Department of Toxic Substances Control

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Secretary for
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Deborah O. Raphael, Director
8800 Cal Center Drive
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Edmund G. Brown Jr.
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May 30, 2014

Mr. Frederick Ganster
Exide Technologies
3000 Montrose Avenue
Reading, Pennsylvania 19605

DTSC RESPONSE TO APRIL 30, 2014 REQUEST FOR RESOLUTION LETTER AND COMMENTS ON ATTACHMENT A, EXIDE TECHNOLOGIES, 2700 SOUTH INDIANA STREET, VERNON, CA (EXIDE); PURSUANT TO STIPULATION AND ORDER, DOCKET HWCA P3-12/13-010, OAH NO. 2013050540, AND CORRECTIVE ACTION CONSENT ORDER, DOCKET NO.:P3-01/02-010

Dear Mr. Ganster:

On March 21, 2014, Exide Technologies (Exide) submitted an "*Addendum to the November 15, 2013 Work Plan for Off-Site Soil Sampling*", (Work Plan). The Work Plan describes Exide's proposal for obtaining additional soil samples from residential properties in two areas previously identified as the Northern and Southern Assessment Areas (Assessment Areas). The Work Plan also includes a sampling plan for additional residential properties northerly and southerly of the Exide Facility, outside of the Assessment Areas. Since the submittal of the Work Plan, the Department of Toxic Substances Control (DTSC) and Exide have exchanged comment and response letters regarding specific contents of the Work Plan.[1,2,3]

Continued disagreements between Exide and DTSC regarding the contents of the Work Plan have culminated in Exide requesting resolution under Section 32 of the Stipulation and Order (Docket HWCA P3-12/13-010) and Section 19.2 the Corrective Action Consent Order (CACO - Docket No.:P3-01/02-010). On April 30, 2014, DTSC received a letter titled "*Response to April 23, 2014 DTSC Comments on April 11, 2014 Addendum to the Work Plan for Off-site Soil Sampling*" (herein referred to as the "Resolution Request"), which discusses several issues that Exide indicated *"require a higher level of discussion to reach a resolution"*. A copy of the Resolution Request is enclosed. Exide also provided a *"Memorandum"* (also referred to as Attachment A) in response to DTSC's April 23, 2014 comment letter, and a revised work plan, each dated April 30, 2014.[4,5] Exide states that the response and revisions presented in Attachment

[1] DTSC; *"DTSC Review of "Addendum to the November 15, 2013 Work Plan for Off-Site Soil Sampling"*; April 4, 2014.
[2] Exide; *"Response to April 4, 2014 Comments"*; April 11, 2014.
[3] DTSC, *Review of Response to April 4, 2014 Comments*; April 23, 2014.
[4] Exide; *"Attachment A, Memorandum, Responses to Comments, DTSC Letter dated April 23, 2014"*; April 30, 2014.
[5] Exide; *"Revised Addendum to the November 15, 2013 Work Plan for Off-Site Soil Sampling"*; April 30, 2014

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A and revised work plan are consistent with the issues outlined in the Resolution Request.

This letter responds to Exide's Resolution Request. Enclosed is a memorandum dated May 27, 2014, prepared by DTSC's Geological Services Unit (GSU). The contents of which reflect DTSC's position discussed herein on the issues presented in Exide's Resolution Request.

Exide's Resolution Request outlines five (5) outstanding issues, which are identified below:

1) The use of soil sample results from the Long Beach area for background lead concentration comparison analysis.

2) Incorporating a lead-based paint analysis of exterior surfaces of residences into the soil sampling work plan.

3) The use of 80 milligrams per kilogram (mg/kg) of lead in soils as a concentration level to determine the need for additional investigation of the horizontal and lateral extent of lead contaminated soils.

4) The use of discrete sampling vs. composite sampling techniques at residential properties not previously sampled within and beyond the Assessment Areas.

5) The use of fingerprinting laboratory techniques to determine off-site lead attribution from the Exide Facility in Vernon, CA ("Facility").

On May 9, 2014, Exide and DTSC met to afford Exide the opportunity to present information regarding the issues listed above. Based on DTSC's assessment of the information presented by Exide in that meeting, DTSC response is as follows:

Issue 1 – Background Area and Attribution

In Attachment A, Exide states that *"DTSC selected the background area after DTSC turned down Exide's originally proposed background area located 1.2 miles northwest of the facility, which appeared to be more representative".* This assertion is incorrect. In a series of teleconferences, DTSC stated its position that a background area be outside the influence of potential attribution of lead from Exide's Facility. When DTSC inquired whether Exide may have contributed to any lead that might be found in Exide's original proposed background location, Exide indicated this to be the case. Therefore, Exide's proposed background location was unacceptable. Exide subsequently proposed to use one of two alternate background locations: one situated in East Los Angeles, and the other located in the Long Beach area. After receiving the information from Exide regarding the two alternate background locations, DTSC concluded that the Long Beach background study was the more appropriate of the two areas suggested by Exide to represent background residential lead levels in an urban environment. Thus, selection of the background area was concluded only after reviewing the information provided by Exide.

Exide is now taking the position that its own background data set is irrelevant, asserting that there are few to no lead-related production and manufacturing areas located within the Long Beach background study area. This assertion by Exide was only expressed to DTSC subsequent to the sampling effort, and only after data analysis showed that the Long Beach background area exhibited an average lead concentration in soils below 80 mg/kg (63 mg/kg for the 0-1 inch sample depth interval), which was significantly less than the average lead concentration found at homes located in the Northern and Southern Assessment Areas (175 mg/kg and 131 mg/kg, respectively).

