MEND VANCOUVER WORKSHOP

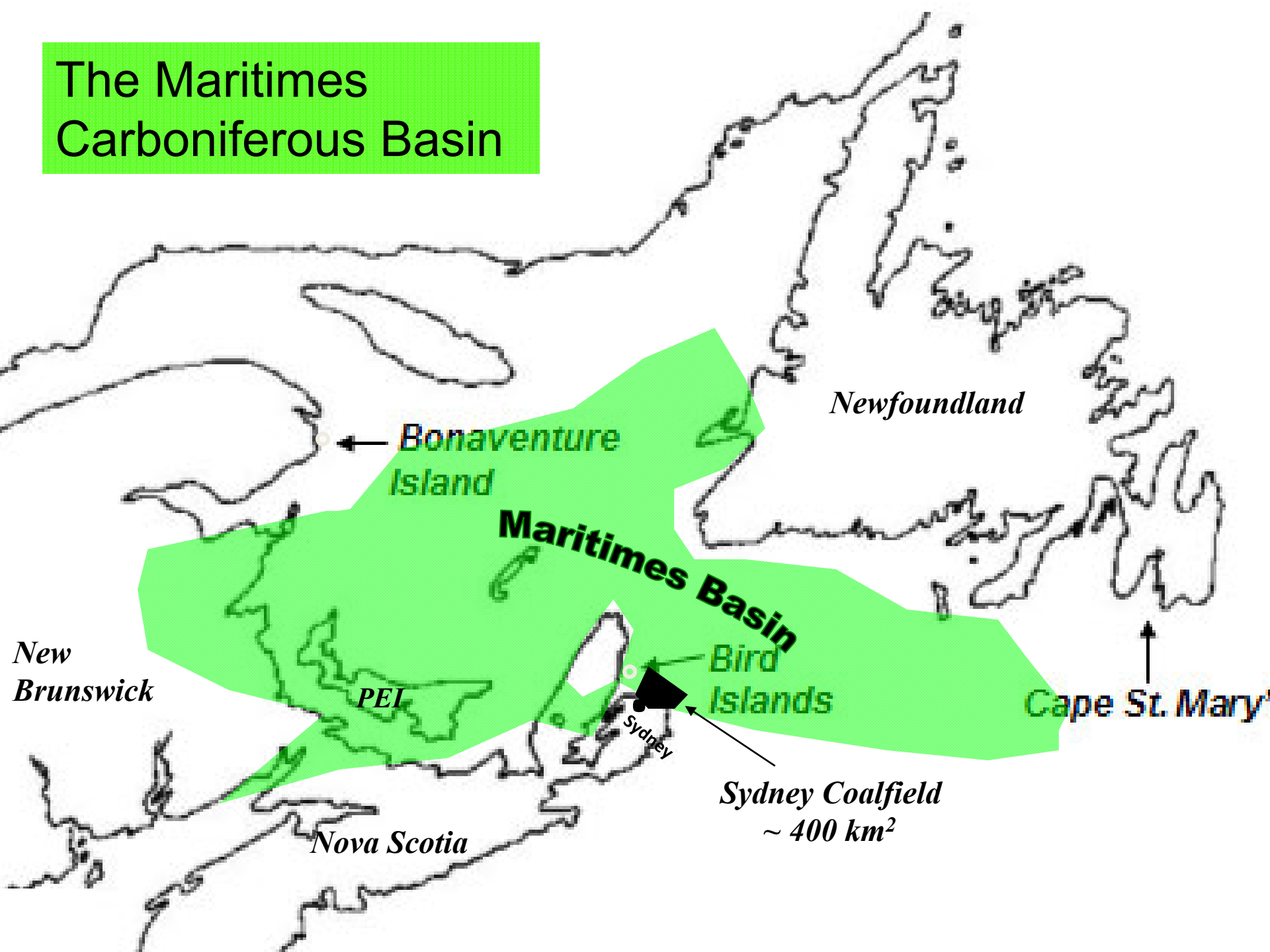
Designing a Treatment System to Deal With the Combined Discharge from a Group of Nine Flooding Coal Mines

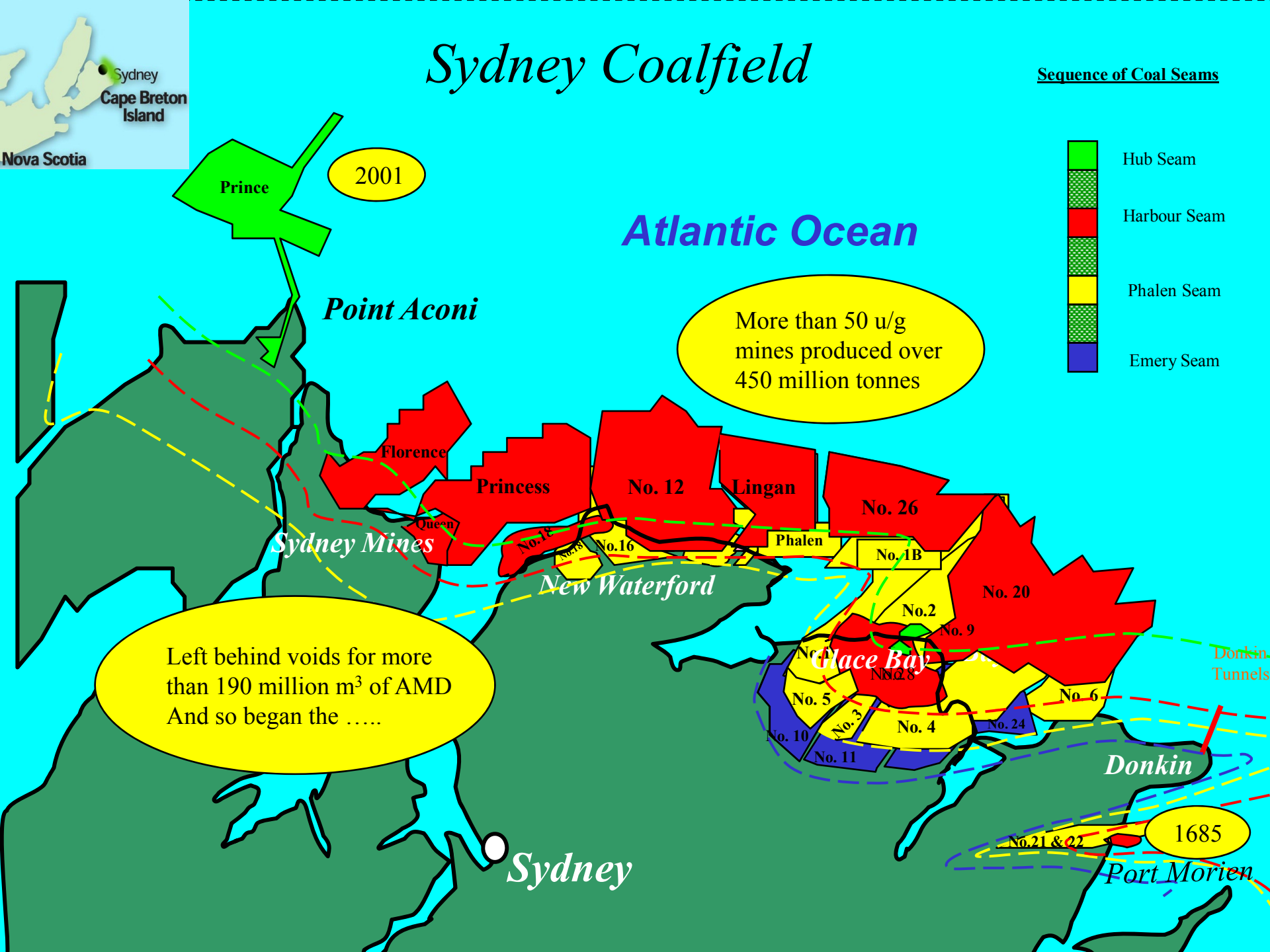
Vancouver, British Columbia
November 28/29, 2012

