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MODELS FOR INDUSTRIAL BENEFITS FROM ENVIRONMENTAL REMEDIATION

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SUMMARY

Over the next 10 years or so four major environmental remediation projects will be undertaken on Cape Breton Island:

- Muggah Creek Watershed Cleanup Project;
- Decommissioning of Cape Breton Development Corporation mine operations;
- Decommissioning of Sydney Steel Plant (SYSCO); and
- Seaboard Power Plant Decommissioning – Nova Scotia Power Inc.

About $942 million in environmental services will be required, which will likely include:

- professional services, $101.7 million (775 person years);
- technical services, $760.2 million (4,785 person years); and
- other expenditures, $80.1 million.

The environment remediation services will include:

- site assessments;
- monitoring of contaminant plumes;
- environment inspection;
- risk assessment;
- environmental assessment registration;
- engineering design, procurement, construction, installation, operation and management of remediation systems;
- environmental sampling, materials testing and analytical laboratory services;
- environmental auditing services;
- contaminant release response capabilities and emergency response planning;
- hazardous materials transportation and disposal;
- environmental training programs;
- regulatory liaison and legal services; and
- research and development.

The study describes the economic principles that need to be adhered to and the tools that can be used to:
increase the participation of Cape Breton Island labour and businesses in the forthcoming major remediation projects; and
help create a sustainable and growing environmental remediation sector.

Existing Corporate and Labour Capacity

Awareness of the Projects - All professional service providers were:

- aware of the projects;
- already participating in environmental assessment and sampling work; and
- able to access resources from off-Island offices.

Firms that would likely be sub-contractors to the professional service firms were:
aware of the projects; but
many were unaware of the size of the projects and the type and amounts of services required; and many were not prepared to make investments in expansion in advance of funding commitments.

Availability of Experienced Environmental Professionals - Survey respondents believe that:
sufficient intermediate to senior level environmental professionals will not be available;
it will be difficult to attract these people without proof of long-term work; and
there are sufficient numbers of engineering technicians, technologists and people with a science (biology and chemistry) backgrounds to meet the future demands.

Availability of Skilled Technical and Trades Workers - There is no shortage of labourers and most skilled technical trades are in good supply.

Implications for Labour Supply and Firms' Capacity
Appendix B shows that about 21 professional and 18 technical and skilled trade types of labour will be required to provide about 20 types of environmental services.

Professional Services - A supply shortage already exists and may worsen in the more senior levels and project management groups.
Developing the skills of junior level technicians to senior levels through local training is possible, but will not likely meet the demand.

There are two strategic approaches to meeting the demand for higher-level professional services:
- attract professionals back to Cape Breton based on long-term commitments to environmental remediation, and
- create a Centre of Excellence that would blend research, academic expertise, innovation, and commercialisation in environmental technologies.

Technical Services and Skilled Trades – The demand for all the technical service labour types can likely be met without importing labour to Cape Breton.

The number of heavy equipment operators, plumbers, electricians, welders, etc., may be insufficient as demand builds.

Cross Jurisdiction Policies and Approaches to Industrial Benefits, Innovation and Commercialisation for Economic Growth
Our examinations focused on the policies and actions that other jurisdictions have used to:
- increase local participation in large projects; and
- maintain the new type and level of local economic activity after the major procurement or project is completed.

Relative to the amount of information on policies and programs designed to encourage research and innovation diffusion (the process by which technology and the knowledge of how it should be used spreads from innovator to users) we uncovered limited examples of programs used to encourage sustained local industrial benefits from large projects

The OECD found that:
- invention and initial commercial exploitation of new products and processes mattered less than the rapid and widespread diffusion of that technology;
- small countries and economies rely on technology imports for more than half their acquired technology;
- acquired technology is as important as a country's own R&D;

- in manufacturing R&D explains most productivity growth; and
- in services, the diffusion of technology matters much more.

Importance of Technology Diffusion to Expansion of the Environmental Services Sector - If diffusion matters more than a company's own R&D then what will improve the diffusion process to and on the Island?

The following were most commonly used (1970 – 90) to facilitate the diffusion process (Diffusing Technology to Industry, OECD Observer, August 1997):

- technology databanks;
- licensing and transfer agencies; and
- regional centres that help small firms upgrade processes and product development.

Many obstacles to diffusion arose from deficiencies in firms' human capital in terms of skills and management capability.

The definition of a best practice in technology diffusion depends on the objectives but the following common themes emerge:

- Programs that support the supply of technology and the demand for it are both needed.
- Technology adoption is a local issue so programs and local infrastructure must be complementary.
- The diffusion program needs experienced and well-trained staff.
- Staff should work from within firms.
- Worker training is required to enhance**.**
- The diffusion program should consider multiple uses of technology, in a range of economic sectors.
- The program needs some indirect support, e.g. tax incentives to promote R&D, training, investment in research personnel.
- Capital markets in the home country must be efficient (i.e., local firms must be able to build wealth and attract investment capital).
- The home country must have stable macro-economic policies (low inflation, orderly foreign exchange markets).
- Firms in the diffusion target area must be geographically close to ensure close interaction for the scale needed to have wide impacts.
- The program should build on local resources.
- The program should maintain close links with industry groups.

Formal diffusion programs do not have to exist indefinitely, just long enough to develop trust and long-term relationships between firms and diffusion service providers. They need not be considered permanent public sector programs.

Commercialisation – "Then You Have to Make It Happen" - Firms and organisations that have successfully commercialised technology have several things in common:

- The importance of innovation to the life of a business / organisation / community is clear to all direct stakeholders.
- Firms and individual participants involved in commercialisation move frequently between research and business units / organisations.
- They target areas where there are still many answers needed.
- "Next-to-impossible" goals are set.

Successful regional economies, known for their rates of diffusion of innovation and commercialisation, also have some things in common:

- They have the correct mix and concentration of skills - scientists and engineers to patent lawyers to venture capitalists.
- There was extensive sharing and therefore a more rapid diffusion of ideas.
- They are more open to new ways of doing research and business.

Target Areas Where There Are Still Many Answers Needed - Based on the experience of companies, large and small, Peter Drucker ranked target areas according to the ease at which one could find unanswered needs to commercialise:

- (easiest) – unexpected success, dissected to see what happened and how to replicate it;
- difference between expected and actual results;
- inadequacy in a product or process that had been taken for granted;
- surprise change in industry or market structure;
- demographic change;
- social perception of change; and
- (most difficult) – changes in awareness caused by new knowledge or technology.

Firms often spent most of their commercialisation efforts tying to create and sell products and services based on new knowledge or technology.

Cape Breton firms will need to focus immediately on export markets (the rest of Canada and the rest of the world). Exporters, especially service exports, innovate and sell by:

- changing their service to meet customer needs more effectively;
- changing the service delivery process; and
- improving management and organisational processes (e.g., quality assurance processes).

Industrial Benefits Targets and Models for Cape Breton Island

The objectives of the industrial benefits program are to maximise:

- the number of Cape Breton residents that work on the forthcoming remediation projects;
- experience gain of resident labour and companies;
- profits earned by resident companies for re-investment into environmental business related exports sales and expansion.

The main means to achieve these objectives should use a combination of depending on the specifics of the remediation project and the expediency with which an approach can be implemented.

The majority of the input by Cape Breton will be in the form of services versus manufactured products.

Extensive lobbying will be required to convince the federal government to take a new path in regional industrial development.

Whichever model is implemented it should be accompanied by a continuous evaluation process.

Model One; Remediation Follows Current Plans - Our projection of the amount of remediation activity is based on the requirement to use proven and standard technology. Therefore, the expertise will be difficult to re-sell. The market for these technologies is mature and dominated by established firms that now compete more for market share and domination than to create new lines of business. Market entry by Cape Breton firms will be very difficult.

Cape Breton based labour and firms, and branch offices of off-Island firms should be able to absorb a larger portion of work than in the past. The future is now quite well known, and firms and labour are already planning to capture work.

The most likely route to creating a larger environmental services sector lies in the use of accumulated expertise and profits to re-invest to create new or improved services.

The benefits plan needs to fix experience and profits in Cape Breton based labour and companies. The model attempts to simulate the experience of Iceland and the Acadian community of New Brunswick. It provides the means for re-investment by Island residents, who because they are residents will more likely invest in their Island community.

Actions to Win Short Term Benefits - Use NAFTA allowances for small firms (5-600 people) and minority group owned business set-asides Define small and minority group (e.g., First Nations, African-Canadian, main centre of operation in Cape Breton,…) to favour firms with headquarters or main centres of operation on Cape Breton Island. The levels of preference should be tiered with the:

- first level going to Cape Breton owned or controlled firms; and the
- remaining levels based on the likelihood that firms or partnerships will lead to:
  - hiring Cape Breton residents
  - earning profits for Cape Breton based companies
  - investing in Cape Breton based firms
  - R&D and commercialisation activities on the Island or for use by locally owned or controlled firms, etc.

NAFTA set aside allowances could be enhanced as a shield from NAFTA restrictions by identifying aspects of the remediation activity that could be financed by transfers of federal funding to Nova Scotia or through co-operative arrangements. That is, make set-asides for Cape Breton small businesses and minority owned or controlled businesses part of the mandate of remediation activity delivered via federal transfers.

Set up structures that specifically utilise NAFTA allowance mechanism by considering the creation of a Special Operating Agency to deliver aspects of the remediation program that can

be considered unique and therefore suitable for delivery only by a special agency. The work of the special agency would likely be shielded from NAFTA considerations. Make set-asides for Cape Breton small businesses and minority owned or controlled businesses part of the mandate of remediation activity delivered via this mechanism.

Break contracts into sizes on which Cape Breton firms can bid. If bonding or insurance costs are prohibitive, provide coverage via a purchase by the provincial government that will be available to Cape Breton firms.

Establish requirements that make Cape Breton based firms the preferred prime contractor. This will help improve the business and management skills of local firms. Provide the Cape Breton firms with business consulting assistance so that they can take on more prime contractor and or project management roles.

Mentoring networks should be set up between firms that have made the commercial and export selling leap and firms that will need to make the leap to maintain themselves after the bubble of work is complete.

Implement the staffing, training and education and labour supply recommendations provided in Section 3.0 to maximise the ability to hire locally.

Create a skills database of people who have moved off-Island and contact them to tell them about opportunities to “come home”.

Opportunities for off-Island sales will stem from the development of labour skills and services that are specialised, innovative and / or are in short supply. Therefore, the benefits plan must incorporate programs to absorb labour that will participate in the bubble of work but whose skills will not be exportable.

Actions to Win Long Term Benefits - The actions needed to win long tem benefits rely on the natural orientation of the private sector to re-investment profits. The Island already has access to the range of business assistance program needed to help market and sell services and products and to successfully manage a business.

Establish a commercially based institute, or modify one of the existing organisations, following the Fraunhofer Institute model. The institute will be private sector led and staffed. It will offer a pool of commercialisation research and testing services, on a non-profit but fee for service basis, to all companies. Companies that are based off-Island will be eligible to have their staff participate and will be eligible to purchase services. All participating companies will be required to participate in the maintenance of the institute.

Establish agreements and processes to ensure that Cape Breton based firms either remain in control or maintain access to intellectual property rights associated with work at the institute.

Model Two; Remediation Does Not Follow Current Plans - This model can be implemented if remediation work does not go as planned with standard technologies or some part of the remediation work can be set-aside as a resource for R&D. By setting aside areas for use in R&D and testing new technologies Cape Breton can follow the model used by the US Department of Defence at its toxic sites. NAFTA and WTO rules allow national and local set-asides where research in the national interest is concerned, and or where public sector supported R&D is being undertaken.

Actions to Win Short Term Benefits - Same as model one.

Actions to Win Long Term Benefits - Same as in model one with the following exceptions:

- set-aside a test site for new techniques, research, etc.;
- establish a research and test facility / space;
- target a long term clean-up date for the test area;
- require participants in research facility to have material investment in it; and
- partner with UCCB but via a purely commercial model (follow the Stamford University experience.)

1.0 THE PURPOSE OF THIS RESEARCH

Mission. The results and recommendations of this research will serve as one tool to succeed in the mission to creating a sustainable and growing environmental remediation sector on Cape Breton Island that sells its services around the world.

Goal. This research identifies approaches to industrial benefits strategies for application to Cape Breton Island. The approaches address means to maximise short and long-term business and employment opportunities in the environmental remediation field. The research provides recommendations on ways to increase Cape Breton Island's ability to capture short-term benefits and, build and sustain long-term benefits.

Objectives. To achieve the goal we:

- documented on-going and anticipated environmental remediation work on the Island in terms of:
  - timing;
  - type of work;
  - amount of work (physical quantity and dollar values); and
  - labour skills (type and amount) required;
- reviewed the practices in industrial benefits approaches and capacity building in other jurisdictions and determined the extent to which they could work in the Cape Breton context;
- assessed the opportunities and constraints posed by trade and procurement agreements associated with the World Trade Organisation, NAFTA and Canada's own Agreement on Internal Trade; and
- assessed the capacity of Cape Breton's business, institutional and human resource bases to:
  - meet the demands of the environmental remediation work;
  - after the work is "done," sell its expertise outside of the Island; and
  - continue to be innovators in the sector so that Island companies can create a large and sustainable environmental economic sector.

1.1 HISTORICAL CONTEXT AND ECONOMIC BACKGROUND

The industrial history of Cape Breton may be an unexpected source of fuel to fire a new economic sector in the Island economy. The history of industrial development occurred when concerns for the use and re-use of resources were not priority issues. At the time we may have convinced ourselves that the earth could replenish air, water and land resources no matter how much we consumed, it is now clear, that resources are limited and natural replenishment rates are finite.

Because of Cape Breton Island's industrial history, its environment now exhibits the scars caused by our previous lack of concern for its natural resource base. Pollution issues associated with the "Tar Ponds" and "Coke Ovens" are well known nationally, and even internationally. Unfortunately for the environment, Cape Breton is not the only place on earth in this situation, and in fact, the presence of large scale contaminated sites is common in less developed countries (e.g., Central Europe).

While this environmental degradation is unfortunate, Cape Breton could, as the old homonym says, "Make lemonade with the lemon it was handed." The remediation work required in Cape Breton is and will continue to be needed around the world. It is possible that upcoming work on

sites such as the Tar Ponds could form the basis for a new industry that exports the technology, services, and expertise developed during the impending remediation process in Cape Breton.

The Cape Breton Adjustment Consultation Process received (2000) over 400 representations. The submissions pointed to five sectors that could form the base of a renewed Cape Breton economy:

- information technology intense industries;
- knowledge based industries;
- oil and gas industries;
- tourism; and
- environmental remediation.

Subsequently, the Enterprise Cape Breton Corporation (ECBC) re-focused its corporate plan to target these areas. The newly formed Cape Breton Growth Fund Corporation (CBGFC) wants to determine if the current and future environmental remediation work on Cape Breton Island can be used to support Island economic development. In the short term, the Island may have enough remediation work on its hands to keep local suppliers of these products and services more than busy. However, in the long-term (likely the next 10 years) as the number of local projects winds down local businesses could take what they have learned and earned and re-invest it to create products and services that they can sell off-Island. Because the current remediation plan specifies that only standard and proven technologies are used we believe that the opportunities for re-selling these same services off-Island will be limited.

1.1.1 Economic Background

The absolute and relative economic condition of the Island is well known to most, by fact or anecdote. The following paragraphs provide the essential evidence that demonstrates the need for action to improve the economic lot of the people now living on the Island.

The current situation ***(table following page.)*** shows high unemployment and low participation rates. Even with the lower participation rates, the unemployment rates in the CBRM and the rest of the Island are substantially higher than their counterparts on the Mainland. Adjusted to the Mainland participation rate the unemployment rate of the Island rises to about 34%.