Exide believes the information that it presented during the May 9, 2014 meeting to DTSC and in Attachment A suggests that the Assessment Areas – which were previously shown in Exide's January 2013 Revised AB2588 Health Risk Report to include the area of the Maximum Exposed Individual Resident (MEIR) – now no longer are, or have ever been, impacted by contributions from Exide's emissions. Apparently dismissive of its own Health Risk Report, Exide now believes that past and current emissions from the Exide Facility have not contributed to lead in soils beyond 1,700 feet of the Facility's fence line. Exide points to several historical concerns within the area that may have engaged in manufacturing activities involving lead. DTSC disagrees with many of Exide's assumptions and conclusions relevant to Exide's assertion of a null contribution to the lead in residential soils surrounding the Facility.

During the May 9, 2014 meeting, Exide provided DTSC with Thiessen polygon diagrams to support Exide's theory that there are indiscriminate occurrences of lead contamination from sources other than Exide located between the Exide Facility and residences to the south and north of the Facility. DTSC believes that the Thiessen polygons are based on insufficient data, and have been prepared in a manner that skews the data to suggest other historical concerns are the source of lead at the residences. For instance, Exide uses tight data clusters to prepare the polygons, but the polygons are extrapolated to represent a significantly larger area than the data would suggest. Additionally, some areas presented on the Thiessen polygon diagrams represent areas that are much smaller in size than they appear (i.e., the use of a larger polygon gives the impression that these are large areas with little to no contamination, when in fact the polygons appear to be based on limited input and could represent areas that are small by comparison).

Exide argues that the lead found in Assessment Areas to date does not show a pattern of aerial deposition. However, this position does not account for redistribution of particulates following deposition on hardscape (which constitutes the majority of surfaces surrounding the Facility) from vehicular traffic, turbulent air flow, wind gusts, and storm events, thereby significantly increasing the area subject to contamination. The potential for redistribution of particulate matter must be considered when comparing environmental impacts from lead smelters.

Exide cites a former Master Metals site located in Detroit, Michigan, as an example of limited smelter related lead contaminant attribution with residences situated close

to that former lead smelting facility. This is a poor comparison to the Exide Facility, as the wind flow patterns at the Master Metals site are omnidirectional compared to those at the Exide Facility, where prevailing wind directions are less variable. Additionally, residences are located directly adjacent to the Master Metals site in Detroit, which would allow for initial deposition of lead to remain fixed in place. As stated above, the area surrounding the Exide Facility is mostly surrounded by hardscape, which results in lead particulates being more mobile and subject to redistribution. As suggested above, the overall climate is also vastly different between Detroit and Los Angeles, which may impact the distribution of lead particulates emitted from the smelters. In addition, the Los Angeles basin where the Exide Facility is located typically experiences Santa Ana winds, which are strong, very dry offshore winds that usually occur in late fall. The Santa Ana winds are likely a significant factor in the distribution of lead and other chemical constituents emitted from the Exide Facility that is not present as the Master Metals site. Additionally, Master Metals operated a lead smelter from 1965 to 1983 (only 18 years), which is not nearly as long as the smelter operations at the Exide Facility (from 1922 to the present or 92 years).

Exide stated during the May 9, 2014 meeting that the age of the Exide Facility is not a factor since the discharge of lead emitted from the Facility was likely limited to areas surrounding the Facility prior to the time that stacks were added. Exide has not provided DTSC with any data to support this assertion. Nonetheless, even if lead was deposited close to the Facility before stacks were constructed, the vast amounts of lead released and deposited from the Exide Facility over the last 92 years has more likely than not been redistributed downfield over time, using surface streets and freeways as pathways, and more likely as far as, and including, the surrounding residential areas.

Based on the information presented, Exide's position that the lead found in soils collected from the Assessment Areas is not attributable to emissions from the Facility is without merit. DTSC sees no reason to discount the use of the Long Beach area background sampling results for the purpose of making environmental investigation and mitigation decisions relative to on and off-site contamination attributed to the Exide Facility. Exide shall continue to investigate the extent of its lead contribution at and from the Facility and be prepared to clean-up lead attributed to the Facility's past and recent operations in the industrial and residential communities surrounding the Facility.

Issue 2 – Lead Based Paint (LBP) Assessment

DTSC's decision regarding Exide's request to conduct a LBP assessment of residential structures as part of the work in connection with the Stipulation and Order and Corrective Action Order has not changed. DTSC has not refused to allow Exide the opportunity to evaluate properties for LBP; however, any such evaluation is outside the scope of the Work Plan. DTSC regulates hazardous waste from cradle to grave in California, including hazardous waste facilities and the contamination attributed to activities of such facilities. Exide's interest in performing LBP inspections at the residences in the Assessment Areas is outside the confines of

DTSC's directive to delineate lead found in the residential soils near the Facility. Therefore, Exide shall remove LBP survey activities from the addendum soil sampling work plan to be submitted to DTSC in connection with the work Exide is to undertake pursuant to the Stipulation and Order and Corrective Action Order.

Issue 3 - 80 mg/kg Soil Screening Level for Lead

DTSC concurs with Exide that the Stipulation and Order states that Exide shall delineate off-site soil lead concentration to 80 mg/kg or background, whichever is higher. The results of the composite sampling presented in the February 28, 2014 Off-Site Soil Sampling Report submitted by Exide indicated that lead in residential soils in the Assessment Areas are substantially higher that 80 mg/kg, and well above the average concentrations of lead found in the Long Beach residential background study area. Exide is now asserting that the Long Beach area sampling results should be ignored; DTSC disagrees and refutes such assertion as indicated in DTSC's response to *Item 1* above.

