Appendix A

CASE STUDY: THE PLASTIC-COATED RACK INVESTMENT

What does this Case Show?

Throughout these guidelines, P2 investments at Precision Circuits have been used to illustrate various elements of a TCA. In this section, individual techniques and calculations are brought together to illustrate one example of the application of TCA. This case study includes:

- an inventory of direct, indirect, contingent and less-quantifiable costs;
- an example of the calculation of after-tax cash flow;
- a calculation of net present value as the preferred financial indicator;
- sensitivity analysis on individual input parameters;
- scenario analysis on sets of input parameters; and
- a Multiple Account table to integrate financial and non-financial indicators of profitability.

Precision was not specifically following these guidelines when they conducted their TCA. Thus, not all of the details outlined in Sections 4 through 9 are covered. However, the case serves to illustrate how one small business applied TCA to the evaluation of a P2 investment.

All data for this case study is drawn from Analysis of Pollution Prevention and Waste Minimization Opportunities Using Total Cost Assessment: A Case Study in the Electronics Industry, published by the Pacific Northwest Pollution Prevention Research Centre in 1995. Some details have been modified slightly to simplify or better explain various aspects of TCA.

Defining the Decision

Precision Circuits, Inc. is a small Northwest circuit board manufacturer. The company has 30 employees, one of whom is primarily responsible for environmental management. In 1993, Precision had a goal of reducing the use and generation of hazardous materials and non-product outputs by 50% as part of a commitment to protect the environment and the health and safety of its employees and neighbours. As part of its 1994 Pollution Prevention Plan, Precision identified an opportunity to reduce the use of nitric acid in the workplace.

Precision produces 100,000 square feet of circuit board on average per year. Circuit board panels undergo a number of plating and rinsing processes. Under the existing process in 1993, the panels were carried by stainless steel racks that needed to be rinsed in nitric acid after each plating run. The P2 option under consideration involved the purchase of a set of copper splined plastic-coated racks that would eliminate the need for the nitric acid rinse.

To understand what kinds of cost information might be needed to seek approval for this option, the following questions were relevant -

1) Are there compelling reasons for doing the option regardless of its financial performance?
   - Yes. Beyond financial performance, the option addresses at least two core business objectives - i) a 50% reduction in the use and generation of hazardous materials and ii) customer satisfaction.

2) Is there more than one action that addresses this option, and do they all deliver the same performance with respect to potential liabilities or strategic objectives?
   - An alternative process was briefly considered. However it does not deliver the same product quality improvements and was eliminated from further consideration.

Appendix A

Identifying and Understanding Costs

Most of the cost information was compiled by Precision's Environmental Manager in about eight hours. Some clarification was required from the accounting and purchasing departments, for a total of about twelve hours of effort. Key costs were identified by asking "What will change as a result of this option?"

Inventory of Direct and Indirect Costs

A preliminary assessment of the option revealed the following easily monetizable benefits of the plastic coated rack investment:

1) cost savings on the nitric acid;

2) storage, handling and recycling costs associated with the nitric acid;

3) productivity improvements (hours saved by maintenance and operations staff as a result of eliminating the need to strip racks); and

4) reductions in the number of product defects[1].

Additional direct and indirect costs that would be affected by the option were identified, including:

5) reductions in environmental reporting/tracking,

6) reductions in health and safety training and equipment,

7) savings in purchasing and inventory management, and

8) reductions in energy and water usage.

[1]This cost item was not easily monetizable before implementation of the project. The numbers used here are drawn from a post-implementation TCA.

However, these additional costs (5 through 8) were either:

- considered irrelevant since they did not change significantly under the new process or were small in comparison to the cost of the new process; or
- difficult to track down.

Inventory of Contingent and Less-Quantifiable Costs

Additional benefits that were deemed to be significant with respect to the firm's profitability but were more difficult to quantify included:

9) removal of nitric acid from the workplace

- contingent costs include potential fines, penalties and personal injury claims
- less-quantifiable strategic considerations include employee and community relations and employee health and safety

10) product quality improvements because the coated racks support a more even distribution of electrical current and thus a more accurate and consistent plating process

- less-quantifiable strategic considerations include customer satisfaction and market share (these are benefits over and above the financial benefits associated with reduced product defects which are included above)

Conducting a Preliminary Assessment

Some of the direct and indirect cost items were easily quantified with existing records or relatively straightforward calculations. Some, however were more difficult to track down, and it was questionable whether they would significantly

affect the decision. As a result, the TCA proceeded on the basis of a preliminary assessment of those direct and indirect costs that were accessible from readily available sources (cost items 1 through 4 above), and a qualitative consideration of the most significant contingent and less-quantifiable costs (9 and 10 above).

Analyzing Financial Performance

Estimating Incremental Cash Flow

Table A-1 shows the underlying inputs for each of the operating costs.

> Note: The format of the cash flow summary has been redeveloped from the original Precision analysis so that it will be more consistent with the format used in the P2/FINANCE software. Note also that the cash flow summary is expressed in incremental terms - i.e., as the difference between the cash flow with the option and that under the existing process.
>
> The cash flow sheet does not fit on one page, so it is shown in smaller pieces (Tables A-1 through A-3) and then brought together in a condensed view at the end (Table A-4).

Table A-1: Underlying Operating Cost Inputs

Operating Costs	Unit type	# of Units	Cost (savings) per Unit
Materials			
Nitric acid	carboys	36	$ (31)
Container Deposit	weeks	52	$ (80)
Employee Productivity	hrs/day	2.75	$ (9)
Maintenance			
Recoat Racks	year	1	$ 3,674
Disposal			
Drums/drum labelling	drums	10	$ (73)
Sampling and labelling	waste stream	1	$ (250)
Recycling Fee	drums	10	$ (346)
Quality	$.year	1	$ (8,660)

Table A-2 shows the result of multiplying the inputs and escalating them out over Year 1 to Year 5 at the respective rates of inflation (shown below in). For example, the annual operating cost of the container deposit is 52 x $80 = $4160 in Year 0. In Year 1 this cost rises to ($4160 x 1.05) - $4368, and so on.[2]

Table A-2: The Plastic Coated Rack Investment - Part I - Operating Cash Flows

Operating Costs	Yr 0	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Materials						
Nitric acid		$ (1,102)	$ (1,157)	$ (1,215)	$ (1,275)	$ (1,339)
Container Deposit		$ (4,160)	$ (4,368)	$ (4,586)	$ (4,816)	$ (5,057)
Employee Productivity		$ (7,525)	$ (7,901)	$ (8,296)	$ (8,711)	$ (9,146)
Maintenance						
Recoat Racks		$ 3,674	$ 3,674	$ 3,674	$ 3,674	$ 3,674
[illegible]						

Table A-3 shows the underlying inputs and total investment costs for Year 0. Since all of the investment costs are incurred in Year 0, no discounting of these costs is required. If these costs had been incurred in Year 5, they would have had to be discounted (e.g., 6 units x $25/unit x 1.05^5)...etc.

Table A-3: The Plastic Coated Rack Investment - Part II - Investment Inputs

Inital Investment Costs	Unit Type	# of Units	Cost (savings) per Unit	Yr 0
New Equipment				
Purchase Price	Price	1	$ 18,372	$ 18,372
Installation Costs	Hours	6	$ 25	$ 150
Net salvage value				
New Equipment/process change				
Testing - labour	Hours	8	$ 25	$ 200
Testing - other operating costs				
Downtime to implement change	Day	1	$ 5,000	$ 5,000
Retired Equipment				
Net Salvage (old equip.)	Sale Price	1	$ (1,200)	$ (1,200)
Initial Investment Costs (Sum of)				$ 22,522

[2]Discrepancies between numbers shown in Table A-1 and Table A-2 are due to rounding.

Table A-4 shows a consolidated view of the sheet. This brings together the operating costs, the investment and the tax payable into an overall after-tax cash flow summary.

