Letter Health Consultation

E.C. ELECTROPLATING
(a/k/a GARFIELD CHROMIUM GROUNDWATER CONTAMINATION SITE)

GARFIELD, BERGEN COUNTY, NEW JERSEY

EPA FACILITY ID: NJD002006773

Prepared by the
New Jersey Department of Health and Senior Services

SEPTEMBER 28, 2010

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

You May Contact ATSDR Toll Free at
1-800-CDC-INFO
or
Visit our Home Page at: http://www.atsdr.cdc.gov

LETTER HEALTH CONSULTATION

E.C. ELECTROPLATING
(a/k/a GARFIELD CHROMIUM GROUNDWATER CONTAMINATION SITE)

GARFIELD, BERGEN COUNTY, NEW JERSEY

EPA FACILITY ID: NJD002006773

Prepared By:

New Jersey Department of Health and Senior Services
Environmental and Occupational Health Surveillance Program
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

State of New Jersey

DEPARTMENT OF HEALTH AND SENIOR SERVICES
DIVISION OF EPIDEMIOLOGY, ENVIRONMENTAL AND OCCUPATIONAL HEALTH
PO BOX 369
TRENTON, N.J. 08625-0369

CHRIS CHRISTIE
Governor

www.nj.gov/health

KIM GUADAGNO
Lt. Governor

POONAM ALAIGH, MD, MSHCPM, FACP
Commissioner

September 28, 2010

Joe Cosentino
On-Scene Coordinator, Removal Action Branch
U.S. Environmental Protection Agency, Region 2
2890 Woodbridge Avenue
Edison, New Jersey 08837-3679

Dear Mr. Cosentino:

This Letter Health Consultation (LHC) has been completed by the New Jersey Department of Health and Senior Services (NJDHSS), through a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR), for the E.C. Electroplating site (a.k.a. Garfield Chromium Groundwater Contamination site) located at 125 Clark Street in Garfield, Bergen County, New Jersey. The LHC was prepared at the request of the U.S. Environmental Protection Agency (USEPA), Region 2, and is based on recent environmental investigations conducted in 2010 by USEPA.

Details on site background and prior investigations related to the E.C. Electroplating site may be found in two prior Health Consultations prepared for this site by NJDHSS and ATSDR, in September 2007 and April 2010 (ATSDR 2007; ATSDR 2010).

Data from Recent USEPA Investigations at Residential/Commercial Properties

During February and March 2010, the USEPA collected dust wipe samples from a total of 92 residential/commercial properties. In July 2010, the USEPA collected dust wipe samples from an additional 13 residential/commercial properties. The USEPA identified these properties for evaluation based on resident survey responses and property location in relation to the contaminated groundwater plume. The purpose of the investigations was to determine if hexavalent chromium in groundwater was impacting the interior of basements, causing an increased exposure potential to residents or others accessing basements.

A total of one hundred and five basements were sampled with concentrations of hexavalent chromium in surface dust as high as 2,640,000 micrograms per square meter ($\mu g/m^2$). Hexavalent chromium was detected in 41 of the 105 basements sampled. Table 1 summarizes the analytical results for the 2010 dust wipe sampling investigations.

Table 1: Summary of Hexavalent Chromium Concentrations in Wipe Samples.
USEPA Investigations: February, March, and July 2010

Sample Locations	Number of Samples	Number of Detections	Number of Residences with Detections	Range of Detected Concentrations ($\mu g/m^2$)	Median of Detected Concentrations ($\mu g/m^2$)
105 properties	405	65	41	1 – 2,640,000	160

Based on preliminary groundwater investigations conducted by the US EPA in April 2010, the hexavalent chromium groundwater plume appears to be migrating in a westerly direction towards the Passaic River located approximately 2,800 feet away. The "hot-spot" of the groundwater plume is shown to have maximum concentrations of hexavalent chromium in groundwater at 36,200 parts per billion (ppb). Based on all wipe sampling investigation data collected by the US EPA from February 2009 through July 2010, there are three properties in the immediate vicinity of the groundwater "hot-spot" area which show the highest concentrations of hexavalent chromium in surface dust ranging from 51,600 to 2,640,000 $\mu g/m^2$ (see Table 2). There are a conservatively estimated 15 to 20 properties in the immediate vicinity of this "hot-spot" groundwater plume area which have not been sampled.

Further, there are approximately 40 to 45 additional non-sampled properties farther outside the "hot-spot" area where the groundwater plume shows hexavalent chromium concentrations ranging from approximately 2,000 to 8,000 ppb. Six properties sampled within this area of the plume indicate hexavalent chromium concentrations in surface dust range from 100 to 6,890 $\mu g/m^2$ (see Table 2).

