 6 months. About 21 companies are expected to put up $25,000 each to cover the required matching funds.

Gary Livingstone, Director of the Mining Association of BC, recently stated "Britannia is much more than an embarrassment to the Mining Industry, it is a liability!" As our plans intend to change the image of the site from an eyesore into something of value, this statement will definitely help us obtain company support.

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INFRASTRUCTURE USED FOR RESEARCH AND OTHER PURPOSES

Indicate the percentage utilization of the infrastructure in the categories below.

	Percentage of Planned Utilization
Research and research training (eligible for CFI support)	100
Education, excluding research training (not eligible for CFI support)	
Administrative (not eligible for CFI support)	
Clinical or other service function (not eligible for CFI support)	
Other (specify)	
Total	100.00%

Explain the methodology used to estimate the percentage of utilization in the different categories and how the budget was prorated.

The infrastructure requested will be used 100% for research.

An agreement has been struck with NRCan to house all of the CEMR Centre's administrative facilities within the Britannia Centre for Mining Innovation. In exchange, NRCan, through their environmental research group at CANMET, will have access to use and work in our research laboratories. NRCan is also supplying significant funding for our project through CANMET, so this situation is an outstanding example of cross-disciplinary cooperative investment in Canadian research.

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FINANCIAL RESOURCES FOR OPERATIONS AND MAINTENANCE

Outline the annual costs and sources of support committed to ensuring effective operations and maintenance of the infrastructure for the first five-year period of operation after it is operational. Do not include research project costs. If CFI Infrastructure Operating Funds are used as a source of funding, list these under Institutional contributions. Although contributions from grants may be a source of funding, do not include the total grants received by the users as sources of funding. Only the sums contributed for operations and maintenance of the infrastructure should be included.

Operations and Maintenance Budget Summary

Costs	Year 1	Year 2	Year 3	Year 4	Year 5
Personnel	360,000	371,000	382,000	393,000	404,000
Supplies	15,000	16,000	17,000	18,000	19,000
Maintenance and repairs	125,000	132,000	139,000	146,000	153,000
Services	35,000	36,000	37,000	38,000	39,000
Other, specify Awards, Fellowships	25,000	30,000	35,000	40,000	45,000
TOTAL	$560,000	$585,000	$610,000	$635,000	$660,000

Funding sources	Year 1	Year 2	Year 3	Year 4	Year 5
Institutional contributions	210,000	220,000	231,000	243,000	255,000
Other organizations	20,000	20,000	20,000	20,000	20,000
User fees	150,000	150,000	150,000	150,000	150,000
Other, specify below Research O/H & Service Fees	180,000	195,000	209,000	222,000	235,000
TOTAL	$560,000	$585,000	$610,000	$635,000	$660,000

In the space provided below and one additional page, if required, describe the plans for the operation and maintenance of the infrastructure for the first five years after it has become operational and beyond this time period.

The annual funding will grow as show above. Institutional contributions will derive from UBC and from the CFI Infratructure Operating Fund. Government departments that are related to the mining industry (NRCan, BCMEM, Environment-Canada, BCMWLAP) will contribute as "other organizations" and will become ex-officio Corporate Members. User Fees will be contributed by Corporate Members of CEMR who will each have access to collaborate on research projects in the Centre. Each member will pay an annual fee of $5,000 and supply funding for part of one major project and one company-specific project. Four types of projects and their typical funding levels are planned for CEMR as shown below:

Type of Project	Major		Site-Specific		Broad Scope		Development Study		
Unit Cost	$100,000		$40,000		$20,000		$5,000		
Overhead	$20,000		$8,000		$4,000		$1,000		
Year	No.	Income	No.	Income	No.	Income	No.	Income	Total
1	1	$20,000	5	$40,000	10	$160,000	20	$20,000	$120,000
2	1	$20,000	6	$48,000	10	$220,000	22	$22,000	$130,000
3	1	$20,000	7	$56,000	10	$260,000	24	$24,000	$140,000
4	2	$40,000	7	$56,000	9	$320,000	22	$22,000	$150,000
5	3	$60,000	7	$56,000	6	$460,000	20	$20,000	$160,000

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As can be seen a modest growth rate in numbers of projects and revenue is being considered with the centre receiving an overhead charge of 20% on each research project. Note that the number of major projects grows over time while the number of broad scope and development studies declines from year 1 to year 5. The plan is for the research to grow from small one-off type work for single clients to larger-scale projects with major impact across the industry. Because of the initial focus on short-term projects Corporate Members will be encouraged to second employees to the CEMR Centre for periods of time required to complete such collaborative research projects. Part of the Corporate contribution can involve in-kind contributions of samples, equipment, assays, etc. Through exposure to the broadly-based projects, the presence of these seconded researchers can help to develop an atmosphere of acceptance for new technology can grow through dissemination of the news of these projects back into industry.

The Director will be appointed for a period of 5-years, renewable for a second term, following which a new Director will be appointed from the current junior ranks of the UBC research team. Our team includes over 35 researchers distrubted anong Emeritus Professors, Full Professors, Associate Professors, Assistant Professors and Adjunct Professors. The breadth to the age group and experience guarantees that excellence in the research will be achieved through the outstanding senior professors involved and continuity will be achieved through the involvement of the junior personnel.

Each year, the budget will include funding for equipment replacement and/or upgrades. Any new equipment required will be funded through the establishment of new research proposals to industry and government funding agencies.

Part of the project income will be used to recruit high quality students and researchers from around the world through awards and stipends although we anticipate that most researchers will come to CEMR with funds from the project they bring with them from their employer.