Table A-4: The Plastic Coated Rack Investment - Part III - Consolidated Summary

Assumptions												
Operating Days per year	312											
Useful Life	5											
Inflation	5%											
Inflation (disposal)	10%											
Corporate Income Tax Rate	40%											
Discount Rate	15%											
	Yr 0		Yr 1		Yr 2		Yr 3		Yr 4		Yr 5	
Taxable Income Calculation												
Revenues												
Other												
	$	-	$	-	$	-	$	-	$	-	$	-
Less:												
Operating Costs	$	-	$	(22,216)	$	(23,684)	$	(25,243)	$	(26,898)	$	(28,657)
CCA			$	4,504	$	4,504	$	4,504	$	4,504	$	4,504
Other deductions												
	$	-	$	(17,712)	$	(19,180)	$	(20,738)	$	(22,394)	$	(24,153)
Taxable Income	$	-	$	17,712	$	19,180	$	20,738	$	22,394	$	24,153
Tax Calculation												
Income Tax	$	-	$	7,085	$	7,672	$	8,295	$	8,957	$	9,661
Net Tax Payable	$	-	$	7,085	$	7,672	$	8,295	$	8,957	$	9,661
Cash Flow Calculation												
Revenues	$	-	$	-	$	-	$	-	$	-	$	-
Working Capital Recovery	$	-	$	-	$	-	$	-				
Salvage Value	$	-	$	-	$	-	$	-				
	$	-	$	-	$	-	$	-	$	-	$	-
less:												
Operating Costs	$	-	$	(22,216)	$	(23,684)	$	(25,243)	$	(26,898)	$	(28,657)
Total Tax	$	-	$	7,085	$	7,672	$	8,295	$	8,957	$	9,661
Initial Investment Costs (Sum of)	$	22,522										
	$	22,522	$	(15,132)	$	(16,012)	$	(16,947)	$	(17,941)	$	(18,996)
After-Tax Cash Flow	$	(22,522)	$	15,132	$	16,012	$	16,947	$	17,941	$	18,996

Note: Disposal costs were expected to inflate at twice the rate of general materials and labour.

Interpreting Financial Indicators

Based on this preliminary financial evaluation, the plastic coated rack investment appears to be a profitable investment based on both net present value and internal rate of return (Table A-5).

Table A-5: Financial Indicators

NPV	$ 33,589
IRR	66%
Payback	2 Years

After Tax Cash Flow from the Plastic-Coated Rack Case

Yr 0	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
$ (22,522)	$ 15,132	$ 16,012	$ 16,947	$ 17,941	$ 18,996

All indicators suggest the option is attractive under the current set of assumptions. The positive NPV means that, on balance, after paying for and installing the new equipment and discounting the savings at the Opportunity Cost of Capital, the firm will be better off by $33,589.

The IRR indicates that the cash flows for this option could be discounted at 66% and the option would still break even. From this decision-makers at Precision could infer the following. "We are concerned that this option is risky (relative to our typical projects) and that as a result our nominal cost of capital should be higher than our typical 15%, but it is certainly not 66%. Therefore, we are comfortable with the option."

The payback figure indicates that by some point in Year 2, Precision will have recovered its initial investment. Simple payback does not account for the time value of money and is not a good indicator of true profitability. Nonetheless, it is often preferred by decision makers and is shown here for reference. A short payback is appealing to decision-makers who are distrustful of projections beyond a couple of years. Note, however, that the NPV analysis already incorporates the risk inherent in the future cash flows.

Conducting Sensitivity Analysis

To see how sensitive the indicators are to changes in individual inputs, Precision conducted sensitivity analyses (Table A-6). The sensitivity on the discount rate and inflation are performed using values on either side of the

original value. The sensitivity on the initial investment and the productivity gains was tested only in the direction that made the option less attractive (i.e., a more expensive investment and lower productivity respectively). Note that the NPV does not simply fall by the value of the increased initial cost. This is because the increased initial cost is also accompanied by an increase in CCA tax shields (see Appendix B).

Table A-6: Sensitivity Analysis

VARIABLE	NEW VALUE	NEW NPV
Discount Rate	10%	$ 41,249
	20%	$ 27,301
Inflation	3%	$31,916
	7%	$35,323
Initial Investment	$ 35,000	$ 24,457
	$ 50,000	$ 13,479
	$ 68,500	($ 59)
Productivity Gains, hours/day	2	$29,089
	1	$23,089
	0	$17,089

Scenario Analysis

In addition to testing how each input individually affected overall financial performance, Precision could also have done a scenario analysis in which several input parameters change simultaneously. This often shows quite a different picture of the riskiness of an investment.

Table A-7 shows the results of a hypothetical scenario analysis in which several parameters are varied at once. A plausible range of values was estimated for each input parameter. To create the "worst case" scenario, a pessimistic value was chosen for each input, while "likely case" and "best case" represent moderate and optimistic values for the inputs. The best case is not significantly better than the likely case since in this example there are very few parameters which could actually lead to a higher NPV than the one calculated.

Table A-7: Scenario Analysis

PARAMETERS	WORST CASE	LIKELY CASE	BEST CASE
Inflation - General	3%	5%	7%
Inflation - Disposal	7%	10%	20%
Discount Rate	15%	15%	15%
Productivity Gains (hrs / day)	0	2.75	2.75
Capital Cost	$ 50,000	$ 18,372	$ 18,372
Quality Changes ($ / year)	$ -	$ (8,660)	$ (8,660)
PROFITABILITY			
NPV	$ (25,933)	$ 33,589	$ 36,897
IRR	-7%	66%	69%
Payback (years)	>5	2	2

Making the Decision

Integrating Financial and Non-Financial Indicators of Profitability

Benefits of the option that were not quantified included reduced liability, improved employee morale (resulting from improved safety) and product quality enhancements. These are integrated in a Multiple Account table (Table A-8) so that decision makers can see both financial and non-financial indicators of profitability.

Since Precision considered only the base case (or existing process) and one alternative (the plastic coated rack option) it is unnecessary to show more than one alternative in the columns. Instead, the figures recorded under the plastic-coated rack investment are incremental costs and benefits, relative to the existing process. The MA table demonstrates the performance of the option with respect to several decision criteria, and under several scenarios reflecting different assumptions about uncertain parameters. Under "likely" or "best" conditions, the option is clearly profitable without consideration of contingent costs or strategic issues. It was only in the worst case scenario that decision makers have to consider the unquantified costs they have identified.

In this example, it was relatively easy for Precision to make the decision to invest in the plastic-coated rack technology without a rigorous characterization of contingent and less-quantifiable costs because the unquantified benefits of reduced liability, improved employee morale (resulting from improved safety) and product quality enhancements were clearly very significant. However, other P2 options may be more difficult to justify this way. Had management at Precision been uncomfortable with the option based on its preliminary financial performance and qualitative considerations alone, they could have calculated the critical value that the qualitative benefits would have to have in order for the option to be attractive.

In this example, the calculation of the critical value for non-financial criteria is relatively straight-forward. If the expected profitability is less than zero, all other contingent costs and strategic benefits must be worth at least this amount in order to make the option attractive. If the expected profitability is greater than zero, the contingent costs and strategic benefits do not necessarily have to be worth anything to make the option attractive. In this case, decision makers need only be concerned about a "worst case" scenario, and now can assess whether the unquantified benefits are likely to be worth at least $25,933 (see bottom row of Table A-8).

Where critical value analysis provides insufficient insight to decision makers, Section 7 provides some examples of how to conduct a more rigorous assessment of contingent and less-quantifiable costs.

Table A-8: Multiple Account Table for the Plastic-Coated Rack Investment

EVALUATION CRITERIA	PLASTIC-COATED RACK INVESTMENT		
	SCENARIOS		
	Worst	Likely	Best
Profitability (1)			
NPV	$ (25,933)	$ 33,589	$ 36,897
Discounted Payback	>5	2	2
Monetized Contingent Costs	-	-	-
Expected Profitability (2)	$ (25,933)	$ 33,589	$ 36,897
Qualitative Contingent Costs	• Decreased risk of spills associated with storage, handling, use and disposal of nitric acid. • Decreased risk of third-party liability.		
Other Strategic Considerations	• Improved worker safety and morale. • Improved product quality. • Progress toward goal of 50% reduction in hazardous materials		
Critical Value of Non-Financial Criteria Required to Make Project Attractive	$ 25,933	0	0

Notes:

1. Profitability calculations are based on an initial assessment of direct and indirect costs only.
2. Expected Profitability equals NPV in this case because there are no monetized contingent costs.
3. In this case, the plastic coated rack alternative was compared against the existing process and all values shown are incremental costs relative to the existing process. If further options were under consideration, the table could be expanded to the right to compare the performance of several alternatives against the same evaluation criteria.

Outcome

Precision invested in the plastic-coated rack technology, and confirmed the actual financial performance of the option with a post-implementation TCA in 1995.

TCA was seen as a flexible and practical tool for businesses of all kinds - including small business - to use. In particular:

- the company's conventional financial analysis was easily expanded to meet the needs of the TCA;
- TCA allowed the Environmental Manager to provide more complete information on the benefits to senior management;
- by focusing on things that change as a result of an option, TCA provided a streamlined approach to identifying costs and benefits;
- the ability to start with a preliminary assessment requiring minimal resources made TCA a feasible undertaking for a small business;
- having access to a previously developed spreadsheet (such as P2/FINANCE) will increase the use of TCA in the future.


