EXIDE COMMITTEE
DISCUSSION D R A F T
12/28/12

To: Conservation (and Inland Wetland Agency), Shellfish, and Harbor Management Commissions' Exide Review Committee
From T.J. Steinke, CD
Subject: Conservation staff review of Exide's proposed remedial action plan for lead-contaminated sediments in Mill River and Southport Harbor (SedRAP, April 2012)
Date: December 28, 2012

To assist the committee in relating this review to the Exide report text, this staff outline approximates the format of Exide's proposed SedRAP Plan and Drawings for remediating the lead-contaminated sediments in Mill River. The committee will note sections that may seem redundant, but this is due to the format of the remedial action plan where similar subjects may be described in terms of different activities, functions, or impacts on a common element of the plan.

Background

Exide has submitted for review and approval by the CTDEEP its proposed "Remedial Action Plan for Lead Impacted River Sediments Mill River Study Areas I – V pertaining to CTDEEP Consent Order No. SRD-193 Dated October 2011, Revised April 2012" (SedRAP), in which Exide proposes to dredge 21,440 cubic yards of lead-contaminated sediment out of five areas comprising approximately 30 acres of the Mill River above and below the Tidemill Dam at Harbor Road.

As noted in its report, Exide has been complying over several decades with multiple orders by the CTDEEP to investigate the nature and extent of lead contamination in and adjacent to its upland factory site and in the sediments of Mill River; to locate and secure the sources of contamination; and to remediate the contaminated upland soils, groundwater, and Mill River sediments affected by Exide's factory operations. The lead contamination exists due to discharges of lead from battery manufacturing following Exide's acquisition of the aluminum factory property from ALCOA in 1948. Following its cessation of battery manufacturing in 1981, Exide complied with a CTDEP order in 1983 to remediate 4,100 cu. yds. of contaminated sediment in a portion of Mill River located between the Post Rd. and the railroad adjacent to Exide's property. The target level for residual lead was 500 mg/kg and lead remediation was conducted with a hydraulic cutterhead dredge working within a floating silt curtain enclosing the dredge site or cell. After chasing resuspended sediments with lead exceedances, Exide removed a total of 4,383 cu. yds., of sediment. After successful remediation of the site in 1983, the river was recontaminated to the extent we find it in today. Exide has nearly completed its upland remediation activities as it addresses the factory leaching field and easterly bank of the mill pond, and now proposes to again address the Mill River in its proposed April 2012 (revision of the October 2011 version) sediment remedial action plan known as the SedRAP.

Exide's proposed Mill River sediment remediation plan or SedRAP is the product of years of investigation, sampling, and analysis of river sediments to define the extent and degree of lead contamination in the river and to determine the acceptable residual lead concentrations that may be considered safe for human and ecological receptors predicated on a search of the literature and bioassays for chronic toxicity. Based on a compromise following their respective interpretations of the data and conclusions for an acceptable residual lead concentration, Exide at 400 mg/kg and the CTDEEP at 220 mg/kg, the state and Exide have agreed upon a dual target for residual lead concentrations in the river sediments based on their location. In the four remediation areas located below or downstream of I-95 (Areas I, II, III and IV), where the highest levels of lead contamination are found, Exide will remove the contaminated sediments down to 220 mg of lead per kilogram of sediment (often referred to as 220 parts per million). In the remedial area above or upstream of I-95, Exide

will remove lead-contaminated sediment down to a residual concentration of 400 mg/kg; the reasoning for the two targets being that the extensive disturbance required to remediate the lower areas to either target level will necessarily also eliminate the natural habitat in the river, while the less contaminated upper area with its valuable habitat would be protected by less dredge disturbance seeking a 400 mg/kg residual lead concentration.

In a parallel matter, the CTDEEP and Superior Plating Company have been addressing chromium contamination of soil, groundwater, and river sediments along the shore of Mill River opposite the Exide factory. Similar to Exide's Lead-SedRAP subject matter, the chromium review suggests that the Superior Plating Company will also need to address the remediation of chromium exceedances in the soils, groundwater, and Mill River sediments in the future. The three drawings accompanying the CTDEEP October 12, 2012 compliance letter to Superior Plating Company depict the chromium sample exceedances in the river sediments that are to be addressed in a related remedial action plan.

Existing Conditions:
The present water quality status of the Mill River is clearly described in the CTDEEP's April 11, 2011 State of Connecticut Integrated Water Quality Report to the EPA, the CTDEEP has listed the Mill River and Southport Harbor as impaired waters relative to Sections 305(b) and 303(d) of the federal Clean Water Act. The impaired uses are Fish Consumption – due to Lead; Habitat for Marine Fish and Other Aquatic Life and Wildlife – due to Chromium (total), Chromium (hexavalent) and Lead; Recreation – due to Chromium (total), Chromium (hexavalent) and Lead; Shellfish Harvesting for Direct Consumption Where Authorized – due to Fecal Coliform bacteria. The Potential Sources of the heavy metals are listed as Industrial Point Source Discharge and Contaminated Sediments. There is a health advisory posted around the river against consuming blue-clawed crabs by pregnant women and children; and no swimming, fishing, or boating activities. The 2012 Exide SedRAP will address the lead-contaminated sediments and may also include chromium-contaminated sediments that are co-located with the lead. Chromium that is not co-located with lead-contaminated sediment is expected to remain an impairment to the river until remediated in the future.

Much of the SedRAP concerns and activities, and staff review comments, are related to Exide's efforts to minimize the duration of its in-water remediation project by working during the normally protective seasons for spawning fish and shellfish. As noted below, Exide proposed this year-round waiver of spawning restrictions during a meeting several years ago when it stated that it believed that it could conduct its dredging activities and demonstrate no adverse effects on the protected spawning species. Exide has not yet demonstrated its ability to meet that performance standard.

2010 CTDEP meeting agenda for reviewing Exide's proposal to be permitted to dredge in the Mill River estuary during normally protected spawning seasons for fish and shellfish

AGENDA
Exide/Inco 2190 Boston Post Road, Fairfield, CT
Allowable Dredging Periods
Potential Moratorium Waivers

Date : November 10, 2010
Place: DEP Headquarters
79 Elm Street, Hartford CT
Conference Room 4D 2:00 p.m.

Items:

1. Introduction of Attendees (EGI/DEP)
2. Meeting Objectives/Goal (EGI)

3. Mill River Sediment RAP Concept Development (EGI presentation)
4. Discussion of RAP Concept and Application of DEP Policies (group discussion)
5. Status of Response to Mill River Environmental Risk Assessment (DEP)
6. Discussion of next steps and schedule (group discussion)

With this background, Exide and the CTDEEP convened a meeting on November 10, 2010 with local, state and federal interests in the Mill River remediation project for the purpose of reviewing the need for protective seasons during spawning periods. At that meeting, Exide noted many technological advances in dredging methods in the twenty-seven years since its 1983 remediation dredging work in the Mill River and proposed in-water river dredging activities during the normal dredge exclusion periods intended to protect spawning fish and shellfish species. Exide prefaced its proposal with the condition that it would protect those species by precluding the discharge of harmful resuspended sediment during those protective seasons. In other words, if Exide could show that its dredging activities would have no adverse impact on the spawning fish and shellfish then it would be acceptable to allow dredging during the spawning seasons.

If approved by regulatory agencies, this spawning season dredging window could shorten the remediation project thereby reducing risk of secondary environmental impacts and project expenses associated with an otherwise extended project duration. When questioned about the release of resuspended sediment and related problems encountered in its 1983 dredging experiences, Exide offered examples of new dredge technologies in the form of such designs as the Tornado-Motion Technology hydraulic dredge method and the use of silt curtains with horizontal bottom panels that actually confined resuspended sediment and protected the open water from active dredge cell sediment discharges. The consensus of meeting participants was favorable to Exide's proposal if Exide could demonstrate its success in isolating contaminated resuspended sediments from the open river water during spawning seasons.

