

"Developing Brownfields and contaminated sites in Canada; building partnerships with the stakeholders"

Adrien Pilon

**Presentation to
Renare Mark Konferens
Göteborg, Sweden
18-19 October 2005**

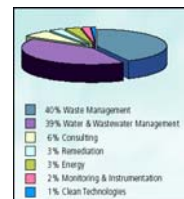
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- PART 1
- Overview of current situation in Canada
- Regulation
- Financial assistance and programs for site remediation
- PART 2
- Montreal Centre of Excellence for Brownfields (MCEBR)
- Partnership with stakeholders for site restoration
- Building sustainable communities

A diversity of site conditions !



Global Environmental Market by Sector



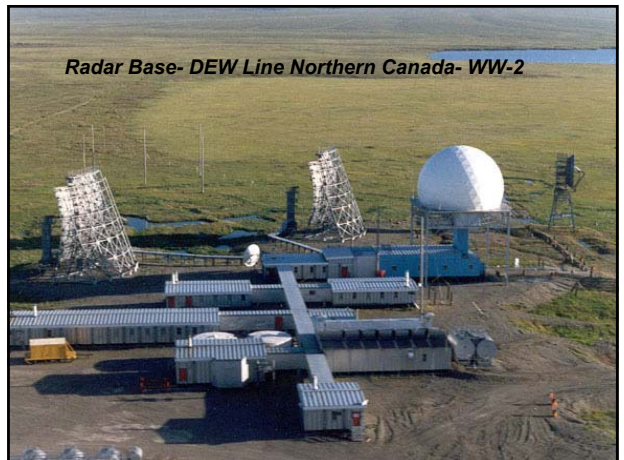
Source: Global Environmental Markets and the UK Environmental Industry Opportunities to 2010, 2002.

Canada's Performance


Valued at more than \$29 billion, the environmental market in Canada consists of some 8 000 firms generating environmental exports currently worth more than \$1.4 billion per year. Small firms (fewer than 100 employees) form the majority (93 percent) of the country's environmental firms.

Categories of Contaminated Sites

- **Industrial sites** : owned and operated by private companies, mining, petroleum, metal transformation, manufacturing, etc.
- **Institutional sites** : owned and operated by government departments, e.g. DND, Transports, municipalities, school boards.
- **Federal sites**: former sites for different use (military, mining, radar, etc.) returned to the government as a legacy of the past
- **Orphan sites**: different kinds of operations returned to the government (municipal, provincial, federal) (no tax payment, bankruptcy, etc.)
- **Brownfields**: located in a municipality, infrastructures and services, contaminated or suspected to be contaminator, owner may not be the polluter or went bankrupt








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Sydney Tar Ponds

One of Canada's largest & most contaminated sites

- Not considered a federal site
- 25,000 people in a 4 sq km area
- 700,000 tonnes of contaminated sediments
- PCBs, PAHs, raw sewage, heavy metals
- Football field 60 storeys high
- clean up costs \$ 500 M estimated
- public not supportive of HHRA




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Industrial Sites






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Brownfields

South – West of Montreal
Several sites- 1,000,000 m.sq.
Brownfields





(source, J. Lewis)





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Contaminated Sites in Canada

- 30,000 – 50,000 Brownfields in Canadian cities (source NRTEE 2003)
- 100,000-200,000 sites, including industrial sites
- 8560 Federal sites
- Issues :
 - Financial issues
 - Legal issues
 - Economic and public issues
 - Urban and municipal issues
 - Technical issues



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Financial Issues and driving forces

Clean-up of Federal Sites & Redevelopment of Brownfields in Municipalities



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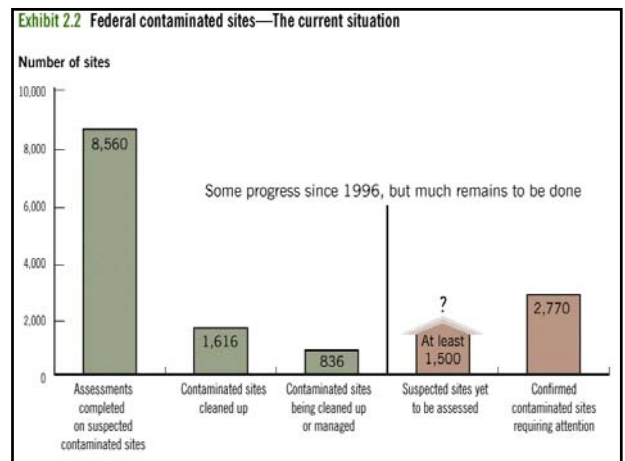
The Legacy of Federal Contaminated Sites in Canada