Within the next year, there is a real possibility that all parties at Britannia Beach will agree to found a public-private partnership to administer and operate the site. We are monitoring these plans and intend to contribute and participate fully with our neighbours in formulating a plan that can benefit all. For example, if the goal of the NRCan Innovation Centre to become one of the top five destination tourist attractions in British Columbia is successful then we envisage the Centre participating in the creation of exhibits and tours to assist in this work. Obviously this opportunity presents a potential revenue source to support our continuing research.

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PLANS FOR MANAGEMENT OF INFRASTRUCTURE

Use the space below and one additional page, if required, to describe the management structure and plans for the first five (5) years of operation after the infrastructure has become operational. In line with the complexity of the project, the plans should describe how the infrastructure will be managed, utilization monitored, user priorities established, and major upgrades determined and financed.

The Centre will be managed on a day-to-day basis by a Director and an Assistant. Three additonal permanent employees will include a Receptionist-Secretary, a Chemist and a Technologist who will all be located at Britannia Beach.

The Director will report to the Dean of Applied Science and coordinate directly with the Head of the Mining Department at the main campus.

NRCan researchers will be using the CEMR Centre laboratories, but access to all labs and equipment must be approved by the Director. Priorities to using the equipment will be established in discussions with all Laboratory Heads and Key Users. The priority order will likely be as follows:

1. UBC Research Members of CERM3 who have a funded project in place.
2. UBC Research Members of CERM3 who do not have a funded project in place.
3. Sponsors of CEMR and their employees.
4. Research Visitors to the CEMR Centre.
5. Other UBC Researchers in need of a particular piece of equipment.
6. Consultants and Non-Member Companies.

These last two groups will pay a fee to use the facility at rates established by the Head of UBC-Mining and the Director of CEMR.

Each Laboratory will be allocated to one of the current Lab Heads of the 5 CERM3 facilities at the Point Grey campus. Their responsibilities will include installation of new equipment and maintenance of existing facilities. They will report any difficulties or requirements to the Director of CEMR and work out details of access and use of the equipment. As listed in the Financial Operations section, monies are allocated each year for acquisition of new equipment and replacement of equipment that has failed and cannot be reasonably repaired. This maintenance and replacement program will be funded from residuals from the Research Projects.

All research projects will be negotiated under terms established by the UBC University-Industry Liaison Office. Grants-in-Aid of Research and Research Contracts are the main way to formalize links with a company on a project. UILO overhead charges will be assessed on all contracts. Intellectual Property developed at the CEMR Centre will remain the property of UBC.

However, a special program has been negotiated with UILO regarding IP developed in CERM3 facilities. Each Corporate Member involved in a specific project has an unrestricted right to employ IP developed by CERM3 for use on one mine anywhere in the world. Further applications of the technology will require royalty charges negotiated with UILO. The ability to purchase the rights to any IP exists for a Corporate Member following negotiations with UILO.

A management board for the site operation will be struck with representatives participating from the following organizations:

NRCan	BC MWLAP
CEMR	Commercial Retail Facilities
BC Museum of Mining	Britannia Beach Community

The CEMR Centre will appoint a Technical Advisory Committee to provide input into future directions in the research to be conducted. Representatives on this committee will include:

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PLANS FOR MANAGEMENT OF INFRASTRUCTURE

- Dean of Applied Science
- Head of Mining Engineering
- Director of CEMR
- Representative of each Corporate Member
- Representative of each government agency

A Steering Sub-committee consisting of the first three members above will examine financial matters on a quarterly and annual basis to ensure the centre remains self-sustainable over the long term. Our first priority is to see that the Centre maintains close ties to the Point Grey campus. The establishment of CERM3 in 2000 has been highly successful in providing opportunities for collaboration among the 35 participating Faculty members. The Britannia projects will rely on the available resources at the mine site such as ARD, waste dumps, and contaminated sites. This will be an attraction to our current researchers to attend the site. Similarly the CERM3 facilities we have established on campus will provide support for the research at Britannia so seconded researchers will interact with personnel on the main campus.

Our second goal is to ensure the Centre is self-sufficient and becomes sustainable over the long-term. As the Centre establishes itself, researchers will be drawn to the site for periods of 3-12 months. Accommodation is planned by the Museum of Mining in a modern Bed & Breakfast-style bunkhouse. For longer stays, rental housing is available in Squamish.

The research team will coordinate with the Museum, the NRCan Innovation Centre, and the Water Treatment Plant (WTP). We will provide the Museum with exhibits for the public to learn about the linkages between the Present (Development), the Future (Research) and the Past (History). Since our initial research will focus on reducing the WTP operating costs, we will closely coordinate with personnel running that plant. NRCan researchers will have access to the research labs in exchange for this admininstrative space, so daily interactions will occur.

A Research Project Committee will write applications to provide regular funding. Ideas will be circulated widely and Corporate Members can pool their funds to support the work. Mining companies have traditionally been slow to enter into cooperative projects because of the highly competitive nature of the business, but when it comes to the environment, miners are prepared to share their knowledge. We expect this trend to continue in support of our research.

Each month, all researchers involved in projects being conducted in the centre will meet to discuss progress and assess any shortcomings or difficulties regarding infrastructure failures or availability. Elements of the key findings will be summarized in a monthly report to be sent to all Corporate Members and government agencies.

At regular intervals, the Director will report to the Dean of Applied Science on funding issues, staffing, research progress, and logistical problems. The report will detail facilities utilization in terms of access to labs and equipment as well as availablity of key components such as the research computer network. The Centre will hold an Annual Workshop Symposium inviting all interested participants locally and globally. Progress on each research project will be reported and other related projects from collaborating institutions around the world will also be invited. Each year the Centre will hold an Open House for the public to meet with our research team and see the work in progress and planned for the future. During the year, seminars and other meetings will take place once a month or more frequently on an ad-hoc basis to showcase research visitors to the centre to the public and other groups.