Table 2: Summary of Detected Hexavalent Chromium Concentrations in Wipe Samples for Residences within the Predominant Groundwater Plume Area.
USEPA Investigations: February 2009 through July 2010

Sample Locations	Number of Samples/ Detections	Range of Detected Concentrations ($\mu g/m^2$)	Median of Detected Concentrations ($\mu g/m^2$)
3 Properties: Near "Hot-Spot" Area	6	51,600 – 2,640,000	114,950
6 Properties: Outside "Hot-Spot" Area	14	100 – 6,890	1,110

A second groundwater plume area having hexavalent chromium concentrations ranging from 2,000 to over 7,000 ppb is located approximately 1,800 feet to the west of the former EC Electroplating facility. This plume extends approximately 1,000 feet in length reaching the Passaic River. Hexavalent chromium concentrations were detected in surface dust ranging from 270 to 29,100 $\mu g/m^2$ for five properties within this plume area (see Table 3). There are a conservatively estimated 80 to 85 properties within this plume area which have not been sampled.

Table 3: Summary of Detected Hexavalent Chromium Concentrations in Wipe Samples for Residences within the Second Groundwater Plume Area.
USEPA Investigations: February 2009 through July 2010

Sample Locations	Number of Samples/ Detections	Range of Detected Concentrations ($\mu g/m^2$)	Median of Detected Concentrations ($\mu g/m^2$)
5 Properties	5	270 – 29,100	1,370

Discussion

The method for assessing whether a health hazard exists to a community is to determine whether there is a completed exposure pathway from a contaminant source to a receptor population and whether exposures to contamination are high enough to be of health concern. As described in the April 2010 Health Consultation, there is a completed exposure pathway regarding ingestion of and dermal contact with surface dust containing hexavalent chromium. The recent basement data confirms the existence of this pathway for the 41 properties evaluated during the February through July 2010 investigation period. Exposed individuals may include children and adults occupying or working in structures identified to have been contaminated.

Following the evaluation format discussed in the April 2010 Health Consultation, basement usage at sampled residences may be characterized as either "high usage" or "low usage." The general assumption is that the high use category is applied to basements that serve as an extra living space and where usage of this area would be intensive (e.g., for playing, sleeping, working, etc.) and on a daily basis. The general assumption is that the low use category applies to basements that are used intermittently (e.g., for laundry or storage). Based on these high use and low use exposure scenarios, site-specific exposure doses can be calculated and compared with health guideline comparison values (CVs).

There is no known environmental comparison value regarding dermal exposures to hexavalent chromium in surface dust. Hexavalent chromium is a known skin irritant and can cause skin ulcers; however, the health risks via the dermal pathway are uncertain and are not evaluated quantitatively in this health consultation.

The inhalation exposure pathway involves hexavalent chromium in surface dusts being disturbed and becoming airborne where the contaminated particulates are inhaled. This pathway was evaluated in the April 2010 health consultation report which concluded that adverse non-cancer health effects were not likely to occur and there was no expected increase of cancer. However, based on existing data, the report cautioned that unless remedial actions are taken, the risk to develop adverse non-cancer health effects along with the theoretical cancer risk may increase in the future if there is an increase in concentrations of hexavalent chromium in indoor air. As results of the July 2010 sampling show significantly higher concentrations of hexavalent chromium in surface dust, the inhalation pathway may also be significant to residents, specifically during cleaning activities involving dry sweeping or brushing wall and floor areas.

Public Health Implications of Completed Exposure Pathways

Non-Cancer Health Effects - Incidental Ingestion of Surface Dust

Exposure dose estimates were calculated using the exposure assumptions outlined in the April 2010 Health Consultation report. For the purposes of this evaluation, the maximum concentration of hexavalent chromium detected in surface dust at 2,640,000 µg/m^2 in a low use basement was used to present exposure scenarios for both high and low use basements for properties within the immediate vicinity of this property. The maximum concentration was used since the basement of properties in the immediate vicinity of this property and the groundwater "hot-spot" area fall within high or low usage and that USEPA data verify that contaminated groundwater can infiltrate into basements and leave behind a residue of very high levels of hexavalent chromium in surface dust.

As environmental sampling can only show the concentration of a contaminant at a point in time, resident actions such as cleaning can influence sampling results, which could lead to an underestimation of actual exposures and risks. Furthermore, high concentrations may recur following new water infiltration events. Therefore, for the purposes of this LHC, all properties in the vicinity of the property showing the highest hexavalent chromium concentration in surface dust are considered to be at risk of having similar concentrations in basement surface dusts. In support of this assumption, the three residences evaluated within the groundwater "hot-spot" plume area show concentrations of hexavalent chromium in surface dust creating conditions where exposure doses can exceed the margin of safety represented by the chronic and intermediate health CVs and also the chronic, intermediate and acute lowest-observed-adverse-effect level (LOAELs) based on recent animal studies. From a public health standpoint, exceeding the LOAEL is important as it represents a level at which harmful (adverse) health effects have been seen in either animals or humans.