**“2004 Budget announcement
\$3,5 Billions over the next 10
years to clean federal sites”**

23 March 2004



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National Round Table
on the Environment
and the Economy




Table ronde nationale
sur l'environnement
et l'économie

CLEANING UP THE PAST
-BUILDING THE FUTURE
A NATIONAL BROWNFIELD
REDEVELOPMENT
STRATEGY FOR CANADA

February 2003



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Benefits for the federal government – development of Brownfields

	Assumed activity levels of brownfield redevelopment cluster			
	\$50 m	\$100 m	\$150 m	\$200 m
Federal personal income tax	\$4.55 m	\$9.1 m	\$13.7 m	\$18.2 m
Federal indirect taxes (e.g. GST, gas tax)	\$1.05 m	\$2.09 m	\$3.14 m	\$4.18 m
Employer and employee contributions to CPP	\$3.07 m	\$6.14 m	\$9.12 m	\$12.3 m
Employer and employee contributions to EI	\$2.14 m	\$4.28 m	\$6.43 m	\$8.57 m
Other transfers from persons to government	\$0.005 m	\$0.009 m	\$0.014 m	\$0.018 m
Total impact on federal revenues	\$10.8 m	\$21.6 m	\$32.4 m	\$43.2 m


Source, NRTEE, 2003



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Indicators – Key sectors of economic activity in Canada

Sector of the Canadian economy	Total output multiplier
Brownfield redevelopment cluster	3.8
Government	3.1
Construction	3.0
Transportation and warehousing	3.0
Forestry and logging	2.9
Manufacturing	2.8
Education services	2.7
Information and cultural industries	2.7
Mining and oil and gas extraction	2.5
Health care and social assistance	2.4
Finance, insurance and real estate	2.2
Utilities	1.9


Source, NRTEE, 2003



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Financial issues -Diversity of solutions implemented in Canada

- First program in 1998, ended in 2005, Revi-sols in Quebec = grants for remediation and clean-up
- Since 2001, TIF programs « tax-increment financing »; mostly in Ontario, implemented by the municipality with the support of the provincial government
 - Tax reduction on the value after development; distributed over 6-10 years
- Loans for remediation: Federation of Canadian Municipalities, 2005



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in Brownfields Rehabilitation


Montréal


- Revi-sols Program, 1998-2005
 - Restoration/redevelopment of brownfields
 - cover 50% of remediation costs, plus 20% if use of treatment technologies
 - Contributions: \$114 M, \$75 M for Montréal
 - Total, 192 projects, 131 in Montréal
 - 2,057,995 sq.m. restored land in Montréal
 - ROI estimated over 10 to 1 after development, job creation, new housing, municipal taxes, etc.

Source: M Beaulieu, Ministère du développement durable, de l'environnement et des parcs du Québec



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Major issues

Legal



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Regulation for Contaminated Sites

- Provincial jurisdiction; each province/territory has its own site remediation policy, some have laws and regulation
- Risk analysis is permitted
- Environment protection act; obligation to report release, no impact on environment, offsite migration, GW protection;
- Regulations on solid waste and hazardous waste
- CCME guidelines
- Specific regulation for Brownfields in Ontario, Bill 56
- Quebec regulations for contaminated sites(Bill 72),
 - by-law for secure landfills for soils (2001)
 - by-law for soil quality = norms for residential and industrial/commercial usage (2003)



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Recent legal cases – Leading to new strategies

- Properties owned by petroleum companies
 - Case 1:
 - Remediation done
 - Property transfered
 - Change of use after several years; decision by the Court in favour of the developer, petroleum company to clean to new standards
 - Case 2:
 - Remediation done on site
 - Civil action by the neighbour because of contamination at site boundary, decision of the Court in favor of the citizen, company to compensate the neighbour

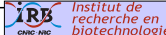



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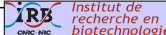