Labour Force Activity, Cape Breton Island					
	N S *seasonally adjusted*	**CBRM***	**RoCBI***	**HRM**	**RoNS***
	October 2000	Average, August – October 2000**			
LABOUR FORCE AGE GROUP	*750.4*	91.5	31.4	290.1	337.4
Labour Force	*461.5*	46.7	16.0	201.2	197.6
Employed	*418.4*	38.4	13.2	188.1	178.7
Unemployed	*43.1*	8.4	2.9	13.0	18.8
Participation Rate	*61.5%*	51.0%	51.0%	69.4%	58.8%
Unemployment Rate	*9.3%*	18.0%	18.1%	6.5%	9.5%

CBRM = Cape Breton Regional Municipality, * = estimated by EDM
RoCBI = Rest of Cape Breton Island, * = estimated by EDM
HRM = Halifax Regional Municipality
RoNS = Rest of Nova Scotia, * = estimated by EDM
Total may not add due to rounding.
** '000s
Source: Statistics Canada
EDM

The long-term trend suggests that most of the direct impacts of the downsizing of the primary fishery and the closure of the coal mines and SYSCO have been absorbed. Total employment has remained about the same, as has earned income. This suggests that the underlying Island economy is producing jobs independent of these elements of the historic economic base.

Even with the stabilisation of the economy, or bottoming out depending on one's perspective, most population projections assume that population growth will be low to negative ***(see table below).***

Cape Breton Island Population, 1996 – 2011				
	1996	2001	2006	2011
Cape Breton County	117,788	117,847	116,601	117,600
Inverness County	20,930	20,838	20,509	20,588
Richmond County	10,985	10,757	10,408	10,398
Victoria County	8,470	8,598	8,686	8,817
Cape Breton Island	158,173	158,040	156,204	157,403

Source: Nova Scotia and Counties Population Projections, 2001 – 20011; Canmac Economics
EDM

Even with 1% annual employment growth and a declining population unemployment will grow ***(see table below)*** even if the participation rate of the Island stays below that of the rest of Nova Scotia. The evidence is strong that without employment growth about 1% per year the population of the Island will stabilise at best.

Cape Breton Island Labour Force 2001 - 2011			
	2001	2006	2011
LFAG	122,797	121,370	114,532
Part. Rate	0.51	0.55	0.59
Emp.	54,774	57,568	60,505
Unemp.	7,905	9,970	11,103

Source: EDM

2.0 FORTHCOMING REMEDIATION ACTIVITY

The estimation and characterisation of forthcoming remediation work provides a basis for the identification of economic opportunities that will occur. Having placed metrics on the opportunities, we are able to devise business planning, education and training, and research and development strategies that will help achieve the overarching goal of the assignment.

We find, summarised in the ***table below***, that about $942 million in environmental services will be required to deal with the major remediation projects on the Island, over the next 10 years. The total figure breaks down as follows:

- professional services, $101.7 million (775 person years);
- technical services, $760.2 million (4,785 person years); and
- other, $80.1 million.

Identification of Potential Cape Breton Benefits from Upcoming Environmental Remediation Activities

Major Projects	Estimated Min. Project Value ($M)	Estimated Professional Fees –15% ($M)	Total Professional HR Requirements (PYs)*	Potential Cape Breton Benefits (Labour / Contracting)60-70% ($M)	Potential Cape Breton Benefits (Professional HR) 60-70% ($M)	Additional Professional PY Requirements for CB* (PYs)
Tar Ponds (Phase IV-VI)	140	21	15.5	71.4 - 83.3	12.6 -14.7	9-11
Coke Ovens MAID, Sewer Collector etc. (Phase III-VI)	100	15	11	51- 59.5	9-10.5	7-8
SYSCO (Phase I-VI)	100	15	11	51- 59.5	9-10.5	7-8
DEVCO (Phase I-VI)	110	16.5	12	56.1 – 65.5	9.9-11.55	7-8.5
Total	**450 ($M)**	**67.5 ($M)**	**49.5 (PYs)**	**229.5 –267.8 ($M)**	**40.5 - 47.25 ($M)**	**30-36 (PYs)**

*Assumptions
- Based on min. project value of $450 M
- 15% professional Fees ($67.5 M)
- Project duration 10 years
- 52 weeks, 40 hrs / week,
- Average professional rate of $65 / hour

Source: Jacques Whitford Environmental Limited

The following paragraphs describe how we made these estimates.

2.1 IDENTIFICATION OF MAJOR ENVIRONMENTAL REMEDIATION PROJECTS

To produce an effective strategy it is first necessary to define the anticipated needs for future remediation projects including the:

- type of remediation work;
- likely technologies to be used;
- anticipated volume and value of the work;
- volumes of materials to be managed;
- person years;
- timing of the services that will be required; and
- any other special requirements of buyers of remediation services.

Our survey and projection describes the type, amount and general timing of remediation work. Once the major projects are completed, we believe that on-Island environmental remediation work will re-establish itself at a normal background level associated with economic development, accidents, property transfers and the like.

We completed the survey and projection by:

- differentiating between potential types and amounts of service required depending on intended land re-use, community demands, standards to be met, schedule to be met;
- surveying potential buyers of remediation services;
- attempting, via the survey of potential buyers of service, to establish the timing of remediation work;
- identifying the business capacity (employment, skills, bonding requirements, etc.) and labour skills needed to do the work; and
- surveying professional and technical service firms to determine the extent to which they believed they could and would adjust to absorb the bubble of work.

The following pages outline the results of our survey and estimate of forthcoming remediation work.

Appendix B provides the detailed tables describing the and level of remediation activity that is expected to make up the "bubble" over the next 10 years. The tables also describe the type and level of professional and technical person hours that will be required to complete the work.

2.2 CHARACTERISING THE "BUBBLE" OF ENVIRONMENTAL REMEDIATION WORK

Cape Breton Island, and in particular Cape Breton County, has a history of industrial production going back over 100. The industries included and includes, coal mining, basic steel production, rail manufacturing, electrical power generation, pulp and paper production and petrochemical related industry. This combination of activities, particularly the now defunct coal mining and basic steel manufacturing operations, generated large volumes of industrial waste that went largely untreated. The waste left behind includes over 800,000 tonnes of coal tar residue containing polycyclic aromatic hydrocarbons (PAHs), heavy metals and PCBs most commonly associated with the Sydney Tar Ponds.

The "bubble," is meant to define the work that is above some normal background level of remediation work. The bubble is likely to be made up of the current big projects (as noted above) and others that are on the horizon. The background-level work is likely the amount and type of work that will continue on a year to year basis after the big projects are completed.

2.2.1 Muggah Creek Watershed Cleanup Project

Untreated sewage, municipal landfill leachate, coking wastes (coal tar) and steel making wastes have been discharged through the Muggah Creek watershed for over 100 years. The Sydney Tar Ponds has long been described as Canada's most toxic waste site. The costs for the cleanup of the watershed are being borne by three levels of government through a trilateral funding agreement. The project has also established the Joint Action Group (JAG) as a community advisory group for the project.

The existing $62M commitment ends in March 2001. This funding has provided for:

- complete characterisation and delineation of the Tar Ponds area (Phase III);
- intrusive testing on the Coke Ovens property (Phase II);
- design of a sewer collection system to collect and bypass sewage from entering the inner harbour (south Pond);
- comprehensive air monitoring;
- demolition of structures;
- capping of the municipal landfill; and
- comprehensive testing in the residential area located to the north of the Coke Ovens site.

Costs for completion of the entire Muggah Creek watershed project have been estimated by the government partners and JAG to be between $400M and $800M. The cleanup of these sites is anticipated to continue for the next 8-12 years.

2.2.2 Decommissioning of Cape Breton Development Corporation Mine Operations

Cape Breton Development Corporation (DEVCO) has operated coal mines in Cape Breton as a federal Crown Corporation since the 1960s. The shut down of the remaining DEVCO operations is scheduled for December 2001. DEVCO's major infrastructure includes:

- three mines (Lingan, Phalen - New Waterford and Prince Mine - North Sydney);
- the International Coal Pier;
- a railway and rail maintenance building;
- the coal preparation plant; and
- over 500 individual properties across Cape Breton, mainly in the Cape Breton County.

In 2000, DEVCO commissioned a study to quantify the total environmental liabilities for the its operations in Cape Breton. This study identified $110M in environmental liabilities attributable to the corporation. DEVCO has $1.5M in environmental projects underway or recently completed. These include a hydrogeological study at the Victoria Junction Coal preparation plant and capping of old mine sites. DEVCO and Public Works and Government Services Canada are preparing submissions to the Federal Government to secure the funding required for the projects. At the time of writing, it appears that the projects will be administered through Public Works and Government Services Canada utilising DEVCO expertise.

2.2.3 Decommissioning of Sydney Steel Plant (SYSCO)

Sydney Steel has operated as a Provincial Crown Corporation for the past three decades. The steel plant has operated in Sydney since the turn of the 20th century. Several chemical spills, explosions and fires occurred over the years. A fire in an electrical substation in 1993 involved several PCB transformers and other electrical equipment. The operation of the steel plant has no doubt resulted in significant releases of heavy metals, petroleum hydrocarbons and PAHs, cleaning solvents and other hazardous materials. However, no comprehensive environmental assessment of the steel plant property has been undertaken. Asbestos abatement and the management of large volumes of contaminated construction and demolition materials will also be a major concern throughout the remediation.

Estimates of cost for the demolition of structures and the remediation of the site range from $217M to over $400M. The Province of Nova Scotia has identified a liability of $217 for the property and has assigned a management team to lead the remediation activities. Some demolition of structures and phased assessment work is underway. SYSCO is also preparing a land use strategy for its properties.

2.2.4 Seaboard Power Plant Decommissioning – Nova Scotia Power Inc.

Nova Scotia Power Inc. has operated four thermal electrical generating stations in Cape Breton, which have historically burned Cape Breton coal. These include facilities at Lingan, Point Aconi, Point Tupper and Glace Bay. The company is decommissioning the former Seaboard Generating station in Glace Bay. The remediation is expected to involve demolition of structures, management of coal waste, asbestos abatement, drainage control and re-grading of the area. The anticipated cost for the project is approximately $15M. No other NSPI decommissioning or remediation projects are scheduled for Cape Breton. The growing availability of natural gas and changes in consumer demands for green energy sources could lead to accelerated decommissioning of the remaining older coal fired facilities.

The information summarised above regarding projected budgets and scope of the anticipated work was confirmed by a number of government and industry officials responsible for these projects. We used this information as the basis for calculating the value and scope of contracting and environmental services.

2.3 POTENTIAL CLIENTS FOR REMEDIATION SERVICES.

2.3.1 Muggah Creek Project

The current program to clean up the Muggah Creek watershed includes the:

- assessment and remediation of the “Tar Ponds” (north and south ponds), the Coke Ovens site and decommissioning;
- capping of the Municipal Ash and Industrial Disposal (MAID) site; and
- installation of a collector sewer and treatment plant.

The project is funded through a trilateral arrangement between the federal, provincial and municipal governments. Representatives on the Intergovernmental co-ordinating committee for the project include Environment Canada, Health Canada, Nova Scotia Environment and Labour, Nova Scotia Department of Health, Nova Scotia Transportation and Public Works and the Cape Breton Regional Municipality. Community participation and decision making is co-ordinated through various committees of the Joint Action Group. The contracts for the work to

this point have been tendered by the Department of Transportation and Public Works and are being managed through project management consultant.

2.3.2 DEVCO Remediation Projects

DEVCO operated as a federal crown corporation for the past several decades. Therefore, the liability for environmental remediation of the DEVCO lands and assets rests with the Federal Government. It is our understanding that submissions are being prepared for the federal Treasury Board to secure funding to have the work completed. At the time off writing its appears that Public Works and Government Services Canada will administer and manage the remediation projects.

Public Works and Government Services Canada is also mandated with the completion of an extensive sampling program and human health risk assessment of residential properties in Whitney Pier, which is immediately north of the Coke Ovens. The program involves extensive surface and subsurface soil sampling of local and background areas.

2.3.3 SYSCO Remediation

SYSCO operated as a provincial crown corporation since 1967 and thus the environmental liability rests with the provincial government. The assets of the company were recently sold at auction. Several contracts have been let for the demolition of certain surface structures and a land use planning study is underway. The management of the SYSCO remediation will also be the responsibility of the recently announced provincial management team, which reports to the Minister of Transportation and Public Works.

2.3.4 Seaboard Power Plant

The decommissioning of the Seaboard Power Plant is the responsibility of Nova Scotia Power Inc (NSPI). Local environmental managers will manage with support from their corporate environmental services group in Halifax. NSPI is the provincial power utility. It operates three coal / oil fired thermal electric generating plants on Cape Breton Island as well as the Wreck Cove hydro generating station in Victoria County. The utility also maintains the large network of transmission and distribution facilities and electrical substations.

2.3.5 "Background Level" Remediation Needs

Demand for environmental remediation services has grown and evolved significantly throughout the 1980s and 1990s due to improved understanding and awareness of the impact of pollution on the health of the natural environment. In the 20 years since 1980, governments have enacted large amounts of environmental legislation to meet the demand. The major drivers for environmental assessment and remediation services have been the liability provisions of the Nova Scotia Environment Act introduced in 1995. This legislation established the concepts of lender liability and the liability of Corporate Directors. These legislative changes have driven these persons responsible for properties and activities to ensure proper environmental management. Environmental remediation services will continue to be a service requirement.

The following organisations will likely remain as the largest consumers of remediation service on the Island:

- Major commercial /industrial operators in Cape Breton, which include:
  - banking and lending institutions;
    - The major banks have ongoing needs for environmental assessment and remediation services. The involvement of the major banks and other lending agencies is due to the liabilities regime established for contaminated sites under the Nova Scotia Environment Act and other environmental legislation.

- Insurance companies;
  - Insurance companies have ongoing needs for environmental remediation services because of domestic fuel oil spills etc. The Insurance Bureau of Canada represents many of these companies. Environmental remediation projects covered by the major insurance companies involve local claims adjustment firms and industry project managers.

- Major property managers include: Laurentian Energy Corp Inc., NSPI, Enterprise Cape Breton Corporation (ECBC), Stora Forest Industries, Statia Terminals (bulk oil handling facility) and Point Tupper Marine Services.
  - Statia Terminals operates a major bulk storage and marine transhipment facility in Port Hawkesbury, Nova Scotia.

- Aliant (MT&T) is the major telephone utility in the province, which owns the majority of the telecommunications infrastructure in the Atlantic Provinces.
  - Other telecommunications companies are establishing and maintaining remote transmission facilities, which often contain remote electrical generators with fuel stockpiles.

- Sable Offshore Energy Inc., Pan Canadian, Marathon and other petroleum exploration companies will have ongoing service needs from Environmental Impact Assessment, design and construction of transmission and distribution pipelines. Most recently, El Paso Corporation has announced plans for a sub-sea pipeline from the Scotian shelf directly to New York and/or Boston.

- Georgia Pacific is the operator of large gypsum quarries in central Cape Breton.

- Louisiana Pacific operates a large wall board plant in Port Hawkesbury.

- The Cape Breton and Central Nova Scotia Railway operates the main rail links east of Truro, Nova Scotia and throughout Cape Breton.

- Municipal Governments
  - Cape Breton Regional Municipality (CBRM)
  - County of Victoria
  - County of Inverness
  - County of Richmond

- Provincial Government Departments and Agencies
  - Transportation and Public Works
  - Department of Education
  - Department of Health (CB Regional Health Care Complex)
  - Department of the Environment
  - Department of Natural Resources

- Federal Government Departments and Agencies:
  - Public Works and Government Services Canada:
    - Public Works and Government Services Canada contracts Brookfield Lepage Johnson Controls (BLJC) to act as the property manager for large numbers of federal government buildings in Cape Breton and throughout Canada.
  - Parks Canada
  - Canada Post
  - Department of National Defence (DND)
  - Coast Guard
  - Health Canada
  - Environment Canada
  - Department of Indian and Northern Affairs
  - Marine Atlantic (Federal Crown Corporation)
  - Fisheries and Oceans (Ports Canada)

- Retail and bulk facilities operated by the major oil companies including:
  - Shell Products
  - Imperial Oil
  - Irving Oil Limited
  - Ultramar
  - Petro Canada.