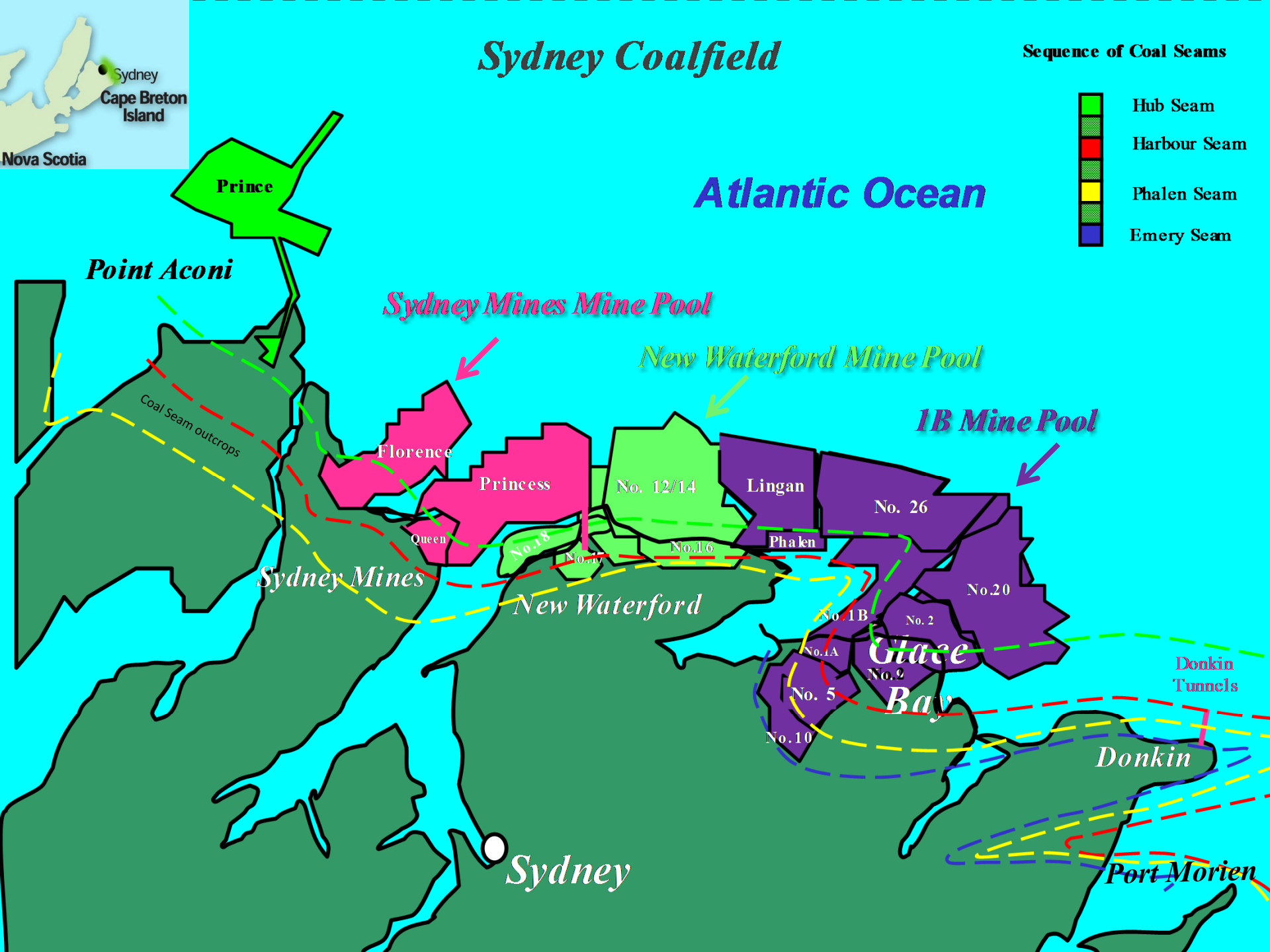
OUTLINE OF PRESENTATION

1) Sydney Coal field – brief description
2) Identifying and quantifying the problem
3) Trying to limit the water inflow paths
4) The project design and schedule
5) Implementing the design
6) Waiting for the mine water

The Maritimes Carboniferous Basin




Sydney Coalfield
Sydney
Cape Breton Island
Nova Scotia
Sequence of Coal Seams
Hub Seam
Harbour Seam
Phalen Seam
Emery Seam
Prince
2001
Atlantic Ocean
Point Aconi
More than 50 u/g mines produced over 450 million tonnes
Florence
Princess
No. 12
Lingan
No. 26
Queen
Sydney Mines
No.14
No.18
No.16
Phalen
No. 1B
New Waterford
No. 20
No.2
No. 9
Glace Bay
No.8
No. 5
No. 6
No. 3
No. 4
No. 24
No. 10
No. 11
Donkin
Donkin-Tunnels
Left behind voids for more than 190 million m³ of AMD
And so began the …..
Sydney
No.21 & 22
1685
Port Morien