The question of allowing in-water dredge remediation activities during spawning seasons has particular significance to Fairfield and to the river herring and shellfish that are dependent upon clean water in Mill River. River herring, alewives and Blueback herring, are anadromous fish species that live as adults in the Atlantic Ocean and in the spring of the year, responding to unknown cues and methods of orientation, return to their natal rivers and streams to spawn. There is a relict population of perhaps several hundred adults of both species in Fairfield that are greatly hindered in their spawning runs by the obstruction of the tidemill dam (they can only pass it at high tide where, while waiting, they are fed upon by herons, striped bass, bluefish and other predators) and which are totally prevented from reaching their upper spawning areas in the watershed by the Samp Mortar Dam. The adults now go no further than the spawning pool beneath the dam's spillway. Along the east coast, these species have experienced plummeting populations due to dams and loss of spawning habit, water pollution, predation, and over-harvesting. As a result, these species have been nominated in 2011 for consideration under the Endangered Species Act and the National Oceanic and Atmospheric Administration has made a preliminary determination that supports the concern resulting in a 90-day finding of their being Candidate Species with a final determination expected within three months (March 2013). The Mill River herring populations would be well-served by protecting the water quality and the river passage that they are so dependent upon.

Similarly, the Mill River estuary is one of the most productive shellfish areas in Fairfield with its Natural Beds and water quality supporting hard clam and oyster populations that form a base for seed transplants and relays for the commercial and recreational shellfish programs. These populations, and the shellfish programs that they support, are entirely dependent upon good water quality that protects the spawning adults, the larvae in the water column, and the young spat-fall coming to rest on the bottom. Like river herring, these shellfish species'

life forms may be adversely affected by "clean" sediment plumes and smothering sediment or mud waves on the bottom, and if the sediments also contain contaminated materials, they could have a direct and acute toxic affect on the species. If dredging continues through several spawning seasons, the species populations could lose several year classes of recruitment cycles in the affected area.

Following the CTDEEP meeting, Exide proceeded to compile the proposed 2011-2012 SedRAP revisions under review today. To save time, Exide has submitted this SedRAP proposal in a federal application to dredge approximately 27,600 cu. yds. of lead-contaminated sediment over 36-acres of river and harbor bottom and it has received an Army Corps permit for the project based on the proposed SedRAP (Corps Permit No. 2011-2074 dated 9/18/12).

The reader will note the nearly thirty percent increase in dredge volume from the SedRAP (21,440 CY) to the Corps permit and the Appendix III CTDEEP Natural Diversity Database Review Request Form (27,600 CY). This new increase in dredged sediment volume and the reason for it is not addressed in the current April 2012 Exide SedRAP and will need to be reviewed in further detail. While there is undoubtedly a good reason for the increase in sediment volume to be removed, it may affect nearly every aspect of the remediation project from a new multi-year time schedule and increased treatment and mitigation requirements to how it may affect the chromium problem in the river. Given such significant changes in the SedRAP it may necessitate a new revision of the proposed remedial action plan.

If the proposed SedRAP is revised, Exide may have to revise its existing permit or apply for new permits.

Staff Review

Staff comments concerning the proposed Mill River lead-contaminated sediment remediation plan (SedRAP April 2012) are as follow:

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Section 1 Introduction

1.2 Background – Project History Leading to Preparation of Remedial Action Plan

1.2.1 Summary of 1983 Remediation of Mill Pond

The report notes the 1983 dredge remediation of 4,100 cubic yards (CY) of in-situ lead-contaminated sediment plus the recovery of 283 CY of additional contaminated sediment from chasing deeper lead deposits for a total volume of 4,383 CY.

The report does not reflect that the 283 CY (6.9 % of the 4,100 CY target contaminated dredge material) of additional volume included secondary contamination requiring extended dredge recovery efforts of the unconsolidated semi-liquid mud wave and flocculated materials of the resuspended contaminated residual sediment layer about 4 to 10 inches thick covering the bottom of the dredged area. The report also provides no estimate for the volumes of resuspended sediment that was discharged from the dredge cell out into the open river water by flowing over the silt curtain; and after tightening the curtain head-rope the resuspended sediment flowed out around the ends of the silt curtain; and after securing the ends of the silt curtain and tightening the foot rope and anchoring it in the bottom, the water pressure from the tide, river, upland runoff, and variable dredge pumping rates apparently caused the resuspended sediment to blow out the fine bottom silt beneath the curtain and then flow out into the river water. The attached photos depict these conditions arising from Exide's hydraulic cutterhead dredging in 1983 with incomplete control of resuspended sediment. The resuspended sediment problems arising from the 1983 hydraulic cutterhead dredge project were some of the reasons why Exide conducted its dredge technology search and had prepared responses to the questions it anticipated from the CT DEEP 2010 meeting participants.

These are some of the issues that prompted Exide to investigate new dredging technologies, such as Tornado Motion dredging and sophisticated silt curtain designs protective of spawning species, before proposing to be exempt from the protected spawning window prohibitions. In this SedRAP, Exide does not propose Tornado Motion or any other new dredging technology or sophisticated silt curtain designs – it states that it will rely on the use of a hydraulic cutterhead dredge and a silt curtain suspended at least 6-inches off the bottom around the active dredge cell.

Exide offers no information on the potential contamination of the resuspended sediment; it offers no results from any Elutriate test of the dredge slurry to characterize heavy metals or other pollutants in the dredged material; it offers no information on a bioassay of the potential acute toxicity of the resuspended sediments to the life forms of the species to be protected during their spawning periods. Exide should be able to demonstrate what the potential effects could be on the protected fish and shellfish resources before it proposes actions that could have significant environmental impacts on those resources.

The point being, that if Exide does not know the risk to protected spawning species and cannot control the discharge of contaminated resuspended sediment out of the dredge cell in order to protect the spawning species' life forms present during the protected spawning seasons when Exide proposes to dredge, than Exide should not be conducting any in-water dredging activities during the spawning periods.

The attached photos depict elements of the 1983 dredging project wherein a hydraulic cutterhead dredge with shroud and variable speed pump and cutterhead rotation was used to remove sediments and pump them to the upland treatment and transfer-disposal location at the factory site.

View of the 1983 Exide Mill River sediment remediation project. This is a hydraulic cutterhead dredge with shroud, variable-speed pump and cutterhead. The dredge shifts its position by moving along a cable suspended between timber pilings located around the shoreline. April 1983 tjs

Photo #1

View of Exide's 1983 Mill River sediment Lead remediation project. The work barge in the foreground is driving timber piling along the shoreline to support the cable for shifting the dredge as it cuts into the river bottom.'83 tjs

Photo #2

Looking northerly at Exide's 1983 Lead remediation project in Mill River sediments. The floating silt curtain is deployed around the dredge cell on the left side to protect the open water in the river; the pile-driver is installing timber support piles for shifting the dredge on cables; the hydraulic cutterhead drege is dredging the bottom sediment and pumping it through a floating pipeline to the treatment and disposal area. April 1983 tjs

Photo # 3

View of Exide's 1983 remediation of Mill River mill pond looking from the railroad toward the Post Rd. The dredge cell silt curtain to the right is suspended from the floating boom and is intended to protect the open water in the Mill River. Note the oil slick in the foreground contained within the boom. April 1983 tjs

Photo # 4

View of Exide's 1983 MIll River Lead remediation project. Note silt curtain suspended from floating boom with resuspended sediment discharging from under the curtain in the foreground. Depending on the tide, river flow, rainfall, and dredge pumping, the resuspended sediment discharged over, around, and under the silt curtain into the open river. April 1983 tjs