2.4 ANTICIPATED SCOPE OF ENVIRONMENTAL SERVICES

It is difficult to define exactly the types and amounts of service that will be required to meet the demands of the major projects. The amount of work and the type of technology utilised in the projects will depend on the:

- post treatment remediation objectives;
- intended land use;
- demands of the community;
- development of site specific environmental quality standards;
- proposed schedule; and
- budget availability.

It is reasonable to assume that the major projects will require a broad variety of environmental services to be completed.

2.4.1 General Environmental Service Requirements

The scope of the general environment services, which will be required at various stages of the major remediation projects, will include:

- environmental spill response capabilities: air monitoring, containment systems, portable water treatment, debris disposal, as well as, environmental emergency response planning
- environmental analytical laboratory services including environmental sampling of air, water, soil, and biological sampling as well as physical and materials testing;
- monitor natural attenuation of contaminant plumes in soils and groundwater
- hazardous materials transportation and disposal services;
- phased environmental site assessment (Phase I-VI as defined by CCME Guidelines for Decommissioning Industrial Sites;
- risk assessment including both human health and ecological health risk assessments;
- environmental auditing services;
- environmental assessment registration may be required under either federal or provincial processes including the Canadian Environmental Assessment Act or the Nova Scotia Environmental Assessment Regulations;
- regulatory liaison and legal services will be an ongoing requirement
- environmental training programs;
- environment inspection services;
- the engineering design, procurement, construction, installation, operation and management of advanced remediation systems; and
- research and development.

2.4.1.1 Water Management Services

Major water issues, which may be included in some phase of the remediation and monitoring programs, include the following activities:

- water supply management
- potable water
- industrial process water
- wastewater treatment:
  - municipal sewage treatment
  - industrial process waste treatment
- on-site septic services:
  - pumping
  - treatment
  - disposal
- acid mine drainage/leachate:
  - control
  - containment
  - treatment

2.4.1.2 Air Quality Monitoring and Management Services

These include:

- ambient air testing
- indoor air testing
- greenhouse gas monitoring / reduction technologies
- monitoring and management of ozone depleting substances
- National Pollutants Release Inventory (NPRI) reporting requirements

2.4.1.3 Solid Waste/ Soil /Sludge sampling and Management Services

These include:

- solid waste
  - municipal solid waste
    - landfill operation
    - landfill closure
    - landfill leachate management / treatment
  - industrial solid waste:
    - landfills
    - composting
    - land-farming
  - sludge management:
    - municipal sewage sludge
    - industrial process sludge
  - mine waste management:
    - tailings management
    - drainage management
- construction and demolition material management:
  - disposal
  - recycling
- composting of industrial wastes

2.4.1.4 Hazardous Materials Management

These include:

- asbestos:
  - assessment
  - removal
  - in place management
  - disposal
- mercury
- lead
- PCB management:
  - storage
  - transportation
  - treatment
  - disposal

- petroleum services:
  - storage system design
  - equipment supply
  - used oil management
  - management of CEPA toxic substances
  - NPRI reportable substances

2.4.1.5 Energy Management

These include:

- HVAC upgrades / retrofits
- geothermal energy systems
- energy audits

2.4.2.6 Contaminated Soil - Management/Treatment/Disposal Services

These include:

- petroleum hydrocarbons
- glycols
- chlorinated solvents
- metals
- PAHs
- PCBs
- other

2.4.1.7 Radioactive Materials Management

These include:

- nuclear source management
- naturally occurring radioactive materials (NORMs)

2.5 CALCULATION OF THE VALUE OF ENVIRONMENTAL SERVICES

To identify the types of types and amounts of services involved in the major Cape Breton remediation projects JWEL completed a review of cost and performance reports for selected projects that have relevance to the Island situation. This work included a review past projects involving of a variety of remediation technologies and contaminants and volumes of impacted materials. The financial review of each project was broken into two major categories including contracting services and professional services. Contracting costs included capital, mobilisation, commissioning, set-up operation and maintenance costs. Professional services included such services as chemical characterisation, sampling and monitoring programs, preparation of Environmental Impact Assessment reports, obtaining regulatory approvals and analytical testing fees. These fees were broken down further to identify the percentage of each cost category as a percentage of the total project value. ***Appendix A*** provides a summary of the costs associated with Superfund Projects.

A variety of projects involving different technologies and contaminants were used to match the information from these projects with the projects scheduled for Cape Breton.

We calculated the portion of costs for environmental services required for the major Cape Breton projects based on the cost breakdown from these projects. The range for professional

environmental services is with in the range of 9-14 percent of the total project costs. JWEL has made certain assumptions about the apportionment of project costs and various professional services based on our understanding of the scope of the projects and our previous experience. This information was then used to calculate the anticipated total value for each environmental service line.

2.5.1 Professional Service Requirements

Professional environmental services will include needs for the following disciplines:

- project managers
- engineers (environmental, civil, geotechnical, mechanical, electrical, chemical, mining)
- geologist / hydrogeologists
- industrial hygienists (OHS specialists)
- engineering technician / technologist
- environmental scientists
- toxicologist
- biologist including aquatic (marine, freshwater) and terrestrial,
- surveyors / drafting
- analytical chemists
- high tech information management services including web based technologies and database management
- communications specialists
- environmental / land use planners
- auditors (QA / QC, ISO, EMS specialists)
- administrative support

2.5.1.1 Calculation of Personnel Requirements (Professional Services)

JWEL reviewed the major projects and assigned a percentage of cost for the project to each of the various professional disciplines required to complete the work.

In our experience, engineering technicians will be required to conduct the bulk of the fieldwork including sampling, monitoring supervision and documentation. The role of engineering technicians is typically in the range of 35-40 % of the project costs. Engineering fees usually account for 20-30% of the project value. Hydrogeologists asses the environmental impacts to the subsurface and groundwater. They usually account for 10-20% of total professional technical services. Project management is generally in the order of 10%. The consultants assigned unit fee rates for each of these services, and making some assumptions about workweeks and vacation, calculated the total number of person years anticipated for each of these disciplines. ***Appendix B*** provides a spreadsheet containing the cost summary and breakdown.

2.5.2 Anticipated Contracting Services

Contracting services to complete the remedial work will employ a variety of workers with skills that include the following:

- hazardous waste disposal contractors
- waste treatment (on-site / off-site)
- air
- water
- solid waste

- treatment technologies are expected to include bio-remediation, thermal treatment technologies, (incineration, thermal desorption), pump and treat groundwater systems
- earthworks are expected to include excavating, trucking, backhoe, grading
- demolition services including asbestos disposal, lead etc.
- equipment suppliers include health and safety supplies, monitoring equipment
- union trades including electricians, plumbers, pipe fitters, welders, wood workers, equipment operators and general labourers
- marine spill response may include requirements for certified boat operators, divers
- project insurance, including project performance bonding, general liability as well as special environmental liability and errors and omissions insurance.

2.5.2.1 Calculation of Personnel Requirements (Technical Trade Services)

We used a similar approach to that for the professional services to calculate the distribution and value and person years for the technical trades anticipated for the projects. The distribution of services is based on experience and the scope of the projects.

We allowed for a portion of the contracting fees to go specifically towards capital costs, commissioning, operation and maintenance and administration including travel, meals, accommodations, rentals etc. These fees will be in the range of 20-35 % of the total project value. By assigning unit fee rates for each of these services and making some assumption about workweeks and vacation, we calculated the total number of person years anticipated for each of these disciplines. We assume that there are profit margins built into these unit fees. In some cases the unit fees include the equipment i.e. for equipment operators and drilling services the capital costs of the equipment as well as other materials have been included in the unit rates. ***Appendix B*** provides a spreadsheet containing the cost summary and breakdown**.**

2.5.3 Survey of Existing Corporate and Labour Capacity

If Cape Breton businesses are to maximise their participation in these upcoming projects appropriate business planning, education and training, research and development may need to be established. To identify gaps or deficiencies in the capacity of the existing workforce and companies the consultants surveyed local companies. We used the survey to document the current capacity to do more remediation work and changes they need to make to capture a greater share of the projects. We developed a questionnaire for the professional and contracting service sectors. ***Appendix C*** provides copies of the questionnaires.

Each survey respondent received the results of the needs analysis and a copy of the survey form. Contact was made directly with the key personnel responsible for these companies. The contacts were provided with the results of our estimation of the type and amount of work upcoming in Cape Breton. The survey also identified their experience on previous environmental / remediation jobs and their ability to obtain the skilled labour when required through local unions or off-island contractors.

2.5.3.1 Survey Results

The survey polled the major Cape Breton based environmental consulting firms that could be expected to provide the bulk of the environmental services to the projects identified in the study. JWEL also identified several large contracting firms, which have been or have the technical expertise to provide services for these projects. Five consulting firms were polled as

well as 18 contractors providing services including hazardous materials handling and disposal contractors. We also surveyed small 3-4 person welding shops and general trucking/excavation contractors. This sample survey provides a cross-section description of the capabilities of companies on the Island and their readiness to complete anticipated work.

Awareness of the Projects - All of the professional service providers were aware and were actively participating in various phases of the environmental assessment and sampling work on these projects. All have been involved in various aspects of the work completed on the Muggah Creek project to date. The work included the phased assessment on the Coke Ovens and Tar Ponds sites, sampling programs to support the risk assessments in the residential areas, the sewer collector project and the capping of the landfill. All of the firms also identified additional resources in their other offices that could provide general and specialist resources for the projects if required. Technology transfer is also available from other offices.

The subcontracting firms were aware of the scope of the projects but many were unaware of the anticipated project budget and had never seen a breakdown of the anticipated worker requirements. Many were excited about the possibility of such a block of work. However, many firms suggested they were not prepared to make strategic capital investment in equipment in advance of funding commitments for these projects due to the uncertainty with government commitment (as the major source of funding) to these projects.

Availability of Experienced Environmental Professionals - In general all firms believed there was sufficient numbers of engineering technicians, technologists and people with a science (biology and chemistry) background to meet the demand for the anticipated field and laboratory work. However, there was an overwhelming consensus that intermediate to senior level environmental professionals did not exist in the workforce and it was very difficult to attract people with such skills to the area. Without sustainable long-term work on the Island, upon which to build a career, it will be difficult to attract professionals. A long-term funding and schedule commitment could help remove some of this uncertainty for professionals who may wish to return to the area to build a career.

All respondents identified a desire to obtain professions with environmental engineering and risk assessment experience. Based on our understanding of the Cape Breton market, very little risk assessment is done which, our interviews suggest, may be due to the lack of people with experience in this service area.[1]

Availability of Skilled Technical Trade Workers - There is no shortage of labourers and in general. Most of the skilled technical trades were sufficient to supply historical need. Many of the speciality firms (electricians, plumbers, etc) were unionised and many had previous experience in other remediation projects. Most companies believed that they could readily hire additional skilled labour from the local union membership. The only trade that identified some limitation was the sheet metal worker who would be involved in ductwork etc. Most of the skilled technical labour had more than 10 years experience, which suggests that this pool of skilled workers is the result of the recent closures of the DEVCO mining operations and

[1] Risk assessment has been accepted by regulators as a process that can result in significant savings in remediation.

Sydney Steel etc. One firm also reported that it was difficult to find experienced field supervisors to manage large projects in the field.

Specific Suggestions from the Survey - Several respondents reflected a frustration that on some recent jobs, tenders specifications that called for certain engineering and / or material requirements were changed to less stringent requirements after the project was awarded. They believed this situation was unfair as many of the bids were awarded on price to supply the tender specific service. Interviewees believed that for major projects funded by public money, there should be a public opening of the bids prices. They also stressed the importance of strong project management on the ground and that no variance in the tender specification is permitted once the job has been awarded.

2.5.4 Uncertainty Assessment

The project cost estimates in this study include an element of uncertainty with respect to the type and value of environmental remediation work to be completed over the next 10-12 years in Cape Breton Island. The budgets projected for the remediation projects are large and range up to $950 M. While many factors have been considered in the cost estimation the actual values will be influenced significantly by a great variety of uncertainty factors, as discussed below. Consequently, this assessment will likely not represent the actual work that will be completed or the value for each type of service required over the next decade. In this study, we estimated the project values based on:

- interviews with government and private sector project managers;
- informal discussions with other government departments, educational institutions, contractors and service providers and other experts in the field;
- well understood and generally accepted methods for demolition, deconstruction, contaminant assessment, remediation, regulatory processes and the experience of senior project managers; and
- discussions with the JAG and member of the environmental, who served as the steering committee for this study.

A list of factors that could effect the value and timing of services required for the completion of these projects includes:

- government commitment to funding;
- community acceptance of the assessment process and the remedial technology selected;
- volumes and types of contaminants identified during upcoming assessment activities;
- anticipated end-use of the impacted lands;
- the ongoing role and influence of the jag committee; and
- regulatory approval processes including Environmental Impact Assessment Review and Regulatory approvals.

Based on our research and surveys we define the following as the primary environmental remediation projects.

2.5.4.1 Muggah Creek Watershed Cleanup Project

The largest of the Cape Breton remediation projects is the Muggah Creek Watershed Cleanup project. The value of this project has been estimated to be in the range of $400-$800M. The series of projects anticipated to be undertaken for the cleanup of the Muggah Creek Watershed

includes a number of large contaminated sites with widely divergent environmental issues (Tar Ponds, Coke Ovens, MAID Site, etc). The wide range of estimates for this project has the greatest potential to over/under predict the results of this analysis.

For the purposes of this evaluation, $600 M has been used as the estimated value of the remediation for the Muggah Creek Projects. $600 M is the mean value of the estimates for the project identified by the government partners and the JAG Committee. It also takes into account that there has already been a significant amount of environmental assessment work completed on the project including Phase II/III work on the Tar Ponds and Phase II on the Coke Ovens site. This estimate also recognises that risk assessment will likely be used to manage some portions of the properties and that land use restrictions may be put in place to manage some areas in the watershed. With these factors considered, the project value for cleanup is projected to be $600M (+/- 20%). On the other hand, the minimum work required to ensure no adverse effects or off site migration from these various sites has been estimated at $200-250M with ongoing site management and monitoring.

2.5.4.2 SYSCO Decommissioning

The SYSCO Decommissioning has been estimated by the Province to cost about $217 M and therefore is the second largest of the major Cape Breton remediation projects. A previous "Class D" estimate had been prepared early in 2001, which identified the costs for the demolition of the facility structures and remediation of impacts in the range $400M (+/- 25%). It is our understanding that this estimate was based on 49 potential demolition projects (total cost up to $90 M) and 24 identified environmental projects (range of cost between $200-400 M). For the purpose of this evaluation, JWEL used the provincial government estimate of $217 M as it was developed with the benefit of additional information and it is probably more reflective of what has been budgeted for this site. Considering the status of the provincial deficit and debt, the timing for the project may be delayed. On the other hand, if risk management and land use restrictions are used as methods to manage impacts on this property, the project values could be as low as $20-50 million.

2.5.4.3 DEVCO Decommissioning

The DEVCO Projects have been estimated by Senes Consultant Limited to be in the range of $110M. It is generally believed that there is a high likelihood that the federal Treasury Board will approve the funds for the DEVCO remediation projects within the next several months. Some senior government project managers are of the opinion that the amount of uncertainty and the number of properties owned by DEVCO suggest that $110 M is a low estimate of the resources required to manage the DEVCO liabilities. The actual amount of remediation will be refined pending the results of environmental assessments on these properties. Based on the information to date this estimate is considered accurate for the purposes of our analysis +/- 25%.