Sydney Coalfield
Sequence of Coal Seams
Hub Seam
Harbour Seam
Phalen Seam
Emery Seam
Sydney
Cape Breton Island
Nova Scotia
Atlantic Ocean
Prince
Point Aconi
Sydney Mines Mine Pool
New Waterford Mine Pool
1B Mine Pool
Coal Seam outcrops
Florence
Princess
No. 12/14
Lingan
No. 26
Queen
No.18
No.17
No.16
Phalen
No.20
Sydney Mines
New Waterford
No.1B
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Glace Bay
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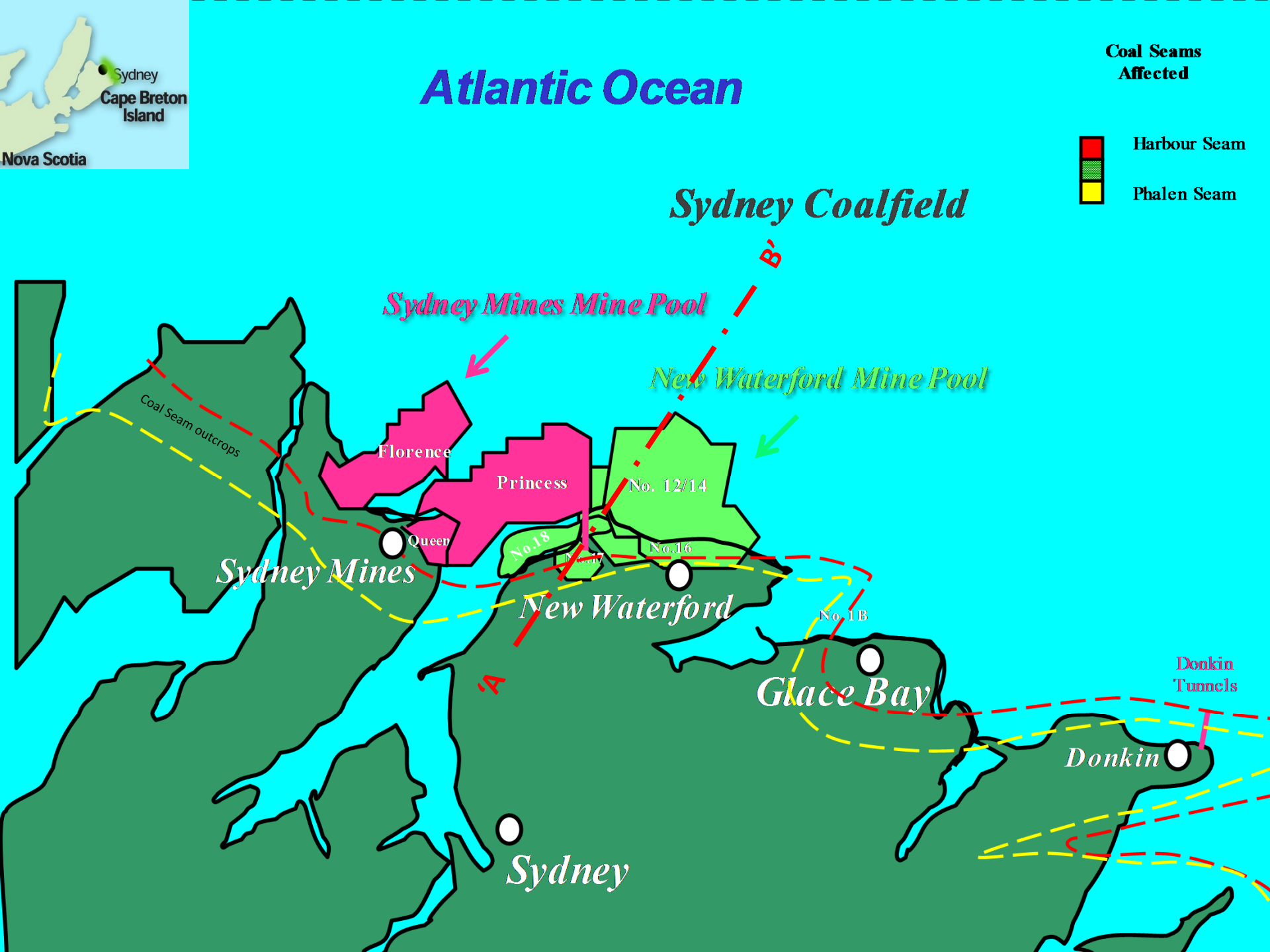
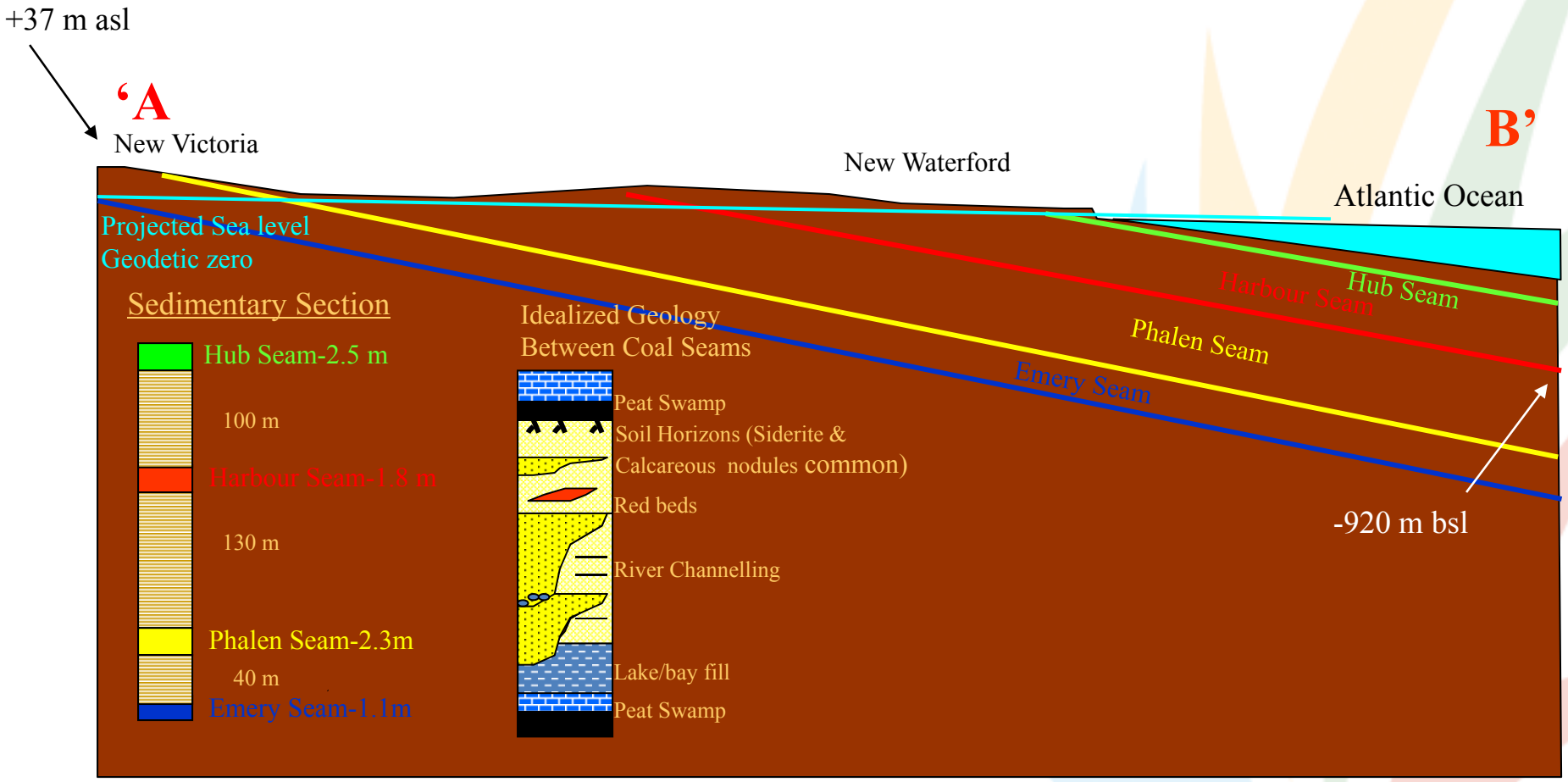
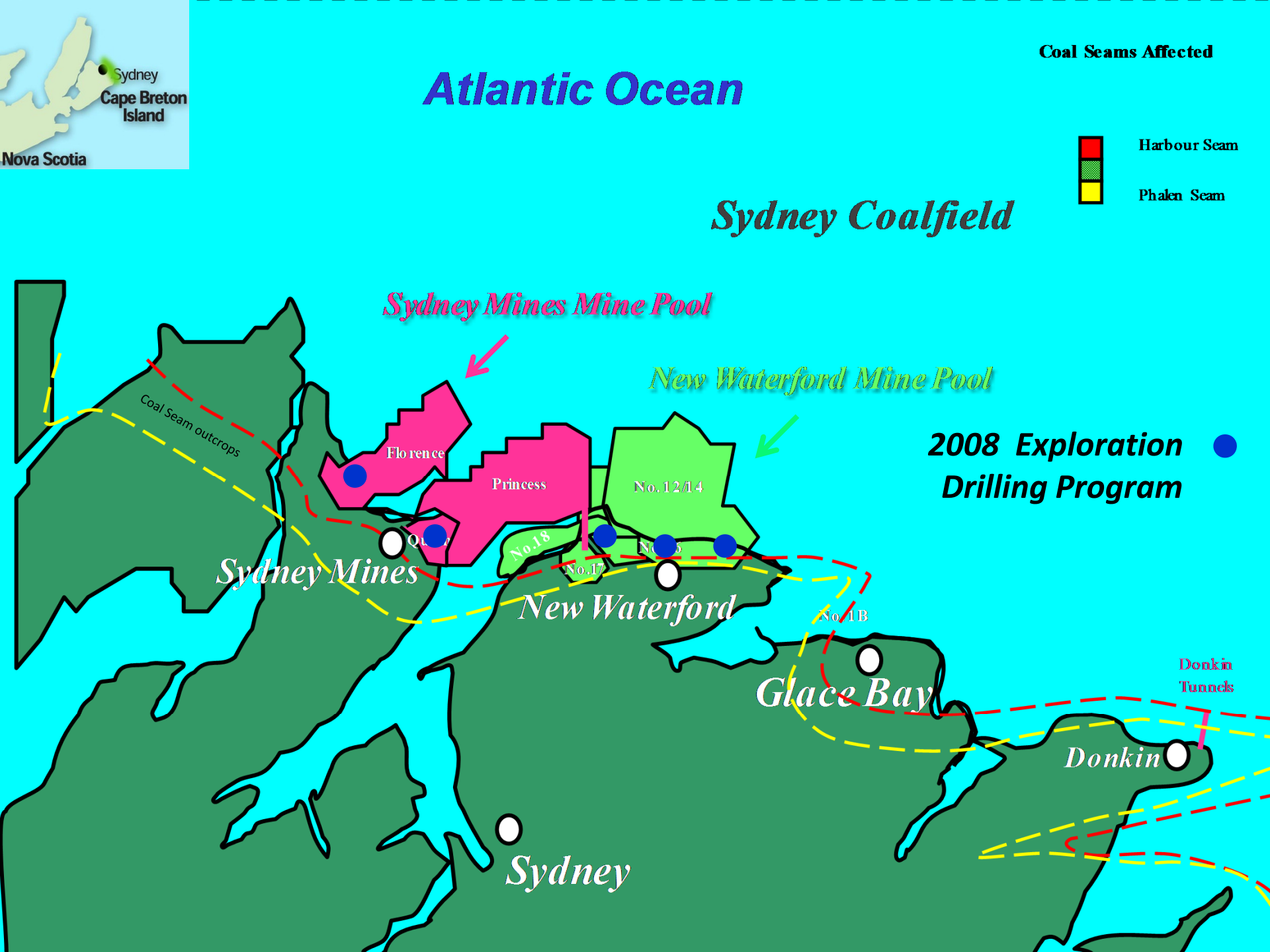
No. 5
No.10
Donkin Tunnels
Donkin
Sydney
Port Morien