Legal issues related to contaminated sites

- Polluters pay principle:
 - application of the « polluter pays » principle
 - impossible in the case of bankrupt companies
 - highlights the need to collect sufficient financial security while the companies are in operation
- Retro-activity , company maybe responsible long time after transfer of property
- Experts professionals
 - protection for owners
 - responsibility after approving assessment & remediation



Legal Issues – Brownfields National Strategy

- Termination of on and off-site regulatory liability (subject to specific re-openers and fraud) upon issuance of regulatory remediation approval
- Termination of civil liability after the expiry of an appropriate limitation period.
- Provinces and territories provide for regulatory approval and confirmation of acceptability of remediation efforts.
- Provinces/regions establish regimes to enable effective site-specific (risk) assessment of common contaminants.
- Provincial/territorial registration on title of right to regulatory liability termination or allocation


Technical issues


Soil & groundwater contamination

Soil contamination

- Heavy metals
 - mining sites
 - brownfields sites
 - historic fill materials (Pb, Zn, Cd, As)
 - bound to matrix or new mineral complex
 - bioavailability
 - standard digestion methods vs leaching
- Hydrocarbons
 - long chain hydrocarbons
 - PAH's, PCP's






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Remediation Solutions-Soils

- **Biotreatment facilities:** since 1990, over 20 treatment centres for hydrocarbons available in Quebec and abroad in Canada
- **Bioremediation :** broadly used for site specific solutions
- **Incinerator :** two facilities certified for PCB's
- **Thermal desorption :** facilities available in several provinces
- **Fixation-solidification:** one facility Stablex, mostly for hazardous wastes
 - No in-situ stabilization process permitted in Canada, tests underway
- **Metals:** no extraction process implemented yet-possibly in 2005
 - technologies developed by Alex-sol, Dragage Verreault, partners of MCEBR
- **Chemical oxydation :** in-situ soil treatment
- **Dig & dump in MW landfills:** regulations vary in jurisdictions, largely used
- **in Québec:** new regulation for Contaminated soils landfills 2001
 - Secure landfills, 30 years of life cycle
 - Fees , from 45-50\$/ton reached 90 -100\$/ton



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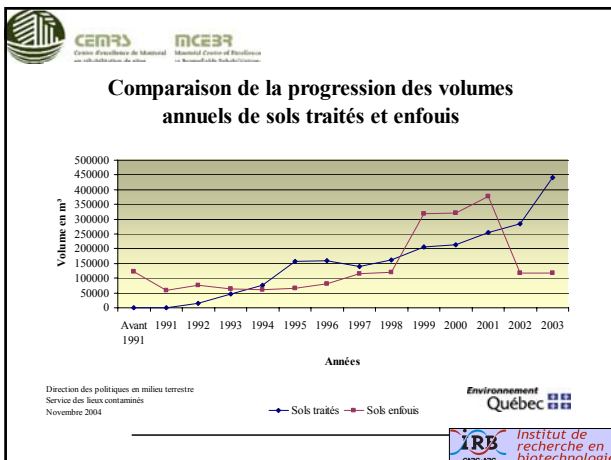
Management of contaminated soils









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Biotreatment facilities – short history

- 1990, petroleum industry initiated large UST program
 - Large volumes of soils
 - Few secure landfills, high costs (\$350/ton)
 - No other solutions permitted/lack of data on performance
 - Long term responsibility issue
- Joint committee industry-Ministry of Environment
 - 1 year testing
 - Development of guidelines and code of practice
 - Petroleum companies built & operated treatment
 - Since 1990, 20 facilities, operated by contractors
 - Costs : \$110/ton → 30-50 \$/ton




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Complex Groundwater Contamination

- Chlorinated solvents, phenols, HC, PAH's:
 - major cases, 20-30 years old, no solution yet!
 - public and abandoned industrial sites
 - large plumes, several sq. kilometers
 - complex hydrogeological systems, fractured bedrock, DNAPL's and LNAPL's.
 - drinking water sources, domestic and institution impacted
 - impacts on natural environment, rivers
 - solutions: building water distribution systems, mitigation, control and treatment
 - multi-Millions \$ solutions to fully recover GW use




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Remediation Solutions-Groundwater

- In situ biotreatment:
 - bioventing, bioslurping/sparging, oxydation, co-substrate injection
- Funnel and gate with reactive barrier
- Biobarrier
- Oxydation
- Pump and Treat with surface treatment
 - air stripping
 - bioreactors
 - biofilters