CANADA
DOLLAR

Appendix B

DETAILS ON ANALYZING FINANCIAL PERFORMANCE

1. DETAILS FROM SECTION 8.1 "ESTIMATING INCREMENTAL CASH FLOW"

1.1 Overview of Taxes and Related Issues
1.2 Corporate Income Tax Rates, 1997
1.3 Tax Credits
1.4 Possible Funding Sources
1.5 Capital Cost Allowance (CCA and ACCA)
    1.5.1 CCA CLASSES
    1.5.2 ACCELERATED CCA
    1.5.3 EXAMPLE OF A DECLINING BALANCE CCA CALCULATION
    1.5.4 EXAMPLE OF A STRAIGHT-LINE CCA CALCULATION
    1.5.5 CCA TAX SHIELDS
1.6 Example of a Consolidated Cash Flow Summary
1.7 Dealing with One-Time Costs

2. DETAILS FROM SECTION 8.2 "CALCULATING FINANCIAL INDICATORS"

2.1 Converting From Nominal to Real Discount Rates (and back again)
2.2 Computing Adjusted Cost of Capital
2.3 Other Methods of Addressing Cost of Capital

DETAILS FROM SECTION 8.1 "ESTIMATING INCREMENTAL CASH FLOW"

1.1 Overview of Taxes and Related Issues

Table B-1 summarizes the relevance of some taxes and related issues for identifying and recording cash outflows. Details on a few of the most relevant items follow.

Table B-1: Relevance of Taxes and Related Issues "At a Glance"

TAX/ISSUE	WHAT IS THE RELEVANCE FOR P2 DECISIONS
Combined Federal and Provincial Corporate Income Tax	If the cash flows from a P2 project will be taxed at a different marginal rate than the status-quo, this may significantly impact the incremental after tax cash flows. However, most projects will likely be taxed at a similar marginal rate. In these cases the decision will be less sensitive to the choice of rate (because NPV's of the project and the status quo will generally move in the same direction). See separate discussion on selecting a reasonable rate.
Capital Cost Allowance (CCA)	The choice of class for a potential P2 project has a significant impact on the attractiveness of a project (see for an abbreviated list of classes). Of particular note is Accelerated Capital Cost Allowance (see separate discussion). However, even if P2 projects are not eligible for ACCA, they may be eligible for other more subtle class changes that will benefit the project.
Property Tax	No longer relevant. Projects that were granted a pollution abatement exemption prior to 1997 may retain it, but no new exemptions will be granted for pollution abatement.
Investment Tax Credits	Innovative P2 projects (depending how they are structured) may be eligible for Scientific Research & Experimental Development Investment Tax Credits. (see discussion)
Corporation Capital Tax (CCT)	The incremental impact could be zero if taxable capital < $1.5 million, and gradually work up to 0.3% of the change in taxable capital. This could be ignored or treated as a line item in the cash flow summary. Note that CCT is deductible from income.
Large Corporations Tax (LCT)	The incremental impact could be zero if taxable capital is less than $10 million, and gradually work up to 0.225% of the change in taxable capital. Federal surtax may also reduce LCT payable. As with CCT, net LCT impact could be ignored or recorded as a line-item if felt to be material. LCT is not deductible from income.
Provincial Sales Taxes (PST)	PST should simply be included as part of the purchase price where relevant.
Goods and Services Tax (GST)	For most P2 analyses the GST will have no impact and can be ignored because all GST paid out will be returned in the form of input tax credits which are then used to reduce GST payable.
Excise Tax	Excise Tax is generally built into the price and should simply be left as part of the purchase price. Drawing it out would add needless complexity.
Payroll Tax, CPP and UI	If labour costs were to be significantly different under the P2 process these might be relevant but most companies will likely use a loaded rate that will be adequate. Therefore, no special treatment required.

Appendix B

1.2 Corporate Income Tax Rates, 1997

Table B-2 shows the underlying rates that can be used to determine a reasonable marginal corporate income tax rate.

Table B-2: Corporate Income Tax Rates, 1997

Income Tax Rates

	Basic	With Surtax 4%
Basic Federal Rate	38%	
Federal Abatement	10%	
Effective Federal Rate	28%	29.12%
Less Small Business Deduction (SBD) if applicable	16%	13.12%
Less Manufacturing & Processing (M&P) Rate if applicable	7%	22.12%

Basic Provincial Rate	16.50%
Small Business Provincial Rate	9.00%

The Small Business Deduction (SBD) shown above may be claimed by Canadian Controlled Private Corporations on the lesser of income from active business in Canada or the corporations reduced business limit. To be eligible for the Manufacturing and Processing (M&P), a corporation must derive 10% or more of its gross revenue from all active business in Canada from Manufacturing & Processing.

1.3 Tax Credits

Scientific Research & Experimental Development (SR&ED) Investment Tax Credits are the only investment tax credits that are likely to be relevant in BC. P2 expenditures that qualify as SR&ED expenditures may be eligible for an investment tax credit of up to 35%.

SR&ED is defined as the "systematic investigation or search carried out in a field of science or technology by means of experiment or analysis". This includes basic research, applied research, development, or any engineering, design,

operations, research, mathematical analysis, computer programming, data collection and so forth that directly supports the first three.

While it may seem this is more suited to research, some fairly applied items have been shown to qualify (e.g. adaptation and re-tooling of heavy equipment for specific forest harvesting applications).

SR&ED investment tax credits are attractive because not only do they generate a tax credit of 20% or 35% (which is sometimes refundable), the expenditure (current or capital) is treated in a SR&ED expenditure "pool" that allows expenditures to be either deducted in the year they are made, or accumulated and carried forward to deduct in future years.

A Two-Step Rule of Thumb for SR&ED Investment Tax Credits

If the option is eligible, apply the credit against tax-payable immediately (with an addback to income of the same amount as the credit in the following year) and deduct the full expenditure immediately (or whenever it is most valuable to do so).

Non-CCPC's1 should use a 20% SR&ED ITC. Large CCPC's (i.e. that have a reduced or low business limit and declare income most years) will probably only get a 20% investment tax credit on SR&ED. But smaller CCPC's (i.e. that have a higher business limit and lower income levels) may get a 35% credit on all or some portion of the SR&ED expenditure.

To determine eligibility and to treat the SR&ED investment tax credit more rigorously, further information on "expenditure limits", "SR&ED Pools", "add-backs to income/reduction of UCC", "reduction of regional credits", "refunds" and other complexities can be found in the following sources.

1) Revenue Canada, T2 Corporation Income Tax Guide, 1995, Pages 51 -54

2) Revenue Canada Guides IT-151 and IC 78-4

3) Revenue Canada Forms 2038(CORP), 2013, and T661

4) Income Tax Act Subsections 13(7.1), 127(9.1), 127(9.2).

5) CCH, Preparing Your Corporate Tax Returns, 16th edition, 1996, Page 336 - 371

6) Revenue Canada, Claiming Scientific Research and Experimental Development Expenditures (T4088)

1.4 Possible Funding Sources

P2 options may also be eligible for special funding under existing provincial and federal funding programs. Some examples include the Environmental Technology Loan Program, the Industrial Research Assistance Program (IRAP), the Forest Renewal Fund and Technology BC. These and other programs are summarized in Table B-3.

From a timing perspective, special funding would likely occur at the implementation stage of the option as an offset to the initial investment costs. In the cases where the funding is not repayable, it is simply recorded as an inflow. Where the funding is a repayable loan, the inflow could be recorded as the net present value of the loan plus the payments (interest and principal) discounted at the adjusted cost of capital.[2]

[1] CCPC stands for Canadian Controlled Private Corporation

[2] Net Present Value is defined in Section 8.2 and Adjusted Cost of Capital is defined in Section 2.2 of Appendix B. This computation would result in a positive NPV because the present value of the payments, once discounted at the Adjusted Cost of Capital, would be smaller than the original value of the loan.