Exposures are based on incidental ingestion of surface dust contaminated with hexavalent chromium during use of residential basement areas. Non-cancer exposure doses were calculated using the following formula obtained from the US EPA World Trade Center Indoor Environment Assessment study (US EPA 2003):

Exposure Dose (mg/kg/day) =

$$\frac{[(ET_{hard} \times FTSS_{hard} \times CSL_{hard}) + (ET_{soft} \times FTSS_{soft} t \times CSL_{soft})] \times SA \times FQ \times SE}{BW}$$

where, mg/kg/day = milligrams of contaminant per kilogram of body weight per day;

ET = Exposure Time (hr/day) for hard and soft (carpeted) surfaces;
FTSS = Fractions Transferred from Surface to Skin (unitless)
$FTSS_{hard}$ = 50%, $FTSS_{soft}$ = 10%;
CSL = Contaminant Surface Load (mg/cm^2);
SA = Surface Area (cm^2/event);

FQ = Frequency of hand-to-mouth events (events/hr);

SE = Saliva Extraction Factor at 50% (unitless); and,

BW = Body Weight (kg)

The above formula requires multiple assumptions in estimating exposures to surfaces which add uncertainty to estimating exposure doses. Factors such as surface loading and transfers to skin are likely to be highly variable as they have not been well studied. Variability of these factors may be influenced by characteristics of different surfaces, activity patterns related to surface contact, and surface cleaning techniques and frequency (US EPA 2003). In following the US EPA World Trade Center Indoor Environment Assessment study, this assessment used input parameters to reasonably define maximum exposures for both high and low use basement areas.

The following site-specific exposure assumptions (US EPA 1997, 2003, 2008) were used to calculate exposure doses to child and adult residents, child students and adult employees. The exposure assumptions for the residential population are based on information provided in residential surveys and ATSDR and NJDHSS criteria classifying low and high basement usage scenarios.

General Exposure Assumptions

Exposure Setting	Exposed Population	Surface Area (mouthing area)	Hand-to-Mouth Contacts (events/hour)
Resident	Child (1 through 6 years)	15 to 25 cm^2 (Age Adjusted)	9.5 (Age Adjusted)
	Child (1 through 18 years)	15 to 45 cm^2 (Age Adjusted)	2 to 9.5 (Age Adjusted)
	Child/Adult (1 to 31 years)	15 to 45 cm^2 (Age Adjusted)	1 to 9.5 (Age Adjusted)
Resident/Employee	Adult	45 cm^2	1

Location Specific Assumptions: Low Usage Scenario for Basements

Exposed Population	**Body Weight**	**Exposure Time** [(e)]	**Number of Years Exposed**
Child [(a)] (1 through 6 years)	12 to 23 kg (Age Adjusted)	1 hour/day 5 days/week	6
Child [(b)] (7 through 12 years)	26 to 53 kg (Age Adjusted)	1 hour/day 2 days/week	
Child [(c)] (13 through 18 years)	56 to 70 kg (Age Adjusted)	2.5 hours/day 5 days/week	
Adult [(d)]	12 to 70 kg (Age Adjusted)	2.5 hours/day 5 days/week	30

(a) Child spends less than half the time that an adult does in basement.
(b) School-aged child exposed only during weekend period.
(c) Assumes child 13 to 18 years takes on laundry duties.
(d) Worst-case scenario: child exposed through and into adulthood in residence.
(e) Low Usage Assumption (i.e. unfinished basements, laundry use, storage)

Location Specific Assumptions: High Usage Scenario for Basements

Exposed Population	**Body Weight**	**Exposure Time**	**Number of Years Exposed**
Child (1 through 6 years)	12 to 23 kg (Age Adjusted)	12 hours/day 365 days/year [(b)]	6
Child (1 through 18 years)	12 to 70 kg (Age Adjusted)		18
Child/Adult (1 to 31 years) [(a)]	12 to 70 kg (Age Adjusted)		30

(a) Worst-case scenario: child exposed through and into adulthood in residence
(b) High Usage Assumption (i.e. living space, actively used area) at 12 hours/day

To assess non-cancer health effects, ATSDR has developed Minimal Risk Levels (MRLs) for contaminants that are commonly found at hazardous waste sites. An MRL is an estimate of the daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of adverse, non-cancer health effects. MRLs are developed for a route of exposure, i.e., ingestion or inhalation, over a specified time period, e.g., acute (less than 14 days); intermediate (15-364 days); and chronic (365 days or more). MRLs are based largely on toxicological studies in animals and on reports of human occupational (workplace) exposures. MRLs are usually extrapolated doses from observed effect levels in animal toxicological studies

or occupational studies, and are adjusted by a series of uncertainty factors and /or through the use of statistical models. In toxicological literature, observed effect levels include:

- no-observed-adverse-effect level (NOAEL); and
- lowest-observed-adverse-effect level (LOAEL).