Photo #5

View of Exide's 1983 Lead remediation of Mill River sediments. The silt curtain to upper right is intended to separate the resuspended sediment within the active dredge cell from the protected open water in the river located to the left. Note the boiling clouds of resuspended sediment blowing out from beneath the curtain into the open river water between the rope and the warning sign. April 1983 tjs

Photo # 6

View in September 1985 of the Mill River mill pond two years following Exide's Lead remediation of the Mill River in 1983. The river bottom is marked by shallow furrows from the dredge, deeper holes in the open water areas from chasing deep Lead deposits, but notably a smooth homogenized featureless substrate of little habitat value to plants or animals. 9/1985 tjs

Photo #7

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Section 2 Remedial Action Plan (RAP) Overview
2.1 Overview/Purpose.
The SedRAP is offered for two reasons: to comply with CTDEEP Consent Order No. SRD 193; and to reduce the concentration and bioavailability of lead in the Mill River study areas to levels that are protective of human health and the environment.
2.2 Desired Effects
Exide notes that "in spite of the elevated sediment lead contamination in some areas, Mill River currently exhibits a vibrant array of dependent flora and fauna. It is desirable that whatever remedial alternative is selected, consideration be given to minimizing the negative short term disturbance to these organisms and maximizing the long term benefits of reducing lead in the environment in which they live."

2.2.1 Short Term
Comment:
The Overview and Desired Effects statements above capture the conceptual essence of the Exide proposal now under consideration.

Unfortunately, Exide has not provided any quantitative biological baseline data or description of the plants and animals that will be affected by the dredging project. The absence of such information negates any effort to monitor species and numbers to be able to objectively detect whether or not environmental restoration is achieved or approximated following the lead remediation project.

Based on our experience and observations with Exide's 1983 dredging project, Exide has yet to address the short term impacts of resuspended sediment associated with its proposed hydraulic dredge project.

Hydraulic dredging is analogous to the action of a kitchen blender where its spinning cutterhead cuts into and breaks up the bottom sediment deposits into small pieces, allowing water to mix with the resuspended sediment to make a fluid-like slurry of about 80 to 90% water and 10 to 20% solids which is then sucked up by a pump and pushed through a floating pipe to the sediment treatment and disposal area. The resuspended sediment typically occurs with dredge-induced changes from a reducing environment to one in which the contaminants are subjected to significant changes in dissolved oxygen, temperature, light, ph, salinity, and water content that may increase their bioavailability and acute toxicity to protected species and their life forms.

In addition to the turbulence generated by the turning motions of the cutterhead, ladder-boom, relocation of dredge barge and service vessels over the bottom, the presence of submerged trash, stones, logs and related debris impede and foul the dredge creating more turbulence until they can be cleared and removed. Further turbulence and transport of resuspended sediment occurs with the reversing tidal and river currents, upland runoff, wind and rainfall.

The resuspended sediment has several forms or phases of development depending on the specific project operation, sediment types, and proximity to the dredge head, but typically include a plume of resuspended solids in the water column transitioning to an unconsolidated semi-fluid mass of flocculated organic matter and fine-grained sediment particles in a mud wave moving along the bottom away from the dredge head.

In general-navigation projects where dredging is used to maintain channels with environmentally "clean" sediments, a simple floating silt curtain is often used to mitigate adverse effects by containing resuspended sediments and impeding their discharge from the active dredge cell or area so that non-target areas and life forms will not be adversely affected by the project. Contaminated sediments are another matter entirely,

requiring significantly different mitigation measures in the form of specially-designed silt curtains, redundancy, or the use of cofferdams to protect non-target areas and organisms. If Exide's proposed silt curtain functions as did the 1983 unit, we can anticipate significant impacts beyond the dredge cell in non-target areas.

As noted in the SedRAP and depicted in the photos of the 1983 dredge project, the resuspended sediment spreads out in the water column and along the bottom throughout the dredge cell This resuspended material of unconsolidated sediment and fine-grained organic matter is typically measured as total suspended solids within the plume or cloud of discoloration in the water column. If contaminated, this resuspended material settles on both contaminated and uncontaminated bottom surfaces within the dredge cell, necessitating the expansion of the dredging project to chase down and recover errant exceedances. This secondary recovery action results in increased volume and handling/treatment expenses, more time, and increased destruction of vegetation and habitat that would have otherwise remained protected and intact.

Exide proposes to monitor the water column silt plume and near-bottom mud waves for their optical properties or signature to determine if contaminated resuspended sediment is discharging from the dredge cell curtain and thereby impacting protected spawning species. Exide must then be able to equate these optical turbidity units to total suspended solids and the concentrations of potentially toxic constituents in the resuspended sediment so that dredging may be stopped immediately if contaminants discharge from the dredge cell.

Exide has not provided any test data to describe the physical or chemical status of contaminated resuspended sediments relative to its proposed use of optical data units to monitor plumes and mud waves.

No bench test or field trial data have been submitted as to the volume of resuspended sediment to be expected with this dredging project; no data are provided for any contaminants associated with the resuspended sediment; no data are provided for any potential acute toxicity of the resuspended sediment on the species and their life forms (e.g., adult spawning river herring, shellfish, shellfish larvae in the water column, and spatfall) that Exide proposed to protect during their critical spawning periods.

Exide has not provided a debris survey or any data on the nature and extent of submerged obstructions that may interfere with and foul the dredge causing increased exposure to resuspended sediments.

Exide has not provided any test data on the proposed silt curtain (to be suspended at least six inches off the bottom) or its effectiveness in containing potentially contaminated resuspended sediment within the dredge cell.

Exide did not include any list of references for its literature citations, but a search of the literature found many publications addressing dredging methods, environmental impacts, and practices for mitigating impacts on aquatic resources and eco receptors – the Army Corps of Engineers has a remarkably effective dredge research program whose knowledge-base is readily available for projects such as these.

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2.2.2 Long Term
Exide notes the long-term advantages of reduced lead contamination in the river sediments, but does not address long-term adverse effects.
The dredging project will do several things as observed in the enclosed 1983 and 1985 photos:

1. To provide a clean dredging bottom surface, the project will cause the removal of all significant physical structural elements of the river bottom in terms of logs, stones, and related materials thereby destroying habitat conditions for both plants and animals.

2. The removal of submerged debris and the dredge's mechanical agitation of the bottom sediments will leave a smooth, relatively level, homogenized mud substrate having little diversity and value to plants and animals.
3. The dredging of deep contaminated sediments will involve creating or aggravating significant areas of deep lifeless sumps or pits on the bottom of the river. These dredged holes or craters, some up to three feet or more in depth, will typically fill with fine-grained organic matter characterized by acidic conditions, low or no dissolved oxygen, a rotten-eggs odor, and incapable of supporting plant and animal species associated with the natural river bottom. Exide characterizes these sediments as black pudding and black mayonnaise.
4. These changes may approximate a veritable biological desert as the river has been dammed since 1700 during which time it has acquired a great variety of habitats and conditions that support the plants and animals found there today.

These conditions may be mitigated by Exide by providing for the future refilling of its dredged sumps with clean soil material and by restoring the submerged structural habitat elements, logs, stones, etc., on the bottom following the dredging project.

Exide should continue to monitor lead concentrations in eco-receptors following its remediation activities to ensure that the health advisory on blue-clawed crabs will eventually be removed.

Further, Exide should conduct a quantitative pre-dredge base-line survey of plants and animals in the affected areas and provide a long-term monitoring program so that it may document when the remediation project may be successfully concluded by Exide's success in achieving the reestablishment of plant and animal communities equivalent to the pre-dredged condition in Mill River or to the Reference Sites.

Exide should be held accountable for continued long-term mitigation until the river is restored and the lead impairments and health advisories are no longer needed.