Table B-3: Table of Possible Funding Sources

TABLE B-3: TABLE OF POSSIBLE FUNDING SOURCES

PROGRAM	DESCRIPTION	RELEVANCE TO P2	CONTACT
Environmental Technology Loan Program	Provides patient debt capital for companies with sales less than $10 million and less than 150 employees in Western Canada	While aimed at companies who produce or supply a technology that will prevent pollution, P2 projects that could ultimately be commercialised may also qualify.	Western Economic Diversification Tel: 666 6256 or 1 800 663 2008
First Time Scientific Research and Experimental Development Program	Provides assistance with submitting application only - no funding	SR&ED ITC's are well suited to P2 projects because a project will often involve some innovation, adaptation or development on behalf of the project proponents.	Vancouver Tax Services Tel: 604 666 4566
Forest Renewal BC	Provides funding for qualifying projects that renew BC's forest economy.	Restoring and protecting the forest environment is identified as a key priority.	Any of the regional Forest Renewal Offices or Science Council of BC at 438 2752 or http://www.forestrenewal.bc.ca
Industrial Research Assistance Program	Helps small and medium size businesses implement technological solutions. Available funds per project are in the range of $15,000 - $200,000	No specific environmental focus, but to the extent that the P2 process enhances technological capability or adapts existing technology, funding may be available	IRAP Vancouver 604 221 3100
Technology Assistance Program	Will share 50% of costs that small and medium sized BC firms incur to hire a BC based research firm (up $40,000 cost sharing).	This may help in areas where a leading edge P2 solution seems within reach but must be developed and refined before it could be implemented.	TAP Coordinator Tel 221 3109
Technology BC	Under the industry component, 50% of eligible project costs will be covered for the development of new products and processes that have a positive economic impact on BC.	Some key areas such as Environmental technology, and Waste Management, Forestry, Mining, Energy and Agriculture are considered eligible.	Science Council of BC 438 2752 http://www.scbc.org/program/techbc.html
Technology Partnerships Canada	Encourages development and demonstration of innovative technologies through repayable cost sharing investments. $250 million will be available annually and investments will typically be 30% of project cost.	The fund's focus is on innovative environmental technologies and strategic enabling technologies. However, the fund is looking to participate in upside returns.	Technology Partnerships Canada Tel: 1 800 266 7531

Note: Another general source is http://virtualoffice.ic.gc.ca/bc

Appendix B

1.5 Capital Cost Allowance (CCA and ACCA)

1.5.1 CCA Classes

For reference, Table B-4 provides an abbreviated list of CCA classes.

Table B-4: Abbreviated Table of CCA Classes

CLASS	DESCRIPTION	RATE
1	Most buildings made of brick, stone, or, cement acquired before 1987, including their component parts such as electric wiring, lighting, fixtures, plumbing, heating and cooling, equipment, elevators, and escalators	4%
2	Electrical generating equipment, a pipeline and various other distributing equipment acquired before 1988.	6%
3	Most buildings made of brick, stone, or, cement acquired before 1988, including their component parts such as electric wiring, lighting, fixtures, plumbing, heating and cooling, equipment, elevators, and escalators	5%
8	Property that is not included in any other class such as furniture, calculators and cash, registers, photocopy and fax machines, printers, display fixtures, refrigeration equipment, machinery, tools costing $200 or more, and, outdoor advertising billboards and greenhouses, with rigid frames and plastic covers acquired, after 1987	20%
10	Automobiles (except taxis and others used for, lease or rent), vans, wagons, trucks, buses, tractors, trailers, drive-in theatres, general-purpose electronic data-processing, equipment (e.g., personal computers) and systems, software, and timber cutting and removing, equipment	30%
13	Property that is a leasehold interest, (the maximum CCA rate depends on the type of, the leasehold and the terms of the lease).....	n/a
16	Automobiles for lease or rent...certain tractors and large trucks acquired after, December 6, 1991, that are used to haul freight, and that weigh more than 11,788 kilograms	40%
17	Roads, sidewalks, parking-lot or storage areas, telephone, telegraph, or non-electronic data, communication switching equipment	8%
24 & 27	Please refer to the Accelerated Capital Cost Acceptance discussion in section on CCA.	50%
38	Most power-operated movable equipment acquired, after 1987 used for moving, excavating, placing, or compacting earth, rock, concrete, or asphalt	30%
39	Machinery and equipment acquired after 1987 that, is used in Canada primarily to manufacture and, process goods for sale or lease	25%
43	Manufacturing and processing machinery and equipment acquired after February 25, 1992, described in class 39 above	30%

Further background on basic CCA concepts can be found in:

1) Revenue Canada, T2 Corporation Income Tax Guide, 1995, Pages 28 - 32; and

2) CCH, Preparing Your Corporate Tax Returns, 1996, 16th Edition, Page 162 234.

1.5.2 Accelerated CCA

Four key eligibility criteria must be met for an option or expenditure to be eligible for ACCA:

1) Does it abate pollution?

2) Does it specifically address pollution (rather than being a pure efficiency measure)?

3) Was the pollution established before 1974?

4) Will the control expenditures be incurred before Dec. 31, 1998?

Pre-authorization is available from Environment Canada so that you know in advance whether or not the option qualifies. Most options will be clearly in or out (and mostly out) based on the timing criteria (3 and 4 above).

For further information or pre-authorization, the contact is:

ACCA Program, Environment Canada, Ottawa, ONT, K1A 0H3
(Tel: 819-997-2057).

1.5.3 Example of a Declining Balance CCA Calculation

Table B-5 shows an example of a simplified declining balance calculation assuming there is only one asset in Class 8. Although the rate for Class 8 is 20%, CCA in the first year is only 10%. This is due to the half-year rule that applies in the first year for most assets.

Table B-5: Example of The Declining Balance Method of Depreciation

EQUIPMENT A

Example Calculation of a Declining Balance Method — CCA Class 8

	Yr. of Purchase Yr 0	Yr 1	Yr 2	Yr 3	Yr. of Sale Yr 4
Additions	$ 100,000				
UCC at beginning of Year	$ -	$ 90,000	$ 72,000	$ 57,600	$ 46,080
CCA	$ 10,000	$ 18,000	$ 14,400	$ 11,520	
UCC at end of year	$ 90,000	$ 72,000	$ 57,600	$ 46,080	
Salvage Value	$ -	$ -	$ -	$ -	$ 130,000
CCA Recapture (Terminal Loss)					$ 53,920
Capital Gain					$ 30,000
Inclusion Portion of Capital Gain					$ 22,500

1.5.4 Example of a Straight-Line CCA Calculation

Table B-6 shows how a $100,000 investment would be depreciated using the straight-line method. This is how ACCA would be calculated.

Table B-6: Example of The Straight-Line Method of Depreciation

EQUIPMENT B

Example Calculation of a Straight Line Method — CCA Class 24

	Yr. of Purchase Yr 0	Yr 1	Yr 2	Yr 3	Yr. of Sale Yr 4
Additions	$ 100,000				
UCC at the beginning of the year	$ -	$ 75,000	$ 25,000	$ -	$ -
CCA	$ 25,000	$ 50,000	$ 25,000	$ -	$ -
UCC at end of year	$ 75,000	$ 25,000	$ -	$ -	
Salvage Value	$ -	$ -	$ -	$ -	$ 130,000
CCA Recapture (Terminal Loss)					$ 100,000
Capital Gain					$ 30,000
Inclusion Portion of Capital Gain					$ 22,500

1.5.5 CCA Tax Shields

As a standalone item, CCA tax shields are computed as follows:

Present Value of Tax Shields =

PV(CCA in Year 0 * tax rate) + PV(CCA in Year 1 * tax rate...) + ...

However, most methods of computing cash flow will automatically consider the value of the tax shields. Under the method used by P2/FINANCE, for example, the tax payable is computed on taxable income (including CCA). This tax payable has already been reduced by the exact amount of the tax shield. Tax payable is then summed along with Revenues, Working Capital Recoveries, Salvage Value, Operating Costs (which does not include CCA) and Capital Cost to arrive at an After Tax Cash Flow.

If you use the form in Appendix C, you do not need to compute CCA tax shields separately. Be careful not to double count.

1.6 Example of a Consolidated Cash Flow Summary

Table B-7 can be used as a guide to where some of the preceding cost items could be recorded in the analysis. The numbers are for illustration purposes only and do not relate to any of the cases shown in the other sections.

