Honeywell

FEBRUARY 2014

# Harbor Point
# Surface Water and Sediment Scientific Studies
# Quarterly Monitoring

## Scientific studies find: No relationship between chromium and toxicity in Baltimore harbor

In 1989, the U.S. Environmental Protection Agency (EPA), the Maryland Department of the Environment (MDE) and AlliedSignal (Honeywell's predecessor) entered into a Consent Decree to clean up the former Baltimore Works site. The Consent Decree required a remedy that permanently contained chromium-contaminated soils and groundwater within the site, isolated those contaminants from possible human or animal contact, and prevented further contamination of surrounding soils, surface, and groundwater. Honeywell completed that remedy in 1999.

An underground barrier encircles the property. It is three feet thick and averages 70 feet deep. It is constructed out of clay and effectively seals off the groundwater under the site, preventing it from reaching the Patapsco River.

The Consent Decree specifies that the remedy meet two performance standards – one for surface water and another for groundwater. The surface water performance standard requires the concentration of total dissolved chromium in the surface water to be below 50 parts per billion (ppb) averaged at multiple sample locations. To date, almost 8,000 samples have been collected and 100% meet government criteria; most are below the laboratory detection limit.

The groundwater performance standard, which always has been met, requires Honeywell to maintain the average groundwater level inside the containment area lower than the average water level outside the wall. This standard is based upon measurements averaged over a 30-day period.

A computer managed control system constantly monitors the various water levels, inside and outside the wall. Groundwater pumping wells maintain a lower water level within the wall. The system, including the underground wall and pumping wells, prevents any groundwater from leaving the site or leaking into the river. It has been extremely reliable.

## Fourteen years of water sampling: All results meet regulatory criteria

In 1999, 20 sampling locations were identified along the perimeter of the property where it is adjacent to the water (see map below). Starting in 1999, water samples have been collected quarterly and the results submitted to MDE; *all* results have been well below the 50 ppb criteria (see graph on page 2).


*Surface water monitoring locations*

## MDE Assessment: Chromium does not affect aquatic life

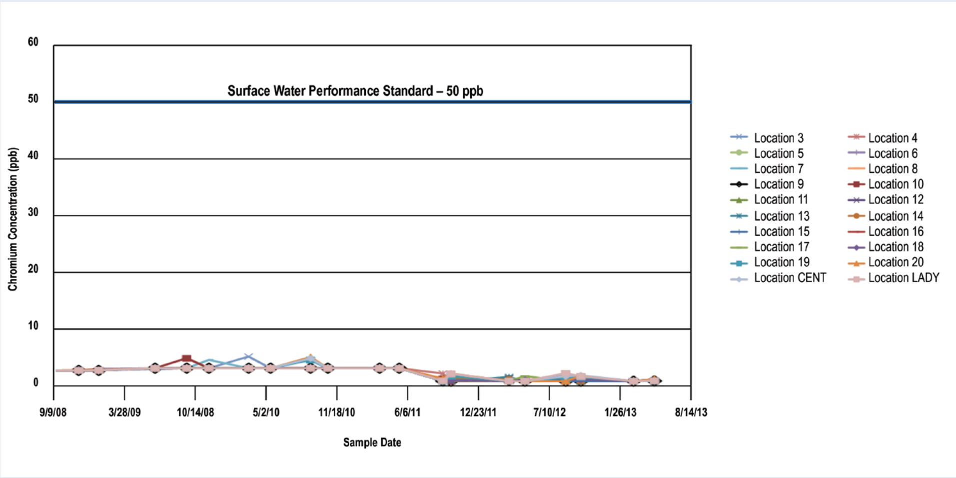
The federal Clean Water Act requires states to assess what chemicals are affecting the health of a water body and to establish a limit known as Total Maximum Daily Loads (TMDLs) for those chemicals. TMDLs are a "calculation of the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards." (water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/).

In the 1990s and early 2000s, MDE identified numerous different pollutants that the agency believed affected the Inner Harbor, including fecal coliform, total chromium, zinc, lead, and polychorinated biphenyls, as well as biological community impacts.