NOAEL is the highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals. LOAEL is the lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals. In order to provide additional perspective on these health effects, the calculated exposure doses were then compared to observed effect levels (e.g., NOAEL, LOAEL). As the exposure dose increases beyond the MRL to the level of the NOAEL and/or LOAEL, the likelihood of adverse health effects increases.

If the NOAEL or LOAEL is not available, the BMDL (benchmark dose level) can be used. The BMD is a dose that produces a predetermined change in response rate of an adverse effect (called the benchmark response or BMR) compared to background. The BMD can be used as an alternative to the NOAEL/LOAEL in dose-response assessment. The lower limit of the BMDL is a characterization of the dose or concentration corresponding to a specified increase in the probability of a specified response. For example, a $BMDL_{10}$ is the lower confidence limit of the estimated dose corresponding to an increase of 0.10 in the probability of the specified response relative to the probability of that same response at dose zero. A $BMDL_{2sd}$ is an estimate of the dose associated with a change of 2 standard deviations from the control; the use of 2 standard deviations takes into consideration the normal variability in a population (ATSDR 2008).

Low Usage Basements

Hexavalent Chromium. The intermediate oral Minimal Risk Level (MRL) for hexavalent chromium of 0.005 milligrams of contaminant per kilogram of body weight per day (mg/kg/day) is based on the health effect of microcytic, hypochromic anemia in male rats intermediately exposed to sodium dichromate dihydrate in drinking water for 22 days to 6 months. An uncertainty factor of 100 and the $BMDL_{2sd}$ of 0.52 mg/kg/day were used to calculate the intermediate oral MRL (ATSDR 2008; NTP 2008). The chronic oral MRL for hexavalent chromium of 0.001 mg/kg/day is based on the health effect of diffuse epithelial hyperplasia of the duodenum observed in male and female mice chronically exposed to sodium dichromate dihydrate in drinking water for one to two years. An uncertainty factor of 100 and the $BMDL_{10}$ of 0.09 mg/kg/day were used to calculate the chronic oral MRL (ATSDR 2008; NTP 2008).

Based on the maximum concentration of hexavalent chromium detected in surface dusts, the exposure dose calculated for children (1-6 years) at 0.54 mg/kg/day, children (1-18 years) at 0.31 mg/kg/day and adults at 0.25 mg/kg/day significantly exceeded the margin of safety represented by the ATSDR intermediate and chronic MRLs of 0.005 and 0.001 mg/kg/day, respectively (see Table 4 attached). They also met or exceeded effect levels shown in animal studies as detailed below.

Compared to toxicological studies, the calculated exposure doses based on the maximum hexavalent concentration in surface dust:

- exceed the lowest-observed-adverse-effect level (LOAEL) of 0.38 mg/kg/day in female mice and are near the LOAELs of 0.77 and 1.4 mg/kg/day in male rats and female mice for intermediate exposures known to cause hematological effects (NTP 2008);
- exceed the LOAEL of 0.38 mg/kg/day for chronic exposures known to cause gastrointestinal and hepatic effects in male and female mice (NTP 2008); and
- exceed the benchmark dose level ($BMDL_{10}$) of 0.09 mg/kg/day for chronic exposures known to cause diffuse epithelial hyperplasia of the duodenum observed in male and female mice (NTP 2008).

The three intermediate LOAELs are cited to provide the range of exposure doses where health effects were observed for the specific intermediate exposure period. The LOAELs are based on studies conducted by the National Toxicology Program published in 2008. These studies examined the health effects of oral exposures in mice and rats intermediately exposed to sodium dichromate dihydrate in drinking water. The three intermediate LOAELs identified in these studies are based on hematological effects observed for the following: 0.38 mg/kg/day for female mice after a 22 day exposure; 0.77 mg/kg/day for male rats after 22 day and 6 month exposures; and 1.4 mg/kg/day for female mice after a 6 month exposure (NTP 2008). Therefore, for the property where the maximum observed concentration of hexavalent chromium in dust was detected, non-cancer adverse health effects could occur in children and adults who have and continue to access this low use basement. This conclusion may also apply to all properties with low use basements in the vicinity of the above property exhibiting the highest concentration of hexavalent chromium detected in basement dust, if those basements have similar contamination levels.

High Usage Basements

Hexavalent Chromium. Based on the maximum observed concentration of hexavalent chromium, the estimated exposure dose calculated for children (1-6 years) at 4.3 mg/kg/day, children (1-18 years) at 2.2 mg/kg/day and adults at 1.7 mg/kg/day significantly exceeded the margin of safety represented by the ATSDR intermediate and chronic MRLs of 0.005 and 0.001 mg/kg/day, respectively (see Table 4 attached). They exceeded effect levels shown in animal studies as detailed below.

