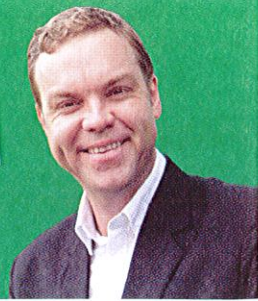




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Western Harbour Tunnel Proposed trench tunnel construction – contamination, construction and impacts.

EPA's policy in relation to contaminated sediments

The policy of the EPA with respect to contaminated sediments in Sydney Harbour has been to leave them in place and to implement measures that ensure the sediments are not disturbed so as to prevent mobilisation of contaminants into the water column.

Significant contamination of sediments is known to remain in place at:

- Garden Island
- Cockatoo Island
- Berrys Bay
- Rozelle Bay
- White Bay
- Homebush Bay
- Blackwattle Bay
- Rozelle Bay

Remediation at Homebush Bay

Homebush Bay is one of the only locations where remediation of sediments has been undertaken in Sydney Harbour and its estuaries.

The purpose of the remediation of the most contaminated sediments in Homebush Bay was to reduce concentrations of dioxins in edible fish throughout Sydney Harbour.

The remediation works removed the sediments most contaminated by dioxins and chlorinated hydrocarbons adjacent to the seawall of the former Union Carbide (Lednez) site in Homebush Bay. These sediments were excavated, transported to the shore on a barge, dewatered and remediated by a thermal desorption process.

The remediation works in Homebush Bay were undertaken under highly controlled conditions imposed by the EPA behind silt curtains anchored to the seawall, the purpose of which was to prevent migration of sediment fines from the remediation works area. Daily monitoring of the effectiveness of the silt curtains was undertaken by visual and real time instrument monitoring to identify any increase in turbidity and by collection and chemical analysis of water samples.

Significant odour was encountered from the excavated sediments that required odour suppression method to be implemented.

Remediation at Kendall Bay

The EPA has ordered remediation of contaminated sediments in Kendall Bay, adjacent to the former AGL Mortlake gasworks. Planning is currently underway for this remediation project. The

contamination comprises principally tars that contain benzene, polynuclear aromatic hydrocarbons (PAHs) and petroleum hydrocarbons.

Publicly available information documents measures to be implemented to minimise migration of contaminated sediments from the works area using of silt curtains and control of odours.

Benzene and some PAHs are known carcinogens. Many of these compounds are highly odorous. Measures are proposed to be implemented during the remediation works to limit migration of odours to nearby residences, including ceasing works when winds would carry odours towards residences.

Potential for contamination of sediments in Balls Head Bay

The proposed route of the tunnel will traverse Balls Head Bay from Yurulbin Point to the vicinity of the abandoned coal loader at Waverton.

Very few results of assessment of contamination of sediments in Balls Head Bay are publicly available.

Sediments adjacent to gasworks adjacent to Sydney Harbour and its estuaries are or were contaminated with similar compounds identified at Kendall Bay and it is expected that sediments in Balls Head Bay, adjacent to AGL's former Waverton gasworks, would also be contaminated by similar compounds. In operation of the former gasworks, waste from the gasworks operations was dumped into the adjacent waterways.

It is also expected that operations over time at the former Shell terminal at Greenwich would have contributed to contamination of sediments in Gore Cove and the adjacent Balls Head Bay. Significant contamination of sediments has been identified in Berrys Bay adjacent to the former BP terminal and by heavy metals and tributyltin (TBT) adjacent to the former Woodley's marina.

In addition, it is likely that vessels that transit Balls Head Bay to the Shell terminal, Waverton gasworks, HMAS Waterhen and Waverton coal loader would have been protected by anti-fouling paints that commonly contained TBT, lead, zinc, copper and mercury, which contaminate sediments as they erode from the hulls of vessels. The components of the anti-fouling paints are highly toxic to marine biota.