Exide wants to use a value of 200 mg/kg lead for delineating lead in residential soils. Exide appears to have chosen this value because it is between the range of 150 mg/kg and 250 mg/kg, which Exide has stated is the likely range of lead in soils for residential areas surrounding the Vernon area. Exide does not explain the origin of this range. To the extent Exide relies on a paper titled "*Spatial Analysis of Bioavailable Lead Concentrations in Los Angeles*" (Wu., et al.)(2010), DTSC does not find this study applicable because the study does not contain specific information within the area surrounding the Facility currently being investigated. In fact, none of the samples collected in the Wu., et al., 2010 study area were within a mile of the Exide Facility. While the study does show that soil data were collected at increasing distances from major freeways in the Los Angeles basin, it does not clearly show that concentrations of lead decrease with increasing distances from the freeways. It should also be noted that soil samples collected from residential lots (referred to collectively as a "grid" in the Wu, et al. study) had a mean (or average) lead concentration of 107 mg/kg and a median concentration of 57 mg/kg. The median lead concentrations for the upper one-inch of soils for the Assessment Areas are 162 mg/kg (Northern Assessment Area) and 134 mg/kg (Southern Assessment Area), respectively.

Based on the above discussion and prior DTSC statements on this matter, Exide shall continue to use a concentration of 80 mg/kg lead in soils for the purpose of delineating lead impacted soils as Exide agreed to in the Stipulation and Order.

Issue 4 – Discrete vs. Composite Sampling

DTSC agrees to Exide's proposal to perform composite sample soils in the expanded assessment areas located outside the Northern and Southern Assessment Areas in accordance with USEPA guidance "*Superfund Lead-Contaminated Residential Sites Handbook*" (OSWER 9285.7-50, August 2003). Exide, however, must revise section 3.4 of the work plan to both reflect and follow this guidance document that recommends separate composite samples from distinct

locations on the residential properties. For example, for houses located on lots of less than 5,000 square feet, USEPA's guidance document recommends collecting one 5-point composite soil sample from the front yard, one 5-point composite sample from the back yard, and samples from a home's exterior drip zones. It also recommends collecting samples from distinct play areas and gardens, unpaved driveways, etc. (See Section 4.2.4 of the above referenced USEPA guidance).

However, in regard to the 39 properties and any additional properties (where sampling is requested by homeowners) in the Assessment Areas, Exide shall follow the applicable portions of the discrete "*soil*" sampling protocol in Sections 3.1.1 and 3.1.2 of the April 30, 2014 *"Revised Addendum to the November 15, 2013 Work Plan for Off-site Soil Sampling*".

Item 5 – Fingerprinting

Exide states that based upon its "knowledge of and experience with fingerprinting", it will be very difficult to differentiate between emissions from the Exide Facility and any of the other numerous potential lead emissions sources within the industrial area surrounding the Facility. At the May 9, 2014 meeting, Exide stated that it wishes to conduct a scientifically valid analysis and is willing to consider appropriate fingerprinting methods. Exide requested that DTSC provide specific information regarding techniques that are appropriate for separating emission sources of lead. DTSC believes that appropriate methods could include performing stable lead isotope analyses and/or examining the external morphology and crystalline structure of lead using Scanning Electron Microscopy. Therefore, if Exide has experience with fingerprint analysis regarding lead emissions, it should share that information with DTSC so that DTSC can consider if the methods Exide used for fingerprinting analysis might be useful to evaluate the situation in connection with the Facility.

The above constitute DTSC's final position on the above issues. If you have any questions, please contact me at 916-255-3572 or at Rizgar.Ghazi @dtsc.ca.gov.

Sincerely,

Rizgar Ghazi

Rizgar Ghazi, P.E.,
Office of Permitting

Enclosures (2)

cc:(via e-mail)

Mr. Bud DeSart, Exide
Mr. John Hogarth, Exide
Mr. Ed Mopas, Exide
Mr. Paul Stratman, AGS
Ms. Nancy Bothwell, DTSC

EXIDE TECHNOLOGIES

Global Leader in Stored Electrical Energy

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April 30, 2014

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Sacramento, CA 95826-3200

Mr. Brian Johnson
California Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, CA 95826-3200

Rizgar Ghazi
California Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, CA 95826-3200

RE: Response to April 23, 2014 DTSC Comments on
April 11, 2014 Addendum to the Work Plan for Off-Site Soil Sampling
Exide Technologies
Vernon, California

Dear Messrs. Ruttan, Johnson and Ghazi:

On April 23, 2014, Exide Technologies received the Department of Toxic Substances Control's (DTSC's) comments to the April 11, 2014 response prepared by Advanced GeoServices Corp. DTSC's comments have been reviewed and discussed with all appropriate members of the Exide team, and it appears that several important items require a higher level of discussion to reach a resolution. Pursuant to the Stipulation and Order (Docket HWCA P3-12/13-010) and the Corrective Action Consent Order (CACO), I have prepared this letter to enumerate those items and frame Exide's concerns in the hopes that these issues can be discussed informally between the parties, using best efforts to resolve any disputes:

1. DTSC has taken the position that all lead observed in the Northern and Southern Assessment Areas above the average concentrations observed in the background area is from Exide. For the reasons stated in our attached response to comments, this position is both overly simplistic and wrong, as it fails to account for the

significant differences that have been identified between the Northern and Southern Assessment Areas and the Long Beach background area since the background area was first proposed. The information suggests that the concentrations observed in the Northern and Southern Assessment Areas are more indicative of background conditions in close proximity to the heavy, metals-related industries (historic and current), major freeway confluences, and older housing stock in the Vernon Area. From a scientific perspective, the concentrations cannot be attributed to the Exide facility alone. DTSC is obligated to objectively evaluate the information and engage our Consultants in technical discussion. If DTSC has tangible technical data that counters the information identified through the soil sampling activities and historical reviews, we request that DTSC provide such information in advance of any technical discussions.