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2.3 Cleanup Criteria
Exide notes the need for a statistical analysis to determine the probability of a successful sediment remediation effort based on sampling of the residual lead concentrations in the sediment to determine if they are within the 95% confidence interval for the clean-up criteria; and if any individual sample location has a lead concentration greater than twice the clean-up target level it will need to be addressed in a post-remediation environmental net benefit analysis of the merits of any supplemental efforts to clean it up.

Comment:
Exide proposes to sample for residual lead according to a pre-determined pattern and range in the 0" to 6" bottom sediment. That sampling schedule should be expanded to require sampling of the near-bottom layer of unconsolidated sediment in the mud wave along the water-soil interface, as well as the deep sumps that Exide created or enlarged during its dredge remediation activities. Otherwise, the potentially contaminated semi-fluid sediment layer lying above the bottom and in the deep holes where contaminated sediment will collect may not be encountered during grid sampling and could subsequently recontaminate other areas when river currents redistribute materials in the channel.

Exide's undefined post-remediation net benefits analysis and supplemental remediation alternatives need to be described in more detail. For example, is Exide contemplating alternatives of doing nothing to mitigate residual exceedances, or a capping operation of clean soil material over the bottom residual lead exceedances (which

may be compromised by future chromium remediation efforts), or of establishing a dedicated fund for future support of mitigation activities in Mill River?

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3.0 Mill River Current Conditions
Exide describes the various remediation areas (Areas I-V), depicted in Figures 1 & 2, Drawings 1 and 2, with respect to their physical features including bathymetry, topography, tidal regime, road crossings, pipe outfalls, structures, and history of the tidal dam and earlier gravel mining operations above I-95 for construction of the Connecticut Thruway.

Comment:
The Exide report notes the 300 year old tidemill dam and one may expect that the impounded mill pond may cover both Colonial and Native American materials, but does not reflect any pre-dredging survey or provision for artifacts of historical or archeological significance that may be encountered in the course of the project. Exide should provide for such eventuality.

The tidal dam structure (tidemill) is over 300 years old and has suffered damage in that time period. The concrete spillway on the east side of the tidemill island was constructed by the town when it replaced the old wooden tidegates at different times in the 1950s and '60s when it believed that the town owned the dam. In 1985-87 the concrete spillway was seriously undermined to the point where the river drained out beneath the spillway and exposed the lead-contaminated river bottom sediments upstream. Dr. Kueffner, tidemill dam owner, requested that the town assist him in repairing the breach in order to protect the contaminated river sediments from scour and redistribution downstream until they could be remediated by Exide. The Conservation Commission approved the project and the Conservation Department crew repaired the leak by placing sand bags in the bottom breach where the colonial foundation stones were washed out of position beneath the dam. Our SCUBA repairs were temporary in that they were merely sand-filled bags placed on the up- and down-stream faces of the dam breach and had to be replaced in 1987. They have apparently remained in position since that time, but no assessment of their condition has been made since installation. The entire multi-year Exide remediation proposal is uniquely dependent upon the structural integrity of the tidemill dam, but Exide has not provided any information as to the condition of the structure, or what Exide is prepared to do if the structure is compromised during or after the dredging activities. Exide should be required to provide such information and a response plan before receiving approval for the proposed SedRAP.

Exide proposes to conduct its remediation activities in the river (mill pond) above the head of navigation at tidemill dam. The dam is apparently the property of the Tidemill owner, while the bottom of the river and Mill Pond is owned by various entities, including Tidemill and Exide. Exide depicts its ownership of the bottom of Mill River (see Figure 9) where the property extends into the river on the easterly side of the main channel between the Post Road and the railroad. This property configuration is derived through Exide's acquisition of the aluminum factory which received it from the prior owners Lacey and Sturges. The remainder of the mill pond property not conveyed to Exide appears to rest with the successors of Sturges. The river bottom property above I-95 appears to be owned by the riparian owners along the shoreline who provided their permission to the turnpike construction contractor to dredge their property for sand and gravel. Ownership of the affected property in the proposed remediation plan is important to what the owner may allow in terms of dredge or cofferdam placement and excavation, existing and possible contamination or recontamination, deployment and location of silt curtains, diversion of upland tributary stream flows away from dredge cells, possible impacts to and integrity of the tidemill dam and other shoreline structural conditions, and condition of the property following the conclusion of the remediation effort. In addition to its own property holdings in the river, Exide

should revise the proposed SedRAP and provide a delineation of all property ownership for the properties located within the remediation areas above the head of navigation at the tidemill dam (I-V).

On the Drawing Set submitted with the proposed SedRAP, Exide has superimposed the elevation 5 contour over the base topographic map detail thereby obscuring the elevations which determine the boundaries between the state's tidal and the town's inland wetlands and watercourse jurisdictions. Exide should submit revised drawings that clearly depict all contour lines and relevant elevations along the shore as well as all soils and the upland setback review areas as depicted on the Fairfield IWWC maps; and the newly defined tidal areas State Jurisdiction Line; so that the Fairfield Inland Wetlands Agency may make a determination of any regulated areas and regulated activities associated with the proposed SedRAP.
(More about this matter in the IWWC section at page 73.)

Exide depicts the town's west-trunk sanitary sewer siphon with its twin pipes approximately two to four feet deep in remediation Area V .beneath the river at Henderson Road. Exide should provide plan, section, and profile views of this important structure to minimize risk of disturbance to the sewer siphon.

Exide has not depicted any sampling within the large culverts of the I-95 river crossing between remediation Areas I and V and it is unclear if Exide has already sampled this area or if it intends to sample this area following dredging in case the area is contaminated. Exide should clarify the status of any sediment samples from the I-95 culverts and indicate if it intends to include them in its pre-and post-remediation sampling program for Areas I and V.

The SedRAP is silent on the status of the railroad drain as a potential source of lead to the Mill River.

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In the proposed SedRAP Exide describes the broad concepts and general methods of the proposed remediation project, but provides no details. Exide states that the details of the remediation project are not known at this time, but will be developed by Exide and the contractor after the SedRAP is approved through its bid documents, the contract documents, and by the successful bid contractor when it provides plans for actually conducting the work. In light of this approach to the project it makes it is impossible to determine at this time whether or not there are any IWWC regulated activities in regulated areas. It may be necessary to wait until the successful bidder submits its statement of work and the related plans and details for each Remediation Area and then the Wetland Agency may use that information to determine if an IWWC permit application is required.

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3.2 Sediment Lead Distribution
Page 19, 3.3 Physical Characteristics of Study Area Sediments
Page 20, 3.4 Hazardous Waste Characteristics of Study Area Sediments

Based on over 2,000 sediment samples, Exide reports that the highest average sediment lead concentrations are present in Area II (mill pond) with the next highest in Areas I and III. These areas also have some of the deepest sediment lead deposits beneath the water column. On page 20, Exide reports that it encountered sulfide-reactive sediment materials and hazardous waste conditions including TCLP lead (toxicity characteristic leaching procedure) requiring special treatment and disposal at a hazardous waste facility. Exide anticipates the need to add chemical stabilizers to the dredge slurry in the on-shore treatment facility, but expresses no concern and offers no treatment suggestions for such hazardous materials that may be mobilized in the water column by dredging and transported as dissolved or particulate matter with resuspended sediment flowing out of the dredge cell into non-target areas and adversely affecting protected spawning species. Further, with respect to Overall

Benefits Analysis and Socio-Economic Issues, in section 4.4 (page 27) Exide finds "That risk to humans through consumption of fish/shellfish or ingestion of lead-contaminated sediment is substantially elevated in Area II, and elevated in Area I, with no substantial risk in Areas III, IV, & V." The risk of incidental ingestion of lead-contaminated sediments through such activities as swimming "is deemed to be substantially elevated in Area II and elevated in Areas I & III, with no substantial risk in Areas IV & V" and thereby concluding that only a net benefit would be gained by dredging the river.