2.5.4.4 Seaboard Power Decommissioning

NSPI completed a comprehensive review of the property and grounds on the Seaboard Plant and established $15M (+/-) as a figure for budgeting. Material and equipment that is recovered reduce the net cost of the project. This projected budget is considered an accurate estimate for the purposes of our evaluation.

3.0 IMPLICATIONS FOR LABOUR SUPPLY AND FIRM'S CAPACITY

UCCB is currently graduating students at the following rates:
- Environmental Technology Diploma: 30 / year
- B.S. degrees in Biology / Chemistry: 20-30 / year
- Other related disciplines: 50-75 / year (control systems, business, etc.)

Many of these young professionals are not finding work in Cape Breton.

The labour supply requirements projected for environmental remediation ***(Appendix B)*** include 21 professional service categories and 18 technical service categories engaged in approximately 20 distinct environmental services. While the expected increase in demand looks substantial in terms of total person hours for many categories, it is important to note this is projected over ten years.

The picture for labour supply is complex and varies from technical trades to professional and project management skills. This section presents the view for technical services and professional services. Section 3.2 discusses how professional services development can lead to the potential for creating on-going economic benefits through improving Cape Breton's capacity to export environmental services in the long term.

3.1 TECHNICAL SERVICES

Based primarily on our survey of 18 technical service companies, the current and projected demand across all the technical service categories can be met without importing labour to Cape Breton[2]. The Nova Scotia Community College (NSCC) has the capacity to meet current and expected employer demands for the technical trades categories assuming the expected remediation work is phased in with adequate lead-time. The existing technical service labour force is experienced and the expanded demands will not lead to a problematic imbalance of new and inexperienced technical trades people. The closing of the steel and coal industries has left many trades people with more than 10 years experience and no work. Supervisory experience exists, although one company reported difficulty recruiting experienced field supervisors.

While the number of heavy equipment operators, plumbers, electricians, welders, etc., is more than adequate at present, there are two large-scale trends that will have to be taken into account:
- nationally there is a projection of a skilled labour shortage: demographics show a slightly smaller work force developing in many parts of the country, and
- a smaller percentage of young people are choosing to enter traditional trades.

On Cape Breton, young people have been leaving for opportunities elsewhere for some time. Cape Breton employers and trade unions are confident they could manage more labour market demand at present for technical trades people (because there is an existing oversupply of technical trades people). We could see a reversal within five years if young people leave in even greater numbers and smaller percentages enter traditional trades fields.

[2] One possible exception is sheet metal work. Further investigation is necessary to determine if this shortage is due a lack of available training or too few people entering the trade.

It must be made clear to the public, and young people in Cape Breton in particular, that the demand for technical trades will increase and remain strong for at least five to ten years. Otherwise, we could see the oversupply of labour dwindle in the technical trades and a new requirement emerge to recruit people into some of those trades. Recruitment in some traditional trades is already a concern in other parts of Nova Scotia.

The pool of technical trades workers, allowing for retirements and new entrants, will be adequate for expanded needs if a long-term commitment to remediation work is made and the labour force is informed and assured that it will be needed.

3.2 PROFESSIONAL SERVICES

The overview for professional services is based on the survey of Cape Breton companies that engage in environmental remediation work, as well as five larger engineering firms that would likely be prime contractors and bring expertise from off-island. The two capacity-building training institutions that were included in our interviews were the University College of Cape Breton (UCCB) and the NSCC.

Appendix B shows 21 professional services categories. However, in many categories there are professional, technician and junior technician levels. At the junior and technician levels, both employers and UCCB sources are confident that the labour supply is and will be adequate to meet the projected increased demand in environmental remediation.[3]

At the technician level, there are a significant number of workers cross-trained in several areas. Not all of the existing technicians are primarily involved in environmental service related businesses. But they have skills in applied research, lab techniques and scientific method that will enable them to serve new industry demands in sampling programs, field survey work, and risk assessments. Skills upgrading programs through the NSCC and UCCB will be possible, as the demand becomes firm.

In addition, there is a one-year engineering technician training program at NSCC designed for mature students (ex-miners and steelworkers) in environmental work.

Program promotion and recruitment adjustments could be made to reflect new technical requirements, if there is enough lead-time. For example, one company that employs UCCB graduates in environmental science will need more workers trained in chemical technologies. While the UCCB graduates have some skills in this area, the employer would prefer to have workers specifically trained in more chemistry. The chemical technologies program already exists at UCCB, but students have preferred other programs.

[3] At the height of remediation work, the human resource requirements will likely double the existing work force in environmental remediation.

3.3 THE HIGHER LEVEL PROFESSIONS

A supply shortage already exists and may increase in the higher levels of professional skills and project management.

Engineering and hydrogeology are the two areas with greatest demand, although there are people graduating from UCCB in these fields. The requirement for engineers with project management experience, and for scientists with advanced degrees and project management experience, is not limited to Cape Breton. Such specialists in environmental remediation work are sought after around the world. The labour market supply and demand picture for these professional service categories is tighter and more complex than the technical service categories.

One company reported they have not been successful in recruiting an intermediate level engineer. Others offered the opinion that it is hard to draw people beyond the bachelor's level to work in Cape Breton. Twenty-five to 45 year-old professionals, including engineers and engineering project managers, are not plentiful. Local graduates move to real job offers, not promises of future work. Project management people are in demand all over, and are tending to choose the offshore oil and gas industry rather than the environmental remediation sector.

Management programs are available through UCCB, but these will not remedy the lack of experienced project management professionals. Developing the skills of junior level technicians to senior levels through local training is possible, but will not likely meet the demand levels anticipated.

There are two strategic approaches to meeting the demand for higher-level professional services:

- attract professionals back to Cape Breton based on long-term commitments to environmental remediation, and
- create a Centre of Excellence -The centre would blend research, academic expertise, innovation, and commercialisation in environmental technologies, would help attract professionals and support the efforts of firms to commercialise their newly earned experience to earn sales off-Island.

These two strategies can work together, and some of the required elements are in place.

3.3.1 Attract Professionals Back

A simple and clear commitment from government that there will be large-scale environmental work over ten years would draw some experienced professionals back to Cape Breton. It is difficult to build capacity until there is a long-term commitment, with significant dollar amounts attached. Promises and shorter-term commitments do not offer enough to draw professionals back. If the work is done piecemeal, without major commitments, the larger off-Island companies will simply bring in the required expertise temporarily from their other offices or by subcontracting as needed. There will be limited net gain for the professional level capacity of Cape Breton companies and direct profits from the work will not accrue to the Island based entrepreneurs and companies.

The benefits of establishing firm, long-term commitments and building local capacity extend beyond the period of remediation. Companies with experienced professionals and proven project managers may well find similar work in Southeast Asia, Eastern Europe and other places beset with environmental problems. It will be at least five to ten years before many these opportunities mature. The timing would be good if Cape Breton developed its capacity in environmental services now.

3.3.2 Create a Centre of Excellence for Environmental Research

"You need a hub; without it you can't build a wheel."

The National Research Council (NRC) recognises that "the development of community-based innovation clusters is vital to sustained economic growth in Canada." The NRC cluster strategies focus on linking existing local strengths and opportunities in emerging sectors to its core R&D capacities. The NRC has already encouraged the development of globally competitive innovation clusters in Cape Breton in the fields of petroleum development and information technology. The strategy works to attract the "critical mass" of professionals needed to circulate between private and publicly sponsored research and innovation, and private sector commercialisation activities. Based on the anticipated environmental remediation work, the academic resources already in place, and the companies poised to take advantage of this work, environmental remediation could be the third innovation cluster in Cape Breton.

The potential has not gone unnoticed by UCCB, the academic institution best positioned by mandate and by geography to host a NRC-sponsored Centre of Excellence. There is a current proposal (to ACOA / AIF) by UCCB to establish a Centre of Excellence for Environmental Research. The Centre would blend:

- professional development;
- research;
- innovation; and
- commercialisation.

3.3.2.1 Professional Development

The proposed Centre could upgrade senior technologists to get their engineering and environment management degrees through affiliations with graduate degree-granting programs in universities across Canada and beyond. The precedent for this is in place. Currently there are graduate students from the University of Waterloo, McMaster University, and even a student from Leipzig, Germany doing research through UCCB. The silver lining in the environmental muck is that it provides a practice field for research and application as it is cleaned up over the next decade. UCCB can provide the technical support, laboratory facilities and contribute significant faculty expertise.

3.3.2.2 Research and Innovation

Research is the conduit to economic benefits. There is a clear opportunity to conduct research and develop innovative approaches to improve current environmental technologies. Specialty remediation technologies are not being emphasised right now, but some of the work necessary may not be economically feasible with current technologies only, according to at least one source

in our survey. This indicates that opportunities for research and innovation may exist. With respect to export potential, university research has already identified areas where new knowledge and products could be used in developing countries.

3.3.2.3 Commercialisation

Canada has established Centres of Excellence in several domains that are incubators for new technology companies. The NRC model for these centres has shown that commercialisation of new technologies is possible and significantly enhanced by the cluster of research infrastructure, innovation leading to commercial production, professional expertise, entrepreneurship and marketing support. Capital investment would be attracted to this combination, if it is known that successful research will lead to a piece of the environmental remediation work.

3.3.3 Public Education

There is also a need for public education. The work opportunities need to be promoted for young people and professionals who have moved away to find work in environmental services. The proposed Centre for Excellence could also inform the public about environmental science itself and serve as a resource to the Joint Action Group (JAG).

4.0 INDUSTRIAL BENEFITS APPROACHES

This section describes our examinations of approaches taken in other areas that might be instructive in creating an environmental industrial benefits program for CBI. Our examinations focused on the policies and actions that other jurisdictions have used to:

- increase local participation in large projects; and
- maintain the new type and level of local economic activity after the major procurement or project is completed.

We have:

- reviewed policies and actions of other jurisdictions;
- reviewed third party assessments of the "industrial benefits" policies and actions;
- determined what opportunities internal and international trade agreements may offer to an Island benefits plan;
- reviewed actions undertaken in other jurisdictions to sustain a local economy once major procurements projects have been completed; and
- reviewed special cases in local procurement (offsets, counter-trade, transacting risk).

Relative to the amount of information on policies and programs designed to encourage research and innovation diffusion we uncovered limited examples of programs used to encourage sustained local industrial benefits from large projects. The majority of typical industrial benefits programs, related to short-term industrial benefits, could be drawn from the defence and energy sectors. Most of the programs in jurisdictions outside of Canada focused on capturing the benefits from R&D and using them as precursors to new types of commercial activity. There is an analogy to Cape Breton Island. It is seeking to capture the experience from the forthcoming remediation work, but to sustain itself after the bubble; it will have to turn its experience and profits into new or improved services.

4.1 CANADA IS IN THE LEADERSHIP GROUP WITH RESPECT TO R&D, TECHNOLOGY DIFFUSION AND INNOVATION

The literature suggests that Canada is considered to be a leader in defence offsets programs and its broader "Industrial and Regional Benefit Policy."

The UK Department of Trade and Industry, in its recent survey of top 300 international companies, found:

- R&D averaged 4.6% of sales;
- by country the top three R&D investors were Denmark (16.3%), Canada (10.8%) and Finland (10.4%) and the US was 7th at 4.9%; and
- Canada is 2nd behind the US in new listings on NASDAQ.

Background research prepared for the National Innovation Summit (Australia, February 2000) found that among OECD countries:

- Canada had highest flows of venture capital as a percentage of GDP (0.2%);
- the US was 4th at about 0.11% of GDP; and
- Canada had highest flows of venture capital to early stage and expansion investments at 0.075% and 0.125% of GDP respectively, almost twice a high as the US.

The negative side of these observations is that it appears the Island may not have been a major beneficiary of either defence related offsets programs or industrial regional benefits policies. From a more positive perspective, that Canada is seen as a major player in the business of offsets and regional industrial benefits actions suggests that the country should be receptive of an industrial benefits program targeted at the Island.

The following sub-section provides an overview of the key types of programs that have, and are being used to capture local economic benefits from large projects and procurements, which are one time events or are expected to occur relatively infrequently.

4.1.1 National Policies and Programs

4.1.1.1 Industrial and Regional Benefit Policy

This policy is implemented on procurements greater than $2 million and is not covered by NAFTA or WTO. The sectors not covered by NAFTA or WTO agreements include procurements related to:

- national security;
- shipbuilding and repair;
- coast guard;
- space;
- information technology;
- research and development; and
- communications.

Within these procurements, the federal government can give potential suppliers specific direction to source material and services from Canadian firms or regions.

The OECD has observed that R&D in Canada is concentrated in a few sectors and in a few firms. It concludes that the concentration likely slows technology diffusion in Canada. As a partial response to this advice federal government R&D programs (e.g., the Space Station Program of Canadian Space Agency) make commercialisation of public research an explicit policy objective. The idea being that once commercialised the diffusion of the innovation in the new product will be accelerated.

4.1.1.2 North American Free Trade Agreement (NAFTA)

NAFTA is designed to free trade flows between its signers in the belief that:

- free flows will increase the efficiency of the North American economy and economic growth will accelerate; and
- a rising tide lifts all boats (assuming you have a boat and it does not leak).

The Agreement set rules for trade and takes into consideration the state of readiness of the economy of each of its signers to benefit from free trade principles.

NAFTA offers Canada several avenues to use the Island's remediation work as a form of economic development. They could be applied singly or in combination, depending on the nature of the projects or elements of a project.

The remediation work associated with the DEVCO properties, as a Crown corporation, is not subject to NAFTA, unless the Corporation chooses to use Public Works Canada as its agent.

Small Business and Minority Set-asides - The Agreement permits countries to set aside portions of procurements for bidding by small firms and firms controlled by minority groups. The United States makes extensive use of set-asides however the Canadian government had not used this option to direct a portion of trade.

Our understanding is that the federal government is loath to employ set-asides because it does not wish to appear to be regressive in terms of its approach to freeing trade. This situation may arise from the fact that European countries and Japan have recently brokered a deal that allows the US to impose set-asides in trade between their countries providing US state governments submit to international trade rules that apply to federal procurements. So far, about 36 states have agreed. By taking up the set-aside option provinces may be asked to submit to international rules. On paper this would be a two way street but the consensus among the provinces is that access to European local government purchases has little to offer. The provinces focus on the US market.

Nova Scotia and ECBC would need to lobby the federal government and demonstrate that set-asides, or at least some form of set-asides, would not compromise Canada's trade negotiations more than the benefit that would accrue.

Contribution Agreement with Nova Scotia – Article 1001 of NAFTA allows governments to enter non-contractual agreements and co-operative agreements for the provision of public goods and services. These purchases would not be considered procurement subject to NAFTA. This article is meant to be invoked when sub-national governments are engaged in activities that are typical of their responsibilities for the provision of public services but may be prevented from meeting their responsibilities for financial reasons.

Canada would need to argue that all or some of the remediation work is typical of what is expected of the Government of Nova Scotia and that federal cash contributions are needed due to the province's financial limitations. The federal government would provide funding but would not direct the remediation-related procurements. As a provincial government purchase, NAFTA would not apply.

Special Operating Agency – A special operating agency could be created to deliver the remediation projects or parts off the overall remediation need. The agency would not be subject to NAFTA.

There are some difficulties with this approach. Nova Scotia would have to make the case that the situation is unique and that no existing organisation can properly deliver the remediation activities. This tactic may be applicable in only a few aspects of the overall remediation program for the obvious reason is that most of the type of work to be done has in the past been managed by existing government departments.

There may be elements of the clean up that could be the job of a special operating agency. The agency would not be subject to NAFTA

Research, Development, and Field Trials of New Technologies – NAFTA permits countries to restrict procurements when publicly funded R&D are involved. It also permits special treatment off procurements that are designed, at least partly so, to field test developing technologies.

This avenue could be taken in Cape Breton as the incinerator complex at Muggah Creek watershed was incorporated into a research program at UCCB and used as a testing site. Part of the remediation program could be reserved for technology testing. This work could be limited to Canadian firms and organisations.