2. DTSC refuses to allow Exide the opportunity to evaluate properties for lead based paint as part of the Off-Site Soil Sampling scope of work. This position is contrary to nearly every other major investigation of lead in residential soil, whether conducted for USEPA or state agencies, that we have conducted. It is also counter to the USEPA guidance in the *Superfund Lead-Contaminated Residential Sites Handbook (OSWER 9285.7-50, August 2003)* which recommends screening/testing of exterior surfaces to evaluate the potential for lead based paint to impact soils. Lead based paint screening is routinely conducted on sites where the soil screening level is 400 mg/kg or higher, based upon our experiences and the agency recommendations cited above. The importance of screening exterior surfaces for the presence of lead based paint is even more significant where the soil screening level is just 80 mg/kg. Analysis of paint chips from one of the two properties that recently underwent discrete soil sampling showed a lead concentration of 63,700 mg/kg. These paint chips were collected in close proximity to and on top of soil that Exide is expected to remove as part of Interim Measures. For future properties, it would be both scientifically improper and a disservice to the community to ignore contributions from sources with such high concentrations of lead directly on the property while Exide owns a facility a mile away. Reasonable alternative sources must be assessed in order to provide context for the analysis and to ensure meaningful results.

3. The Stipulation and Order states that Exide shall delineate off-site soil lead concentrations to 80 mg/kg or background, whichever is higher. As discussed in item 1 above, based upon analysis of further information that has been obtained, the Long Beach background area is not a representative background area. Instead, background concentrations in the residential areas surrounding Vernon are likely in the 150 mg/kg to 250 mg/kg range with high variability, which is expected

given the proximity of the areas to hundreds of other potential sources of lead emission over the last one hundred years. In the February 18, 2014 report on the off-site soil sampling, Exide proposed that the transect sampling being conducted by ENVIRON be used to meet the requirement of the Stipulation and Order rather than further residential soil sampling. This additional data will be submitted to DTSC within the next two weeks. Furthermore, preliminary results of the residential risk assessment (due to be submitted to DTSC in late May 2014) suggest that soil concentrations in the 360 mg/kg range will not present a materially adverse risk to residents. In light of this forthcoming information, Exide wishes to discuss concentrating resources on delineation of properties to a 200 mg/kg total soil lead concentration given that this level is indicative of background in the area and not likely to pose a risk. This suggested 200 mg/kg level will still be health-protective (less than ½ the typical 400 mg/kg level) and well below the levels associated with risk-based decision making.

4. DTSC is requiring that Exide characterize sampling utilizing discrete samples. This is contrary to established guidelines. The use of composite samples has been the nationally recognized methodology for characterizing lead concentrations in residential soil, and provides an average lead concentration for the property consistent with the allowable soil lead concentration generated by both the Integrated Exposure Uptake Biokinetic (IEUBK) model and Adult Lead Methodology (ALM). DTSC's requirement for discrete samples is inconsistent with the USEPA guidance *Superfund Lead-Contaminated Residential Sites Handbook (OSWER 9285.7-50, August 2003)*. Moreover, DTSC's directive will require analysis of over 14,000 soil samples, unnecessarily adding between $250,000 and $500,000 to the cost of the proposed investigation, and increasing the time required for laboratory analysis and data validation during the next round of sampling by 2 to 3 months (which will cause delay and will not add to the scientific analysis). Exide has already agreed to perform discrete sampling at the 39 residential properties previously sampled in the Northern and Southern Assessment Areas. Exide has also agreed to archive discrete samples utilized to create the composites in the event future analysis is warranted. Given agency guidance favoring composite sampling for this type of investigation, there is no demonstrated benefit to using discrete sampling at all properties within the expanded area. At best, the results of discrete sampling (75+ samples per property) will be overwhelming and, as already seen on 2 properties where discrete sampling was already completed, the results will be distracting to a decision making process that should only focus on the property/exposure area arithmetic mean. Discrete analysis on the additional properties proposed for sampling is technically inappropriate, counterproductive and a misdirection of

resources. Accordingly, Exide requests further discussion with DTSC concerning this requirement.

5. DTSC indicates that lead fingerprinting provides a "reasonable, robust and defensible evaluation." Exide wishes to conduct a scientifically-valid analysis. Based upon our knowledge of and experience with fingerprinting, it will be very difficult to differentiate between emissions from Exide and any of the other numerous potential lead emissions sources within the areas. Exide is willing to consider appropriate fingerprinting methods, however. If you have specific information regarding techniques that are appropriate for separating emissions from a secondary lead smelter from other potential sources in heavily industrialized areas and/or residential areas with pre-World War II housing at the relatively low concentration levels we are encountering, please provide such information so that Exide can consider its inclusion in this sampling program.