In 2004, the Maryland Department of the Environment (MDE) conducted a water quality assessment to evaluate chromium in the Northwest Branch and the Bear Creek portions of the Patapsco River. The MDE assessment, which has been submitted to EPA, concluded that the waters do not display signs of chromium impairment to aquatic life in either the water or the sediment.

For more information, or the studies themselves, please contact **Sybil Dinkins** at **410-869-2811**

## Surface water monitoring results




## Scientific research from Johns Hopkins and others: Chromium in sediments is non-toxic

Over the last number of years, a significant body of scientific research and data regarding the toxicity of chromium in water bodies has emerged. Many of the important studies were conducted by Johns Hopkins University's Center for Contaminant Transport, Fate, and Remediation. Others were conducted by EPA and MDE. The scientific research demonstrates that the chromium present in the Inner Harbor exists in the trivalent (rather than hexavalent) form, and that trivalent chromium in sediments is non-toxic. As a result, MDE and EPA made the determination that the Inner Harbor will no longer be listed as impaired by chromium, and hence, no TMDL is required for chromium.

Below is more detailed information:

As a result of MDE's water quality assessment, the Northwest Branch and Bear Creek chromium listings were changed from Category 5 (water quality is impaired) to Category 2 (water quality is meeting chromium standards).

This is supported because the cumulative findings of all studies show:

- Chromium in the sediment is non-toxic "trivalent" and not "hexavalent"
- Chromium in sediment is stable with very little potential for it to change to toxic form even in conditions where sediments are disturbed
- Protection of aquatic life is not impaired by chromium

MDE's conclusions are based on the following scientific studies (each briefly summarized below):

- Johns Hopkins University
- The University of Maryland (UMD)
- Environmental Protection Agency
- CH2MHill and ENVIRON

## Johns Hopkins University Findings (independent studies done under a Honeywell grant)

1. Johns Hopkins researchers conducted toxicity testing in sediments from Baltimore Harbor[1]. The results showed that chromium is present only in the non-toxic form.
2. Johns Hopkins also provided a literature review on the toxicity of chromium for sensitive organisms that live in the sediment and ingest it[2]. This review summarized decades of scientific studies conducted by academic institutions and EPA showing that sediment dwelling organisms "will not only survive, but reproduce normally, while inhabiting sediment composed of pure chromium" as long as the chromium is in the non-toxic form.
3. Johns Hopkins researchers studied changes in chromium chemistry under a variety of laboratory conditions[3]. These studies concluded that even under rigorous laboratory conditions, the chromium in Baltimore Harbor sediments does not convert from non-toxic to toxic form. The conditions that cause chromium to become toxic do not naturally exist in Baltimore Harbor.

## UMD Study of Baltimore Harbor Sediments

UMD researchers systematically studied which chemicals were most likely responsible for the sediment toxicity in the Baltimore Harbor[4]. Much valuable information was collected, analyzed, and reported as part of this study. While the actual cause of toxicity in Baltimore Harbor sediments remains unknown, sufficient information is provided in this study to show that chromium is not the cause of toxicity.

## EPA Study of Bear Creek

EPA evaluated potential risks associated with Bear Creek sediments[5]. The study concluded that toxicity found within the sediments is not due to chromium. EPA also demonstrated that between 1996 and 2011 the average total chromium sediment concentrations has declined by 77% and should continue to decline.

## CH2MHill and ENVIRON Study of Dundalk Marine Terminal

These scientists, conducting research studies funded by Honeywell, evaluated the potential for risks to fish and wildlife exposed to chromium from historic chromium ore process residue used as fill material[6]. This study concluded that chromium does not pose a risk to aquatic life and is therefore not a source of toxicity in sediments because the chromium is present in the non-toxic form.

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[1] *Bioassay Testing of Baltimore Harbor Sediment*
[2] *The Sediment Ingestion Pathway as a Source of Toxicity in the Baltimore Harbor*
[3] *Geochemical Influences on Chromium Speciation and Fate in Estuarine Sediment*
[4] *Toxicity Identification Evaluation (TIE) Study of Baltimore Harbor Sediments*
[5] *Data Evaluation and Screening Level Human Health and Ecological Risk Assessment for Bear Creek Sediments*
[6] *Ecological Risk Assessment for Dundalk Marine Terminal*