4.1.1.3 Agreement on Internal Trade

NAFTA does offer many avenues to direct procurement associated with the major remediation projects to the economic benefit of Canadian firms. However, none of this necessarily means that Nova Scotia, never mind Cape Breton Island, residents and firms will benefit.

The Agreement on Internal Trade (AIT) is an intergovernmental agreement signed by the First Ministers of Canada. It came into force in 1995. It addresses obstacles such as labour mobility and discriminatory procurement practices. It attempts to make internal trade rules consistent with reduction in international trade barriers.

Elements of the agreement allow exceptions with respect to certain government purchases and demonstrated need for special regional development effort. As noted below, British Columbia does take advantage of this option in its procurement policy. Newfoundland and Labrador is attempting to make the case that providing a long term contract to XWave, a provincially based firm, to provide IT services should be regarded as a special regional development effort. There is some possibility that the Newfoundland and Labrador petition may be stretching the rules farther than intended. If so, there may be a minor backlash that leads to the tightening of the circumstances that are deemed special regional development efforts.

This opening, combined with the avenues provided by NAFTA, form the basis of a plan to favour Nova Scotia residents and firms, and by extension residents off Cape Breton and firms based or substantially based there. However, actions need to be designed to target Cape Breton. More on this in section 5.0.

4.1.2 Provincial Policies and Programs

4.1.2.1 British Columbia

Public Sector Purchasing Policy – This policy recommends that up to 20% of decision weight on provincial government tenders can be allocated to the relative BC value added offered by proponent. BC valued added is to be encouraged by:

- modifying tenders to permit BC bids;
- “first buy” initiatives (essentially standing offers that give BC firms the first chance to sell to provincial agencies);
- joint solutions procurement (contract for long-term relationships with suppliers that guarantee minimum levels of purchases from a given firm over a period to time);
- strategic partnering; and
- judging value via a life cycle analysis versus initial cost.

The Federal-Provincial "Agreement on Internal Trade" permits exclusions for special regional development purposes. Therefore, the BC policy should only be implemented when a regional development question is at stake. However, the policy has been quite widely interpreted by BC.

4.1.2.2 New Brunswick

The province does have an informal but powerful industrial benefits process underway. The province's Acadian population has long held the view that its cultural and economic security are tied together. The combined imperatives of community and economic building provided the incentive for economic co-operation within the Acadian community. The "caisse populaire" system is widely used as a means accumulating capital for re-investment into the Acadian community. The concepts of the Co-operative movement are widely used.

This is largely possible because the desire and need to maintain the cultural integrity of the Acadian community create a border effect that helps retain economic activity within the community. Prices may be higher at the co-op store than in Moncton but the community member is getting value for money - the product and insurance for cultural integrity.

As spending is retained in the Acadian community it accrues profits that for re-investment in its community. The benefits of economic development are measured not only in dollars, but also in the security of culture and community, that is part of each of their purchases and investments.

Manufacturing Technology Centre, University of New Brunswick – This centre was established in 1980s as part of the offsets program from Canada's CF-18 purchase. The centre now conducts about $300,000 per year in contract research. All profits are re-invested in the centre.

This centre is virtually the sole lasting legacy in Atlantic Canada of the industrial offsets negotiated for the CF 18 purchase. It survives because it used the short-run offsets benefits to enter lines of business and service that it could reasonably expect to sell. It did not depend on the ability to break into the aerospace market.

4.1.2.3 Newfoundland and Labrador

Memorandum of Understanding to Create Bull Arm Fabricators[4] - This MOU was signed (January 1999) by the Bull Arm Site Corporation (a crown corporation). It is a joint venture of Brown & Root Energy Services, PCL Industrial Constructors, Inc. and ConPro Group Limited. The provincial government is using this MOU to attempt to level downstream benefits from the offsets received by Newfoundland during the construction of offshore structures for the Hibernia and Terra Nova oil field developments.

The joint venture is a response to the need for continuous activity and maintenance of the skilled workforce. Otherwise the skill levels would fall behind those of competing areas and skills labour would leave the province. The initiative intends to help ensure there is no gap between current work, and work related to the development of the next Newfoundland offshore oil field.

[4] A similar attempt to re-use infrastructure and skills was made in New Brunswick. With the completion of the bridge between NB and Prince Edward Island the fabrication yard and load-out facility were left idle. Attempts, to now unsuccessful, are being made to re-use the facilities for large fabrication projects.

The MOU requires Bull Arm Fabricators:

- undertake a six-month review of world wide prospects for work at Bull Arm for the onshore and offshore hydrocarbon exploration and development market; and
- undertake this initiative at their own expense.

The rationale for the firm's creation is that improvements in productivity achieved during the Terra Nova project, which followed the Hibernia project, would help establish Bull Arm as a globally competitive fabrication yard.

In May 2000 Bull Arm Fabricators and Friede Goldman Newfoundland, owner/operator of the Marystown shipyard, joined forces to pursue work for the proposed floating production storage and offloading (FPSO) for the White Rose project. This is the first time that the two largest fabrication providers have joined forces to offer a 100-per-cent Newfoundland solution to a fabrication project of this size.

4.1.2.4 Quebec

Quebec has few apparent programs and policies to accrue benefits from large projects. We say apparent because virtually all development and purchasing decisions and programs include consideration of the impact on Quebec. The consultants were told this is the case because Quebec's interest in acquiring benefits from work done in the province goes beyond economic to social and cultural benefits.

The principles and process in Quebec holds somewhat parallel those found among the Acadian population of New Brunswick.

Bio-industries Association – Quebec has quite a few examples of this type of organisation. The bio-industries association creates alliances and partnerships to assist in research projects, product development, marketing, intellectual and property law issues and human resources development. These types of associations operate with a broader scope of interest, and even more vigour, than similar organisations in the rest of Canada. The primary reason is that the organisation takes on some aspects of social and cultural imperatives.

Their approach has some parallels to that taken by the Acadian community of New Brunswick.

4.2 AUSTRALIA

Australia has a substantial number of programs and polices to encourage investment and innovation. Outside of defence procurements, it has few substantial programs that are designed to direct large project spending to states within the country. The following are the main polices and programs used to help capture economic benefits from technical experience, research and applied research.

The State of Victoria did conduct an Environmental Service enquiry in 2000 to begin a strategy to increase its exports of environmental services and products. The following findings have relevance to Canada and by extension to the environmental benefits strategy of the Island. The enquiry found that the:

- US, UK and Canada by 1998 had adopted foreign aid supported environmental service export strategies with public sector assistance to marketing, export financing, support for embryonic technologies, support for demonstration plants;
- US, Germany, Japan and Canada are net exporters of environmental services; and
- main competition would be from the US and Canada as they are now looking to East and Southeast Asian markets and already have a large share of the OECD market.

These findings bode well for the long-term prospects of a Cape Breton Island based environmental sector. It should be able to use the coat tails of the rest of Canada for quick entry into major world markets. This assumes federal and provincial governments agree that the attention given to the Island's environmental sector is a regional development investment whose national benefits exceed the cost of the additional competition that may be encountered by existing Canadian exporters.

Innovation Investment Fund (1997) – This fund helps technology based small and medium size enterprises (SMEs) (<$5 million AD in sales) access venture capital. It is restricted to SMEs that are commercialising technology

Illawarra Technology Corporation, University of Wollongong – The Corporation, as originally set up, failed as an incubator to nurture spin off companies. In 1996, it changed its approach by focussing on the Technology Development Fund as its essential program. The Fund targets commercialisation of in-house research.

The university-based organisation has the freedom to operate on a commercial basis. The corporation does contract research on a for-profit basis. In 1998 it did $ 18 million AD ??? in contract research. The profits revert to staff research accounts for their own use. Benefits from intellectual property created are split 50/50 between the University and researcher.

The new approach was successful and in 1999 the university went on to establish an off campus Engineering Innovation Centre, in collaboration with private sector firms, to commercialise technology. The success of the Technology Corporation at managing the development fund and conducting profitable research helped build the confidence of private firms and their willingness to partner with the corporation.

4.3 CZECH REPUBLIC

Despite what has been called the Czech Economic Transformation there have been concern raised that the government:

- has been inconsistent in it approach to industrial restructuring, at once supporting technological and market change and providing special financial assistance and special deals to keep "industrial dinosaurs" alive;
- needs to guide firms to change themselves, attracting foreign investment to do so, or allow them to die; and
- has been linking industrial restructuring to industrial offsets, which was like "mixing apples and oranges." Offsets alone would not solve the industrial restructuring problems because market forces not government policy will ultimately direct investment and trade flows.

Industrial offsets provided short-term benefits but the experience gained was not re-invested into new and improved products and services. Profits from the offsets were not accumulated to provide investment capital for industrial improvements, commercialisation and spin-off companies. Firms that were boosted, or created, by offsets did not manage to enter markets directly related to the offsets. Most failed once the offset commitments were fulfilled.

4.4 EUROPEAN UNION

The EU established a process to create Regional Innovation Strategies (RIS) in 19 of the EU's less favoured regions. In the sub-sections below, we review the activities of some of the more successful RISs. The strategies and the organisations that implement them parallel largely the structure and role of "regional development authorities" in Nova Scotia.

4.5 FINLAND

Finland created the National Fund for Research and Development. Its mission is to take research to market. It operates independently to manage a public fund of about $150 million US. The distinguishing feature of the fund is that its main strategy to reach its mission is to support new ventures via minority equity participation. This gives the fund a personal stake in the new firms and puts it in a position to exact direct management control as required.

4.6 GERMANY

Germany has a variety of programs designed to help business take experience and research to new markets and product. The program of particular interest to this study is that embodied in the approach of the Fraunhofer Society. As its names suggests it targets commercialisation of research in the microelectronics sector. To meet its mission it engages in contract commercialisation research, somewhat like the Illawarra Technology Corporation in Australia.

The society is driven by industry lead partnerships with universities, banks and technology transfer centres.

There are other organisations similar to the Fraunhofer Society. They are targeted at other sectors, e.g., biotechnology.

The society offers a pool or research and commercialisation talent that can be drawn upon by its members. The society's staff is composed of full and part time hires and staff seconded from its members. The seconded staff may actually be working on projects for companies other than their own. Obviously, structures, formal and informal, are in place to protect intellectual property rights. The pool of talent is larger, more diverse and more flexible than most firms could develop on their own.

4.7 HONG KONG

In 1999, the City University of Hong Kong created a commercial arm, CityU Enterprises Ltd. to promote technology transfer and realise commercial gains.

4.8 ICELAND

Iceland does not have a particular industrial benefits or innovation commercialisation program. It is of interest to this study due to the startling parallels is has with the New Brunswick Acadian community's development as a cultural and economic force and contrasts it has with Cape Breton Island.

At its independence just after the end of World War II Iceland had a narrow and weak economy based on sheep farming and fishing. Iceland has virtually no arable land.

Iceland has three natural resources; grass, fish and hydro electric and thermal power capacity. Its climate is harsh. Iceland has a population of about 273,000 and GDP per capita that matches Canada's at $24,400. Its unemployment rate is substantially lower than Canada's, even though it has a higher labour force participation rate.

Iceland is reported to be driven by a common partnership in a common economic, and consequently national and societal, fate. It mixes lessons from political and economic ideologies in a fashion that shifts its national purpose. Consequently, it willingly goes to great lengths to add all the value it can to its raw materials. Foreign investment is often conditional on joint venture with the private or public sector. Branches of multinationals are scarce. Programs to accumulate local capital for investment locally limit foreign private and public debt. The government supports more than half a dozen institutes for research in marine science, fishing, agriculture, industry construction and communication. Their mission is to develop applications of technology that will substitute for import and support speciality exporting.

The hard work of Icelanders is to a large part driven by the cultural and political imperative of nation building. It efforts to invest locally and sell internationally are made easier by the fact this it has national borders for some protection and a culture it values in real economic terms.

Cape Breton does not have national or even provincial boundaries that will help it muster its economic resources. It does not have the same cultural imperative of the Acadians in New Brunswick or Icelanders or the same real and perceived isolation that could lead to its demise. However, the Iceland and Acadian models do work. Our recommendations for action in Cape Breton seek to simulate the effect that national and cultural borders have in New Brunswick and Iceland. They seek to help ensure that wages, profits and investment capital are earned by Islanders and can willingly be re-invested in the Island economy.

4.9 KOREA

Korea works to take commercial advantage of experience on large projects and basic research by focusing on increasing the supply of technology to firms via R&D support. R&D results are diffused via a network of "Regional Research Centres." The goal of the Centres is to increase demand for new technology by business. It believes that the willingness to pay for new technology will increase as businesses' ability to understand and know how to use new technologies increases.

4.10 NETHERLANDS

The Netherlands has established a network of regional Innovation Centres. The centres employ consultants who act as intermediaries between firms and sources of technology know-how.

4.11 NEW ZEALAND

This country provides funding to firms to buy research or business consulting services. The purchased services help prepare the business case for new commercial ideas. The support is normally provided only when the case is to be used for presentation to venture capital suppliers.

The focus on supporting the search for financing has the effect of tying government support directly to commercialisation activities.

4.12 NORWAY

Norway focuses its business development efforts through its New Technologies Program. This is a consulting based program. Its purpose is to help firms improve their competitiveness and ability to make and absorb change.

One of the distinctive features of the program is that it rigorously measures progress by a process of continuous evaluation. Most other programs in other jurisdictions are less demanding in the measurement of progress. To some extent, they rely on articles of faith in the relationship between technology use and the creation of new businesses.

The program employs and contracts only those consultants that have the prescribed training in the processes that improve commercial competitiveness. The program also offers consultant training.

The success of the program is demonstrated by the fact that the European Union is now supporting the program's application in other EU countries.

4.15 POLAND

Poland offers an important case study of technology transfer in an underdeveloped sub-region of a nation. The case offers insights into the Cape Breton Island situation.

The Wroclaw Region of Poland has a population of about 1.3 million. A case study was undertaken of a flagship foreign investment in a brownfield site in the region. It was hoped that the investment would help generate spin-off local private greenfield investments.

The case study examined the extent to which flagship investments could transfer skills and competencies that would upgrade human capital and hence increase local economic self-sufficiency.

The belief was that external investment would help pave the way to external market access. Once the access was achieved, the local economy could take on the challenge of progressing to international market significance.

The researchers found that the success of the foreign investment did not depend on lower costs in the region. The technology that the region could accommodate was only slightly different from the foreign investor's.

The real change caused by the foreign investors stemmed from their need for local management skills and people willing and able to compete in international markets. Without these traits at the local level, the project would not be successful.

The case found that:
- external investments had limited backward linkages into the local economy;
- spill-over effects into the indigenous economy were disappointing; and
- un-anticipated positive impacts occurred on human capital, which provided some basis for future local based economic improvements.

Without the backward or spillover effects into the local economy local wealth was not increased significantly. Therefore, unless the existing local economy could muster pools of investment capital the improvements in human capital may not have the where with all to invest in local based economic development.

4.14 SOUTH AFRICA

The Department of Trade and Industry operates and sponsors Spatial Development Initiatives.

The program supports private investment in eight selected geographical areas that show significant economic potential. Government action focus on removing investment obstacles, providing infrastructure, and marketing services.

The Richards Bay Empangeni SDI is one of the largest initiatives. The initiative focussed on developing the Bay as a major ocean port, via foreign investment from a major carrier and port operator. The port development itself was successful but there have been fewer than expected backward linkages into local economy.

The SDI approach appears to have entrenched a notion that growth can only occur by eternal investments. This notion left the area without an endogenous growth dynamic.

The evaluators of this initiative concluded that physical infrastructure and the removal of external investment barriers need to be supported by:
- "soft" infrastructure investment, primarily in human resource development; and the
- removal of barriers to internal investment (e.g., ability to build local wealth, local investment in diversification and new businesses and types of businesses).

