


# Assessment of the Adequacy & Reliability of the STPA Proposed Approach for Remediation of the Sydney Tar Ponds' Sediments

Presentation to the Sydney Tar Ponds and Coke Ovens Sites  
Remediation Project Joint Review Panel  
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G. Fred Lee, PhD, PE, DEE  
Advisor to Cape Breton Group Sierra Club, Canada

G. Fred Lee & Associates El Macero, CA  
ph: 530-753-9630 fax: 530-753-9956  
gfredlee@aol.com  www.gfredlee.com

## Topics

Review Adequacy of STPA EIS, Responses to IRs, & Hearing  
Transcript Testimony to Address Potential for S/S-Treated Tar Ponds'  
Sediments to Comply with Regulatory Requirements to Prevent  
Pollutant Transport to the Estuary

# Qualifications Summary

- Academic Background
  - BA - San Jose State College; MSPH - University of North Carolina Chapel Hill (Public Health & Environmental Quality)
  - PhD - Harvard University – 1960 (Environmental Engineering & Aquatic Chemistry)
  - University Graduate-Level Teaching & Research 30 yrs at Several Major US Universities
    - Most Recently Distinguished Professor Civil & Environmental Engineering - New Jersey Institute of Technology, as well as
      - Director, Site Assessment & Remediation Division of Multi-University Hazardous Waste Research Center
      - Director of New Jersey Sea Grant Water Quality Program
    - Conducted > \$5 million in Research & Published > 500 Professional Papers & Reports on Investigations
      - Researched Sources, Fate & Management of PCBs – since mid-1960s
      - >\$1 million Research on Leaching of Pollutants from Aquatic Sediments
      - Investigated Characteristics of Landfill Liners as Containment Systems for Controlling Pollutant Transport
      - Evaluated Testing Procedures (Including TCLP) for Evaluating Release of Pollutants from Remediated Wastes (Including S/S Treatment)
      - Advisor on Water Quality & Solid & Hazardous Waste Management Issues to
        - Numerous Governmental Agencies in US & Other Countries
        - Industry & Public Groups

## Qualifications Summary (cont'd)

- Full-Time Independent Consultant Since 1989  
Working on Water Quality & Solid & Hazardous Waste Investigation & Remediation
  - Published Additional 600 Professional Papers & Reports on These Issues over Past 17 yrs  
Available at Website: [www.gfredlee.com](http://www.gfredlee.com)
  - Investigated >80 Landfills & Capped Waste Pile Containment Systems (Liners & Covers) for Controlling Waste Releases to Environment
  - Involved in Investigating & Advising Public on Hazardous Chemical Sites, Including US EPA NPL Superfund Sites
  - Member Editorial Boards for Journals ***Remediation*** and ***Stormwater***
- Extensive Experience in Developing & Evaluating Appropriate Implementation of Water Quality Criteria & Standards



# Findings

- Sydney Tar Ponds (STP) Sediments Are Polluted with PCBs, PAHs, Heavy Metals & Variety of Unrecognized, Unregulated Chemicals That Are Significant Threat to Public Health & the Environment
  - Releases of Contaminants from Those Sediments Have Polluted the Estuary & Sydney Harbour
- Tar Ponds Area Sediments Are in Wet Environment
  - Groundwater, Salt Water & Surface Precipitation Interact with the Sediments to Leach Pollutants & Transport Them to Estuary
- STPA Proposing to Use S/S Treatment to Prevent Further Leaching of Pollutants from STP Sediments That Leads to Pollution in the Estuary

## Conclusions (Effectiveness of S/S Treatment)

- STPA's Proposed Approach for "Remediation" of Sediments (S/S Treatment, Capping, & Water Management through Barrier Walls & Interceptor Trenches) **Has Significant Long-term Technical Problems**
- Can Readily Lead to **Failure to Prevent Significant Further Pollution of Estuary**
- Tar Ponds' Sediments Have **High Organic Content**
- S/S Treatment of Inorganic Wastes Containing Heavy Metals Widely Used; May Be Effective in Situations **Where S/S-Treated Wastes Are Kept Dry**
- **Significant Questions about Potential Effectiveness of S/S Treatment for Immobilizing Organic Contaminants in High-Organic-Waste Solids**
- **STPA Claims Number of Examples of "Successful" Practice of S/S Treatment of High-Organic Wastes**
  - **Such Claims Not Supported by Demonstration** that Organic Constituents in S/S-Treated Organic Wastes Are Not Leached at Sufficient Concentrations to Pollute Environment