Table B-7: Example of a Consolidated Cash Flow Summary

		Real Discount Rate	8%				
		NPV	Yr 0	Yr 1	Yr 2	Yr 3	Yr 4
Taxable Income Calculation							
Revenues		$ 79,622	$ -	$ 10,000	$ 20,000	$ 30,000	$ 40,000
CCA Recapture (terminal Loss)		$ 113,136	$ -	$ -	$ -	$ -	$ 153,920
Inclusion Portion of Capital Gain		$ 33,076	$ -	$ -	$ -	$ -	$ 45,000
Non-deductible reserve Add-back		$ 112,554	$ 8,000	$ 65,000	$ 13,000	$ 40,000	$ 2,000
ITC Addback to Income		$ 398,148		$ 430,000	$ -	$ -	$ -
Other		$ -					
		$ 736,536	$ 8,000	$ 505,000	$ 33,000	$ 70,000	$ 240,920
Less: Operating Costs		$ 310,785	$ 17,000	$ 100,000	$ 50,000	$ 130,000	$ 75,000
Capital Cost Allowance		$ 140,887	$ 35,000	$ 68,000	$ 39,400	$ 11,520	$ -
Corporation Capital Tax		$ 6,664	$ 1,968	$ 1,866	$ 1,806	$ 1,789	$ -
Deductible Property Tax		$ 13,249	$ -	$ 4,000	$ 4,000	$ 4,000	$ 4,000
Other deductions #1							
Other deductions #2		$ -					
		$ 471,584	$ 53,968	$ 173,866	$ 95,206	$ 147,309	$ 79,000
Taxable Income		$ 264,952	$ (45,968)	$ 331,135	$ (62,206)	$ (77,309)	$ 161,920
Tax Calculation							
Income Tax	35.52%	$ 94,111	$ (16,328)	$ 117,619	$ (22,096)	$ (27,460)	$ 57,514
Corporation Capital Tax		$ 6,664	$ 1,968	$ 1,866	$ 1,806	$ 1,789	$ -
Large Corporations Tax		$ 767	$ 371	$ 218	$ 130	$ 104	$ -
Property Tax		$ 13,249	$ -	$ 4,000	$ 4,000	$ 4,000	$ 4,000
Other Taxes		$ -					
		$ 114,790	$ (13,989)	$ 123,703	$ (16,160)	$ (21,567)	$ 61,514
Less: Investment Tax Credits		$ 430,000	$ 430,000				
Other Tax Credits		$ -					
		$ 430,000	$ 430,000	$ -	$ -	$ -	$ -
Total Tax Payable		$ (315,210)	$ (443,989)	$ 123,703	$ (16,160)	$ (21,567)	$ 61,514
Cash Flow Calculation							
Revenues		$ 79,622	$ -	$ 10,000	$ 20,000	$ 30,000	$ 40,000
Working Capital Recovery		$ 36,751	$ -	$ -	$ -	$ -	$ 50,000
Salvage Value		$ 191,108	$ -	$ -	$ -	$ -	$ 260,000
		$ 307,481	$ -	$ 10,000	$ 20,000	$ 30,000	$ 350,000
less: Operating Costs		$ 310,785	$ 17,000	$ 100,000	$ 50,000	$ 130,000	$ 75,000
Total Tax		$ (315,210)	$ (443,989)	$ 123,703	$ (16,160)	$ (21,567)	$ 61,514
Inital Investment Costs		$ 200,000	$ 200,000	$ -	$ -	$ -	$ -
		$ 195,575	$ (226,989)	$ 223,703	$ 33,840	$ 108,433	$ 136,514
After-Tax Cash Flow		$ 111,906	$ 226,989	$ (213,703)	$ (13,840)	$ (78,433)	$ 213,486

1.7 Dealing with One-Time Costs

Some costs are one-time and occur within a defined time period (e.g., at the end of the useful life of a facility). One-time costs may be included in your cash flow analysis in the year in which they are expected to occur. Alternatively, if you are using a software package that requires an annual contingent cost, future lump sums may be converted to a *levelized unit* cost as follows:

Levelized Unit Cost (Annual) = PV of Expected Future Payment(s) * r / (1-(1+r)-n),

where, r = the discount rate and n = the time horizon of the evaluation.

For example, assume that there is a 50% probability that site remediation will be required at the end of a facility's life (10 years) at a cost of $100,000. The expected cost of site remediation is (0.5 X $100,000) or $50,000. Assuming a discount rate of 15%, the PV of this expected remediation cost is therefore $50,000 / (1+0.15)10 or $12,359. If you are using a 20-year evaluation horizon, the levelized expected cost of site remediation would be $12,359 X [0.15 / (1-(1+ 0.15)20)] or $1,974 / year.[3]

[3] A simple test of this calculation is to compute the present value of this stream of payments over 20 years which, in this case, should be equivalent to $12,359.

DETAILS FROM SECTION 8.2 "CALCULATING FINANCIAL INDICATORS"

2.1 Converting From Nominal to Real Discount Rates (and back again)

To convert from real to nominal (or the other way), adding inflation to the real rate (or subtracting it from the nominal rate) to make the conversion is adequate, given that both are uncertain estimates anyway. However, there is actually a little more math involved to get the true answer.

Converting from Nominal to Real and Back Again

Real Discount Rate = (1 + Nominal Discount Rate) / (1 + inflation rate) - 1

Example: **(assume Nominal = 20% and inflation = 5%)**
Real Discount Rate = (1+.2) / (1+.05)-1 = (1.2 / 1.05) -1= 14.3%

And back again
Nominal = (1+Real Discount Rate) * (1+Inflation) - 1 =(1.143*1.05) - 1 = 20%

2.2 Computing Adjusted Cost of Capital

One of the simpler formulas for computing the Adjusted Cost of Capital is shown below. This formula is intended to account for interest tax shields. Interest tax-shields are incremental cash flows that arise if the firm is able to borrow more and in turn benefit from the tax-deductibility of interest payments. Because these interest payments will reduce tax payable, and tax payable is a cash flow this impact on tax payable must be considered.

Appendix B

Adjusted Cost of Capital = r* = r(1-T*L)

where:

r = the Opportunity Cost of Capital for the Option (i.e. the expected return on an alternative investment of similar risk as the option).

L = the option's marginal contribution to the firm's debt capacity as a proportion of the option's present value (e.g. if the initial investment is $1,000,000 and would allow the firm to borrow $400,000, then L = 400,000/1,000,000 = .40)

T* = the effective corporate income tax rate (i.e. a rate somewhere between 0 and the marginal corporate income tax rate). This reflects the fact that interest tax shields may not always exist.

Example:
r = 20%
L = $400,000/$1,000,000 = .40
T* = 30%
Based on the formula, the Adjusted Cost of Capital would be:
r* = r(1-T*L) = .2*(1-.3*4) = .2*.88 = 17.6%

2.3 Other Methods of Addressing Cost of Capital

A number of firms use Weighted Average Cost of Capital (WACC). This is a version of adjusted cost of capital and is better than using the default rate because it will better reflect your company's circumstances. However, WACC has the same limitations as the above Adjusted Cost of Capital formula, plus it is only valid for options that are considered as risky as the average of the firms existing assets.

An Adjusted Present Value approach can also be used that assumes the option is 100% equity financed and then makes adjustments for interest tax shields and other financing side effects. This is in fact the most robust method for getting to the true NPV of a project but it is not widely used in practice because it is perceived to add complexity.

Appendix C

Introduction

A FORM FOR CONDUCTING AN ANALYSIS OF FINANCIAL PERFORMANCE

This Appendix provides a suggestion for developing a single form that can be used in a number of different ways to assist with analyzing financial performance. While several different views are shown in this Appendix, they are all views of the same form. The portion of the form that is being viewed can be determined by looking at the row-numbers down the left hand side.

Designing the form this way allows it to be consistent with the P2/FINANCE software yet still be simple, effective, scaleable (adaptable for small or large investments) and applicable to a broad spectrum of users and types of options.

Rather than record annual costs as one-time average annual operating costs, this form allows the cost items to be mapped out over time. This is important because simply dividing a one-time operating cost by 20 years to get an average annual cost, extrapolating it over 20 years and then discounting it will not yield the correct present value. To obtain the correct present value, the "levelized value" must be calculated. Levelized value is a constant value that when discounted will provide the same present value as an uneven stream of cash flows upon which it is based (see Section I.8 of Appendix A). And in order to do this, the correct present value must be calculated first. So in short, it is best (and easier) to plot real values where they belong. Mapping helps with the thought process too.

[1]The form is based in part on a form that was developed by the Washington State Department of Ecology and in part on the style of presentation used by P2/FINANCE. The notion of scaleability (where a single form can be easily adapted to large or small decisions) is new.

This form should be filled out twice - once for the existing process and once for the option under consideration. The two forms would then be merged into one final form by subtracting the existing process from the option to leave only the incremental cash flows. Mapping both scenarios separately will help ensure that all incremental cash flows are captured.

> Note! On the following forms, space permits only 5 years to be shown. However, the analysis should cover the commercial life of the option (up to 20 years).

Condensed or Summary Form

The condensed version in Table C-1 shows the overall structure of the form. This view could be used as the main sheet for straightforward decisions, or as a summary sheet for more complex decisions.