Compared to toxicological studies, the calculated exposure doses based on the maximum hexavalent concentration in surface dust:

- exceed the LOAEL of 2.8 mg/kg/day for acute exposures known to cause hematological effects in male rats (NTP 2008**);**
- exceed all intermediate and chronic LOAELs (0.38 to 1.4 mg/kg/day) and the chronic $BMDL_{10}$ of 0.09 mg/kg/day described in the preceding *Low Usage Basement* scenario.

Therefore, at the maximum observed concentration of hexavalent chromium in dust, non-cancer adverse health effects are likely to occur in children and adults exposed to hexavalent chromium, for basements considered as high usage. This conclusion is for all properties with high use basements in the vicinity of the low use basement property exhibiting the highest concentration of hexavalent chromium detected in basement dust, if those basements have similar contamination levels.

Cancer Health Effects - Incidental Ingestion of Surface Dust

The evaluation for cancer health effects followed the same exposure assumptions for low and high use basements outlined in the April 2010 Health Consultation report. The risk of cancer was evaluated for incidental ingestion of surface dust contaminated with hexavalent chromium based on the location-specific exposure scenarios used to assess non-cancer health effects. Cancer exposure doses were calculated using the non-cancer exposure dose and adjusting for the following formula:

$$\textit{Cancer Exposure Dose (mg/kg/day)} = \textit{Non-cancer Exposure Dose} \times \frac{ED}{AT}$$

where ED = exposure duration representing the location-specific scenario specified in the *Non-Cancer Health Effects* section of this report (years); and
AT = averaging time (70 years).

The theoretical lifetime excess cancer risk (LECR) for adults was calculated by multiplying the cancer exposure dose by the cancer slope factor (CSF). The CSF is defined as the slope of the dose-response curve obtained from animal and/or human cancer studies and is expressed as the inverse of the daily exposure dose, i.e., $(mg/kg/day)^{-1}$.

The CSF regarding ingestion exposure was obtained from the NJDEP. The NJDEP derived a CSF of 0.5 $(mg\ hexavalent\ chromium/kg/day)^{-1}$ using chronic bioassay data of male mice from the 2008 NTP study and US EPA cancer assessment guidelines (NJDEP 2009).

Low Usage Basements

For the property where the maximum observed concentration of hexavalent chromium in dust was detected, the LECRs for children and adults who have and might continue to access this low use basement were approximately 4 in 100, which is considered an increased risk of cancer as compared to background risk of all or specific cancers (see Table 5 attached). For perspective, ATSDR considers estimated cancer risk of less than one additional cancer case among one million person exposed (expressed as 1 in 1,000,000) as an insignificant lifetime cancer risk. This conclusion also applies to similarly contaminated properties with low use basements in the vicinity of the above property exhibiting the highest concentration of hexavalent chromium detected in basement dust.

High Usage Basements

Based on the maximum observed concentration of hexavalent chromium in dusts, the theoretical LECRs for children and adults were approximately 3 in 10, which is considered an increased risk of cancer (see Table 5 attached). This conclusion also applies to similarly contaminated properties with high use basements in the vicinity of the low use basement property exhibiting the highest concentration of hexavalent chromium detected in basement dust.

Conclusions

This conclusion is for the low use basement property within the groundwater contaminant plume exhibiting the highest concentration of hexavalent chromium detected in basement dust. The conclusion is based on recent USEPA investigation data provided for this LHC.

NJDHSS and ATSDR conclude that children and adults accessing this low use basement area were, are, and will continue to be exposed to hexavalent chromium at levels that may pose an immediate and significant threat to human health. People can be exposed to the harmful levels of hexavalent chromium by accidentally swallowing contaminated dust. The observed concentration of hexavalent chromium in basement dust at this property presents an urgent public health hazard.

Investigation data for the basement area of this property indicated hexavalent chromium was present in dust at very high concentrations due to contaminated groundwater entering the basement area. Based on the concentration detected in basement surface dust and the location specific exposure scenarios for past, present and future exposures, the risk of non-cancer health effects are significantly elevated for children and adults, and the lifetime risk of cancer is increased and of significant concern. The amount of exposure to hexavalent chromium and consequent health risk depends in part on the degree to which residents access this contaminated area. However, these risks remain very high under the low use scenario as recent groundwater data suggests this property has likely been contaminated where intermediate and chronic exposures could have already occurred to residents.

This conclusion is for basement areas for all properties located in the immediate vicinity of the low use basement property exhibiting the highest concentration of hexavalent chromium detected in basement dust.