A response to comments letter and revised Addendum to the Off-Site Soil Sampling Work Plan have been prepared and are provided as attachments. As you will see, the responses and revisions are consistent with the positions presented above. Pursuant to the CACO and the Stipulation and Order, this letter and related prior letters, along with our request for a meeting, constitute Exide's best efforts at informal resolution. We request a face to face meeting with all of you and any other appropriate Technical and Managerial staff at DTSC to review this submission.

If you have any questions, please contact me at (610) 921-4052.

Sincerely,

EXIDE TECHNOLOGIES

Frederick Ganster

cc: D. Raphael – 1 copy
B. Viele, DTSC – 1 copy
Bud DeSart, Exide - electronic
E. Mopas, Exide - electronic
J. Hogarth, Exide – electronic
C. Graessle, Exide - electronic
R. Visser, Shepard Mullin – electronic
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Department of Toxic Substances Control

Matthew Rodriquez
Secretary for
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Chatsworth, California 91311

Edmund G. Brown Jr.
Governor

MEMORANDUM

TO: Peter Ruttan, P.G.
Engineering Geologist
Office of Permitting

FROM: Todd Wallbom, P.G.
Engineering Geologist
Chatsworth Geological Services Unit

CONCUR: Craig Christmann, P.G.
Senior Engineering Geologist
Chatsworth Geological Services Unit

DATE: May 27, 2014

SUBJECT: Technical Review of Response to Comments, DTSC Letter Dated April 23, 2014
Exide Technologies, Inc. Site
2700 South Indiana Street
Vernon, California 90058
Prepared by Advanced GeoServices Corp. (AGC)

PCA: 22120 Site Code: 510410 Phase: 48 Log No: 20024084

As requested, Geological Services Unit (GSU) staff of the Department of Toxic Substances Control (DTSC) has performed a technical review of the April 30, 2014 *Response to Comments, DTSC Letter Dated April 23, 2014* (RTCs), for the purposes of Corrective Action (CA) activities regarding the facility located at 2700 South Indiana Street, Vernon, CA (the Facility). The RTC letter was submitted by AGC on behalf of the Exide Technologies Corporation (Exide).

The Exide Facility is a battery recycling facility. Prior to 1922, a portion of the property was occupied by a meat rendering plant while other areas

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were quarried for gravel. Since 1922, lead smelting and metals processing operations have occurred at the Facility.

Contaminants-of-concern (COCs) at the Facility include volatile organic compounds (VOCs); primarily trichloroethene (TCE), and inorganics; primarily antimony, lead, arsenic, cadmium, and zinc. Elevated sulfate, inorganics, VOCs, and low pH (acidic) conditions also continue to occur in groundwater beneath the Facility.

Exide previously submitted a letter to DTSC titled *Response to April 4, 2014 Comments, Addendum to the November 15, 2013 Work Plan for Off-Site Soil Sampling* (RTCs), dated April 11, 2014. GSU's responses to this letter were incorporated into DTSC's April 23, 2014 letter to Exide.

Previously, the GSU had concurred with Exide's RTCs to Comments Nos. 1, 5, 6, and 7. Conversely, we did not accept Exide's RTCs to Comments Nos. 2, 3, 4, and 8. Following our review of Exide's April 30, 2014 RTCs, we accept their responses to Comments 4 and 8 but not responses to Comments 2 and 3.

We recommend that the Addendum be revised in accordance with the comments provided in this memorandum, and previous letters and memorandums, and resubmitted. Our comments on the outstanding RTCs are as follows:

GSU RESPONSES TO EXIDE's RTCs:

1. RE: GSU COMMENT 2: In their response, Exide acknowledged that soil lead concentrations are more than two times greater in the two Assessment Areas than in the Long Beach Background Study Area (BSA). We do not necessarily find a contradiction in the Yun et al (2010) paper titled *Spatial Analysis of Bioavailable Soil Lead Concentrations in Los Angeles, California* (or 'Yun Lead Study') referenced by Exide to support their position that there are no lead impacts from Exide in the Assessment Areas.

   Exide compared the mean lead concentration, calculated in the Yun Lead Study at 181 mg/kg, to their mean of 175 mg/kg for the Northern Assessment Area (0-1 inch sample depth) to show that the average lead concentration in the surface soils in the Northern Assessment Area is similar to (or less than) anthropogenic background lead for the Los Angeles area. However, the total lead average in the Yun Lead Study includes samples collected not only from residential areas but along freeways and major arterials, which, as illustrated in the Yun Lead Study, have more lead than the residential areas and will skew

the data to show a much higher mean. Using lead data collected from the residences is more representative of the Northern and Southern Assessment Areas than data collected from along freeways or major roadways.

The mean BSA concentration was 63.2 mg/kg. The mean result from the Yun Lead Study for the residential areas (identified as 'grid' samples in the Yun 2010 paper) was somewhat higher at 107 mg/kg than the BSA results, however, still substantially lower than the mean Northern Assessment Area lead concentration. The maximum result from the 111 soil samples collected in the residential areas, according to the Yun Lead Study, was 644 mg/kg. The maximum lead concentration for the BSA was only 195 mg/kg ('SS-BG-08-3'). In contrast, the maximum concentration of lead detected to date in the Assessment Areas was 5,500 mg/kg, collected at the same depth interval (1-3 inches) as the BSA composited sample.

As indicated in the above paragraph, the mean soil lead concentrations are greater for the Assessment Areas when compared to both the BSA sample results, and the gridded/residential sample results reported in the Yun Lead Study. The mean lead concentration for the Northern Assessment Area (0-1 inch) was 175 mg/kg. The mean for the Southern Assessment Area at the same sample depth interval was 131 mg/kg, or fairly close to the median, which indicates that the data is, more or less, evenly divided around the mean. Another factor to consider is that Exide's data are based exclusively on composited samples.