This form starts by calculating taxable income. Costs and revenues that form part of taxable income are entered into the top part of the form to calculate taxable income and ultimately tax payable. However, not all of these items are cash flows. The only cash flow items are: Revenues, Operating Costs and Tax Payable. These are then transferred below to the Cash Flow Calculation and combined with the remaining cash flow items (Working Capital Recoveries, Salvage Value and Initial Investment Costs). Under the cash flow calculation, two groupings emerge, distinguished by the (+/-) sign:

1) **Net Cash Inflows** (Revenues, Working Capital Recoveries and Salvage Value);

2) **Net Cash Outflows** (Operating Costs, Taxes (Tax Payable) and Capital Cost (Initial Investment Costs).

Appendix C

Table C-1: Condensed Version

Discount Rate	Year 0	1	2	3	4	5
5%	1.00	0.95	0.91	0.86	0.82	0.78
10%	1.00	0.91	0.83	0.75	0.68	0.62
15%	1.00	0.87	0.76	0.66	0.57	0.50
20%	1.00	0.83	0.69	0.58	0.48	0.40

		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Taxable Income Calculation							
+	Sum of Revenues						
+	Sum of non-cash inclusions						
-	Sum of Operating Costs						
-	Sum of CCA						
-	Sum of Other deductions						
equals	Sum of Taxable Income						
Tax Calculation							
+	Sum of Taxes						
-	Sum of Tax credits						
equals	Net Tax Payable						
Cash Flow Calculat							
+	Sum of Revenues						
+	Working Capital Recovery						
+	Sum of Salvage Value						
-	Operating Costs						
-	Sum of Taxes						
-	Sum of Capital Cost						
equals	After Tax Cash Flow						
times	PV Factor						
equals	Discounted Cash Flows (DCF)						
	Sum DCF		**Net Present Value**				

Operating and Capital Cost Sections

Table C-2 shows an expanded section of the form that can be used to record operating costs. Note the row numbers to the left are summed under "Sum of Operating Costs" in the condensed table.

Table C-2: Operating Cost Section

			Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
13	-	Operating Costs						
14		+ Item						
15		+ Sub-item						
16		+ Sub-item						
17		+ Sub-item						
18		Sum of Item						
19		+ Item						
20		+ Sub-item						
21		+ Sub-item						
22		+ Sub-item						
23		Sum of Item						
24		+ Item						
25		+ Sub-item						
26		+ Sub-item						
27		+ Sub-item						
28		+ Sum of Item						
29		Item						
30		+ Sub-item						
31		+ Sub-item						
32		+ Sub-item						
33		+ Sum of Item						
34	-	Sum of Operating Costs						

The term "item" in the form stands for any relevant cost items as identified in the discussion of understanding costs in the body of the report.

Table C-3 shows an expanded version of the capital cost section. Note that, in the same format as operating costs, the capital cost rows are summed into the "Sum of Capital Cost" in the condensed table.

Table C-3: Capital Cost Section

			Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
75	-	Capital Costs						
76		Item						
77		+ Sub-item						
78		+ Sub-item						
79		+ Sub-item						
80		Sum of Item						
81		Item						
82		+ Sub-item						
83		+ Sub-item						
84		+ Sub-item						
85		Sum of Item						
86		Working Capital						
87		+ Sub-item						
88		+ Sub-item						
89		+ Sub-item						
90		Sum of Working Capital						
91	-	Sum of Capital Cost						

Full Form (With Operating and Capital Cost Details Hidden)

Table C-4 shows the entire form with operating and capital cost sections closed. The dates that appear at various points in the expanded form indicate the beginning of a sub-section that may be shown or charted separately (e.g. CCA calculation).

Again, the form shown here should be developed over the commercial life of the option (up to 20 years). It is designed to capture both simple cases and more complex cases where the capital costs are not simply a one-time investment and where the operating costs are variable over time.

Prior to being entered into this form, the capital and operating costs may require some pre-consolidation. Consolidation can be conducted in a number of ways. One example is "# hours times hourly rate". These types of simple calculations could be inserted between the columns (in the spreadsheet) and then hidden again as shown in the Plastic Coated Rack case in Appendix A. Another

example is the more involved contingent-value calculations discussed in Section 7. These would likely occur on a separate sheet and then be transferred into the form. It may also be that larger businesses tabulate virtually all inputs elsewhere (e.g. CCA, projected revenues, tax payable, eligible funding and others) and simply collect the information in a form similar to the one shown here to arrive at the overall NPV.

Table C-4: Full Form With Capital And Operating Cost Sections Closed

			Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
1	**Taxable Income Calculation**							
2		Revenues						
3	+	Revenues from Products						
4	+	Revenues from by-products						
5	+	Revenues from Recyclables						
6	+	Sum of Revenues						
7		non-cash inclusions						
8	+	CCA Recapture (terminal loss)						
9	+	Inclusion Portion of Capital Gain						
10	+	non-deductible reserve add-back						
11	+	ITC addback to income						
12	+	Sum of non-cash inclusions						
34	-	Sum of Operating Costs						
35	-	CCA						
36		Class ___						
37		+ Item						
38		+ Item						
39		Sum of Class ___						
40		Class ___						
41		+ Item						
42		+ Item						
43		Sum of Class ___						
44	-	Sum of CCA						
45		Other deductions						
46		+ Corporation Capital Tax						
47		+ Other deductions						
48	-	Sum of Other deductions						
49	equals	Sum of Taxable Income						
50	**Tax Calculation**							
51		Taxes						
52		+ Income Tax						
53		+ Corporation Capital Tax						
54		+ Large Corporations Tax						
55		+ Other Taxes						
56	+	Sum of Taxes						
57		Tax credits						
58		+ Investment Tax Credits						
59		+ Other Tax Credits						
60	-	Sum of Tax credits						
61	equals	Net Tax Payable						
62	**Cash Flow Calculat**							
63								
64	+	Sum of Revenues						
65	+	Working Capital Recovery						
66		Salvage Value						
67		Item						
68		+ Sub-item						
69		+ Sub-item						
70		+ Sub-item						
71		Sum of Item						
72	+	Sum of Salvage Value						
73	-	Operating Costs						
74	-	Sum of Taxes						
91	-	Sum of Capital Cost						
92	equals	After Tax Cash Flow						
93	times	PV Factor						
94	equals	Discounted Cash Flows (DCF)						
95		**Sum DCF**		**Net Present Value**				

Appendix D

DIRECTORY OF RESOURCES

1. Individuals and Organizations to Contact

1.1 Total Cost Assessment

Contact Name, Title	Name of Organization/Location	Telephone/Internet
Orest Maslany, Manager, Municipal Pollution Prevention	BC Ministry of Environment, Lands and Parks	250-387-4167 omaslany@epdiv1.env.gov.bc.ca
Bill Reid, Senior Program Consultant	BC Ministry of Environment, Lands and Parks	250-356-5761 wrkreid@epdiv1.env.gov.bc.ca
Allen White, Vice-Principal	Tellus Institute Boston, MA	617-266-5400
Deborah Savage, Tellus Institute	Tellus Institute Boston, MA	617-266-5400

1.2 Environmental Accounting

Contact Name, Title	Name of Organization/Location	Telephone
Dan Rubenstein, Principal	Auditor General of Canada Ottawa, Ontario	613-995-3708
Rob Gray, Director	Centre for Social and Environmental Accounting Research, University of Dundee Dundee, Scotland	44-038-234-4789
Don Stone, President	Small Business Environmental Accounting, Wendell, Massachussetts	508-544-3594
Daryl Ditz Director, Technol. & Env.	World Resources Institute Washington, D.C.	202-638-6300

1.3 Innovations in Cost Accounting

Contact Name, Title	Name of Organization/Location	Telephone
Allan Willis Research Associate	Canadian Institute of Chartered Accountants Toronto, Ontario	905-855-8529
Julian Freedman Director of Research	Institute of Management Accountants (U.S.) Montvale, New Jersey	800-638-4427 Ext. 21
Tom Pryor, President	Integrated Cost Management Systems Arlington, Texas	817-633-2873
Chris Pieper, CEO	ABC Technologies Inc. Beaverton, Oregon	
Chris Hibbit, Env. Acctg and Reporting	Netherlands Institute of Registered Accountants (NIVRA), The Netherlands	02-02-301-0301

1.4 Environmental Accounting Disclosures and Reporting

Contact Name, Title	Name of Organization/Location	Telephone
Joan Bavaria, Founder	Coalition for Environmentally Responsible Economies (CERES) Boston, MA	617-451-0927