# Conclusions

## (Failure of Water Management System)

- STPA Proposed to Develop Complex Surface Water, Groundwater & Marine Water Flow Management System That, According to STPA, Would
  - “Not Allow” Those Waters to Enter the S/S-treated Sediments, But If They Did, Would
    - Collect All Polluted Water Released from S/S-treated Sediment, &
    - Treat the Polluted Water Adequately before Discharge to Estuary
- Problems:
  - HDPE Plastic Sheeting Barriers Incorporated into Containment System for STP S/S-Treated Sediments & to Control Water Flow in STP Area Will Deteriorate over Time & Allow Substantial Passage of Water through Them
  - STPA Failed to Acknowledge & Prepare for Inevitable Failure of HDPE Liners in the Barriers & Resultant Release of Pollutants to Groundwaters & the Estuary over Period of Time That the S/S-Treated Sediments Will Be a Threat to Release Pollutants
- Failure of HDPE Plastic Sheeting Layer to Prevent Water from Entering S/S-Treated Sediments & Polluted Water from Exiting S/S-Treated-Waste Area to the Estuary Will Not Be Readily Detectable



## Conclusions (Effectiveness of GCL Cap)

- GCL Layer in STP Sediment Cap Can Initially Have Very Low Permeability
  - This Type of Liner Subject to Variety of Failure Mechanisms
    - Will Allow Substantial Amounts of Water on Surface of Capped S/S-Treated Sediments to Pass through Cap into the S/S-Treated Sediments
    - Will Result in Leaching of Pollutants to the Estuary
- Failure of GCL Layer to Prevent Penetration of Water on Surface of Cap into S/S-Treated Sediments Will Not Be Readily Detectable
  - STPA Failed to Adequately Consider Potential for Water That Has Leached Pollutants from S/S-Treated Sediments, to Become Part of Groundwater Flow Regime in Fractured Bedrock Underlying STP Area That Could Transport Pollutants to the Estuary

# Conclusions

## (Duration of Threat – “Walk Away”)

- STPA Has **Grossly Underestimated Duration of Threat** of Additional Pollution to Estuary Posed by S/S-Treated STP Sediments
  - **25-yr MOA-Established Project Period Represents Small Part of Time** That S/S-Treated STP Sediments Will Be Threat to Pollute Environment
  - For Planning of Assured Funding for Monitoring & Maintenance of S/S-Treated Sediments & Water Management System: **Duration of Threat to Public Health & Environment Posed by S/S-Treated Sediments Should Be Considered Infinite**



# Issues

- **STPA claims** that its proposed remediation approach will eliminate further pollution of the Estuary in **25 years**. **Such claims are not in accord with what can reasonably be expected from their proposed remediation approach.**
- The **cost of this remediation approach will increase** over time beyond the \$400 million allocated for the Project, due to monitoring and maintenance of the S/S-treated STP sediment area for the very long period of time that the S/S-treated sediments will be a threat to public health and the environment.
- Ultimately, it could be concluded that the current approach for **S/S treatment of the STP sediments did not achieve the desired goal** of eliminating pollution of the Estuary, with the result that there would be need to develop a new, more reliable and effective remediation approach.

# Prior Use ≠ Proven Technology

- MOA Requirement for Remediation of Tar Ponds' Sediments:
  - “Proven Technology” That Has Been “Successfully Employed for Projects of Similar Size & Nature”
- STPA Erroneously Assumes That Prior Use of S/S Treatment Is Demonstration That It is Proven Technology
  - Approach Has Not Been Adequately & Reliably Evaluated with Respect to Prevention of Release of Pollutants
  - Small Amounts of Release of Some Pollutants from S/S Treated Sediments Can Lead to Pollution of Estuary
    - TCLP Not Reliable Evaluation Procedure

STABILIZATION AND  
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Gilliam/Wiles,  
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**Hazardous,  
Radioactive,  
and Mixed  
Wastes** 3RD VOLUME

T. Michael Gilliam and  
Carlton C. Wiles, editors

STP 1240



# Current Testing Approaches Known to Be Inadequate

## Quotes from ASTM S/S Treatment Symposia

- *“To date, there has been little or no verification of these tests [leach test results] to ensure that they accurately predict behavior of the treated material in the field setting. Conner, J. Chemical Fixation and Solidification of Hazardous Wastes, VanNostrand Reinhold*
- *Even though S/S has been used for over 30 years there is no direct evidence of long-term material durability in the field. The durability of a S/S waste is dependent on how well it endures long term exposure to environmental stresses. A number of physical and chemical tests haven been applied to S/S wastes to determine the durability of the material. Generally, these tests are short term tests and do not give a full correlation to field performance. [reference to Conner (1990)].”*

*Means et al.*

- *“The long-term performance of treated waste is not clearly understood, and no definitive test procedures exist to measure or assess this property. The Toxicity Characteristic Leaching Procedure (TCLP) is not an adequate measure of long-term leaching. Monitoring data from field disposal sites are needed to detect the premature deterioration of solidification or stabilization of previously processed wastes. Because of the uncertainties surrounding long-term performance, wastes previously treated using S/S and disposed of may have to be retrieved and retreated in the future.”*