Instead of a One-Size-Fits-All remediation method to treat both high- and low-risk areas through dredging alone, the above information supports a far more effective approach wherein Exide should be selective and use the open-water dredge system to remediate the relatively low risk Areas while using a closed system cofferdam method to excavate the high risk Areas. The use of a cofferdam in Areas I, II, and III would allow Exide to isolate the worst sediments from the river and dewater and observe the areas to be dredged; clear all debris that would normally foul the dredge; allow Exide to directly obtain confirmation samples of residual lead and be able to chase any lead exceedances without resuspending the highest-risk sediments; it would allow Exide to easily replace the excavated sediment with clean material, refill and eliminate its anaerobic sumps; and replace submerged structural habitat elements. If the cofferdams were installed prior to the protected spawning periods, Exide would avoid in-water disturbance to spawning species and could continue to conduct these cofferdam activities within the protected spawning periods. Exide already owns the easterly shoreline and a large portion of the bottom of Mill River in Area II, with State ownership in Area I and Tidemill in Area III. Concerns for flooding due to cofferdam encroachment on the river are acknowledged and may be ameliorated by avoiding encroachment within the cross-sectional areas of the existing river control sections of the Railroad and Post Road bridges. With this dual approach Exide could work within the cofferdams during the spawning season, and dredge with appropriate silt curtains outside of the spawning periods, thereby protecting ecological receptors, achieving the most successful residual lead targets in the sediments, and saving a great deal of time and expense in the project.

Page 22
3.6 Federal Wetlands Delineation
And Drawing Set Dwg.. #11 and #12
Exide notes the need for state and federal wetlands delineation by survey and map, but does not depict on drawings 11 and 12 the soil flag numbers, the soil types, or identify any municipal IWWC watercourses. Exide omits the Federal Wetland Delineation Transect for Area I, and Drawing #11 also apparently omits soil delineations along the southeast section of the I-95 shoreline for Area I. Exide should explain/clarify/complete the missing information. (This discussion continues on Page 73-74)

Page 22
3.7 Natural Diversity Database (NDDB) Research
As noted above, the relict populations of river herring are stressed in Mill River as well as in the ocean, and Exide's proposed SedRAP of April 2012 should be revised to reflect the on-going review of the 2011 NOAA evaluation of river herring (alewife and bluebacked herring) for consideration under the Endangered Species Act.

Page 25+
4.0 Human Health and Ecological Risk Assessment and Appendix II, Exponent Sediment Toxicity Study
Exide describes the human and ecological receptors that are affected in the project area and the derivation of the target residual sediment lead concentrations that are protective of those receptors on a chronic basis. Exide goes on to note (page 28, 4.4.2 Short Term/Long Term Impact) that "A proactive sediment remediation alternative (e.g., dredging) is expected to increase short-term risk factors due to physical disturbance of organisms and

potential sediment resuspension thus possibly increasing (in the short term) bioavailability to river flora and fauna." Exide does not indicate how the increased bioavailability of potentially acutely toxic materials is to be controlled in its remediation activities, or how it supports or negates Exide's intentions to allow resuspended sediment to be discharged from its dredge cells and affect spawning fish and shellfish species. This increased short-term risk of bioavailability to ecological receptors, such as spawning fish and shellfish, motivated Exide to conduct its remediation technology search and to propose to the CTDEEP in 2010 that it be allowed to conduct its remediation activities in the Mill River during spawning periods if it could demonstrate protection of protected spawning species. Unfortunately, Exide does not include any information on the short-term risk that it acknowledges, no information on what receptors may be affected, such as shellfish larvae, or when, where, or for how long; no data on the contaminants and concentrations that may be associated with the dredge slurry, or with the resuspended sediment in the water column silt plume or the unconsolidated semi-liquid mud wave migrating near the bottom; no information on the volumes of resuspended sediment involved or potentially discharging from an active dredge cell; no information for any modified elutriate test or bioassay to determine acute toxicity of the resuspended sediment against the spawning species and life forms that Exide proposes to protect so that it may justify in-water remediation activities during their spawning periods. Exide should provide this information before receiving approval of its proposed SedRAP, or restrict its in-water remediation activities to non-spawning seasons.

Page 27
4.4.1 Socio-Economic Issues
Exide notes that its consultant, Exponent, Inc., expects recovery of the remediated benthic community within one to three years, but Exide has not provided any quantitative data on the pre-dredge, i.e., existing, flora and fauna found in the remediation project area in terms of information that can be used following remediation for an objective assessment of its progress in restoring the plant and animal communities in species and numbers to pre-disturbance or Reference Site conditions. Exide, and Exponent, are silent on the environmental impacts of the post-dredging homogenized and leveled river substrates with all dredge-fouling submerged structural elements removed, with new, deeper or enlarged anaerobic sumps or holes excavated in the bottom of the river.

Exide does not describe how or for what time period it will monitor the post-dredging remediation river to ensure its restoration and the eventual removal of the blueclaw crab health advisory and use restrictions for the river.

Page 29+
Remediation Methodology; Figure 6 Remedial Options; Figure 7 Dredging Options
Exide states that "The ultimate over-arching goal is to select the solution, which maximizes the overall benefit to the environment." Exide summarizes five remedial options: Taking No Further Action; Monitored Natural Recovery; Capping-In-Place; Excavation In-The-Dry (Cofferdams) with off-site disposal; and Dredging with off-site disposal; noting associated risks, the advantages and disadvantages, time and relative costs. Exide compares six different dredging methods settling on Hydraulic Cutterhead Dredging as the method of choice for remediation of the lead-contaminated sediments. This one-size-fits-all approach is not conducive to an effective or efficient remediation project. Exide needs to fit the method to the site conditions where there are five different Areas, I-V, with different conditions of topography and bathymetry, contamination, hazardous waste materials, total and TCLP exceedances, vegetation, substrate depths, submerged debris, property ownerships, all of which require adaptive management and flexibility in remediation methods in order to achieve success in the project.

Page 32
5.5.1.1 Hydraulic Cutterhead Dredge

Exide acknowledges the need to control the generation of contaminated resuspended sediment as it is far more difficult and costly to chase, recover, and treat it after its dispersion. Exide notes the ability to minimize resuspended sediment through adjustments to cutterhead speeds, pumping rates, and the use of floating silt screens (suspended off the bottom allowing mud waves to by-pass the curtain perimeter). Although Exide recounts how its in-situ contaminated sediment poses a threat to ecological receptors due to its chronic toxicity and must be removed down to established residual sediment-lead targets, Exide does not explain "why" it is necessary to control its resuspended sediments during the removal process. Exide provides no description of its resuspended sediment with respect to its physical and chemical properties and characteristics or its contaminants, bioavailability or degree of toxicity to protected spawning species in the river. Exide provides no lab or field test information as to the volumes of resuspended sediment that it will generate, how this material may travel through the water column or along the bottom, or what distances it may travel up-stream or down- depending on river and tidal water current conditions. Exide should provide an evaluation of its resuspended sediment with respect to its contaminants and biotoxicity to protected spawning species' life forms with the variables noted above, and describe how it proposes to mitigate any adverse effects consistent with the performance standards noted below.

Exide's SedRAP project is not yet defined with respect to the performance standards within which it must operate. At this time, Exide expresses no knowledge of the volume of resuspended sediment that may be discharged from a dredge cell, or of the degree of contamination of its resuspended dredge sediments, or of their bioavailability or potential acute toxicity to eco-receptors, no idea of how the physical, chemical or biotoxic properties of the resuspended sediment silt plume and mud wave will affect non-target organisms, or be relevant to the optical monitoring instruments proposed to be deployed in a mixing-zone from 100 to 200 feet downstream of the dredge cell in order to signal potential failure of mitigation measures designed to protect non-target conditions in the open river.