Nature of contaminated sediment to be excavated

- Contaminants most likely to be present in contaminated sediments are:
 - Heavy metals (lead, zinc, copper, mercury and perhaps others)
 - polynuclear aromatic hydrocarbons (PAHs)
 - Petroleum hydrocarbons
 - Pesticides
 - Tributyltin
- In addition to the anthropogenic contaminants, naturally occurring hydrogen sulfide (H₂S – 'rotten egg gas') is known to be present in sediments within the harbour estuaries. H₂S is toxic and is highly odorous even at extremely low concentrations.
- Sediments excavated for placement of the tunnel sections are likely to be acid sulfate soils that contain naturally occurring iron sulfides, which on exposure to the atmosphere, produce sulfuric acid, which is likely to then increase the mobility of heavy metals. Release of sulfuric acid from excavated acid sulfate soils has been attributed to fish kill in numerous Australian and overseas locations.

Remediation methodology

- The methodology proposed to be implemented for placement of the tunnel sections has not been publically announced. However, two options are likely to have been considered:
 - Excavation using excavators on barge/s; and
 - Excavation using suction cutter dredges or similar.

Both methods result in large volumes of contaminated water being extracted with the contaminated sediments. The water is not suitable to be returned to the harbour and must be treated in a water treatment plant (WTP). The throughput of the WTP is expected to pose a very high constraint to the progress of the remediation works.

The treatment of the water through the WTP may not be sufficient to remove contaminants to concentrations that the EPA would allow treated water to be discharged to the harbour. In this situation considerable cost would be involved in disposing of the water to the Aqueous Waste Treatment Plant at Lidcombe (owned by NSW Government).

Because of the presence of odorous contaminants in the excavated sediments it is unlikely that sediments can be dewatered by evaporation in basins open to the atmosphere. The odours are expected to impact White Bay (including the cruise ship terminal, residents in proximity to White Bay including parts of Rozelle, East Balmain, Pyrmont and Glebe).

The disposal of excavated sediments to an off-shore dumping area requires approval by the Commonwealth. It is unlikely that approval would be given for off-shore disposal of contaminated sediments.

It is possible that uncontaminated sediments may be present beneath the contaminated sediments and that approval may be given for disposal of these materials. However, it is difficult to envisage excavation of uncontaminated sediments because these materials are very likely to be cross-contaminated by contaminated sediments that would flow into the deeper excavated areas under the influence of gravity, strong tidal flow and from disturbance by vessels transiting across and near the excavation area.

Quantity of contaminated sediment to be excavated

- Approximately 100,000 cubic metres were stated to be excavated to allow concrete tunnel sections to be placed. The depth of the excavation would probably be an average of approximately 6 to 8 m below the current sea floor
- A further 480,000 cubic metres were stated to be excavated at White Bay. These materials were stated to be "heavily contaminated". No information is publically available relating to the nature and extent of contamination in White Bay. However, sediments in the nearby Rozelle and Blackwattle Bays are known to be contaminated by organochlorine pesticides (OCPs, including DDT), PCBs and heavy metals.

The volumes of sediment proposed to be excavated are very large and would represent by far the largest contamination remediation project carried out in Sydney Harbour and would be one of the largest contamination remediation projects carried out in Australia.

The cost of treating 500,000 cubic metres of contaminated sediments (approximately 1 million tonnes) at White Bay and treatment and disposal of contaminated water may be as high as \$200 million and disposal to landfill may be in the order of a further \$250 million for disposal to landfill, although the current land fill levy under section 88 of the Protection of the Environment Operations Act of \$138.20 per tonne paid by RMS would be recoverable by the government.

It is envisaged that excavated sediments would be transported to White Bay by barge.

Although some risk is posed by this method, it is greatly superior to transport of contaminated sediments by trucks through narrow residential streets.

Treatment options for contaminated sediments

Once excavated and removed from their current locations, the contaminated sediments are classified as a "waste" and cannot be used for any beneficial purpose and are thereby required to be classified according to the process described in the EPA's Waste Classification Guidelines and disposed to a landfill that can lawfully accept General Solid Waste or Restricted Solid Waste.

Following dewatering, contaminated sediments are likely to be not suitable for direct disposal to landfill and will require stabilisation by mixing with cement to meet the classification of General Solid Waste or Restricted Solid Waste before they can be disposed.

EPA's policy relating to disposal of contaminated materials

The disposal to landfill of the contaminated sediments is contrary to the NSW Government's stated Waste Avoidance and Resource Recovery Strategy (2014) which has set a target of "increasing waste diverted to landfill to 75 %" by 2021.