*US EPA Wiles and Barth*

- *“However, results of several studies, as well as data from remediation of several Superfund sites, have raised concerns about whether S/S is a valid technology for treating organic-bearing wastes.”*
- *“Furthermore, studies also provide evidence that tests other than the regulatory extraction tests [for example, toxicity characteristic leaching procedure (TCLP)] will be required to evaluate the effectiveness of S/S, especially when applied to organic wastes.”*



- *“These results suggested that any successful durability test or predictive model will have to account for significant chemical and structural changes over time that influence leaching rate.”*
- *“The durability of S/S wastes remains unclear, in part [due] to the relative time that the technology has been used, and to the lack of information on the sites using it.”*
- *“Evaluation of S/S process design, performance, and treatment efficiency should be based on a matrix of several testing protocols. No single test, such as TCLP, can provide all the information required to evaluate contaminant release potential, contaminant release rate, and physical durability. An appropriate test matrix to evaluate S/S processes should include tests that will address these factors.”*

*(More quotes provided in report)*

# Overall Assessment

- Although S/S Treatment of Solid Wastes Has Been Widely Applied Largely Because It Is Initially Cheaper Than Removal and Adequate Treatment of the Wastes, It Is **Not a Proven Technology that has been Successfully Demonstrated on Similar Wastes** to the STP Sediments
- STPA's Proposed Approach Fails to Meet MOA Requirements for STP Sediments Remediation Approach

# Post-Project Management Issues

- At the end of the 25-year MOA-established Project life, **Nova Scotia will inherit a legacy of highly polluted sediments that will have the potential to release pollutants at sufficient concentrations to be a threat to public health and the environment in the Estuary**
- **Nova Scotia** will also inherit an elaborate **water management system** that will require detailed monitoring/management to **try to detect/repair failure of the system components** (such as HDPE liners and the GCL layer in the cap)
  - The inevitable failure of these components will result in Nova Scotia's having to spend **large amounts of funds for periodic replacement of the liners and cap in an attempt to restore effective water management at the STP S/S-treated sediment area**
    - **Could Lead to Need for Re-Remediation**



# Alternative Approach

- **Removal and Treatment/Management** of the Tar Ponds' Sediments would, in the long-term, be **more technically valid and cost-effective** in restoring the Estuary to a non-polluted or less-polluted condition
- The **excavation and off-site management** of PCB-polluted aquatic sediments has been found by the US EPA to be the **most technically valid, cost-effective approach for reducing PCB pollution of the Hudson River and Estuary in New York and the Upper Fox River in Wisconsin**

## Synopsis

- STPA's proposed remediation approach for the Sydney Tar Ponds' (STP) sediments has significant technical problems that are not discussed in their EIS
- Stabilization and Solidification (S/S) for STP sediments is NOT a **proven technology** that has been successfully demonstrated elsewhere for high-organic wastes
- STPA assumes incorrectly that because S/S has been used elsewhere its use has been successful – use dependent on a variety of factors not related to immobilization of pollutants
- S/S treatment of STP sediments does not meet MOA requirements for use of a “proven technology”
- STPA's evaluation of S/S treatment for STP sediments was conducted incorrectly  
Do not know if PCBs and other pollutants in STP S/S-treated sediments will be released at sufficient concentrations to continue to pollute the Estuary
- STPA has not properly considered the S/S literature on these potential problems

- STPA proposed a complex water management system to attempt to control groundwater, marine water and rainwater from entering S/S-treated STP sediments
- Water management component systems in the STP S/S-treated sediment cap and barrier walls and trenches are all subject to failure to prevent water from being transported through them
- Containment properties of HDPE plastic sheeting and GCL layers deteriorate over time
- Water will enter STP S/S-treated sediments, which can leach pollutants
- Water can escape from the S/S-treated sediment area to the Estuary
- STPA has not adequately considered the long-term problems of the water management system components in working as designed for as long as the S/S-treated sediments will be a threat to public health and the environment



- STPA claims that remediation approach will result in a “walk away” situation in 25 years
- Such claims are not based on a reliable evaluation of the length of time that the pollutants in the S/S-treated sediments will be a threat – effectively, forever
- In 25 years, Nova Scotia will inherit highly polluted S/S-treated sediments and a complex water management system that ultimately will cost the Province large amounts of funds to try to control continued pollutant discharge to the Estuary
- The \$400 million proposed cost of the STPA remediation approach could be a small part of the total cost of the Project, considering the ad infinitum monitoring and maintenance of the S/S-treated sediments and the potential need to re-remediate those sediments