4.15 UNITED KINGDOM

Three Regional Innovation Strategies were developed in 1999 for areas in England and Scotland (Strathclyde, Scotland; West Midlands, England; and Yorkshire and Humberside, England). Each had a "unique" local focus but it is their common elements that are instructive to the Cape Breton Island situation. Each of the areas had the following features in common:
- services to help engender innovation and an entrepreneurial culture;
- upgraded information technology and communication infrastructure;

- regional universities for R&D; and
- universities committed to the commercialisation of ideas.

The strategies are being implemented by:
- establishing a policy and objectives consensus;
- conducting a survey of needs for innovation;
- programs to build an innovation culture;
- programs that encouraged university "spin-outs"; and
- building business support structures.

The implementation actions are led by business or business / agency coalitions. Within the coalitions, the business sector is the more equal of the two parts.

The Yorkshire and Humberside RIS, England is of interest because it has an environmental industries component, primarily because the area has 1,500 companies and 7,500 direct jobs in environmental industries.

The Environmental Industries Board is private sector lead. It has set up the Environmental Business Network at University of Sheffield ($2.5 million US), which implements the strategy of the Environmental Industries Board.

The overall efforts of this RIS are supported by the Technology Innovation and Development for the Environment pump-priming investment fund.

This RIS has established a regional database, supports an Export club and sponsors an Ecodesign program. The program works to apply environmental principles in the design of new products and processes

4.16 UNITED STATES

4.16.1 Federal

The federal government set the stage for acquisition of expertise and commercialisation of the experience and research via two pieces of legislation.

The Stevenson-Wydler Technology Innovation Act, 1980, was crafted to facilitate the movement of technology developed in government laboratories into private sector hands.

The Baigh-Dole Act, 1980, allowed universities and not-for-profit research institutes and small businesses doing government contract research to keep technologies developed and apply for patents in their own names.

In combination, these pieces of legislation boosted innovation and start-ups. They have subsequently been modelled on by other countries.

4.16.1.1 Department of Energy

This department has a variety of industrial benefits and commercialisation related programs. The essential ones are summarised below.

The department offers a variety of environmental technology development programs and services. These include:

- collaborative arrangements;
- procurement provisions;
- licensing of technologies;
- consulting; and
- reimbursable work for industry.

Grants and collaborative agreements are entered into if 51% of the value of the work is related to a public interest goal (primarily the advancement of US capabilities, technology transfer, advancement of scientific knowledge, education and training of individuals or businesses).

The Department's "Industry and University Programs Area" funds R&D partnerships with the public and private sectors, providing they introduce new technologies to DoE programs.

Special consideration is given to small business, which in the US context includes firms with less than about 500 employees. For example, the Small Business Technology Transfer Program helps small firms participate in the commercialisation of expertise and technology via procurement set-asides

The DoE is also one of eleven federal agencies involved in the Small Business Innovation Research Program of the Small Business Administration.

4.16.1.2 Small Business Administration

This agency offers three important programs to small businesses seeking to take advantage of technology and experience:

- The Small Business Innovation Research Program provides grants and contracts to firms with fewer than 500 employees for technology feasibility studies.
- The Small Business Technology Transfer Program sets a percentage of federal R&D funding aside for small business and non-profit R&D and commercialisation proposals.
- The Manufacturing Extension Partnership is private and publicly financed. It provides a network of extension centres to assist in the commercialisation activities of private business. A recent evaluation found that about 70% of the volume of service it provided was incremental to what the companies would have otherwise purchased from private sources.

4.16.1.3 Department of Commerce

This department offers the Rapid Commercialisation Initiative that is an inter-agency R&D assistance program. It provides a gateway to funding and in-kind assistance from other agencies to private sector firms with commercial-ready technologies. It does not provide marketing, financing or production assistance.

The technologies must be private market focused.

4.16.1.4 Environmental Protection Agency

The EPA offers a wide range of R&D and commercialisation assistance programs.

The National Environmental Technology Applications Corporation has the most relevance to the Cape Breton Island industrial benefits question. The corporation provides business evaluations, technology evaluations, regulatory and intellectual property assistance, training and technical services such as testing and demonstration to private firms.

4.16.1.5 Department of Defence (R&D assistance programs)

The Department of Defence is one of the major conduits for public sector support to regional economic development. The department has many programs that relate to the environmental sector.

For example the Air Force Center for Environmental Excellence Innovative Technology Program provides grants to field test innovative technology of special interest to air force sites

The Center's Environmental Security Technology Certification Program provides support to field test lab-proven technologies with broad DoD and private market application.

Many other R&D, field-testing and commercialisation support programs use DoD sites. The work generally must meet DoD needs and have application to private sector needs. Because the support can be described as national security related support and preference provided to US firms it is not constrained by NADTA or WTO agreements.

The process of setting aside DoD sites for testing and product development works well for several reasons:

- The sites are generally remote.
- Activities at the sites have been well documented and therefore they are well suited to field test activities.
- They can legally serve as a major conduit of preference and aid to the US private sector to build experience and commercialise technologies.

4.16.2 State of Hawaii

The key environmental related commercialisation program of the state is its Strategic Technology Marketing and Development Program (2000). The activities of the program target Asia-Pacific markets. Cultural ties serve as a launch pad for its network building.

The program:

- seeks to sell local technology and attract US mainland firms to Hawaii;
- established the Center for Asia-Pacific Infrastructure Development to promote environmental and energy related export;
- established the Hawaii-Philippines Energy Efficiency Technology and Policy Transfer Project to introduce advanced energy efficiency technology and policies;
- conducts technical and market assessments; and
- supports trade missions, seminars, workshops, exchanges, etc.

4.16.3 State of Wisconsin

The Wisconsin Environmental Industry Export Forum provides networking and education programs for export ready firms. It also serves as an "honest broker" with European firms.

4.17 SPECIAL CASES

There are a select number of special case industrial benefits strategies that are, or were, widely used by a large number of jurisdictions. Some of the more relevant are described below.

4.17.1 Industrial Offsets (also called Compensatory Trade)

Demands for, and acquiescence to, industrial offsets are banned under GATT, WTO, US law and NAFTA (Article 1006). Exemptions are allowed for national security reasons. In practice, governments have restricted their demands for offsets to defence related procurements. About 100 countries have on-going offsets programs, versus about 20 in 1985. Canada is reported to have among the largest number of bureaucrats tracking offsets, in the order of 200.

Offsets approaches include:

- co-production agreements;
- investments by vendor in purchasing country;
- international marketing assistance to firms in the purchasing country;
- provision of export credits to firms in the purchasing country;
- participation in non-defence contracts of foreign vendor firm;
- provision of offset credits from vendor to purchase vendor's defence or other equipment and services; and
- joint ventures with firms in purchasing country.

Offsets can exceed 100% of contract value.

Canada negotiates offsets via DND's Major capital Projects Industrial Development Initiative.

Canadian and world-wide experience with offsets has been mixed. Many firms or industries supported or created by offsets failed because they were focused on one-of-a-kind procurements and were unable to move into markets associated with the offset. In many cases, the expertise associated with the offset was so specific that firms were not able to adapt the new-found expertise to other markets or products. The Manufacturing Technology Centre in New Brunswick is one of the exceptions because it used the new technology to gain market share in aspects of the economy to which it had historical and strong links.

4.17.2 Counter Trade

Counter trade is the equivalent of barter. It offers few industrial benefits but is used by countries that have foreign exchange shortages or very weak credit ratings.

4.17.3 Transacting Risk

This is a special form of trade financing that can offer the buying country industrial benefits. The buyer often pays based on cost savings or benefits promised by the vendor – a form of performance payment. The payment schedule is negotiated up-front to ensure that the performance standards are understood and easy to measure.

The buyer generally attempts to disperse more risk by paying with equity positions in its firm.

4.18 CROSS JURISDICTION POLICIES AND APPROACHES TO INNOVATION AND COMMERCIALISATION FOR ECONOMIC GROWTH

The following sub-sections describe important findings that have general application to the creation of industrial benefits and commercialisation programs.

The OECD in its report "Technology and Industrial Performance, 1997" found that:

- invention and initial commercial exploitation of new products and processes mattered less than the rapid and widespread diffusion of that technology;
- small countries and economies rely on technology imports for more than half their acquired technology;
- acquired technology is as important as own country R&D;
- in manufacturing R&D explains most productivity growth; and
- in services, the diffusion of technology matters much more.

4.18.1 Importance of Technology Diffusion to Expansion of the Environmental Services Sector

The question for Cape Breton Island is "If diffusion (the process by which technology and the "tacit" knowledge of how it should be used spreads from innovator to users) matters more than a company's own R&D then what will improve the diffusion process to and on the Island?"

The OECD found the following methods were most commonly used to facilitate the diffusions process (Diffusing Technology to Industry, OECD Observer, August 1997). During the 1970 – 80 period OECD countries set up:

- technology databanks;
- licensing and transfer agencies; and
- regional centres that help small firms upgrade processes and product development.

The researchers found that many obstacles to diffusion arose from deficiencies in firms' human capital in terms of skills and management capability. As a response to this need Australia, Denmark and Germany created and now maintain technology broker services, networking initiatives and business advisory services in addition to their technology demonstration centres. The Netherlands and the UK take this further by providing support for worker training.

A related study of best practices (in technology diffusion) found that the definition of a best practice depends on the objectives of diffusion. However, the following general themes emerge:

- The mix of programs is important. Programs that support the supply of technology and the demand for it are both needed.
- Technology adoption is a local issue so there needs to be some complement between programs and local infrastructure.
- The diffusion program needs experienced and well-trained staff to deliver programs.
- The staff should work from within firms.
- Worker training is required to enhance its capacity to absorb new technology.
- The diffusion program should consider multiple uses of technology, in a range of economic sectors.
- The program needs some indirect support, e.g. tax incentives to promote R&D, training, investment in research personnel.

- The capital markets in the home country must be efficient (i.e., local firms must be able to build wealth and attract investment capital).
- The home country must have stable macro-economic policies (low inflation, orderly foreign exchange markets).
- Firms in the diffusion target area must be geographically close to ensure close interaction and the scale needed to have wide impacts.
- The program should build on local resources.
- The program should maintain close links with industry groups.

Formal diffusion programs do not have to exist indefinitely, just long enough to develop trust and long-term relationships between firms and diffusion service providers. They need not be considered permanent public sector programs.

4.18.2 Commercialisation – "Then You Have to Make It Happen"

By the 1990s, diffusion became less of an issue than "making innovation happen." Making it happen, getting use out of an innovation, rose to 1st from 5th on US industry's issue list in the mid-90s and had been at the top of Canadian industry's list for several years prior

Firms and organisations that are successful in making it happen have several things in common:

- The importance of innovation to the life of a business / organisation / community is clear to all direct stakeholders.
- "Next-to-impossible" goals are set.
- Firms and individual participants involved in commercialisation move frequently between research and business units / organisations.
- The successful firms target areas where there are still many answers needed.

Successful regional economies, known for their rates of diffusion of innovation and commercialisation, also have some things in common. Stanford University produces as many start-ups companies each year as engineering and business graduates. Why did this not happen in Massachusetts? The sense of sovereignty was greater in Massachusetts. "It was too proud of its skill set" which made it:

- reluctant to share ideas; and
- relatively insular to new technologies and new ways of doing business that were happening elsewhere.

Why did it happen in California? The consensus answer is that:

- It had the correct mix and concentration of skills - scientists and engineers to patent lawyers to venture capitalists.
- There was more sharing and therefore a more rapid diffusion of ideas.
- It was more open to new ways of doing research and business.

Why does it happen in Israel? Israel is now 3rd behind the US and Canada in new listings on NASDAQ. It is seen as potential rival to California because it:

- is a close-knit, ceaselessly networking community;
- deals daily with risk, admires risk-takers and actually has some disdain for non-risk-takers;

- reveres learning; and
- has large inflows of well-educated immigrants (Israel has 125 engineers and technicians per 100 thousand people versus 18 in US).

4.18.3.1Target Areas Where There Are Still Many Answers Needed

Experience and research have shown that firms often lose their way in the search for places where many answers are still needed. Peter Drucker summarised the "Seven Sources of Commercial Opportunity" (Innovation and Entrepreneurship, 1985). His research showed that the following situations pointed to locations where there were still many answers needed. Based on the experience of companies, large and small, he ranked places according to the ease at which one could find unanswered needs to commercialise:

- (easiest) – unexpected success, dissected to see what happened and how to replicate it;
- difference between expected and actual results;
- inadequacy in a product or process that had been taken for granted;
- surprise change in industry or market structure;
- demographic change;
- social perception of change; and
- (most difficult) – changes in awareness caused by new knowledge or technology.

He discovered that firms often spent most of their commercialisation efforts tying to create and sell products and services based on new knowledge or technology. Large firms may be able to afford this approach because they have the carrying capacity to wait for the idea to mature and possibly to spawn additional spin-off products and services. Small firms and small economies do not have the carrying capacity. They need to focus on the easiest places to find sources for commercial opportunity. This is doubly true for Cape Breton Island. It has small firms and a small economy; and on a per person or per firm basis the economy is already weaker than the rest of the Maritimes and much weaker than the rest of Canada.

Once firms in Cape Breton focus on the easy places to apply their experience and profits to find commercial ideas they will need to almost immediately focus on export markets (the rest of Canada and the rest of the world). Experience and research shows that exporters, especially service exports, innovate and sell by:

- changing their service; redesigning it to meet customer needs more effectively;
- changing the service delivery process; and
- improving management and organisational processes (e.g., quality assurance processes).

5.0 INDUSTRIAL BENEFITS TARGETS AND MODELS FOR CAPE BRETON ISLAND

The objectives of the industrial benefits program are to maximise:
- the number of Cape Breton residents that work on the forthcoming remediation projects;
- experience gain of resident labour and companies;
- profits earned by resident companies for re-investment into environmental business related exports sales and expansion.

The main means to achieve these objectives are as follows. The approaches can and should be used in combination, depending on the specifics of the remediation project being undertaken and the expediency with which an approach can be implemented.

Based on findings presented in the preceding sections and the condition of the Cape Breton Island economy and labour force we recommend two model programs to capture short and long-term industrial benefits.

We assume that in the short run the majority of the input by Cape Breton will be in the form of services versus manufactured products. Based on this assumption the recommended models focus on the types of actions needed most to capture the experience and expertise associated with the Island's remediation projects that can lead to:
- a large number of short term jobs and contracts; and
- a larger environmental services sector that can develop and export new and improved services.

Regardless of the type of model followed extensive lobbying will be required by Nova Scotia and Enterprise Cape Breton Corporation (ECBC) with the federal government to convinced it to take a new path in regional industrial development. The lobbying should be broad based to prove that the initiative has broad support in Cape Breton Island.

Whichever model is implemented it should be accompanied by a continuous evaluation process. Successes and failures need to be monitored, explained and then changes to the industrial benefits strategy made accordingly.

5.1 MODEL ONE: REMEDIATION FOLLOWS CURRENT PLANS

Our projection of the amount of remediation activity is based on the current requirement to use proven and standard technology. Therefore the expertise gained will also be standard and proven and will, without modification, be difficult to re-sell. The market for these technologies is mature and dominated by established firms that now compete more for market share and market domination than to create new lines of business. Market entry by Cape Breton firms will be very difficult.

The results of sections 2.0 and 3.0 show Cape Breton based labour and firms, and branch offices of off-Island firms should be able to absorb a larger portion of work than in the past. This should be the case is for no other reason than the attention that this study and others drew to the type and amount of forthcoming work. The future market is now quite well known, and firms and labour are already planning to capture work.

Under this scenario, the most likely route to creating a larger environmental services sector for the long term lies in the use of accumulated expertise and profits to re-invest to create new or improved services. Moreover, we recommend that the creators look to the easiest places to find new commercial ideas (as described in the previous section).

