

**KINGSTON TRANSHIPMENT PORT EXPANSION  
ENVIRONMENTAL IMPACT ASSESSMENT  
FOLLOW UP WATER QUALITY ASSESSMENT**

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## **SUMMARY:**

Follow up sampling carried out by TEMN on March 8 and April 8 2001 produced results at variance with that presented in the Phase 1 EIA but more consistent with levels of lead and chromium in Kingston Harbour determined by previous workers, and literature values. On both occasions levels of chromium (Cr) and lead (Pb) were near or below the test detection limit. For all water samples the ranges were <0.5ppb – 1.1ppb for chromium and <1.3ppb for lead.

The consistency of results from the follow up sampling exercises indicates that the high values determined for samples collected in the Phase 1 EIA was quite likely due to introduction of error(s) during sample handling and/or analysis.

## **1. BACKGROUND:**

The unexpectedly high values obtained for the trace metals lead and chromium sediment and water samples generated for Phase I of the EIA, was considered adequate reason to repeat these analyses on freshly collected samples. Background levels of these parameters in Kingston Harbour (water column), determined by previous workers were in the range 1 - 6  $\mu\text{g/L}$  (ppb) for Pb, and 0.6 - 13  $\mu\text{g/L}$  for Cr. Water samples collected for Phase I of this EIA were determined by the Bureau of Standards to have concentrations of 26ppb to 3142ppb for lead, and 166ppb to 2262ppb for Chromium.

As a result of the seeming discrepancy, a preliminary follow up water sampling exercise was carried out on March 8. Based on the preliminary results, a more comprehensive sampling exercise was carried out on April 8 focussing on the sampling stations within the areas of the harbour to be dredged.

We have now ascertained that though the samples from the Phase 1 study were scheduled to be analysed by graphite furnace atomic absorption, the method actually used was flame atomic absorption. This method is less reliable for the determination of chromium and lead in the parts per billion range, being susceptible to salt interference.

## **2. METHODOLOGY:**

### **2.1 Field Work**

In order to test the data generated during Phase I, a decision was taken to carry out preliminary repeat sampling at Station 2 (Ship Channel near Ft. Augusta) on March 8. On this occasion, samples were taken in duplicate at the surface and bottom of the water column. In addition samples were collected at Causeway Fishing Beach (launching point). For further comparison, two samples of tap

water were collected in immediate succession from the public water supply in the upper Mountain View Avenue area.

The results from the preliminary work were used to guide a more comprehensive water quality sampling exercise that included repeat of sediment sampling. This was done on April 8, and involved collection of water and sediment samples at previously “marked” sites (from the Phase 1 Study) in the outer and inner channel as follows:

- the channel near Port Royal (Station 2)
- the channel near Fort Augusta (Station 3)
- the turning basin near Gordon Cay (Station 4)

Sample collection was carried out using previously employed sampling techniques. Collection of sub-surface water samples was achieved using the Van Dorn Sampler, while sediment samples were collected using a core sampler constructed from PVC 125cm (length) X 6cm (diameter). Core samples were transferred to plastic buckets, allowed to settle and then decanted. The supernatant from each sediment sample was bottled and designated as pore water (PW). The filtered supernatants were analysed for chromium and lead.

## **Analysis**

Analyses were carried out by the International Centre for Environmental and Nuclear Sciences (ICENS) using graphic furnace atomic absorption spectrometry with Zeeman-Effect background correction. Quality assurance was provided through the analysis of spiked samples, and reference material. The quoted approximate detection limits are 0.5ppb for Chromium, and 1.3ppb for lead.

## **3. RESULTS:**

### **3.1 March 8**

The results of analyses for samples collected on March 8 are presented in Table 1. Lead was below the detection limit of the test method in all samples. Chromium was determined to be in the range <0.5 to 1.1ppb for all samples collected. The duplicate samples of tap water showed traces of chromium (0.6ppb and 0.7ppb). While there was a trace of chromium in the sample taken from the channel surface near Port Royal, concentration in the duplicate sample taken at this site was below the test detection limit. The samples of tap water consistently showed a trace of chromium.

**Table 1**  
**Kingston Transshipment Port Expansion EIA**  
**Water Quality Results March 8**

Location	Cr(ppb)	Pb(ppb)
Channel Near Ft. Augusta (Surface)	1.1	<1.3
Channel Near Ft. Augusta (Surface)	<0.5	<1.3
Channel Near Ft. Augusta (Bottom)	<0.5	<1.3
Channel Near Ft. Augusta (Bottom)	<0.5	<1.3
Causeway Fishing Beach	<0.5	<1.3
Causeway Fishing Beach	<0.5	<1.3
Tap Water upper Mountain View Avenue	0.6	<1.3
Tap Water upper Mountain View Avenue	0.7	<1.3

### 3.2 April 8

The results of analyses for water samples collected on April 8 are presented in Table 2. Lead and chromium were below the test detection limits (<1.3ppb and <0.5ppb respectively).

**Table 2**  
**Kingston Transshipment Port Expansion EIA**  
**Water Quality Results April 8**

Location	Cr(ppb)	Pb(ppb)
Channel near Port Royal Surface	<0.5	<1.3
Channel near Port Royal Bottom	<0.5	<1.3
Channel Near Ft. Augusta Surface	<0.5	<1.3
Channel Near Ft. Augusta Surface	<0.5	<1.3
Channel Near Ft. Augusta Bottom	<0.5	<1.3
Turning Bay near Gordon Cay	<0.5	<1.3

The results of sediment analyses are presented in Table 3.

**Table 3**  
**Kingston Transhipment Port Expansion EIA**  
**Sediment Quality Results April 8**

Location	Sediment Analysis		Pore Water Analysis	
	Cr(mg/kg)	Pb(mg/kg)	Cr(ppb)	Pb(ppb)
Channel near Port Royal Surface	13.0 (4.8)	34.2 (4.7)	<0.5	<1.3
Channel near Fort Augusta	13.9 (0.6)	29.0 (5.3)	<0.5	<1.3
Turning Bay near Gordon Cay	26.4 (1.0)	27.5 (6.0)	<0.5	<1.3

*n.b. Figures in parentheses represent the standard deviation of the results obtained from duplicate analyses*

#### 4. CONCLUSIONS & RECOMMENDATIONS

The traces of lead and chromium detected in the sample taken from the ship channel on March 8, were generally in the lower part of the range quoted from literature sources prior to the Kingston Transhipment Port Expansion EIA. These values are considered to be normal background levels. The results of sediment analysis indicated levels of chromium and lead well within literature values for the background values of these metals in soils (Table 4).

**Table 4**  
**Background values of lead and chromium in soil**

Metal	Average Concentration in Soils (mg/kg)	Typical Range (mg/kg)
Chromium	200	5 -1000
Lead	10	2 -200

*Source: Hawkes, H.E., and Webb, J.S. "Geochemistry in Mineral Exploration" (1962)*

From the repeat sampling and analysis there appears to be no measurable risk of heavy metal contamination associated with the sediment to be dredged. The absence of lead and chromium in pore water suggests that these heavy metals are in a form not readily available for biological uptake. Previous high values that were determined for samples taken from the water column, sediment pore water and sediment are considered to have been erroneous.