1.5 Corporate Environmental Performance Measurement

Contact Name, Title	Name of Organization/Location	Telephone/Internet
	International Institute for Sustainable Development	Internet: http://www.iisd.ca
Marc Epstein Professor/Author	Stanford University Berkely, California	415-723-2146
Harrie, Vredenburg, Director, Env. Management	University of Calgary, Faculty of Mgmt Calgary, Alberta	403-220-7450
Goodfellow, Jim Partner	Deloitte & Touche Inc. Toronto, Ontario	416-601-6132
Rob Minter, Chairman	Global Environmental Management Initiative Washington, D.C.	202-396-7449
	World Business Council on Sustainable Development Geneva, Switzerland	41-22-788-3202

1.6 Pollution Prevention Planning

Contact Name, Title	Name of Organization/Location	Telephone/Internet
Stewart Forbes, Executive Director	Canadian Centre for Pollution Prevention, Ontario	519-337-3423
Dr. Jim McTaggert-Cowan Professor	Environmental Program Royal Roads University	250-391-2646 jmctaggert-cowan@royalroads.ca
	Environmental Industry Virtual Offices	http://VirtualOffice.ic.gc.ca/BC/
Natalie Roy, Executive Director	National Pollution Prevention Roundtable, Washington, D.C.	202-466-7272
Susan McLaughin	US Environmental Protection Agency Washington, D.C.	202-260-3844
Terri Goldberg, P2 Program Manager	Northeast Waste Management Officials Association (NEWMOA) Boston, MA	617-367-8558
Melinda Dower	New Jersey Department of Env. Protection New Jersey	609-292-1122

Appendix D

2. Bibliography

2.1 Total Cost Assessment

EPA (Environmental Protection Agency). 1992. Total Cost Assessment: Accelerating Industrial Pollution Prevention through Innovative Project Financial Analysis. Office of Pollution Prevention and Toxics: Washington, DC.

Global Environmental Management Initiative (GEMI). 1994. Finding Cost-Effective Pollution Prevention Initiatives: Incorporating Environmental Costs into Business Decision Making - A Primer. Global Environmental Management Initiative: Washington, DC.

Northeast Waste Management Officials' Association (NEWMOA). 1994. Improving Your Competitive Position: Strategic and Financial Assessment of Pollution Prevention Projects. Massachusetts Office of Technical Assistance. Boston, MA.

Northeast Waste Management Officials' Association (NEWMOA). 1992. Costing and Financial Analysis of Pollution Prevention Projects: A Training Packet. Boston, MA

Pacific Northwest Pollution Prevention Research Center. 1995. Analysis of Pollution Prevention and Waste Minimization Opportunities Using Total Cost Assessment: A Case Study in the Electronics Industry. September 1995.

Pacific Northwest Pollution Prevention Research Center. 1996. Analysis of Pollution Prevention Opportunities Using Total Cost Assessment: A Case Study in the Metal Finishing Industry. June 1996.

Savage, Deborah E., and Allen L. White. 1995. New Applications of Total Cost Assessment: An Exploration of the P2-Production Interface. Pollution Prevention Review. Winter, 1994-95

Society of Management Accountants of Canada. 1995. Tools and Techniques of Environmental Accounting for Business Decisions. Hamilton, Ontario.

Province of British Columbia. 1997. P2/FINANCE: Software and Manual for Evaluating Pollution Prevention Projects. Ministry of Environment, Lands and Parks. Available July 1997.

Torborg, Richard H. 1994. Capital Budgeting for Environmental Professionals: Helping Smaller Companies Evaluate the Economics of their P2 Projects. Pollution Prevention Review. Autumn, 1994.

White, Allen L., D. E. Savage, and A. Dierks. 1995b. Environmental Accounting: Principles for the Sustainable Enterprise. Presented at the 1995 TAPPI International Environmental Conference, May 7-10. Atlanta, GA.

White, Allen T., Monica Becker, and Deborah E. Savage. 1993. "Environmentally Smart Accounting: Using Total Cost Assessment to Advance Pollution Prevention," Pollution Prevention Review (Summer 1993), pp. 247-259.

2.2 Pollution Prevention Planning

Environment Canada and Fraser River Action Plan. 1994. Workbook: Pollution Prevention Plans. Reference DOE-FRAP 1994-35.

Environmental Protection Agency (EPA). 1989. Pollution Prevention Benefits Manual. Prepared for Office of Policy, Planning and Evaluation and Office of Solid Waste. October 1989.

Hoeflein, Joseph, W. Corey Trench, David Daniels and Mary McLearn. 1994. Waste Accounting: A Practical Methodology to Enhance Pollution Prevention Performance. Pollution Prevention Review. Sumer 1994.

Province of British Columbia. The P2 Tool Kit. Supporting Documents for Preparing a Pollution Prevention Plan. Pollution Prevention Industrial Implementation Unit. Ministry of Environment, Lands and Parks. Available July 1997.

Spitzer, M.A., R. Pojasek, F.L. Robertaccio, and J. Nelson. 1993. Accounting and Capital Budgeting for Pollution Prevention. Presented at Engineering Foundation Conference. San Diego, California. January 24-29.

Washington State Department of Ecology. 1995. Cost Analysis for Pollution Prevention,

White, Allen. 1993. Accounting for Pollution Prevention. IN: EPA Journal. July-September, 1993. pp. 23-25.

2.3 Innovations in Cost Accounting (From Accounting Associations)

American Institute of Certified Public Accountants. 1994. Environmental Remediation Liabilities. Environmental Accounting Task Force, Accounting Standards Division.

American Institute of Certified Public Accountants. 1995. Exposure Draft: Proposed Statement of Position - Environmental Remediation Liabilities. Prepared by Environmental Accounting Task Force, Accounting Standards Division. New York. June 30. 1995.

Boritz, J. E. 1990. Approaches to Dealing with Risk and Uncertainty. Toronto: CICA.

Bell, S. 1992. Environmentally Sensitive: Practical Audit and Accounting Concerns Associated with Environmental Liability. Pennsylvania CPA Journal, Winter: 8-11.

Canadian Institute of Chartered Accountants (CICA). 1995. Full Cost Accounting Research Project. BC Focus Group. Vancouver, B.C.

Canadian Institute of Chartered Accountants (CICA). 1995. Environmental Costs and Liabilities. Associated Draft: Draft Statement of Principles & Discussion Paper. Accounting Standards Board. December 1, 1995.

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Chadick, B., R.W. Rouse and J. Surma. 1993. Perspectives on Environmental Accounting. IN: The CPA Journal. January, 1993.

Collins, F., ed. 1991. Implementing Activity Based Costing. John Wiley and Sons: New Jersey.

Feltmate, Blair. 1997. Accounting for Sustainable Development: A Business Perspective. Prepared for the Society of Management Accountants. Toronto, Ontario.

Hamner, Burt and C.H. Stinson. 1995. Managerial Accounting and Environmental Compliance Costs. IN: Journal of Cost Management. Vol. 9, No. 2. Sumner.

Hicks, Douglas. 1992. Activity-based Costing for Small and Mid-sized Businesses: An Implementation Guide. John Wily and Sons, Inc.

Humphrye, C. P. Miller and R.W. Scapens (eds.). 1993. Accounting, Accountability and the New Public Sector. A special issues of Accounting, Auditing, & Accountability Journal. Vol. 6, No. 3. United Kingdom.

Organization for Economic Cooperation and Development (OECD). 1994. Accelerating Corporate Investment in Cleaner Technologies Through Enhanced Managerial Accounting Systems. OECD: Paris.

American Institute of Certified Public Accountants. 1993. Illustrations of Accounting for Environmental Costs. IN: Financial Report Survey. New York: AICPA.

2.4 Environmental Accounting

Arthur Anderson. 1994. EcoAccounting. Published by Arthur Anderson. Chicago.

Bailey, Paul. and Joseph Karam. 1992. Expressing Environmental Liabilities in Dollars and Cents: What Corporations Can Do Now. IN: Environmental Finance. Winter 1991/92.

Compass Resource Management Group. February, 1996. Environmental Accounting Seminar: Background and Recommendations. Prepared for the Whistler Centre for Business and the Arts in preparation for an Environmental Accounting workshop conducted September 25-27, 1996. Vancouver, B.C.

De Groene, A. and J. de Haan. 1993. Organizing Environmental Management in Small and Medium-Sized Firms: A Cost-Benefit Instrument as a Tool to Integrate Environmental Policy into the Overall Business Policy. Paper presented at the Second International Research Conference of the Greening of Industry Network. Boston. Mass. November 14-16, 1993.

Ditz, D., Janet Ranganathan, and R. Darryl Banck. 1995. Green Ledgers: Case Studies in Corporate Environmental Accounting. World Resources Institute.