NJDHSS and ATSDR conclude that children and adults living in the vicinity of the highest detected concentration of hexavalent chromium in basement dust, have been, are presently, and/or will be in the future exposed to hexavalent chromium at levels that may pose an immediate and significant threat to human health. Properties with both high and low use basements in the above described vicinity are presently at risk of having hexavalent chromium present in basement dust at concentrations presenting an urgent public health hazard.

Investigation data for one of the properties sampled within the plume indicated hexavalent chromium was present in basement dust at very high concentrations due to contaminated groundwater entering the basement area. While not all properties within the plume area have been evaluated, the finding of a high concentration of hexavalent chromium in basement dust at one property is an indicator that all residences in this immediate vicinity have been, are presently, and/or will be in the future at risk of becoming contaminated, to a degree that could pose a significant health risk to residents, whether the basement is a high or low use area.

As long as groundwater remains contaminated with high levels of hexavalent chromium, groundwater may continue to infiltrate into the basements of residences, as demonstrated by current USEPA data, where children and adults will continue to be at risk of exposure to levels of hexavalent chromium posing an immediate and significant threat to human health. This risk is considered to be present for all residents at properties within the immediate vicinity of the property exhibiting the maximum hexavalent chromium concentration.

Recommendations

1. Concerning the property identified in the first conclusion, the USEPA should take measures to prevent exposures to residents from the high concentrations of hexavalent chromium detected in surface dust in the basement area. Immediate actions should be implemented to clean this basement to prevent additional exposure to contaminated surface dust and to provide additional measures to prevent contaminated groundwater from re-entering the basement of this property. As of the issuance of this LHC, the USEPA has completed the remediation of this property. This action was performed based on ATSDR's and NJDHSSs' recommendation to the USEPA during the drafting of this document.

2. In addition to following all recommendations cited in the April 2010 Health Consultation, short- and long-term actions should be continued by the USEPA to prevent exposures of individuals (either in residential or commercial properties), who are located in the area of the contaminant plume, from hexavalent chromium exposures due to the infiltration of contaminated ground water into the basements of these properties.

3. In the long term, it should be USEPA's priority to take steps necessary to expedite groundwater remedial actions to provide a permanent solution to remove the source of hexavalent chromium contamination in groundwater. In the absence of a permanent solution, residents within the contaminant plume may continue to be exposed to hexavalent chromium at levels which present an immediate and significant threat to their health.

4. Until a permanent solution to address groundwater contamination is accomplished, the USEPA should continue to implement actions to prevent groundwater contaminated with hexavalent chromium from entering any residences within the groundwater plume.

5. As concentrations of hexavalent chromium in basement dust have been found to be significantly higher than previous data presented in the April 2010 health consultation

report, it is recommended that residents in the immediate vicinity of the property showing the highest contaminant levels be advised by the US EPA to not access their basements until an environmental assessment is conducted to determine if a health hazard exists. Additionally, these residents should be advised to contact the US EPA if they observe signs of hexavalent chromium contamination (e.g. yellow dust or crystals) in the basement of their home.

6. The NJDHSS and ATSDR recommend that if residents of building(s) with basements impacted by hexavalent chromium are concerned about their health, they should discuss their concerns with their health care providers. NJDHSS and ATSDR can provide further information on health effects of chromium exposure and on physicians trained as experts in occupational and environmental medicine. The NJDHSS and ATSDR do not recommend biological monitoring for exposure to chromium in this situation. While there are urine and blood tests that measure exposure to chromium, these tests are generally useful only for measuring the high exposure levels that could occur in an occupational setting. Urine tests for chromium only reflect exposures in the past day or two, while red blood cell chromium tests may indicate exposures over the past few weeks.

Public Health Action Plan

The purpose of a Public Health Action Plan is to ensure that this health consultation not only identifies public health hazards, but also provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the part of the ATSDR and the NJDHSS to follow-up on this plan to ensure that it is implemented. The public health actions to be implemented by the ATSDR and NJDHSS are as follows:

Public Health Actions Taken

1. The ATSDR and NJDHSS have worked with USEPA to review information and relevant data to evaluate the potential health implications for exposures to hexavalent chromium detected in surface dust at residences within the hexavalent chromium groundwater plume associated with the E.C. Electroplating site.

2. A LHC and a Health Consultation report were completed by the ATSDR and NJDHSS in September 2007 and April 2010, respectively (ATSDR 2007; ATSDR 2010).

3. The NJDHSS attended a public meeting held in September 2008 by the USEPA to discuss site investigations planned for the residential area within the impacted groundwater plume area.

4. In May 2010, in coordination with the USEPA, the NJDHSS and ATSDR held a public meeting to discuss the findings and recommendations within the April 2010 Health Consultation prepared for the site.