Performance standards should include:

1. No discharge of potentially harmful materials outside the perimeter of the dredge cell if these materials could harm the life forms or spawning behavior of the fish and shellfish species intended to be protected during their spawning seasons. Consider the interior of the remediation cell (whether defined by dredge silt curtain or cofferdam) as the mixing zone and the cell perimeter as a point source discharge for these resuspended industrial wastes. If this performance standard cannot be achieved and demonstrated, then Exide should not conduct in-water remediation activities during protective spawning periods.
2. Inventory, if removed, and restore all naturally-occurring materials, such as submerged stones, boulders, submerged logs and other woody debris, to their source locations.
3. Replace all sediment volumes dredged from the river with suitable clean material to restore the pre-disturbance bottom profile and physical habitat conditions.
4. Restore with suitable clean materials, all sediment removed during the creation or enlargement of deep holes and anaerobic sumps.
5. Monitor recovery of post-disturbance flora and fauna and actively restore the site if natural recovery does not approximate pre-disturbance or Reference Site conditions after three years following disturbance.
6. Provide an independent post-disturbance mitigation proposal to accommodate activities and structures needed to achieve river restoration and its flora and fauna if Exide's SedRAP program does not do so.

Page 35,
5.5.3 Summary Comparison of Hydraulic and Mechanical Dredging.

Cites Hayes and Wu (2001) [no list of references cited in the report] finding of a percent solids loss as low as 0.013% with hydraulic dredging – the lowest value. What is the range of values and the average value for hydraulic cutterhead dredging?

Page 36,
5.6 Excavation (in-the-dry) Exide notes the use of cofferdams and their water-tight enclosures with dewatering to expose the bottom sediments presenting the advantage over the alternative of dredging of being able to view the bottom and thereby result in lower residual lead contamination.

Comment: In addition to being able to view the bottom materials and chase lead exceedances in-the-dry to be certain of compliance with residual lead targets, Exide's other advantages include being able to remediate the river sediments during the protected spawning periods without adverse effects from discharges of resuspended sediments to protected species and life forms and thereby effecting a significant savings in time and expense; the ability to remove the most highly-contaminated sediments and hazardous waste conditions in the areas having the highest risk associated with human and ecological receptors without mobilizing these materials in the water column to contaminate non-target areas; the ability to remove all debris and trash that would otherwise foul a dredge with consequent downtime and resuspended sediment; the ability to back-fill all excavated pits and holes in the bottom and avoid or minimize anaerobic sumps; the ability to restore the bottom material and profile with suitable clean material to match the contaminated sediment removed from the cell; the ability to restore all natural submerged bottom materials and structures (boulders, stones, woody debris) to their original condition and locations for restored habitat; avoidance of secondary contamination of uncontaminated and non-target areas and disturbance and loss of valuable vegetation, habitat, time and money that would otherwise be required if dredging were involved.

Exide's list of disadvantages include:

1. Inconvenient access in the residential areas of some of the river remediation sites;
   Comment: This cautionary note applies to Areas III, IV and V , but Areas I and II are substantially industrial in land use, located between I-95 and the railroad with the State of Connecticut as the apparent major property owner with access to the river; and between the railroad and the Post Road where Tidemill and Exide own the river bottom property with Exide's riverbank access from its factory site. These are the most contaminated Areas with hazardous wastes and with the greatest risk to human and ecological receptors and are the ideal candidates for consideration of remediation within cofferdams.

2. Uncertain bottom conditions to support cofferdam structures;
   Comment: Cofferdams may take many forms – such as Exide's sheet piling that requires sufficient depth penetration in the substrate to resist water pressure. Sheet piling cofferdams may also need supplementary support-piling in some bottom types; and cofferdams may also take the form of earthen berms, sand-filled Geotubes, Porta-Dams, or other designs, depending on the project site conditions. Exide is uncertain of site conditions because it has not yet investigated the river bottom remediation Areas in terms of their ability to support the use of cofferdams. Exide should investigate these bottom conditions and determine their ability to support various cofferdam designs as a viable alternative remediation method.

3. Disturbance to river sediments from driving and removing sheet piling;
   Driving and removing sheet piling may disturb river sediments, but typically to a lesser degree than the sediment disturbance associated with hydraulic dredging; and any cofferdam's sediment disturbance may be mitigated with a suitable temporary silt curtain until the cell wall is intact or subsequently

removed. If the in-water construction of the cofferdam wall is completed before the dates of the protected spawning seasons, then the enclosed contaminated sediments in the cell may be excavated during the spawning seasons.

4. Localized diversion of river flow around the cofferdams with possible scour and redistribution of potentially-contaminated sediments.
   Comment: This concern bears further investigation to determine if Exide's assumption holds in specific areas (see Drawing #8).
   I. Exide's Area I lead-contaminated sediments are primarily located in the quiescent area to the west of the main channel which focuses water currents flowing from the I-95 culverts into the railroad bridge thereby providing an apparent opportunity to isolate the most highly contaminated sediments within a cofferdam cell without significantly affecting scour of other sediments.
   II. Exide's Area II lead-contaminated sediments are primarily located in the mill pond area located to the easterly side of the relatively uncontaminated channel on the west side of the river which flows directly from the railroad bridge to the Post Road bridge. This configuration appears to allow the construction of a cofferdam wall on the easterly side of the channel between the Post Road and the railroad without significant scour or disturbance to potentially contaminated sediments.

Page 38
6.0 Sediment Processing Options

Page 45
7.0 Material Handling and Disposal
Page 49
7.5 De-Watering Wastewater Handling, Treatment & discharge
Exide notes that its dredge pipe slurry water must be treated and discharged back to the river because its volume will exceed the capacity of the town sanitary sewer system. This discharge of treated dredge slurry waste water into the Mill River constitutes an industrial waste treatment point-source and will require an NPDES permit application under the Clean Water Act.

It appears that the proposed hydraulic cutterhead dredge cell (where typically reduced contaminated sediments will be mechanically agitated and diluted with water of different acidity, dissolved oxygen, etc.) will also be a point source of potential industrial waste discharges in the form of contaminated resuspended sediment from the dredge, contained within the mixing zone of the dredge cell, and, if it escapes, will be subsequently discharged from the dredge cell into the receiving waters of Mill River where it may contaminate non-target areas and, through potentially toxic effects on protected species and their life forms, significantly impact these ecological receptors. In light of the experience in Exide's 1983 remediation effort of the mill pond with its discharge of resuspended sediment out of the dredge cell (see photos), Exide should investigate all aspects of its dredged resuspended sediment with respect to the nature and extent of its constituents, its contamination, any acute biotoxicity, its volume, its characteristics in the mixing zone of the dredge cell, its forms and modes of transport, and the distances it may travel to impact downstream receptors.

Page 50
8.0 Controls
8.1 Fugitive Sediment Mitigation
Exide notes that the redistribution of some sediment is unavoidable during the implementation of any dredging project, and asserts that the mitigation objectives are to localize sediment redistribution as much as possible through the use of best management practices, engineered controls and monitoring of turbidity.

Exide does not indicate the nature of its resuspended sediment nor does it identify its degree of contamination; potential bioavailability, any acute toxicity, or what risk it might pose to ecological receptors and therefore Exide cannot defend its proposal to conduct in-water dredging activities during protective spawning seasons. Exide's proposed silt plume monitoring program and procedures using optical instruments and visual observations have not been connected in any way to the physical, chemical, or biological properties of the resuspended sediments in order to be able to determine if the proposed mitigation and monitoring systems, distances, depths, or any other variable or sampling results are protective of the environment and ecological receptors.