Environmental Protection Agency (EPA)). 1995a. An Introduction to Environmental Accounting as a Business Management Tool: Key Concepts and Terms. EPA Office of Pollution Prevention and Toxics: Washington, DC.

Executive Enterprise Publications. 1992. Understanding Environmental Accounting and Disclosure Today. New York: Executive Enterprise Publications Co.

Grayson, L., H. Woolston and J. Tanega. 1993. Business and Environmental Accountability: An overview and guide to the literature. Published by Technical Communications Ltd. in association with The British Library. United Kingdom. 89 pp.

ICF Incorporated. 1996. Valuing Environmental Liabilities for Managerial Decision-Making: A Review of Available Techniques. Prepared for Pollution Prevention Division. Office of Pollution Prevention and Toxic Substances. U.S. Environmental Protection Agency.

Moilanen, Tuula and Christopher Martin. 1996. Financial Evaluation of Environmental Investments. Gulf Publishing. Houston, Texas.

Price Waterhouse. 1992. Accounting for Environmental Compliance: Crossroads of GAAP, Engineering and Government. New York.

Rubenstein, Dan. 1994. Environmental Accounting for the Sustainable Corporation: Strategies and Techniques. Quorum Books, Westport, Connecticut.

Russel, W.G., S.L. Skalak, and G. Miller. 1994. Environmental Cost Accounting: The Bottom Line for Environmental Quality Management. Total Quality Environmental Management, pp. 255-268. John Wiley and Sones: New Jersey.

Schoemaker, Paul and A. Joyce. Spring, 1995. Estimating Environmental Liability: Quantifying the Unknown. IN: California Management Review. Volume 37, No. 3.

White, A., D. Savage, and M. Becker. 1995. Environmental Cost Accounting in the Capital Budgeting Process: A Benchmarking Survey of Management Accounting. Prepared for the EPA Office of Pollution Prevention.

White, Allen. January, 1993. Accelerating Corporate Investment in Cleaner Technologies Through Enhanced Managerial Accounting Systems. Paris. Prepared for the Organization for Economic Cooperation and Development (OECD).

Wise, Kenneth, Gayle Koch and Paul Ammann. February, 1994. Evaluating Environmental Costs: Accounting for Uncertainties. IN: Chemical Waste Litigation Reporter, Washington, D.C.

2.5 Corporate Environmental Performance Measurement

Eccles, R. and P.J. Pyburn. 1992. Creating a Comprehensive System to Measure Performance. IN: Management Accounting. October, 1992. pp 41-44.

Epstein, Marc. 1996. Measuring Corporate Environmental Performance: Best Practices for Costing and Managing an Effective Environmental Strategy. Irwin Professional Publishing and the IMA foundation for Applied Research Inc. USA.

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2.6 Environmental Management in Business

Denton, D.K. 1994. Enviro-Management -- How Smart Companies Turn Environmental Costs into Profits. Prentice Hall: New Jersey.

Klassen, R. and C. McLaughlin. 1996. The Impact of Environmental Management on Firm Performance. Management Science. 42(8): 1199-1213.


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Appendix E

GLOSSARY OF TERMS

Activity — The processes or procedures that cause work to be performed within an organization (EPA 1995).

Activity-Based Costing (ABC) — An accounting approach that measures the cost and performance or activities, resources and cost objects. Resources are assigned to activities (using resource drivers), then activities are assigned to cost objects (using activity drivers) based on their use. ABC recognizes the causal relationship of cost drivers to activities. In ABC, activities that once were "lost" in general overhead are identified separately and allocated to specific cost drivers. This leads to more effective identification of cost-bearing activities, including those related to the environment, and hence better control over results and costs.

Benefit/Cost Ratio - The present value of the net cash flow divided by the present value of the original investment.

Business Case - An evaluation prepared to justify a project, either capital or operating, that typically includes a description of the project, a financial analysis and a discussion of any benefits and risks that were not quantified in the financial analysis.

Capital Budgeting - The process of allocating capital resources among competing projects, usually based on financial and strategic considerations.

Contingent Costs — Contingent costs are those costs that may occur in the future as a result of a past transaction in that they are not considered estimable or likely to occur. There is also not likely to be an obligation or stated intention to pay, and, consequently they do not meet the "recognition" criterion, and are not usually entered in accounting records. Note that "Contingent Cost" is a term generally used by non-accountants. In this document it does not carry the special provisions of Contingent Losses and Gains (see CICA Handbook Section 3290).

Cost Accounting — The internal accounting procedures used to record, measure, and report information about costs. Also commonly called managerial accounting.
Cost Allocation - The process of assigning costs and revenues to cost objects or cost centres for purposed of product pricing or cost tracking.

Cost Driver — Any factor that causes a change in the cost of an activity (e.g. the type or quality or inputs, process design, product design, or product mix.

Cost Object —Any customer, product, service, contract, project or other work unit for which a separate cost measurement is desired (EPA 1995).

Critical Value Analysis - A method of assessing how much contingent and less-quantifiable costs would have to be worth to make an investment attractive.

Discount Rate — The rate of interest or return that businesses can earn on the best alternative use of money at the same level of risk. Used to express the value of a future cash flow in the present year.

Discounted Cash Flow — Cash flow is the stream of cash outflows (costs) and cash inflows (savings, revenues etc.) related to a given project. The discount rate is used to translate these inflows and outflows (which occur at various points in time) into present values. *Incremental* cash flow is simply the projected cash flow (i.e. with the P2 project) minus the current cash flow (i.e. with the existing process).

Externalities — The positive or negative impacts associated with a firm's products, services, or activities that are borne by external, third parties and for which the firm is generally not held responsible.

Full Cost Accounting (or Full Cost Assessment) — The practice of assigning all costs, both internal to the firm as well as externalities, to products, production processes or services. Note that GAAP (Generally Accepted Accounting Practices) has a strict definition for full cost accounting that does not match with the definition used in this document.

Internal Rate of Return (IRR) — The discount rate at which an investment has a zero net present value. Usually, the IRR calculated for a specific project is compared against a company's desired rate of return.

ISO 14000 — A set of voluntary industry standards developed by the International Organization for Standardization (ISO) that outline the policies and procedures that an organization would need to put in place to establish an effective environmental management system.

Liability — An obligation of an entity arising from past transactions or events, the settlement of which may result in the transfer or use of assets, provision of services, or yielding of economic benefits in the future (CICA Handbook, Section 1000). Before being

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recognized in financial statements, a liability must meet three recognition criteria: (1) existence of an obligation, (2) the transaction or event has already occurred, and (3) the obligation cannot reasonably be avoided.

Life Cycle Analysis (LCA) — An assessment of the environmental impacts of a product or process over its full life cycle from extraction/harvesting of raw materials, through production and use to disposal. May be quantified in financial ($) or environmental (e.g., tonnes of emissions) terms.

Life Cycle Costing — An estimation of the costs associated with the environmental impacts of a product or process throughout its life cycle. These costs are typically added to the conventional production cost to produce a "life cycle cost" estimate for the product or process.

Opportunity Cost - The value of a resource in its next-best use. For example, if a parcel of land could be sold for $100,000 but is instead used for a settling pond, the opportunity cost is $100,000.

Opportunity Cost of Capital - The return that could be realized by investing money targeted for a specific project on the next-best investment of similar risk.

Payback Period (PP) — The length of time for a project to recoup its original investment from cash inflows.

Pollution Prevention - Avoiding, eliminating or reducing pollution at source, including eliminating hazardous material inputs, improving production processes, and reducing or re-using residual wastes.

Present Value — The value today of cash received or spent in the future, calculated using an appropriate discount rate. *Net* present value subtracts future cash outflows from cash inflows. Also referred to as the discounted value of future cash flows.

Profitability Ratio (PR) — The ration of a project's present value to the initial investment.

Time Value of Money — A recognition that the value of a sum of money depends on when it is received. $1000 today is worth more than $1000 received in the future because it could be invested today and grow over time.

Sensitivity Analysis - The process of testing to see how sensitive the indicators are to changes in individual inputs. For example, an uncertain input (such as estimated investment cost) could be increased and/or decreased by 10% to see the effect on net present value.

Scenario Analysis - The process of testing to see how indicators respond when several input parameters are varied at once.

Sunk Costs - Costs relating to historical (and sometimes current) events which cannot be avoided. Such costs can still be managed to improve efficiency of spending; however, they are not truly avoidable, and should be distinguished from those that are for cost control purposes.

Total Cost Assessment (TCA) — An accounting technique developed to evaluate the comprehensive and long-term costs and savings of pollution prevention investments.