Public Health Actions Planned

1. Based on the findings of this LHC, the ATSDR may issue a Public Health Advisory for this site aimed at preventing exposures of this magnitude from continuing to area residents. This Advisory should call for the USEPA to implement short- and long-term actions necessary to prevent exposures of residents to hexavalent chromium and to address hexavalent chromium in groundwater. Short-term actions would include continuing to assess properties in areas above or near groundwater with high levels of hexavalent chromium, outreach to residents and community members to inform the USEPA of any wet basements, chromium blooms (e.g. yellow dust or crystals) or other evidence of suspected site-related contamination, and continued monitoring of properties that have already been remediated to evaluate whether recontamination is occurring. Concurrently, in the long-term, it will call on the USEPA to develop options for addressing the contaminated groundwater plume, with an emphasis on remediating the area of highest groundwater contamination as soon as possible.

2. NJDHSS will advise area health care providers, particularly pediatricians and family practitioners, of the findings of this report. NJDHSS will make available to them materials on hexavalent chromium, including the ATSDR's Case Study in Environmental Medicine – Chromium Toxicity and their chromium ToxFAQ. NJDHSS will also provide copies of the report to New Jersey Poison Information and Education System for their reference and information.

3. NJDHSS will provide additional community health education to inform residents to limit activities in chromium-contaminated basements. Also, NJDHSS will encourage residents to contact EPA if they see yellow deposits in dust or on the floors or walls.

If you have any questions, please contact me at 609-826-4973, or by e-mail at Glenn.Pulliam@doh.state.nj.us. Alternately, please contact Ms. Leah Graziano, Senior Regional Representative, ATSDR Region II at 732-906-6932, or Escobar.Leah@epamail.epa.gov.

Sincerely,

Glenn Pulliam, MPH
Occupational Health Consultant
Environmental and Occupational Health
Surveillance Program

c: Gregory Ulirsch, MS, PhD, Technical Project Officer, ATSDR
Leah Graziano, Senior Regional Representative, ATSDR Region II
Jerald Fagliano, MPH, PhD, Program Manager, NJDHSS

References

[ATSDR] Agency for Toxic Substances and Disease Registry. 2010. Health Consultation for the E.C. Electroplating Site. Garfield, Bergen County, New Jersey. US Department of Health and Human Services, Atlanta, Georgia. April 26, 2010.

[ATSDR] Agency for Toxic Substances and Disease Registry. September 2008. Toxicological Profile for Chromium (draft). Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2007. Letter Health Consultation for the E.C. Electroplating Site. Garfield, Bergen County, New Jersey. US Department of Health and Human Services, Atlanta, Georgia. September 2007.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2005. Public health assessment guidance manual (update). Atlanta: US Department of Health and Human Services.

[NJDEP] New Jersey Department of Environmental Protection. 2009. Derivation of an Ingestion-Based Soil Remediation Criterion for Cr+6 Based on the NTP Chronic Bioassay Data for Sodium Dichromate Dihydrate. Office of Science. Trenton, NJ. June 2009.

[NTP] National Toxicology Program. 2008a. NTP technical report on the toxicology and carcinogenesis studies of sodium dichromate dihydrate (CAS No. 7789-12-0) in F344/N rats and B6C3F1 mice (drinking water studies). Washington, DC: National Toxicology Program. NTP TR 546. August 13, 2008. http://ntp.niehs.nih.gov/files/546_web_FINAL.pdf.

[USEPA] US Environmental Protection Agency, Region 2. 2010. Compiled surface dust results related to the EC Electroplating site – Investigations conducted July 2010 via e-mail dated August 5, 2010.

[USEPA] US Environmental Protection Agency, Region 2. 2010. Compiled surface dust results related to the EC Electroplating site – Investigations conducted from February through March 2010 via e-mail dated June 8, 2010.

[USEPA] US Environmental Protection Agency, Region 2. 2010. Compiled groundwater results related to the EC Electroplating site – Investigations conducted April 5-9, 2010 via e-mail dated May 20, 2010.

[USEPA] US Environmental Protection Agency. 2008b. National Center for Environmental Assessment. Office of Research and Development. Integrated Risk Information System, Glossary of Terms. Available from: http://www.epa.gov/iris/help_gloss.htm#content

[USEPA] US Environmental Protection Agency. 2008. National Center for Environmental Assessment. Office of Research and Development. Child-Specific Exposure Factors Handbook. Washington, DC. September 2008.

[USEPA] US Environmental Protection Agency. 2003. World Trade Center Indoor Environment Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks. Prepared by the Contaminants of Potential Concern (COPC) Committee of the World Trade Center Indoor Air Task Force Working Group. New York, NY. May 2003.

[USEPA] US Environmental Protection Agency. 1997. National Center for Environmental Assessment. Office of Research and Development. Exposure Factors Handbook. Washington, DC. August 1997.