The worth of this approach is demonstrated by the results of a survey in the latest edition of Inc. magazine. It surveyed the 500 fastest growing companies and found that 75% of the CEOs reported that their whole business was based on the ordinary, the simple, and almost the mundane. Their growth was based on providing goods and services better, faster and cheaper - not creating a product or service revolution or by taking the newest science or technology to market.

To make something of the expertise that Cape Breton will gain it must learn the lessons of its history. The economic base of the Island has been, and to some extent still is, dominated by large non-resident firms and organisations. Coal and steel producers took their profits off the Island while at the same time paying less than competitive wages and leaving environmental and human health liabilities behind. There is a growing consensus that it was the lack of labour mobility that allowed off-Island companies to take advantage of the labour force. Any benefits plan must do more than provide for wages and salaries to labour. It must "fix" profits in firms that have a personal stake in the success of the Island economy and community and provide for labour mobility off-Island.

The benefits plan needs to fix experience and profits in Cape Breton based labour and companies. The model will attempt to simulate the experience of Iceland and the Acadian community of New Brunswick. Not having the natural benefit of a national or cultural imperative will make the job more difficult. To simulate these conditions the plan will have to take steps that diverge from past practices. It must provide the means for re-investment by Island residents, who because they are residents will more likely invest in their Island community.

5.1.1 Actions to Win Short Term Benefits

The recommendations outlined below should be used in combinations that best suit the needs at hand. No one recommendation will provide the full scope of access to Island industrial benefits.

- Use NAFTA allowances for small firms (5-600 people) and minority group (e.g., First Nations, African-Canadian) owned business set asides and favour firms with headquarters or main centres of operation on Cape Breton Island. Canada has not yet exercised these options in NAFTA. The Province and Enterprise Cape Breton will need to lobby cogently and firmly for federal action.

Given the relatively small number of Island owner or controlled firms that might bid on remediation work it may be necessary to also favour firms that:

- are off-Island firms but meet pre-requisites for partnering with Cape Breton firms; and / or
- meet targets for including participation by Island firms in their bids.

The partnering and participation must be meaningful. By meaningful we mean the Island firms and labour must acquire new experience and skills that are valuable in the marketplace. Island firms must be warded large portions of work so that they can amass sufficient profits for meaningful re-investment.

The levels of preference should be tiered with the first level going to Cape Breton owned or controlled firms. The remaining levels should be established on the likelihood that firms or partnerships will lead to hiring Cape Breton residents, earning profits for Cape Breton based companies, investment in Cape Breton based firms, R&D and commercialisation activities on the Island or for use by locally owned or controlled firms, etc.

- Consider aspects of the remediation activity that could see remediation financed by transfers of federal funding to Nova Scotia or through co-operative arrangements, to shield the activity or activities from NAFTA.

  Make set-asides for Cape Breton small businesses and minority owned or controlled businesses part of the mandate of remediation activity delivered via this mechanism.

- If special circumstances present themselves consider the creation of a Special Operating Agency to deliver aspects of the remediation program that can be considered unique and therefore suitable for delivery only be a special agency. The work of the special agency would likely be shielded from NAFTA considerations.

- Break contracts into sizes that Cape Breton firms can bid on. If bonding or insurance costs are prohibitive, provide coverage via a purchase by the provincial government that will be available to Cape Breton firms.

- Establish requirements that make Cape Breton based firms the preferred prime contractor. It is common for small Nova Scotia firms to serve as prime contractor for large international service export projects when firms larger than Nova Scotia firm are involved. This will help improve the business and management skills of local firms. It will help remove one of the main barriers to technology diffusion into firms and innovation into commercial services.

  If necessary, provide the Cape Breton firms with business consulting assistance so that they can take on more prime contractor and or project management roles. For example, the province could establish support systems; training and “apprenticeship” type arrangements for Cape Breton based firms to enable them to successfully take prime contractor and management roles.

Case study examples can be drawn from Island success stories, such as that of the Environmental Services Laboratory that is a commercial spin-off of UCCB. Mentoring networks should be set up between firms that have made commercial and export selling leap and firms that will need to make the leap to maintain themselves after the bubble of work is complete.

The objectives here are to:

- assist labour and management in its transition into larger remediation and project management roles;
- overcome some of the human capital issues that have been shown to be so important in successful benefits plans in other jurisdictions; and
- prepare local managers for the task of product and service development and export selling.

- Implement the staffing, training and education and labour supply recommendations provided in section 3.0 to maximise the ability to hire locally.

- Create a skills database of people who have moved off-Island and contact them to tell them about opportunities to "come home." Previous residents will be more likely to move to the Island and more likely to make stronger attempts to stay after the bubble is over. Their efforts are consequently more likely to manifest themselves in investment in businesses on the Island or controlled from the Island.

- If former residents are willing to make investments in Island businesses make them eligible to bid for small business set-asides.

- Once the bubble of work is complete, the on-Island demand for remediation services will drop dramatically. The services of lower skilled labour and lower order technical services will not be exportable, as they will likely be available in the export destination.

  Opportunities for off-Island sales will stem from the development of labour skills and services that are specialised, innovative and / or are in short supply.

  Therefore, the benefits plan must incorporate programs to absorb labour that will participate in the bubble of work but whose skills will not be exportable. Tell them in advance that they will be provided with opportunities for re-training or re-location assistance when and if the need should arise.

5.1.2 Actions to Win Long Term Benefits

The actions needed to win long tem benefits rely on the natural orientation of the private sector to sustain itself by the re-investment of profits into new services or lines of business to ensure long term prosperity. The Island already has access to the range of business assistance program needed to help market and sell services and products and to successfully manage a business. The following actions, in combination with the experience and profits they will earn in the next 10 years, provide a place to nurture local investment into new services and products.

- Establish a commercially based institute, or modify one of the existing organisations, following the Fraunhofer Institute model. The institute will be private sector led and

staffed. It will offer a pool of commercialisation research and testing services, on a non-profit but fee for service basis, to all companies. Companies that are based off-Island will be eligible to have their staff participate and will be eligible to purchase services. All participating companies will be required to participate in the maintenance of the institute.

- Establish agreements and processes to ensure that Cape Breton based firms either remain in control or maintain access to intellectual property rights associated with work at the institute.

5.2 MODEL TWO: REMEDIATION DOES NOT FOLLOW CURRENT PLANS

This model can be implemented if remediation work does not go as planned with standard technologies or some part of the remediation work can be set-aside as a resource for R&D. By setting aside areas for use in R&D and testing new technologies Cape Breton can follow the model used by the US Department of Defence at its toxic sites. The larger the site that is allowed for use for testing and using alternative technologies, the larger the amount of remediation work that can be set-aside for bidding by cape Breton and rest-of-Canada firms, within the NAFTA and WTO rules.

NAFTA and WTO rules will allow national and local set-asides where research that in the national interest is concerned, and or where public sector supported R&D is being undertaken. By setting aside an area for R&D and testing new technologies Cape Breton can open this NAFTA and WTO door.

5.2.1 Actions to Win Short Term Benefits

The actions to win short-term benefits are the same as model one.

5.2.2 Actions to Win Long Term Benefits

The actions to win long term benefits are the same as in model one with the following exceptions:

- set-aside a portion of remediation work for use as test site for new techniques, research, etc.;
- establish a research and test facility / space, possibly at the SERL incinerator site;
- target a long term clean-up date for the test area;
- require participants in research facility to have material investment in it, not in kind (the existence of the facility and the requirement for material support of the facility by members will give off-Island firms the incentive to invest more of their profits in Cape Breton Island); and
- partner with UCCB but via a purely commercial model, not education model (follow the Stanford University experience.)

APPENDIX A

SUMMARY OF THE COSTS ASSOCIATED WITH SELECTED SUPERFUND PROJECTS

SUPERFUND PROJECT COST BREAKDOWN - CAPE BETON GROWTH FUND INDUSTRIAL BENEFITS PROGRAM

Project	Total Project Value	Type of Technology	Quantity Treated	Contractors Costs		Treatment Costs		Consulting Fees		Laboratory Costs	Surface & Groundwater Collection	Disposal	Permits	PPE
				Mob Equipment Facilities	Earthworks	Set Up Plus Commission	Operaton & Main	Assessment & Related	Supervision & Monitoring					
Bayou Bonfouca Louisiana (creosote treatment for railway ties)	$110 M	On-site Incineration Rotary Kiln	169,000yd^3 250 000 tons	21m (19.1%)	20m (18.1%)	54m (49.1%)	18m (16.4%)	3.3m (3%)	4.5m (4%)	2.5m (2.3%)			0.1M (0.1%)	
MidLand Products (Wood preserving plant) Arkansas	$27 M	On-Site Incineration Rotary Kiln (SCC)	69 000 yd^3 102 000 tons	1 m (3.7 %)	4.9 m (18.1%)	8.1m (30%)	10m (37%)	0.3 m (3.8)	1.3M (4.8%)	1.3M (4.8%)			0.05M (0.2%)	
Celonese North Carolina (Polyester Products)	$5.8 M	On-Site Incineration Rotary Kiln (SCC)	3,150 yd^3 4,660 tons	0.1m (1.7%)	0.53m (9%)	2.2m (38%)	1.85m (31.8%)	0.2M (3.4%)	0.2m (3.4%)	0.15m (2.6%)			0.03m (0.5%)	
Baird & McGuire (Massachusetts) Chemical Mixing & Batching	$133 M	On-Site Incineration Rotary Kiln	167,600 yd^3 248,000 tons	est. 20m(15%)	est. 25m(18.8%)	est. 60m (45.1%)	est. 20m (15%)	est. 4m (3.0%)	est. 4m (3.0%)	est. 3m (2.2)			0.2m (0.15%)	
Petro Processers Louisiana (Petrochemical waste disposal)	Presently $32.8M + $18.8M=$ 51.6M	Incineration Stripping & Scrubbing	254,000 yd^3 377,500 tons +groundwater	4m (7.7%)	8m(15.5%)	14m (27.1%)	4.75 m (9.2%)	3.0m (5.8%)	1.5m (2.9%)	2.0m (3.8%)	14.8m (28.7%)	0.25m (0.5%)	0.05m (0.1%)	
Sikes Disposal Pits, Texas (Waste Disposal Site)	$115 M	Incineration On-Site Rotary Kiln & SCC	335,300 yd3 496,000 tons +groundwater	11.8m (10.3%)	6.4m (5.6%)	69m (60.0%)	12m (10.4%)	2.5m (2.4%)	2.0m (1.7%)	1.5m (1.3%)	4m (3.5%)	3.1m (2.7%)	0.5m (0.1%)	
Anderson Development, Michigan (Hardeners for plastics)	$4.50M	Thermal Desorption	5,100 tons	0.25 m (5.5%)	0.75m (16.7%)	1.3m (28.7%)	0.75m (18.3%)	0.5m (9.2%)	0.8m (17%)	0.2m (4.4%)	0.1m (2.2%)	0.5m (9.1%)	0-0.18m (0.4%)	0.18m (0.4%)
McKin Co., Maine (Waste Collection Facility	$3.00 M	Thermal Desorption	11,500 yd^3	0.63 m (21%)	0.63m (21%)	0.72m (24%)	0.55m (18.3%)	0.13m (4.3%)	0.13m (4.3%)	0.1m (3.3%)	-	-	-	-
Outboard Marine (Illinois) Marine Product Manufacturing	$2.60M	Thermal Desorption	12,750 tons	0.65m (25%)	0.2m (7.7%)	0.52m (20%)	0.81m (30.8%)	0.10m (3.4%)	0.10m (3.4%)	0.05m (1.9%)	-	0.2m (7.6%)	0.2m (3.4%)	0.01m (0.03%)
Wide Beach (New York) PCB Oil waste oil - dust control	$15.9M	Thermal Desorption	42,000 tons	0.59m (3.7%)	1.0 m (6.2%)	2.1m *18.5%)	0.13m (1.7%)	0.30m (1.9%)	0.40m (2.5%)	0.2m (1.3%)	-	3.4m (21.4%)	0.1m (0.06%)	0.1m (1.5%)
Basket Creek -Georgia Hazardous Disposal (Liquid)	$6.5M	Soil Vapour Extraction	-	1.1m (23%)	2.4m (36%)	1.2m (18.5%)	0.13m (1.7%)	0.50m (7.7%)	0.20m (3.1%)	0.1m (1.6%)		0.13m (2%)	0.1m (1.5%)	0.1m (1.5%)
Sand Creek (Colorado) Petroleum Co. & Pesticide Mfg	$2.2M	Soil Vapour Extraction	-	0.7M (31.2%)	0.8M (36.4%)	2M (9.1%)	0.1M (4.6%)	0.20m (9.1%)	0.10m (4.5%)	0.05m (2.2%)		-	0.1m (0.5%)	0.01m (0.5%)
Scott Lumber (Missouri) Wood Treatment Diesel/Creosote	$4.05 M	Land Farming Treatment	15,960 tons	est. 0.8m (19.8%)	est. 1.3m (32%)	est. 0.4m (9.9%)	est. 0.1m (2.5%)	0.2m (4.9%)	est. 0.2m (4.9%)	est. 0.15m (3.7%)	est. 0.6m (14.8%)	est. 0.2m (4.9%)	est. 0.05m (1.2%)	0.02m (0.5%)
Brown Wood Preserving (Florida) (Creosote and PCP)	$0.65M	Land Farming Treatment	8,100 yd^3	0.06m (9.2%)	0.14m (21.5%)	0.20m (30.7%)	0.12m (18.5%)	0.02m (3.0%)	0.025m (3.7%)	0.01m (1.5%)	0.08m (12.3%)	0-0.09m (1.1%	0-0.09m (1.1%)	0-0.09m (1.1%)
French Limited (Texas) Petrochemical Disposal	$49.3M	Slurry Phase Bioremediation	300, 000 tons Sludge	1.1m (2.2%)	6.9m (14%)	11.1m (22.5%)	13.6m (27.6%)	2.0m (4.1%)	2.9m (5.9%)	0.9m (1.8%)	5.2m (10.5%)	3.2m (7.9%)	1.3m (2.6%)	0.5m (1.0%)

APPENDIX B

ANTICIPATED TOTAL VALUE FOR EACH ENVIRONMENTAL SERVICE LINE

Environmental Service Category	Hazardous Materials Survey	Phased Env. Site Assessment	Phase I Historical Review	Phase II Intrusive Investigation	Phase III Delineation Program	Phase IV RAP Development	Phase V RAP Implementation	Phase VI Confirmatory Sampling	Human Health Risk Assessment	Ecological Risk Assessment	Federal EA Registration	Provincial EA Registration/Approvals	Water Management Services	Wastewater Treatment	Mine/ stockpile Leachate Control	Air Management Issues	Ambient Air Monitoring	Solid Waste Disposal	Hazardous Waste Disposal	C&D Waste Disposal	Percentage of Environmental Services	Total Anticipated Project Cost ($M)	Percentage of Environmental Service Fees (Rounded to nearest percentage)	Projected Total Fees for Environmental Services ($M)	Reference
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20					
Project Site	**Environmental Service category**																								
MUGGAH CREEK WATERSHED CLEANUP PROJECT (10-12 years)	**5**	**55**							**5**	**5**	**0.5**	**0.5**		**2**			**3**	**5**	**18**	**1**	**100**	**$600**	**10**	**$60.00**	Bayou Bonfouca, La Creosote Plant
DEVCO REMEDIATION PROJECTS (>500 properties) (7-10 Years)	**5**	**60**							**5**	**5**	**0.5**	**0.5**		**2**	**10**		**1**	**1**	**5**	**5**	**100**	**$110**	**9**	**$9.90**	Brown Wood Preserving, Fl. Creosote and PCP Contamination
NSPI PROJECTS (Decommissioning of Seaboard Plant) (2-4 years)	**10**	**35**							**5**	**5**		**2**			**9**		**2**	**2**	**20**	**10**	**100**	**$15**	**9**	**$1.35**	Brown Wood Preserving, Fl. Creosote and PCP Contamination
SYSCO DECOMMISSIONING (10 Years)	**15**	**40**							**10**	**10**		**1**		**2**			**1**	**1**	**5**	**15**	**100**	**$217**	**14**	**$30.40**	Scott Lumber, Mo Wood Treatment Diesel, Creosote
	Environmental Service Values by Project																					**$942**	**10.5**	**$101.65**	
MUGGAH CREEK WATERSHED CLEANUP PROJECT (10-12 years)	3,000,000	33,000,000							3,000,000	3,000,000	300,000	300,000		1,200,000	0		1,800,000	3,000,000	10,800,000	600,000					
DEVCO REMEDIATION PROJECTS (>500 properties) (7-10 Years)	495,000	5,940,000							495,000	495,000	49,500	49,500		198,000	990,000		99,000	99,000	495,000	495,000					
NSPI PROJECTS (Decommissioning of Seaboard Plant) (2-4 years)	135,000	472,500							67,500	67,500	0	27,000		0	121,500		27,000	27,000	270,000	135,000					
SYSCO DECOMMISSIONING (10 Years)	4,560,000	12,160,000							3,040,000	3,040,000	0	304,000		608,000	0		304,000	304,000	1,520,000	4,560,000					
TOTAL VALUE OF ENVIRONMENTAL SERVICES BY CATEGORY	**8,190,000**	**51,572,500**							**6,602,500**	**6,602,500**	**349,500**	**680,500**		**2,006,000**	**1,111,500**		**2,230,000**	**3,430,000**	**13,085,000**	**5,790,000**					