Sydney
Cape Breton Island
Nova Scotia
Atlantic Ocean
Coal Seams Affected
Harbour Seam
Phalen Seam
Sydney Coalfield
B'
Sydney Mines Mine Pool
New Waterford Mine Pool
Coal Seam outcrops
Florence
Princess
No. 12/14
Queen
No.18
No.16
Sydney Mines
New Waterford
No.1B
A'
Glace Bay
Donkin Tunnels
Donkin
Sydney

Typical Stratigraphic Section Through Coal Seams Mined in the Sydney Coal Field

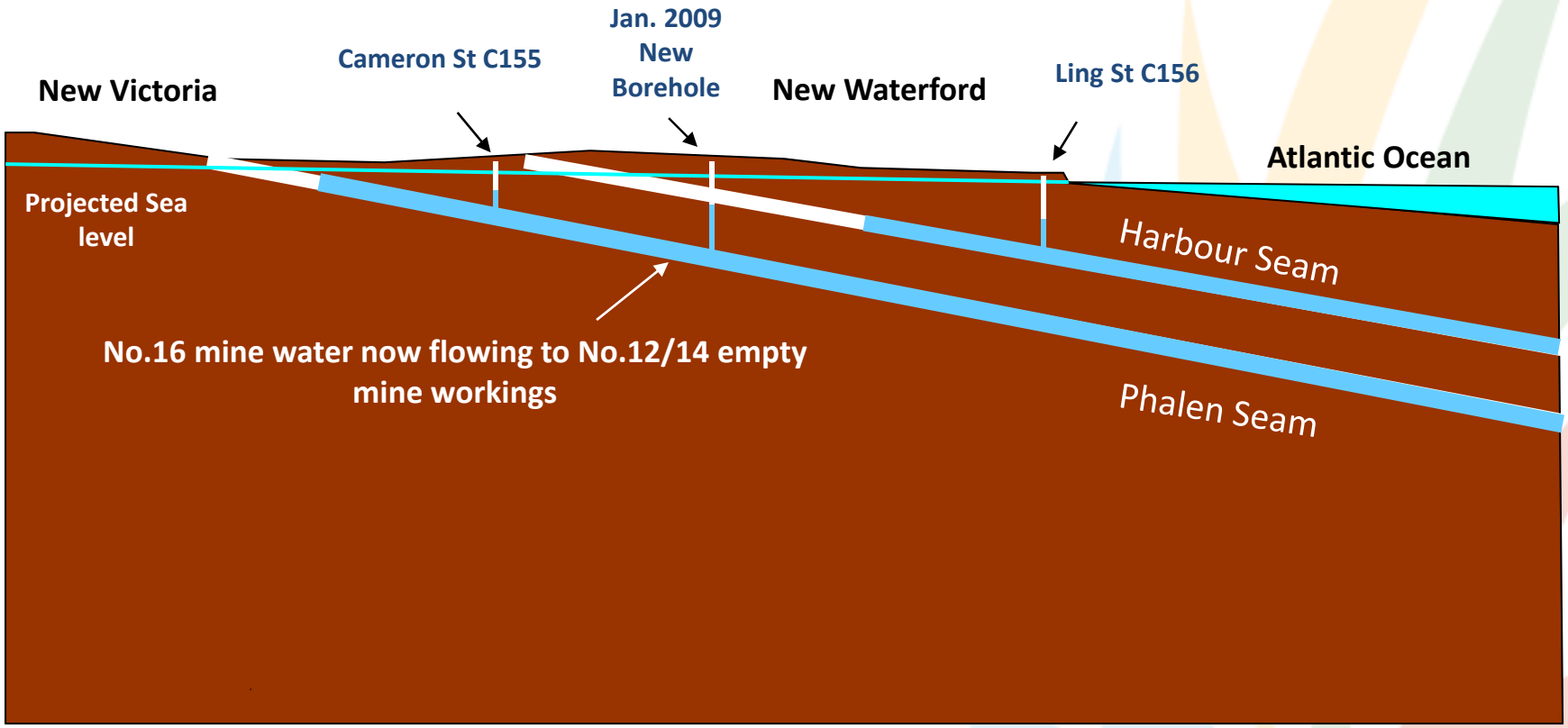
(Section 'A – B' through the New Waterford Mine Pool)




Sydney
Cape Breton Island
Nova Scotia
Atlantic Ocean
Coal Seams Affected
Harbour Seam
Phalen Seam
Sydney Coalfield
Sydney Mines Mine Pool
New Waterford Mine Pool
2008 Exploration Drilling Program
Coal Seam outcrops
Florence
Princess
No. 12/14
No.18
No.17
Sydney Mines
New Waterford
No.11B
Glace Bay
Donkin Tunnels
Donkin
Sydney

Running out of Time !