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PART 2


Building a partnership to address issues

MCEBR partner of the
environment industry, government
and site owners



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MCEBR – Partnership for Brownfields and Contaminated Sites Remediation



- 1997 MCEBR corporation created
- three levels of government involved with private sector
- environmental technologies – risk evaluation
- interactions with site owners-regulators-consultants to understand the issues and solutions



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Our Partners

- **Founding members – represented by**
 - City of Montréal
 - Biotechnology Research Institute-NRC
 - Environment Canada
 - Ministère du développement durable, de l'environnement et des parcs du Québec
- **Financial support**
 - Canada Economic Development
 - Biotechnology Research Institute-NRC
 - Environment Canada
 - Government of Quebec
 - (FAQDD, FPGST-E
 - Ministère des Affaires municipales, du Sport et du Loisir- Gouvernement du Québec
 - MDERR (Québec)
 - City of Montréal
 - Private companies, on project basis




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Board of Directors

- 2 representatives from the government of Quebec
- 3 representatives from the government of Canada
- 2 representatives from the City of Montreal
- 1 representative from the environment industry- Réseau environnement
- 1 representative from universities-Ecole polytechnique de Montreal
- 1 representative from land development industrial association




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Objective

“to create conditions for a mutual discussion on issues and for developing solutions acceptable to all parties”

- Assist site owners/developers in dealing with issues
- Technology development/adaptation and demonstration with private companies
- Public education and information
- Dissemination of information and showcase




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***Knowing what the client needs are !
Networking and Communication with
Stakeholders-Developing Strategies
for Brownfields Redevelopment***

Regional and national working groups
2000-2003



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Themes-stakeholders working groups

- **80 experts – 4 WG**
- **Environmental Management Guidelines and Decision Systems**
 - *Example: risk base decision process*
- **Extent of Responsibilities of Different Stakeholders**
 - *Example: polluter pays vs owner pays*



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Themes-stakeholders working groups

- **Developing Expertise**
 - *inventory of contaminated sites*
 - *incentive to promoters for partnering in technology demonstration projects*
 - *diffusion of information*
- **Economic Incentives for Redeveloping Brownfields**
 - *network site developers with financial institutions*
 - *improve communication between experts , site developers, public, regulators,*
 - *establish urban guidelines to prevent urban spreading on greenfields*



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Strategic Alliances

Network – members and strategic alliances
with existing organizations






























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Canadian Brownfields Network (CBN)

- The Canadian Urban Institute (www.canurb.com) and aboutREMIATION launched the CBN in response to NRTEE recommendation for a national brownfields network
- CBN Principles:
 - Coordinate national interests and strengthen the Canadian brownfields redevelopment industry
 - Facilitate linkages, builds capacity, and coordinate the exchange of ideas, expertise and stories



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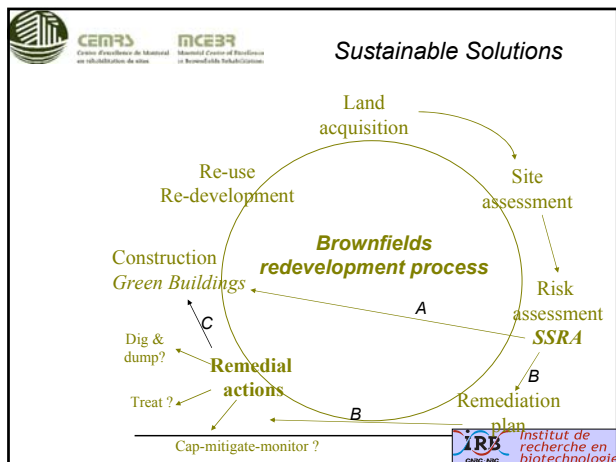
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Demonstration projects

Partnerships with private
companies at MCEBR



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Demonstration Project Partnership

- **Projects leaders**
 - Alex-Sol
 - Dessau-Soprin
 - Dragage Verreault
 - Golder associés (2)
 - Inspec-Sol
 - IRB-CNRC
 - IRBV
 - Sanexen(3)
 - Technorem
 - Gradek Energy
- **Partners**
 - CN railway
 - Shell Canada
 - City of Montreal
 - Ultramar
 - Fiducie de Montreal-est
 - National Defense
 - Ministry of Environment
 - Environment Canada
 - Biotechnology Research Institute-NRC
 - COREM
 - Universities:
 - INRS
 - Waterloo
 - Ecole Polytechnique
 - IRBV-Montreal