Since the data appears to be lognormally distributed, use of median lead concentrations may be more applicable to overall data evaluation than only using the mean values. The median soil concentration for the entire Yun Lead Study was 81 mg/kg. The median 'total' lead concentration for the 'random grids' (mainly residential areas) in the Yun Lead Study was only 57 mg/kg. The median BSA concentration (0-1-inch interval; unsieved) was only 55 mg/kg, or very close to the Yun Lead Study lead median result. The median concentration for the Northern Assessment Area (0-1 inch; unsieved) was nearly three times the median lead for the Yun Lead Study at 162 mg/kg. The median concentration for the Southern Assessment Area was 134 mg/kg for surface soils. The median value for the residences from the Yun Lead Study is in close agreement with the BSA median result, and both results are significantly less than median lead results for the two Assessment Areas.

Recent findings from discrete soil samples collected at the two residences with the highest lead impacts (located in the Northern

Assessment Area) detected in soil reported significantly greater lead concentrations (up to 5,500 mg/kg) when compared to the highest lead composited sample concentration (2,030 mg/kg). Such results may modify the mean and median concentrations for the Northern Assessment Area. Additional flux to the mean and median values may occur as a result of the discrete soil sampling proposed for the remaining 37 residences in the two Assessment Areas.

According to the chief authors of the Yun Lead Study 2010 paper (May 21, 2013 telephone discussion between Dr. Yun, Dr. Edwards and DTSC team members), no samples were collected within a mile of the Exide Facility. Therefore, the Yun Lead Study does not seem to support Exide's contention that they are not a source of lead to these areas. In fact, since the median (including the mean and maximum values) lead concentrations for the Assessment Areas are significantly greater than the residential areas sampled as part of the Yun Lead Study, it helps to strengthen DTSC's position that a significant source of lead exists in the City of Vernon and the surrounding residential communities.

The GSU has reviewed a Caltrans' study, conducted in 1994 (or 'Caltrans' Study'), which occurred along portions of the 710 freeway [close to the 710/Interstate (I) 5 freeway interchange located northeast of Exide's Facility]. Our review of the data in the Caltrans' Study found that while elevated lead [close to or greater than the lead total threshold limit concentration (TTLC) of 1,000 mg/kg] occurs in close proximity to the freeway, it typically does not extend very far, if at all, beyond the shoulder of the freeway itself. For example, Caltrans surface sample no. '1-2A', located on the west-side of the 710 freeway (south of E. Washington Blvd), approximately five feet away from the pavement edge in a pullout, had lead detected at a concentration of 690 mg/kg. Step-out sample no. '1-2B', located 12 feet from the roadway, reported lead at 500 mg/kg, or a 31% drop in lead concentration in soil in only 7 feet lateral distance from the first sample point. Exide surface soil sample no. '6000E-3', collected in close proximity to the freeway in the same general vicinity as the Caltrans samples collected in 1994, reported only 130 mg/kg of lead.

In 1976, the U.S. Environmental Protection Agency (USEPA) conducted a study (reported in their paper titled *Baseline Levels of Platinum and Palladium in Human Tissue*, EPA-600/1-76-019) on lead in soil (or 'EPA Lead Study') along a portion of the 405 Freeway (adjacent to the Wadsworth/University of California/ Los Angeles Veterans' Hospital). While the EPA Lead Study found that lead was elevated close to the freeway (i.e., 10 feet: 5,043 mg/kg), lead concentrations dropped sharply at a distance of approximately 100 feet

(i.e., 100 feet: 77 mg/kg) from the freeway itself. The EPA Lead Study also found that while lead concentrations were fairly uniform along both the upwind and downwind sides of the freeway itself, concentrations were three to nine times greater on the downwind side of the freeway than upwind. For instance, lead concentrations 100 to 125 feet east of the 405 freeway were up to 673 mg/kg, indicating that lead from the freeway was being carried by the prevailing winds blowing from west to east, and that these winds act as a significant causal effect to increase the general distribution and concentration of lead in the soil.

Since the Northern Assessment Area lies upwind of the 5 Interstate freeway, and at a distance of several hundred feet, we believe that any lead input from the freeway to the residences located to the south is minimal at best.

While we recognize that there are spatial and temporal differences between Exide's recent soil sampling efforts , the Yun Lead Study, the Caltrans' Study, and the EPA Lead Study, there seems to be a pattern where lead coming off freeways (minus the influence of prevailing winds) tend to diminish rapidly over fairly short distances (100 feet or less). The EPA Lead Study was conducted when leaded gasoline was still in use and the Caltrans study was conducted a few years after the lead ban in 1991, which means that lead concentrations along freeways in 1976 and 1994 would have been greater than in recent times.

Regarding Exide's response for the GSU to provide our own statistical analysis to prove to Exide that a difference exists, Exide should note that we based our response on the data submitted in their *Off-Site Soil Sampling Report*, dated February 18, 2014. GSU's role is to review Exide's submittals, evaluate the submitted data, and provide comments and recommendations. Our comments and recommendations could include requesting additional work if the submitted information is deficient and/or insufficient. The regression analysis conducted by the GSU was in response to Exide's own regression analysis conducted in their above-referenced report. Our review of the data suggested that Exide's conclusions were flawed because, as indicated in this and earlier memorandums, several of their assumptions are incorrect.