Connection needed to combine the DM-12/DM-14 and DM-16 to avoid a 10 L/s outfall in the Town of New Waterford

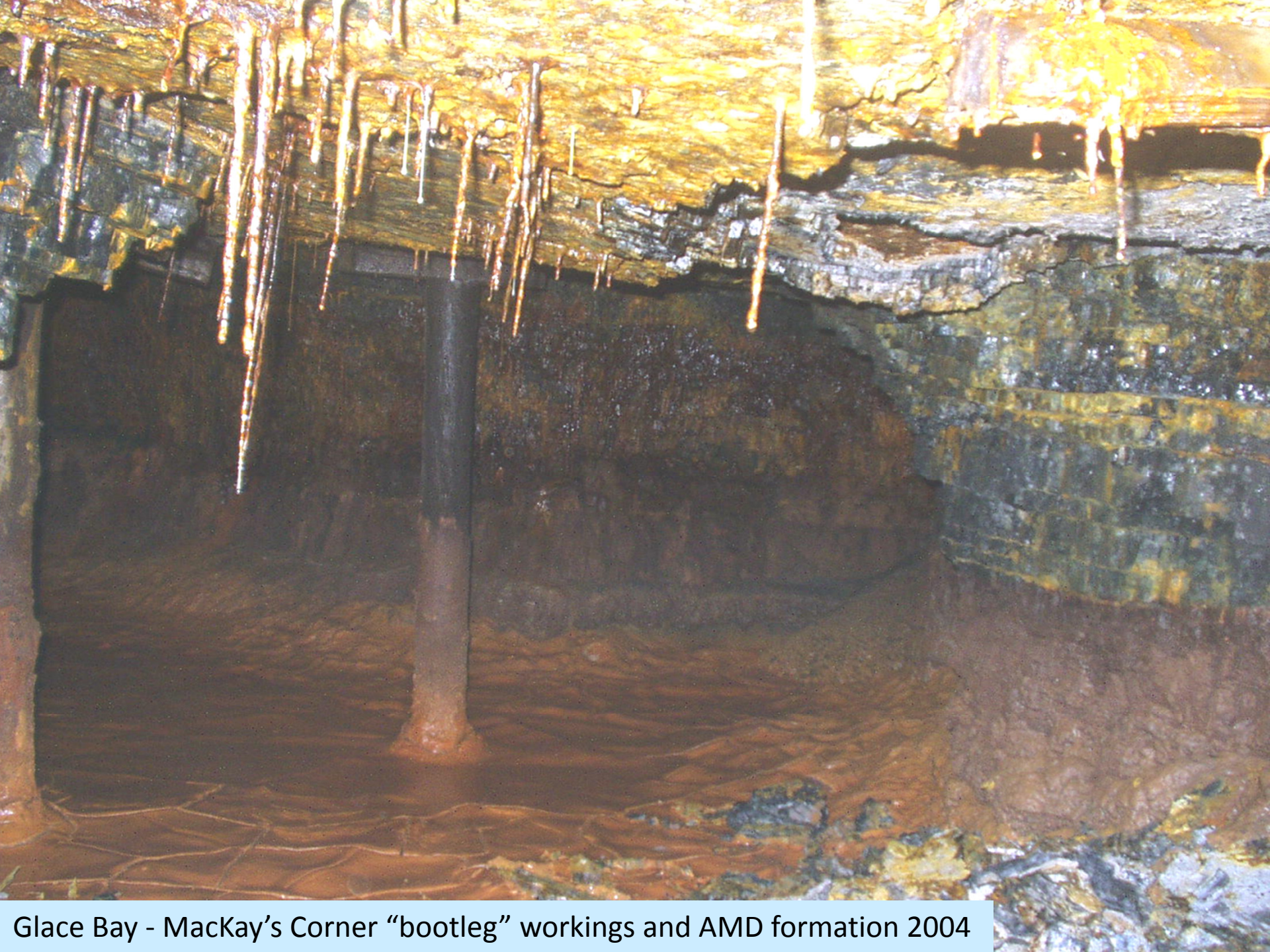


Tools available to find the "bootleg" or "crop" pit locations

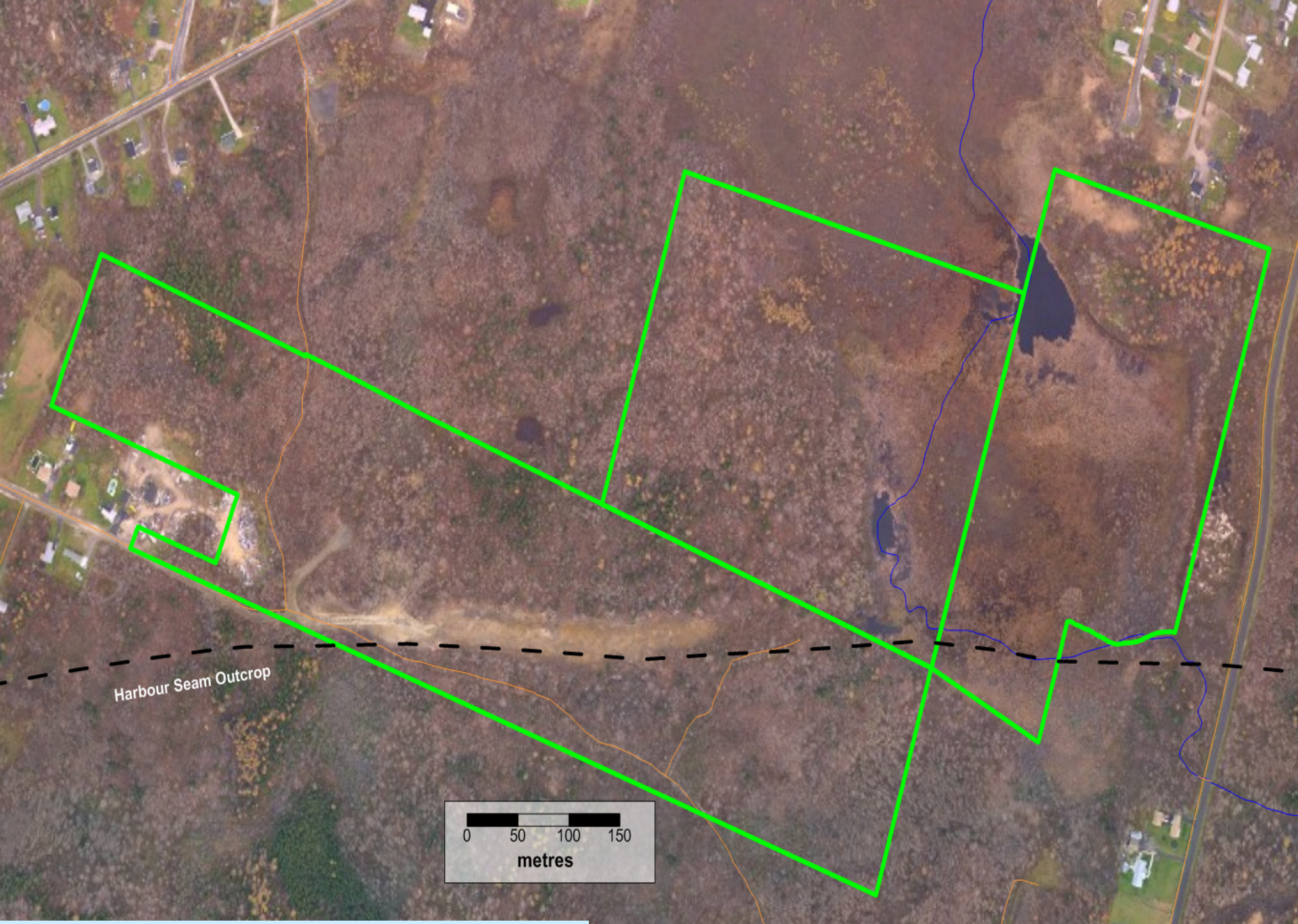
- Identify the high risk zones on surface maps
- Travel high risk zones on a scheduled basis
- Investigate reports from citizens and others
- Fly LIDAR aerial survey to see landform
- Other geophysical methods