To date the EPA's policy relating to contaminated sediments within Sydney Harbour is to leave these materials in place.

Presence of a 'plume of toxic sediments in Sydney Harbour'

The EPA would not allow excavation works in Balls Head bay and at White Bay to result in a 'plume of toxic sediments in Sydney Harbour'. All works would be required to ensure no escape of contaminated sediments or contaminated water to Sydney Harbour.

The environmental protection measures to ensure no escape of contaminated sediments from work areas can be expected to be strictly regulated by the EPA and to result in protracted delays to the work program.

Disposal of excavated sediments into 'deep holes' in Sydney Harbour

It was stated that some excavated sediments could be disposed into "deep holes within Sydney Harbour".

This proposition is preposterous. The EPA and the owners of the seabed of Sydney Harbour (RMS) have never allowed sediment, contaminated or not, to be disposed into Sydney Harbour.

Deep holes in Sydney Harbour are located off shore from:

- Manns Point (up-river, close to the proposed tunnel location)
- Balls Head (down-river, close to the proposed tunnel location)
- McMahons Point
- Milsons Point
- Kirribilli Point
- Bradleys Head
- Vaucluse / Shark Island
- Watson's Bay / Vaucluse

It seems most likely that disposal of any excavated sediments into "deep holes" would be strongly opposed by residents, community groups and environmental activists.

This method must also give rise to contamination of waters, which is an offence under the Protection of the Environment Operations Act.

Significant practical difficulties are expected to arise from excavation of contaminated sediments due to:

- The narrowness of this section of the harbour (approximately only 300 m wide from Yurulbin Point to Manns Point)
- High current velocities in this restricted part of the harbour
- High use of this part of the harbour by ferries and Rivercats, work boats, naval vessels, very large petroleum fuel tankers and pleasure craft.
- Parts of Balls Head Bay are known to be only approximately 12 to 13 metres deep at low tides. Larger vessels, such as petroleum fuel tankers, have a laden draft exceeding 12 metres so that even at high tides significant disturbance of contaminated sediments and placed concrete tunnel sections would be impacted.

The above issues, even when access and speed restrictions are applied to vessels transiting the proposed excavation work area, pose significant difficulties to ensure fine sediments generated by excavation works do not escape across silt curtains.

Truck movements and use of Yurulbin Park and/or Birchgrove Park

Access by trucks to Yurulbin Park is via Louisa Road, which is narrow and most unsuitable for transit by heavy vehicles. Many residents do not have parking spaces on their properties and need to park on Louisa Road.

if Yurulbin Park is to be used as a staging area for tunnel construction, access must be only by water. Again, transit of supply vessels would give rise to practical difficulties to maintaining the integrity of the excavation works.

if Birchgrove Park is to be used as a staging area for tunnel construction, although access by roads is better than for Yurulbin Park, roads from Victoria Road to Birchgrove Park are narrow and are unsuited to passage of large volumes of heavy vehicles.

The proposal for excavation works to be on a 24 hour, 7 days per week basis will give rise to considerable adverse impact to residents of Birchgrove and Waverton.

This is expected to generate serious community concern.

Overall, the excavation of contaminated sediments for construction of the Western Harbour Tunnel does not deliver an environmental sustainable solution, would give rise to a high risk of contamination of harbour waters, unacceptable volumes of contaminated sediments being disposed to landfill, would provide unacceptable impact to residents over a wide area from odours, 24/7 operations and from vessel and truck movements.

Preferred construction option

Given the uncertainties of estimating difficulties associated with excavating, transporting and treating contaminated sediments and the very high probability of lack of amenity to the community caused by noise and odour during these processes together with the high cost of transporting and disposing to landfill of treated materials to landfill and the poor sustainability of these methods, the preferred construction method is by tunnelling in sandstone bedrock.

Excavated sandstone is classified as virgin excavated natural material (VENM) and can be used on any location and need not be disposed to landfill.

Detailed review - consultant's report

To provide a detailed review of the proposed excavation and treatment works, I would need to review the consultant's report addressing the investigation of the chemical condition of the sediments.