Value > \$ 8 Millions cdn




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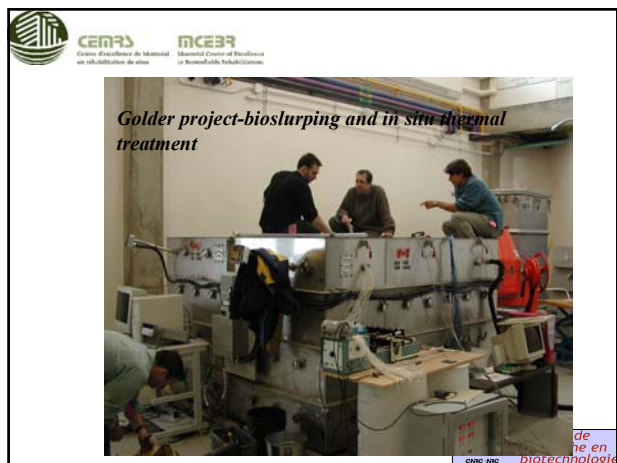
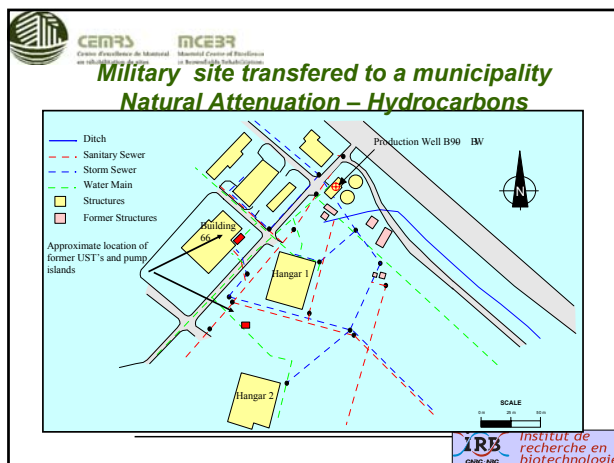
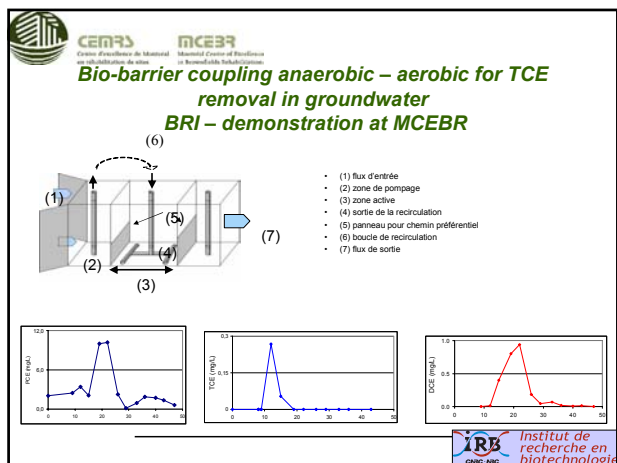
MCEBR –Promotion of Sustainable Solutions



- Exhibit in the hall of the MCEBR
- Presence at major conferences and technical and commercial expositions
- Exposure to end-users
- Support the promotion et la commercialization of technologies and remediation solutions
- In collaboration with Réseau Environnement



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INSPEC-SOL Inc.

**Phytoremediation of mixed contaminants
PAH's and metals**



2001

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**Fractions
Metal speciation – Bio-availability**

	A	B	C	D+E
Copper :	0 %	12 %	27 %	61 %
Lead :	0 %	22 %	39 %	39 %
Zinc :	0 %	16 %	47 %	37 %
	Bioavailable	Potentially Bioavailable	Potentially Bioavailable	Not Bioavailable

limiting factor !