Examples of bootleg pits, high risk zones, use of LIDAR to find bootleg pits

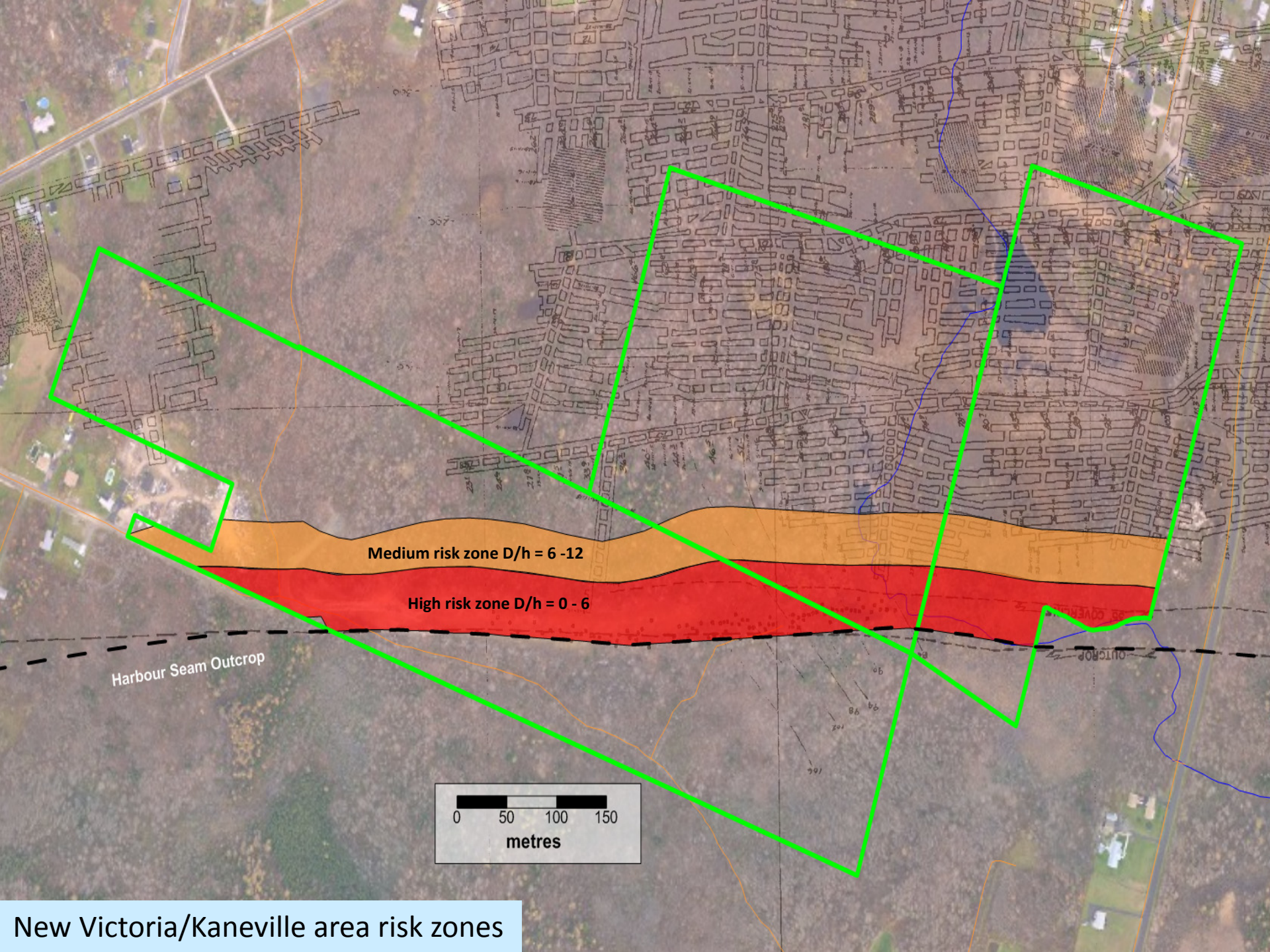
Typical subsidence effect from shallow “bootleg pit”