8.1.2 Turbidity Mitigation

Exide's consultant, CCA, recommends that the successful bid contractor use the American Boom & Barrier Corporation's Model PC-2 silt curtain as it performed satisfactorily with the tidal currents in the Thames River. Exide states that the silt curtain will not come in contact with the river bottom (it proposes to deploy the silt curtain six inches off the bottom). Exide does not indicate the nature of the project at the reference site (for navigation or remediation?) or how it deployed the curtain with respect to the bottom, or what performance standards were evaluated with respect to satisfactory performance of the silt curtain in terms of mitigating the discharge of resuspended sediment from the dredge cell, e.g., what was the configuration of the silt curtain; what was the physical nature and volume of the dredged sediment, the contaminated status of the resuspended sediments, what volume or percentage of the total was discharged from the dredge cell as resuspended sediment? These concerns are important to the applicability of the silt curtain product to the Exide remediation site in light of the release of contaminated resuspended sediments in the 1983 mill pond hydraulic cutterhead dredge remediation project where the additional dredge volume, 283 cu. yds., removed from the cell represented 6.9% of the design volume and did not include the suspended sediment in the plume and mud wave that discharged from the cell silt curtain.

In Drawings #13 and #14, Potential Dredge Cell Layout, Exide depicts 16 potential silt curtain layouts in the four remediation Areas, I, II, III, and V, that, while their final layout will be decided by the successful bid contractor, will have an effect on spawning species, especially river herring on their spawning runs. These silt curtain configurations must encroach on the width of the river to some extent and they will reduce the apparent control points along the river and at the tidal dam and bridge locations to approximately one-third to one half of the original width of the openings. With Exide's consultant, CCA, only recommending the use of the PC-2 silt curtain suspended one-half foot off the bottom and the bid contractor who may decide on a different silt curtain and a greater distance off the bottom, we may expect that there will be significant adverse effects on the river herring spawning run for several reasons:

1. The Mill River blueback and alewife river herring on their spawning runs represent relict populations of species whose spawning habitat has been truncated by upstream dams and whose numbers have diminished in their range, due to dams, poor water quality, overharvest, etc., to such an extent that NOAA found them worthy of evaluation under the Endangered Species Act.
2. The Tidemill Dam represents a significant physical barrier to the fish such that they can only swim over the spillway at the highest high tides and must scoot or may not get over at all on normal and neap tides unless there is sufficient outflow of the river; and while waiting for the tide to rise they are diminished in numbers by every finned, furred, and feathered predator waiting for them along the artificial obstructions of dams and silt curtains in their passage.
3. The cross-sections of the river channel and bridge openings are not uniform and the silt curtain layouts may not physically allow sufficient area or depth for the fish to pass by the silt curtain structures and bottlenecks without adverse effects.

4. If the 1983 Exide mill pond lead-contaminated sediment remediation experience with its cutterhead hydraulic dredge serves as an example, then we may expect that the spawning herring will encounter silt plumes and mud waves of contaminated resuspended sediment being discharged from the active dredge cells into the water column of the bottlenecks – both during the dredge operation as well as during the dredge down-time and overnight – as the river, tidal, and upland runoff water and currents redistribute the lead-contaminated resuspended sediments.

To mitigate these impacts:

1. Exide should not conduct any in-water remediation activities that generate resuspended sediments discharging outside of the dredge cell within any protective fish or shellfish spawning season.
2. Exide should define the geometry and substrate conditions of the minimum cross-section of river channel required to pass spawning herring without any adverse effects on their behavior and meet that configuration as a performance standard for all remediation efforts and activities.
3. Instead of suspended off-bottom silt curtains, Exide should use the "engineered" silt curtain designs, e.g., Gunderboom, that its representatives researched and described during the November 10, 2010 CTDEEP meeting in which Exide requested an exemption from dredging prohibitions during protective spawning seasons if it could demonstrate no adverse impacts on the protected species.

Page 52
In describing its deployment of silt curtains and the need to protect them during storm events, Exide states that its silt curtains will be retracted, pulled up from the water column and secured to the float line, in advance of storm events. Such action to remove the protective silt curtain from an active dredge cell and allow storm-driven river or tidal currents to flush the disturbed sediment materials out of the cell will facilitate the mobilization of contaminated resuspended sediment throughout non-target areas and protected spawning species. Exide should provide revised plans that will mitigate these adverse effects.

From its 1983 experience with the cutterhead hydraulic dredge working within the dredge cell defined by the Post Road and railroad embankments and a floating silt curtain along the westerly side of the mill pond, Exide may expect to find during its SedRAP implementation that the dredge-disturbed resuspended sediments will create contaminated silt plumes and mud waves of unconsolidated semi-liquid flocculants and fine-grained organic matter and sediment that will recontaminate areas that have been successfully remediated and contaminate initially clean areas having no exceedances – both within the active dredge cell and outside of the active dredge cell.

Exide's Drawing #13 and #14 depict three project categories of river bottom within the five remediation Areas I – V, the shaded gray areas of lead-contaminated sediment exceedances comprise 37% of the total area within all silt curtains located above the Tidemill Dam (in areas I, II, III, and V); the clear unshaded areas within these silt curtains amount to 55% of the total; the areas labeled "No Dredging Required" amount to 8%. If Exide's 1983 hydraulic cutterhead dredging experience is used, and it is the only test or trial noted by Exide and described in the SedRAP, Exide may expect that 37% of the river bottom will drive secondary remediation efforts over the remaining 63% of the total area with commensurate commitment of time and expense. The necessary redredging of 283 CY after the targeted 4,100 CY had been remediated in 1983, suggests that there may be a 6.9% resuspended sediment variable as an overdredge requirement that is not accounted for in Exide's proposed remediation – recovery projections; which would be even greater if it included the unknown volumes of silt plumes and mud waves discharged from the silt curtain. This behooves Exide to design its dredge cells as small as needed to remediate the target areas, and construct the dredge perimeter wall as tightly as possible, e.g., with cofferdams whenever feasible.

Page 52
8.2 Turbidity Monitoring
Exide proposes to deploy sensors to monitor the optical properties of resuspended sediment in the water column "to ensure that any resuspended sediment is kept to a minimum and limited to the area immediately adjacent to the dredge intake and, in particular, does not migrate outside of the turbidity curtain constructed around the remediation area being dredged.", but Exide does not propose to meet this performance standard nor does it explain why it is desirable to minimize resuspended sediment, or if the monitored visual and optical cues will be adequate to protect ecological receptors.

If this were a conventional navigation project involving maintenance dredging of "clean" sediments, its primary concern would be to minimize resuspended sediment that could stress spawning species in many ways such as by physically interfering with or altering their behavior, or by silt-smothering of adult and juvenile life forms of shellfish, etc. With contaminated materials, in addition to their physical properties, resuspended sediments present a completely different and more complex condition whose potential impacts have far more significance to non-target and protected species (and their life forms and life stages found during the protected spawning seasons) in the affected area. Exide has not yet described its dredge slurry or the resuspended sediment plume or mud waves and their "action levels" in terms of their constituents and potential contaminants; it provides no information on potential contaminant bioavailability or acute toxicity to protected spawning species; it offers no information as to how it will translate the physical, chemical, and potentially biotoxic properties of the resuspended sediment to the optical properties it proposes to measure in the water column in order to protect non-target areas and animals.

Page 53
8.2.1 Equipment
Exide proposes that a wireless local area network be used to relay optical monitoring instrument signals (nephelometric turbidity units or NTUs) to representatives of the remediation contractor and Exide's representative, CCA and to their cell phones whenever an exceedance is detected whereupon remediation operations will be immediately halted. To enhance public understanding and provide for public education and information, Exide should provide a public website for registering such monitoring exceedances and a forum for comment and explanation of its activities and progress in achieving remediation of the river sediments.