Exide states that there are few to no lead producing or lead related manufacturing activities located close to the BSA. Exide also suggests that DTSC rushed Exide into choosing the Long Beach area for the background study, which Exide would not have selected in retrospect. Exide should remember that the main factor for our concurrence on the Long Beach BSA was that it was outside of emission influences from

the Facility. As suggested earlier in this memorandum, results from the Yun Lead Study appear to be consistent with Exide's selection (and our concurrence) of the BSA.

Exide should also note that while there are no lead smelters located near the BSA, there are several large oil refining operations and oil storage facilities located in close proximity (including a large oil facility located approximately one mile upwind of the BSA) that have operated historically and are ongoing in the Long Beach/South Bay area. If leaded gasoline was formulated in this area, it is possible for historic air emissions tainted with lead (i.e., tetra-ethyl or tetra methyl alky lead) to have impacted these residences.

One of Exide's main conclusions in their presentation to DTSC on May 9, 2014, was that their soil contamination demonstrably extends only 1,700 feet beyond their fence line. Exide also points to several historical sources of lead close or adjacent to the Assessment Areas. While we do not discount the likelihood that there were other historical lead operations in the Los Angeles area, GSU still does not agree with Exide's conclusion regarding the extent of their offsite lead.

Lead significantly above the Commercial/Industrial (C/I) California Human Health Screening Level of 320 mg/kg occurs in shallow soil (0-1 inch depth) directly downwind (or north/northeast) from the Facility; at least up to the 4,500-foot contour. Exide attempted to give the impression that there are separate pockets of contamination that are from sources other than Exide's Facility by using Thiessen polygons to present purple-shaded areas (or lead in soil approximately below 100 mg/kg) between the Facility and the residences. However, these polygons seem to be based somewhat on limited inputs.

Our main concern is that the polygons appear to be based on data clusters that were extrapolated to represent larger areas. In some cases, the polygons are only a few hundred feet wide. For instance, Exide presents a light-purple-colored (<100 mg/kg) polygon that seems to straddle the Union Pacific Railroad (UPR) rail yard and extends just south of East Washington Boulevard along the north/northeast transect line. This lightly-colored polygon gives the impression.that the residences located northwards of E. Washington Blvd are impacted by a different source of lead when in fact there is over 2,000 feet of separation between two soil sample locations along the transect; both with lead greater than the C/I CHHSL (320 mg/kg). A soil sample ('500NE-3'), collected just north of the Facility, reported lead at the 0-1 inch sample depth interval at a concentration of 1,000 mg/kg. The next northern sample location along this transect (approximately 500-feet north of Noakes St.) is '3000NE-14', which had lead at 870 mg/kg.

Beyond this location, '4500NE-10' had 330 mg/kg and '4500N' had 490 mg/kg of lead in surface soils.

At Salazar Park, the lead concentration from a composited sample at the 0-1 inch depth interval was only 70 mg/kg. Salazar Park is located just north of the average ambient lead concentration isocontour of 0.002 $\mu g/m^3$ (or almost 6,000 feet north of the facility). Surface soil sampling, conducted by Los Angeles County (LA County) on March 13, 2014, reported the highest lead concentration (out of 19 discrete samples) at 85.2 mg/kg. Four of the LA County samples were below the laboratory detection limit (12.5 mg/kg). The average concentration (using a default concentration of 12.5 mg/kg for the samples with lead below the laboratory detection limit) is 37 mg/kg. The average lead concentration for the BSA is 63.2 mg/kg. The fact that the average lead concentration in 0-1-inch soil at the Park is significantly less than the average concentration in the BSA is another indicator that the background data is appropriate and can be used for comparison purposes.

Exide could propose using Salazar Park soil data, if they feel that this location, being closer to the Facility, is more representative of anthropogenic background lead for the area surrounding Exide than the Long Beach BSA. Salazar Park is located close to, and downwind of, the I-5 freeway, and should show impacts from lead from vehicular traffic along the freeway, possibly more so than the Northern Assessment Area, which is located upwind of the I-5 freeway. Salazar Park is also located much closer to industrial sources of lead, as identified by Exide, than the BSA, and should address Exide's concerns that the BSA is not representative of lead in a dense, urban area. At this time, it is unknown if lead-based paint (LBP) was used on the building exteriors at Salazar Park.

Exide's argument that the lead does not show a pattern of aerial deposition fails to account for redistribution of particulate following deposition, or possibly even before being deposited on the streets and roadways, from vehicular traffic (i.e., truck traffic along Bandini Boulevard). Exide's model does not seem to account for turbulent air flow which could create swirls or eddies that could spread lead further out than expected, where air flow could be preferentially directed along a large, busy street due to the general lack of obstructions. There are also wind gusts and storm events to consider, which could transport lead at distances greater than normal, thereby increasing the area of contamination. This distribution, independent of prevailing wind direction, may actually be demonstrated on Exide's figure titled 'Concentration of Lead in Dust Samples near the Exide Facility with Wind Direction', which shows an extensive east-to northeast to south-

to southwest elongated area contaminated by lead in dust (>200 mg/kg). This extensive area of lead contamination extends along Bandini Boulevard; an arterial roadway located just south of Exide, and is a busy route that generally connects truck traffic to the 710 freeway.