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**Risk Analysis - Major issue in Canada
Contaminated Sites Management**

- Human health risk assessments, developed with health and environment departments;
 - development of site specific criteria
 - establish remediation or mitigation measures
 - Still limited acceptance by lenders for brownfields redevelopment*
- Ecological risk assessments
 - Sensitive environments and quality of soils
- Risk Base Corrective Action (RBCA) adopted in some provinces.
 - Atlantic PIRI « partnership in RBCA implementation »
- CCME site classification system/potential risk/ranking

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Ecological Risk Assessment Model

- TerraSys**
 - Developed primarily for cases involving contaminated soil, **TerraSys** possesses the tools necessary to **evaluate risks related to the presence of toxic substances in the environment**, whether in terrestrial or aquatic habitats.
 - The numerous ecotoxicological databases integrated into the program may be edited by the analyst and used for the **calculation of reference values**.
 - This characteristic gives **TerraSys** a capacity so far unequalled for performing risk assessments on combinations of receptors and contaminants for which no reference values are currently available.
 - mathematical models for the estimation of ecotoxicological risks** tied to the exposure levels of the various receptors.
- developed by **Sanexen services environnementaux inc** in collaboration with MCEBR (booth b043)
- terrasys@sanexen.com www.sanexen.com

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Testing environmental risks, fate and impacts





source: Biotechnology Research Institute



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**CEMRS – redevelopment of a brownfield –
Pitt property**



- 2001, MCEBR and partners initiate redevelopment process of property
- Former railway
- Contamination - métaux, HC, PAH
- Support of local population and regulator
- Environmental assessment - risks evaluation & restoration
- investment of over \$ 2 Millions
- Technology demonstration





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Le redéveloppement de terrains contaminés
et le développement durable des communautés
Les défis de l'arrondissement Sud-Ouest de Montréal

PITT property (2003)






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Measuring performance and success

- Project selection criteria:
 - economic, environmental, sustainability and commercial impact
- Follow-up by experts and report supported by MCEBR partners
- Independent assessment of impacts, business development, market penetration, technical edge



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Communication and Education

Information to the public and to stakeholders




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Public information and education



- Better understanding of issues, impacts, benefits for cleaning up Brownfields and contaminated sites
- Permanent exhibit for schools
- Next to a pedestrian/cycling path 1 million user per year
- Animation and on site activities- e.g. architect site design workshop
- MCEBR led a major survey involving 80 stakeholders in 2001
 - influence regulator adapting new law
 - strategic positioning in Brownfield business

Collaboration with the City of Montréal (South-West burrow)



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MCEBR – part of the development of sustainable communities



- giving back to citizens
safe and cleaned sites = *quality of life*
- increased security of the public
- revitalization of urban areas
- economic activities
- protection of the environment



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International Links and Activities



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International

- **Since 1996, participation to US Brownfields conference**
- **Consoil Europe**
- **Australia 2004**
- **GEPC Japan (2002)**
- **International Committee on Contaminated Land**
 - Canada: chair & host of meeting in Montreal in 2003
 - Created in 1993
 - 40 countries
 - Forum of exchange, meeting bi-annual
 - Paris 2005
- **USEPA, technology demonstration programs**
 - **RTDF, NABIR**
- **European Networks**
 - **Cabernet, Rescue, Nicole, Clarinet, Claire (UK), Renare Mark.**



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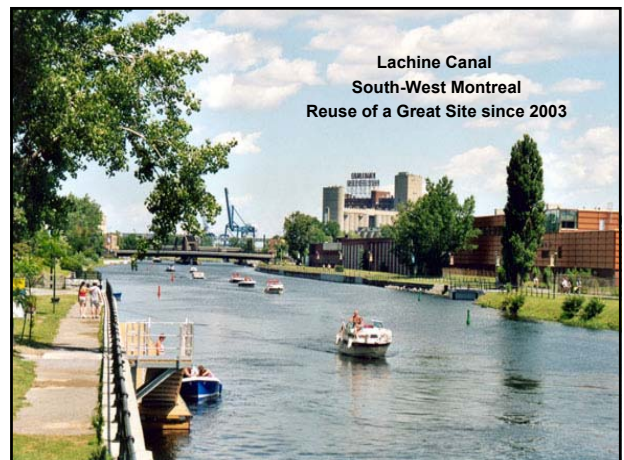
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MCEBR participation to National & International Conferences and Exhibitions

- Pollutec 2004
- US Brownfields 2004
- Journée technique Réseau 2004
- AQVE 2004
- IDU 2004
- Americana 2005
- Toronto 2005
- IFAT-Germany 2005
- International Committee on Contaminated Land, 2005
- Consoil-France 2005
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