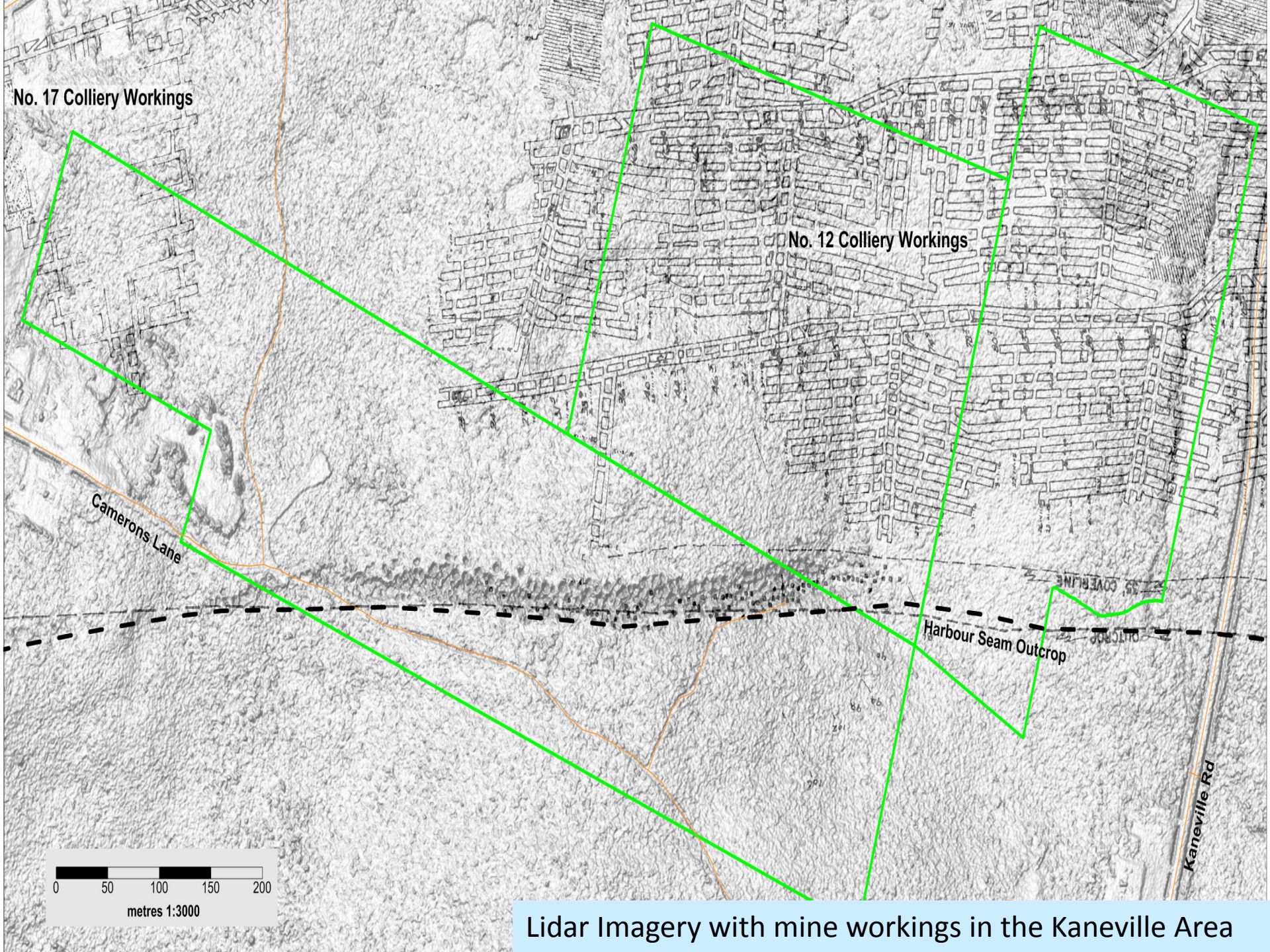
Glace Bay - MacKay's Corner "bootleg" workings and AMD formation 2004



New Victoria/Kaneville area – aerial photo



New Victoria/Kaneville area risk zones



Lidar Imagery with mine workings in the Kaneville Area

New Victoria - Kaneville “bootleg pits” 2009

Kaneville area remediated 2009

Criteria used by ECBC to determine where the mine water treatment plant needed to be located

- Identify the location(s) where the abandoned mine workings can be accessed in order to intercept the rising mine water.
- Look at connecting mine pools to be able to minimize the number of treatment plants that need to be constructed.
- Does ECBC own sufficient land at these locations to construct a treatment plant and dispose of the solid waste residue.
- Locate the treatment plant as close to the ocean as possible so that it can receive the treated water with minimum effect on the environment.
- Locate the treatment plant in an area that will have the least effect on the community.

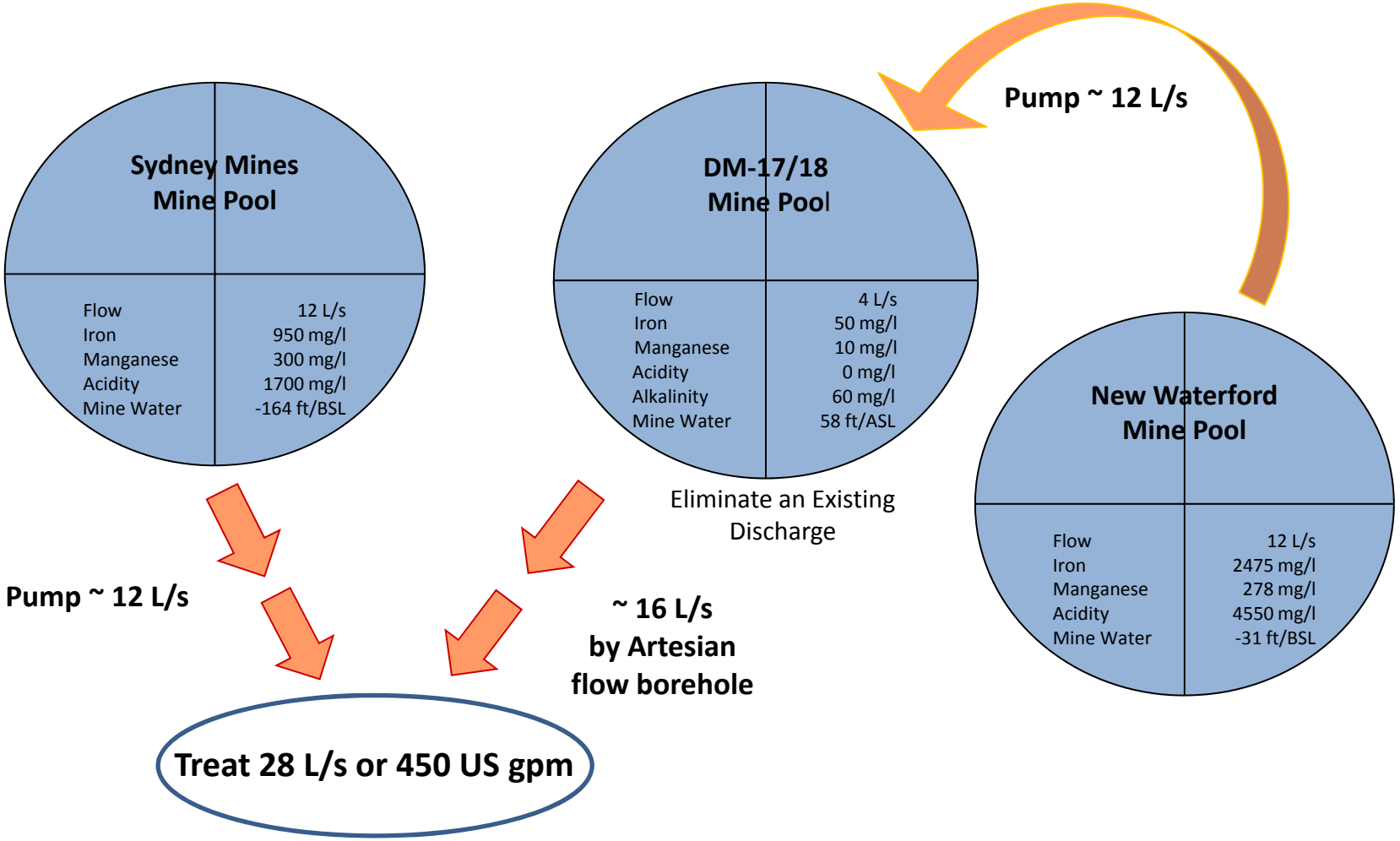
New Victoria site June 2009

New Victoria Mine Water Treatment Plant Project Schedule

TASK	2010				2011				2012			
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
Preliminary Design												
Field Investigations												
Mine Pumping System Design												
Treatment Process Selection and Design												
Site Layout												
Equipment Tender and Procurement												
Construction Phase I, II, III												
Commissioning Pumping System												
Commissioning Treatment Plant												
Facility Fully Operational												
Mine Water Outfalls Predicted												

The New Victoria Mine water Treatment Plant must be fully operational before November 2012 when mine water levels are expected to reach equilibrium and outfalls are predicted to occur.