[Weston] Weston Solutions. 2010. Preliminary Data Package, EC Electroplating Site, Garfield, Bergen County, New Jersey. Provided to the New Jersey Department of Health and Senior Services through the US Environmental Protection Agency, Region 2 via e-mail dated July 21, 2010.

Table 4: Comparison of Ingested Exposure Dose to Hexavalent Chromium in Surface Dust with Health Guideline Comparison Values (CVs) for Non-Cancer Health Effects - EC Electroplating Site

Exposure Point/Scenario (Residences within Groundwater Plume)	Exposure Point Concentration [c] ($\mu g/m^2$)	Exposure Dose (mg/kg/day)			Health Guideline CVs (mg/kg/day)		NTP Study LOAELs (NTP 2008) [f] (mg/kg/day)		Exceedance of LOAEL
		Child (1-6 yrs)	Child (1-18 yrs)	Adult	ATSDR MRL [d]	USEPA RfD [e]	Acute	Intermediate Range	
Residential Basements Low Usage Cr^{+6} [a]	2,640,000	0.54	0.31	0.25	0.005 (I) 0.001 (C)	0.003	2.8	0.38 - 1.4	**Yes**
Residential Basements High Usage Cr^{+6} [b]	2,640,000	4.3	2.2	1.7					**Yes**

(a) Low Usage Exposure Assumptions (source US EPA 1997, 2003):
1 - 2.5 hrs/day, 2 - 5 days/week - i.e. unfinished basements, laundry use
Exposure Duration: 6 and 18 yrs (children), 30 yrs (adult)
Body Weight: Child - 16.5 kg (1-6 yrs), 34 kg (7-12 yrs) and 58 kg (13-18 yrs); Adult - 70 kg

(b) High Usage Exposure Assumptions (source US EPA 1997, 2003):
365 days/year - i.e. living space
Exposure Duration: 6 and 18 yrs (children), 30 yrs (adult)
Body Weight: Child - 16.5 kg (1-6 yrs), 34 kg (7-12 yrs) and 58 kg (13-18 yrs); Adult - 70 kg

(c) Exposure Point Concentrations (micrograms per square meter) derived using Pro UCL Version 4.00.02 (EPA, 2007).

(d) Agency for Toxic Substances Disease Registry's Minimal Risk Level (I = Intermediate 15-365 days; C= Chronic > 364 days)

(e) US Environmental Protection Agency's Chronic Reference Dose

(f) [NTP] National Toxicology Program. 2008a. NTP technical report on the toxicology and carcinogenesis studies of sodium dichromate dihydrate (CAS No. 7789-12-0) in F344/N rats and B6C3F1 mice (drinking water studies). Washington, DC: National Toxicology Program. NTP TR 546. August 13, 2008.

Table 5: Calculated Lifetime Excess Cancer Risk Based on Ingestion Exposures to Hexavalent Chromium in Surface Dust - EC Electroplating Site

Exposure Point/Scenario (Residences within Groundwater Plume)	Exposure Point Concentration [c] ($\mu g/m^2$)	Exposure Duration (years)	Exposed Population	CSF [d] $(mg/kg/day)^{-1}$	LECR
Residential Basements Low Usage Cr^{+6} [a]	2,640,000	30	Adult	0.5	4.1E-02
		18	Child		3.4E-02
Residential Basements High Usage Cr^{+6} [b]	2,640,000	30	Adult		3.0E-01
		18	Child		2.8E-01

(a) Low Usage Exposure Assumptions (source US EPA 1997, 2003):
1 - 2.5 hrs/day, 2 - 5 days/week - i.e. unfinished basements, laundry use, adults only
Exposure Duration: 18 yrs (child), 30 yrs (adult); Averaging Time: 70 years
Body Weight: Child - 16.5 kg (1-6 yrs), 34 kg (7-12 yrs) and 58 kg (13-18 yrs); Adult - 70 kg

(b) High Usage Exposure Assumptions (source US EPA 1997, 2003):
365 days/year - i.e. living space
Exposure Duration: 18 yrs (child), 30 yrs (adult); Averaging Time: 70 years
Body Weight: Child - 16.5 kg (1-6 yrs), 34 kg (7-12 yrs) and 58 kg (13-18 yrs); Adult - 70 kg

(c) Exposure Point Concentrations (micrograms per square meter) derived using Pro UCL Version 4.00.02 (EPA, 2007).

(d) Source: NJDEP 2009

CERTIFICATION

The letter health consultation for the EC Electroplating site, Garfield, New Jersey, was prepared by the New Jersey Department of Health and Senior Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was initiated. Editorial review was completed by the cooperative agreement partner.

for Greg Wirsch

Technical Project Officer, CAT, CAPEB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation, and concurs with its findings.

Team Leader, CAT, CAPEB, DHAC, ATSDR