Professional Service Category	Engineering	Geology	Hydro geology	H&S, Industrial Hygeine	Engineering Technician	Environmental Scientists	Toxicology	Biology	Risk Assessment	Analytical Chemist	Surveying	Drafting	Land Use Planners	Environmental Plannersl	QA/QC Auditors	Database Management	Web Management	Communica -tions	Project Managemnt	Health Professionals	Professional Training	Percentage of of Professional Services	Projected Total Fees for Environmental Services ($M)	Reference
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21			
Project Site	**Professional Service Category - Percentage of Professional Services by Discipline**																							
MUGGAH CREEK WATERSHED CLEANUP PROJECT (10-12 years)	20	5	5	5	38	2	1	1	2	4.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	10	0.5	0.5	100	60.00	Bayou Bonfouca, La. Creosote Plant
DEVCO REMEDIATION PROJECTS (>500 properties, 7-10 Years)	25		9	5	38.5	2		2	1.5	3	1	0.5	0.25	0.25	0.5			0.5	10		1	100	9.90	Brown Wood Preserving, Fl. Creosote and PCP Contamination
NSPI PROJECTS (Decommissioning of Seaboard Plant, 2-4 years)	30		3	2	44	1		1	1.5	2.5	2	1	0.25	0.25	0.5				10		1	100	1.35	Brown Wood Preserving, Fl. Creosote and PCP Contamination
SYSCO DECOMMISSIONING (10 Years)	25	2	7.5	5	39.5	2		1.5	2	4	0.5	0.5	0.25	0.25	0.5	0.25	0.25		8	0.5	0.5	100	30.40	Scott Lumber, Mo Wood Treatment Diesel/ creosote
	Total Professional Service Requirements by Profession																							
Total Value of Professional Services ($)	22,480,000	3,608,000	6,211,500	5,042,000	39,213,500	2,019,500	600,000	1,267,500	1,976,750	4,246,750	578,000	515,000	404,125	404,125	508,250	376,000	376,000	1,249,500	9,557,000	452,000	564,500	101.65	101.65	
Unit Rates ($/hour)	85	85	85	85	50	85	150	85	85	50	45	45	75	75	75	60	60	85	150	85	85			
Total Person Hours	264,471	42,447	73,076	59,318	784,270	23,759	4,000	14,912	23,256	84,935	12,844	11,444	5,388	5,388	6,777	6,267	6,267	14,700	63,713	5,318	6,641			
Total Person Years (40 hr/week and 49 weeks/year)	107.9	17.3	29.8	24.2	320.1	9.7	1.6	6.1	9.5	34.7	5.2	4.7	2.2	2.2	2.8	2.6	2.6	6.0	26.0	2.2	2.7			

Technical Service Category	Heavy Equipment /Operators (incl. Equipment)	Process Control Technicians	Plumbers, Pipefitters	Hazardous Waste Carriers	Welders/Mill wrights	Electricians	Boat Operators	Underwater Divers	Wastewater Treatment Optrs	Drillers (incl. equipment and materials)	General Trucking	General Labourers/ Foremen	Carpenter	Administra -tive Support	Instrument mechanics	Security	Technical Training	Demolition /Implosion Specialists	Capital Costs/ Administra tion/ Operation & Maintenance/ Profit	Total Technical Services	Technical/ Contracting Services as a percentage of Total Project Costs	Projected Total Fees for Technical Services ($M)	Reference	
	1	2	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20					
Potential Project Site	**Technical Service Category - Percentage of Technical Services by Discipline**																							
MUGGAH CREEK WATERSHED CLEANUP PROJECT (10-12 years)	15	5	3	5	3	3	0.25	0.25	2.5	2	5	10	2.5	10	1	0.5	2	2	28	100	90	540.00	Bayou Bonfouca, La. Creosote Plant	
DEVCO REMEDIATION PROJECTS (>500 properties) (7-10 Years)	25		2	2	2	2				1	3	12	2	10	0.5	0.5	2	1	35	100	91	100.10	Brown Wood Preserving, Fl. Creosote and PCP Contamination	
NSPI PROJECTS (Decommissioning of Seaboard Plant) (2-4 years)	20	0.5	10		5	10			0.5	2	2	10	3	8		0.5	2	1.5	25	100	91	13.50	Brown Wood Preserving, Fl. Creosote and PCP Contamination	
SYSCO DECOMMISSIONING (10 Years)	15	2	5	1.5	2.5	2.5	0.5	0.5	2	1.5	3	10	3	10	2	0.5	1	7.5	30	100	86	106.62	Scott Lumber, Mo Wood Treatment Diesel/ creosote	
	Total Technical Service Requirements by Profession																							
Total Value of Technical Services ($M)	124.718	29.1999	24.883	30.6013	21.5425	22.2175	1.8831	1.8831	15.6999	13.6703	33.4716	78.024	19.1056	75.752	8.0329	3.8011	14.1382	20	221.596		760.22	760.22		
Unit Rates ($/hour)	85	65	65	85	65	65	60	75	65	200	75	35	65	35	85	45	85	100						
Total Person Hours	1,467,271	449,229	382,815	360,015	331,423	341,808	31,385	25,108	241,537	68,352	446,288	2,229,257	293,932	2,164,343	94,505	84,469	166,332	200,000						
Total Person Years (40 hrs/week and 49 weeks/year)	748.6	229.2	195.3	183.7	169.1	174.4	16.0	12.8	123.2	34.9	227.7	1137.4	150.0	1104.3	48.2	43.1	84.9	102.0						

APPENDIX C

SURVEY OF EXISTING CORPORATE AND LABOUR CAPACITY

IDENTIFICATION OF CURRENT CAPACITIES AND ABILITY TO MEET FUTURE DEMAND.

FIRM NAME: ______________________ INTERVIEWEE: ____________________________________ DATE: ____________________________

TYPE OF PRODUCT/ SERVICE: ____

____

BASED UPON YOUR ONGOING PROJECTS AND THE WORK YOU HAVE COMPLETED OVER THE LAST FEW YEARS, WHICH OF THE FOLLOWING AREAS OF REMEDIATION HAVE YOU BEEN INVOLVED IN?

- [ ] HAZARDOUS WASTE MANAGEMENT
- [ ] PHASED ENVIRONMENTAL ASSESSMENTS
- [ ] RISK ASSESSMENT (HUMAN/ECOLOGIOCAL)
- [ ] REGULATORY ASPECTS (APPROVALS/EA)
- [ ] WATER SAMPLING/MANAGEMENT
- [ ] AIR MANAGEMENT (AMBIENT/INDOOR)
- [ ] SOLID WASTE MANAGEMENT
- [ ] BUILDING DEMOLITION/ C&D WASTE
- [ ] HEALTH AND SAFETY
- [ ] WASTEWATER COLLECTION AND TREATMENT
- [ ] LANDFILL RECLAMATION
- [ ] MINE RECLAMATION
- [ ] PROJECT MANAGEMENT
- [ ] CHEMICAL ANALYSIS

- [ ] SOILS INORGANICS/METALS
- [ ] ORGANICS/TPH
- [ ] WATER INORGANICS/METALS
- [ ] ORGANICS/TPH
- [ ] AIR INORGANICS/METALS
- [ ] ORGANICS/TPH
- [ ]
- [ ] HAZWASTE
- [ ] PCB
- [ ] ASBESTOS
- [ ] LEAD
- [ ] RADIOACTIVES (RADON TESTING)
- [ ] OTHER ODS, CHLORITAED SOLVENTS

UXO

EMPLOYEE DESCRIPTIONS AND QUALIFICATIONS:

JOB LOC.			JOB TYPE																			YRS OF EXPERIENCE						QNTY
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

EMPLOYEES (CB)
EMPLOYEES (TOTAL)

TYPE OF SUBCONTRACTORS TYPICALLY UTILIZED ON PROJECTS:	**ON CB ISLAND FIRMS**	**OFF CB ISLAND FIRMS**

BASED ON THE TYPE AND AMOUNT OF REMEDIATION WORK EXPECTED FOR THE NEXT 10 YEARS, WHAT ASPECTS OF THE PROJECT WOULD YOU BE CAPABLE OF PARTICIPATING IN?

- [ ] HAZARDOUS WASTE MANAGEMENT
- [ ] PHASED ENVIRONMENTAL ASSESSMENTS
- [ ] RISK ASSESSMENT (HUMAN/ECOLOGIOCAL)
- [ ] REGULATORY ASPECTS (APPROVALS/EA)
- [ ] WATER SAMPLING/MANAGEMENT
- [ ] AIR MANAGEMENT (AMBIENT/INDOOR)
- [ ] SOLID WASTE MANAGEMENT
- [ ] BUILDING DEMOLITION/ C&D WASTE
- [ ] HEALTH AND SAFETY
- [ ] WASTEWATER COLLECTION AND TREATMENT
- [ ] LANDFILL RECLAMATION
- [ ] MINE RECLAMATION
- [ ] PROJECT MANAGEMENT
- [ ] CHEMICAL ANALYSIS

- [ ] SOILS INORGANICS/METALS
- [ ] ORGANICS/TPH
- [ ] WATER INORGANICS/METALS
- [ ] ORGANICS/TPH
- [ ] AIR INORGANICS/METALS
- [ ] ORGANICS/TPH
- [ ]
- [ ] HAZ. WASTE
- [ ] PCB
- [ ] ASBESTOS
- [ ] LEAD
- [ ] RADIOACTIVES
- [ ] OTHER (PAH/semi volitiles)

BASED UPON THE ANTICIPATED TIMELINES AND THE EXPECTED VOLUMES OF WORK, WOULD YOU ANTICIPATE HIRING NEW EMPLOYEES? IF YES, WHAT WOULD BE THEIR JOB TYPE AND LEVELS OF EXPERIENCE?

EMPLOYEE DESCRIPTIONS AND QUALIFICATIONS:

JOB TYPE																			YRS OF EXPERIENCE						QNTY
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

ARE THERE PEOPLE WITH THE REQUIRED SKILLL SETS CURRENTLY AVAILABLE IN THE CAPE BRETON ISLAND LABOUR FORCE?
SPECIFY: ____

____

____

ARE THERE SKILLS THAT REQUIRE SPECIFIC DEVELOPMENT OR WHICH SHOULD BE LOCATED WITHIN THE LOCAL UNIVERSITY ?
SPECIFY: ____

____

____

SUB-CONTRACTOR PROJECT QUESTIONNAIRE

FIRM NAME: INTERVIEWEE: _____ DATE: _____

TYPE OF PRODUCTS /SERVICES PROVIDED: _____

BASED UPON YOUR ONGOING PROJECTS AND THE WORK YOU HAVE COMPLETED OVER THE LAST FEW YEARS, WHICH OF THE FOLLOWING AREAS OF REMEDIATION HAVE YOU BEEN INVOLVED IN?

- ☐ HAZARDOUS WASTE MANAGEMENT
- ☐ PHASED ENVIRONMENTAL ASSESSMENTS (REMEDIATION)
- ☐ RISK ASSESSMENT (HUMAN/ECOLOGIOCAL)
- ☐ REGULATORY ASPECTS (APPROVALS/EA)
- ☐ WATER SAMPLING/MANAGEMENT
- ☐ AIR MANAGEMENT (AMBIENT/INDOOR)
- ☐ SOLID WASTE MANAGEMENT
- ☐ BUILDING DEMOLITION/ C&D WASTE
- ☐ HEALTH AND SAFETY (INTERNAL ONLY)
- ☐ WASTEWATER COLLECTION AND TREATMENT
- ☐ LANDFILL RECLAMATION
- ☐ MINE RECLAMATION
- ☐ PROJECT MANAGEMENT

Specific projects: _____

- ☐ SOILS INORGANICS/METALS
- ☐ ORGANICS/TPH
- ☐ WATER INORGANICS/METALS
- ☐ ORGANICS/TPH
- ☐ AIR INORGANICS/METALS
- ☐ ORGANICS/TPH
- ☐ HAZ. WASTE
- ☐ PCB
- ☐ ASBESTOS
- ☐ LEAD
- ☐ RADIOACTIVES
- ☐ OTHER

EMPLOYEE DESCRIPTIONS AND QUALIFICATIONS:

JOB LOC.			JOB TYPE																			EXPERIENCE				QNTY

Total Employees **VARIABLE**

NOTES: VARIABLE NUMBER OF WORKERS DEPENDING ON THE JOB.

BASED ON THE TYPE AND AMOUNT OF REMEDIATION WORK EXPECTED FOR THE NEXT 10 YEARS, WHAT ASPECTS OF THE PROJECT WOULD YOU BE CAPABLE OF PARTICIPATING IN?

- ☐ HAZARDOUS WASTE MANAGEMENT
- ☐ PHASED ENVIRONMENTAL ASSESSMENTS
- ☐ RISK ASSESSMENT (HUMAN/ECOLOGIOCAL)
- ☐ REGULATORY ASPECTS (APPROVALS/EA)
- ☐ WATER SAMPLING/MANAGEMENT
- ☐ AIR MANAGEMENT (AMBIENT/INDOOR)
- ☐ SOLID WASTE MANAGEMENT
- ☐ BUILDING DEMOLITION/ C&D WASTE
- ☐ HEALTH AND SAFETY
- ☐ WASTEWATER COLLECTION AND TREATMENT
- ☐ LANDFILL RECLAMATION
- ☐ MINE RECLAMATION (CAPPING OF WASTE ROCK PILES)
- ☐ PROJECT MANAGEMENT

Specialty Services :

- ☐ SOILS INORGANICS/METALS
- ☐ ORGANICS/TPH
- ☐ WATER INORGANICS/METALS
- ☐ ORGANICS/TPH
- ☐ AIR INORGANICS/METALS
- ☐ ORGANICS/TPH
- ☐ HAZ. WASTE
- ☐ PCB
- ☐ ASBESTOS
- ☐ LEAD
- ☐ RADIOACTIVES
- ☐ OTHER

BASED UPON THE ANTICIPATED TIMELINES AND THE EXPECTED VOLUMES OF WORK, WOULD YOU ANTICIPATE HIRING NEW STAFF?

JOB LOC.			JOB TYPE																			YRS OF EXPERIENCE					QNTY

Other comments etc. _____

ARE THESE TYPES OF PEOPLE AVAILABLE IN THE CAPE BRETON ISLAND LABOUR FORCE? _____