During the May 9, 2014 meeting, Exide used the former Master Metals site located in Detroit, Michigan, as an example of limited lead contamination with residences situated close to a former lead smelting facility. This example is not applicable to conditions at Exide for several reasons, which are as follows:

1. The wind flow patterns at the Master Metals site are omnidirectional compared to Exide where there the prevailing wind directions are considerably less variable. Sustained strong wind currents (e.g., Santa Ana winds) and gusts blowing over Exide are probably more capable of transporting lead particulate further downfield than in the Master Metals case.
2. Unlike Exide, residences are located directly adjacent to the Master Metals site, which would mean that airborne lead would be entrained close to the site in backyard soil, and not be subject to much redistribution.
3. Exide is mostly surrounded by hardscape which means that lead is more likely to be carried further and redistributed even in areas not necessarily downwind.
4. Master Metals was not in operation nearly as long as Exide, where operations continue (the current production halt notwithstanding) today.

Exide stated in the May 9, 2014 meeting that duration of operations at Facility is not a factor since the discharge of lead emitted from the Facility was likely limited to areas surrounding the Facility prior to the time that stacks were added. This may be the case, however, Exide has not provided DTSC with any data to support that assertion. In addition, even if lead was deposited close to the Facility before stacks were constructed, and since lead tends to persist in the environment, it is possible that over the course of several decades, Exide's lead could have been redistributed and picked up by vehicular traffic, wind gusts, etc., and carried further downfield, possibly as far as, and including, the residential areas, along surface streets and even freeways.

As part of their response, Exide refers to dust concentrations detected 4,500 feet from the Facility as "miniscule, below the measurement ability of the analytical laboratory". However,

- Sample 'SW-4500N' has a concentration of lead at 160 mg/kg (twice that of the residential lead CHHSL of 80 mg/kg).

- Sample 'SWK-46A' had a lead concentration of 370 mg/kg, or well above the C/I CHHSL of 320 mg/kg.
- Sample 'SWK-51B' had lead at 560 mg/kg, which is more than twice the C/I CHHSL and well above the 400 mg/kg threshold for interim measures.

All of the above are samples collected approximately 4,500 feet away from the Facility. These results were generally what prompted DTSC to require step-outs to determine the extent of contamination. GSU does not agree with Exide's descriptive classification of these concentrations as miniscule.

More importantly, elevated concentrations of lead in surface dust were detected at the 6,000-foot isocontour line (i.e. 400 mg/kg for sample '6000N-6'). In addition, lead concentrations in surface dust generally decrease with distance away from Exide to the north-northwest (i.e. up to 2,700 mg/kg just outside of the Facility, 670 mg/kg for sample 'SWK-41' located approximately 2,000 feet to the north-northwest; 910 mg/kg for sample 'SWK-43A' located approximately 3,500 feet to the northwest; 340 mg/kg for sample '6000N-4' located approximately 4,500 feet to the northwest). Lead in surface dust is more likely to be from Exide than from a historical lead emitter.

In general, lead dust concentrations are generally greater in the downwind directions than in the crosswind directions from the Facility. Between the two lateral lines representing different crosswind directions, the highest lead concentration (from samples collected directly along the two hypothetical crosswind lines) was 180 mg/kg (sample location '6000W-1'). In contrast, the highest concentration along the south-southwest lateral line representing a downwind direction was 310 mg/kg ('7500SW-4') and along the north-northwest downwind lateral line (the dominant wind direction) was 670 mg/kg ('SWK-41'). Lead concentrations do show some degree of flux along the two downwind laterals, however, this may be due to more localized dispersion patterns affecting the general accumulation of lead dust in any one spot (as evidenced by the elevated lead levels in dust occurring along Bandini Boulevard).

To summarize, as indicated by the prevailing wind directions blowing to the north-northeast (and southwest) across Exide and the existing data collected along the transect lines that represents the prevailing wind directions, there appears to be a complete pathway for lead from Exide up to, and including, the two Assessment Areas.

2. RE: GSU COMMENT 3: The GSU holds to our opinion regarding Exide's request to conduct a LBP assessment of the homes in the

Assessment and Expanded Areas. To indiscriminately assign LBP as the source of lead in these areas is scientifically unsound; particularly in cases where elevated concentrations of lead occur in dust at locations both adjacent to the Facility and thousands of feet downfield, and in surface soil samples collected in industrial areas located downwind of Exide (e.g., 870 mg/kg at sample '3000NE-14'; 300 mg/kg at sample '3000SW-4'; 340 mg/kg at sample '4500SW-3') or from public right-of-way grassy strips in the residential areas (e.g., 330 mg/kg at sample '4500NE-10').

Regarding Exide's request for DTSC to identify lead fingerprinting techniques that could be used to distinguish between LBP, lead from leaded gasoline, and lead from a smelter, we recommend looking into conducting an isotopic ratio analysis (IRA) study as well as look at the external morphology and crystalline structure of soil and dust samples using a scanning electron microscope (SEM). For LPB in soils, microscopic examination of soils should be able to differentiate between metallic lead particulate and lead carbonate found in paint chips.

3. RE: GSU COMMENT 4: For the expanded assessment areas, the GSU recommends following USEPA guidance "*Superfund Lead-Contaminated Residential Sites Handbook*" (OSWER 9285.7-50, August 2003). Exide, however, must revise the work plan to both reflect and follow this guidance document that recommends separate composite samples from distinct locations on the residential properties. We also recommend following EPA guidance on collecting multi-increment samples (MIS).

   In regard to the 39 properties and any additional properties (where sampling is requested by homeowners) in the Northern and Southern Assessment Areas, Exide shall follow the discrete soil sampling protocol as proposed. Otherwise, the GSU concurs with Exide's response.

4. RE: GSU COMMENT 8: The GSU concurs with Exide's response.

   Questions regarding the memorandum should be directed to Todd Wallbom at (818) 717-6622.