One HDS Treatment Plant – Combined Sydney Mines and New Waterford Mine Pool Flow Schematic



One Treatment Plant located at the New Victoria site

Pipeline to connect the NW mines

SS one-way valve

New Victoria MWTP site October 2011

New Victoria MWTP site December 2011

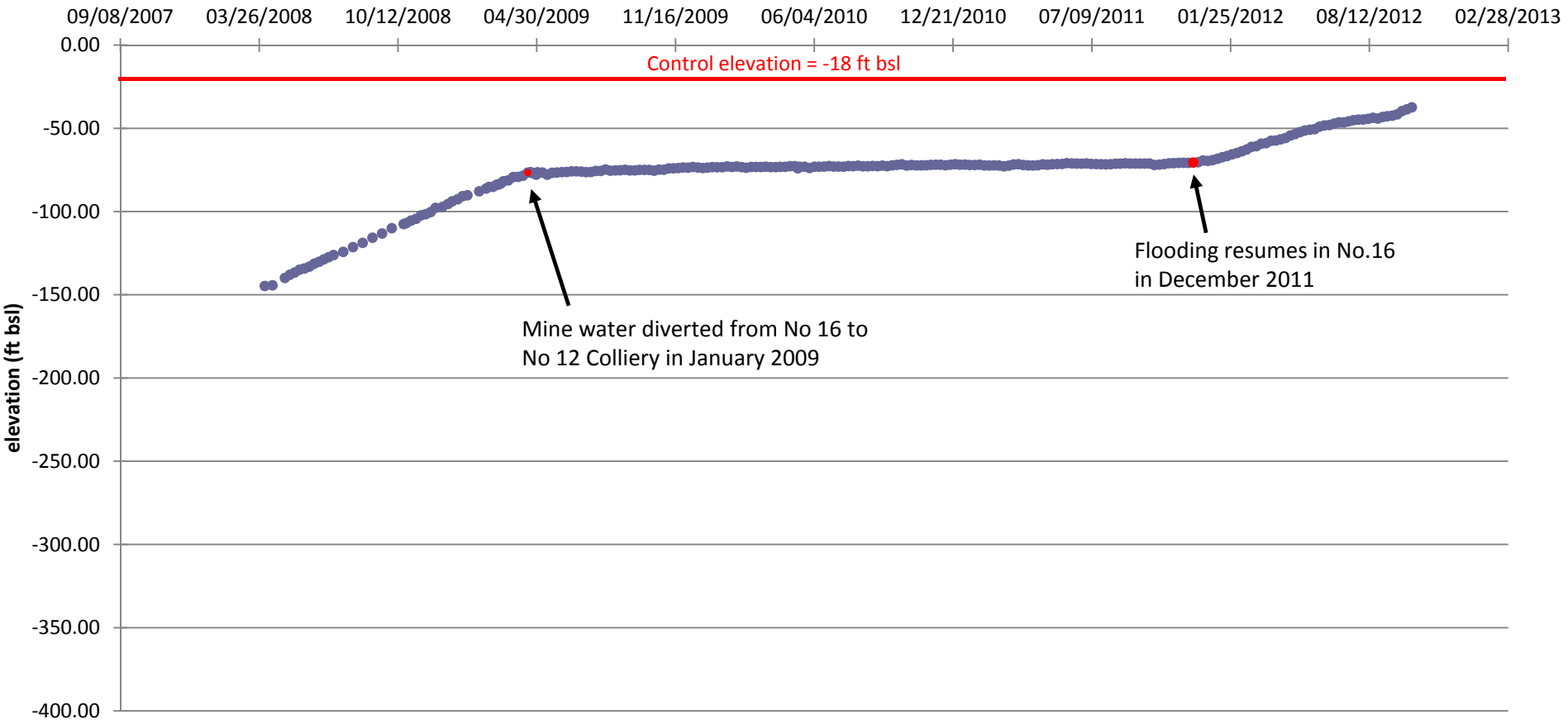
Aeration Cascades

Aerator and Clarifier

Drum filter, Aerator and from Clarifier bridge

New Victoria MWTP site August 2012

Hydrograph for Monitor Well C155 - No. 16 Colliery, Phalen Seam



Question – What would happen if we didn't treat the rising mine water ?


Acidic discharge of 1000 mg/L Fe at 4 L/s

Guidelines - The NVMWTP will adhere to the Canadian Federal guidelines for a discharge into the Marine Environment as noted and posted in our CEAA document to Ottawa.

Regulations - The NVMWTP will be regulated by DFO, EC, and HC in relation to the discharge from the MWTP. (i.e. fish toxicity tests, alteration of habitat, etc.)

CCME Water Quality Guidelines For the Protection of Aquatic Life for Marine Discharge
That ECBC will Apply to the New Victoria Mine Water Treatment Plant

Chemical name	Chemical group	Concentration mg/L Short Term	Concentration mg/L Long Term	Date
Arsenic	Inorganic	No Data	0.0125	1997
Benzene	Organic Monocyclic Aromatic Compounds	No Data	0.11	1999
Cadmium	Inorganic	No Data	0.00012	1996
Chromium, hexavalent(CR(VI))	Inorganic	No Data	0.105	1997
Chromium, trivalent (Cr(III))	Inorganic	No Data	0.056	1997
Colour [1]	Physical	No Data	Narrative	1999
Debris	Physical	No Data	Narrative	1996
Dissolved oxygen	Inorganic	No Data	>8.0 & Narrative	1996
Mercury	Inorganic	No Data	0.000016	2003
Naphthalene PAHs	Organic Polyaromatic Compounds Polycylic Aromatic Hydrocarbons	No Data	0.0014	1999
Nitrate	Inorganic Inorganic nitrogen Compounds	No Data	16	2003
Nutrients		No Data	Guidance Framework	2007
Phosphorus	Organic	No Data	Guidance Framework	2007
Polychlorinated biphenyls PCB's	Organic Polyaromatic Compounds Polychlorinated Biphenyls	No Data	0.00001	1991
pH [2]	Inorganic Acidity, alkalinity and pH	No Data	7.0 to 8.7 & Narrative	1996
Salinity [3]	Physical	No Data	Narrative	1996
Suspended Sediments TSS [4]	Physical Turbidity, clarity and suspended soilds, total particulate matter	No Data	Narrative	1999
Temperature	Physical	No Data	Narrative	1996
Turbidity	Physical Turbidity, clarity and suspended soilds, total particulate matter	No Data	Narrative	1999
Uranium	Inorganic	NRG [5]	NRG	2011

Operational Guidelines ECBC will apply in addition to CCME Marine Guidelines at the NVMWTP

Acidity modified	Inorganic		0	2012
Iron	Inorganic	No Data	1	2012
Aluminum *	Inorganic		0.1	1987
Copper **	Inorganic		0.06	2006
Lead**	Inorganic		0.4	2006
NIckel**	Inorganic		1	2006
Zinc**	Inorganic		1	2006

ecbc | secb
Inspire. Build. Succeed. | Inspirer. Bâtir. Réussir.
Canada

Thank you - Questions

Westech Aerator

Testing various polymers

New Vic Aeration Cascades