Page 53
8.2.2 Monitoring Locations
Exide proposes to locate its monitoring instruments approximately 100 and 200 feet from the outside of the turbidity curtain without knowing if the 100 – 200 foot intervening discharge mixing zone is adequate to protect non-target areas and species from the adverse properties of the resuspended sediment. Exide should define the mixing zone to be within its dredge cell perimeter, and the "action level" to be any discharge of resuspended sediment from its remediation cell.

Page 54
8.2.2 Monitoring Locations
Exide proposes to use a mid-depth monitoring location for its NTU measurements, and in deep water (greater than ten feet) allow the Engineer to use its observations to decide if two depth measurements are warranted – at one-third and at two-thirds of the depth at such location. These depth locations are not unreasonable, but should be supplemented with a third sample array by depths and locations at every active dredge cell so that Exide will monitor the resuspended sediments being discharged from the silt curtain – especially those associated with any silt curtain suspended off-bottom.

Page 54
8.2.4 Parameters
Exide proposes to use action levels based on background turbidity levels without knowing the relationship between these levels and the degree of threat posed by the proposed 5 NTUs of contaminated resuspended sediment above background level (between 0 – 20 NTUs) and a 35% increase over background levels above 20 NTUs. Exide should define the properties of the resuspended sediments, their potential adverse effects on protected spawning species, and how these properties relate to the optical and visual properties that Exide proposes to use in determining action levels.

Page 55
Figure 10, Turbidity Monitoring Station Placement
Exide proposes to use in-river turbidity monitoring stations above and below the active dredge cell to determine the net difference for its action-levels when monitoring upstream background or ambient levels of turbidity, but Exide does not acknowledge the potentially significant probability of "upward creep" of the background NTU readings due to river- and tide-mobilized resuspended sediment travelling up- and down-stream outside the dredge cell to artificially bias the readings of background sediment and thereby artificially increase the acceptable levels of resuspended sediment before action-levels are noted. Exide should reexamine its proposal to eliminate this potential bias in its monitoring program.

Page 56
8.2.5 Action Levels, Record Keeping & Reporting
If its NTU action levels are exceeded, Exide proposes to use a time-driven sequence of inquiries, inspections and samples to seek to determine the possible cause of such exceedances thereby rendering uncertain its section 8.2.2 Monitoring Locations (page 54 statement that dredging operations will halt if one of two readings exceeds a turbidity limit. Exide's proposed sequence no longer includes a directive to cease dredging activities as it did in Exide's first edition of the SedRAP of October 2011 (page 55 "Dredging operations will be halted if the background turbidity value is significantly exceeded…."). Exide should reinstate its directive to halt dredging operations if exceedances are encountered. Exide should define objective parameters of what constitutes "significance" for evaluating any exceedances of action levels.

Page 8.3 Confirmation Sampling of River Sediments
Exide proposes post-dredging residual lead-sediment confirmation samples from the remediation areas according to a predetermined grid pattern and collected from the top six inches of dredged river bottom and references shaded areas in attached drawings for further detail.

Exide should state specifically which set of shaded drawings it is referring to, e.g., 5 & 6; 7, 8 & 9; or 13 & 14.

Exide should expand its sampling program to capture the potential layer of contaminated and unconsolidated semi-liquid flocculated materials of resuspended sediments in the interface between the water and the bottom substrate of dredged and undredged sediments within the dredge cell as well as those nearby bottom areas outside of the active dredge cell.

Exide should expand its sampling program to include all created or enlarged bottom sumps or holes due to dredging where potentially contaminated fine-grained material will tend to collect.

Exide should expand its sampling program to monitor SedRAP remediation parameters in comparison with implementation results, in terms of residual sediment depths achieved; volumes of sediment disturbed, and removed; mass balance of contaminants; residual lead concentrations achieved.

Exide should expand its sampling program to include RCRA metals, especially chromium, and fecal coliform bacteria as these constituents may also be found in close association with the lead-contaminated sediments; all three constituents are causes of the impaired waters of the Mill River and Southport Harbor; and may significantly affect the success of the remediation effort.

Chromium is of importance in order to know if this pollutant has been mobilized during lead remediation activities; if the removal of lead-sediment deposits has exposed residual chromium sediment exceedances that were known, but not exposed, earlier; or if lead remediation activities have resulted in contaminating new areas with chromium where there was no chromium detected in pre-dredging sampling efforts. In such cases, the questions arise as to who "owns" such contaminated material and who is accountable for its remediation?

The highly organic sediments and shallows of the remediation Areas (I -- V) in Mill River are potential sources not only of heavy metals, but also of fecal coliform bacteria received from animals, failing septic systems, and other non-point source pollutants in the watershed. The shellfish water quality in Southport Harbor is determined by such bacteria as is the success of Fairfield's commercial and recreational shellfishing activities depending on relay access to these waters. Exide's dredging activities may mobilize such concentrations of heavy metals and bacteria that shellfish water quality may be compromised and the shellfishing waters closed during Exide's in-water remediation activities. Exide should provide data and information on the potential bacterial contamination of shellfish waters and describe its proposed mitigation to counteract such impacts.

Exide should post its post-dredging remediation residual lead-sediment results to its public I & E website for each remediation Area (I-V) as it progresses through the project.

Page 64
9.0 Concurrent Out-of-River Remediation
Exide limits this discussion to the remediation of the upland riverbank area along the easterly side of the mill pond adjacent to the factory property.

Exide should add a new section to include Concurrent In-River Remediation for the restoration of the structural elements of submerged habitat (natural debris such as stones and boulders, sunken logs and woody debris) restored to their locations as mapped during Exide's remediation activities in Areas I-V, as well as replacing clean sediment material where Exide excavates the bottom of the river.

Page 72
10.0 Post-Remediation Monitoring
10.1 Sediment
Exide proposes a single post-project study area-wide sampling effort to confirm the effectiveness of the remediation project using the top six inches of substrate on a pre-established grid system.
As noted in the earlier discussion of Chapter 8 for the "real time" confirmation sampling of the river bottom before relocating the dredge and silt curtain, Exide should expand its sampling to include the potential layer of contaminated and unconsolidated semi-liquid flocculated materials of resuspended sediments in the interface between the water and the bottom substrate of dredged and undredged sediment areas, as well as all sumps and holes in the bottom of the river; for RCRA metals, especially chromium.

Exide's monitoring proposal appears to be limited to the one-time post-remediation mapping effort for residual lead. Exide needs to revise its proposed SedRAP to include a new section 10.2 Long-Term Environmental Conditions and Ecological Receptors.

Exide should expand its long-term annual monitoring program with an objective sampling program to quantify flora and fauna in the river until such time as these disturbed riverine communities approximate the pre-disturbance baseline condition or that of the Reference Site locations.

Exide should expand its annual monitoring program of blue-clawed crabs to determine when the associated health advisory for lead may be safely removed.

Exide should expand its long-term monitoring program to include the sumps and holes that it created or expanded and refilled with clean material until they approximate adjacent non-sump areas for plant and animal species.

Page 73
11.0 Project Permitting and Figure 13 (page 74)
Exide acknowledges the need for state and federal permits some of which have already been approved. In its first edition of the SedRap of October 2011 page 71, Exide noted that site conditions may require that Exide revise or modify its existing IWWC permit or apply for a new IWWC permit. In this April 2012 draft, Project Permitting and Exide's Figure 13 Permitting Summary, Exide does not acknowledge any municipal regulations with which it must comply, although it notes that it is relying on the assistance of soil scientists and local permitting experts to evaluate the applicability of any town regulations.

Response:
In a project such as this proposed Exide SedRAP where the company will be conducting activities in the river, where limited tidal action exists placing it under state and federal jurisdiction, and on and above the riverbank in soils and watercourses where federal and municipal IWWC jurisdiction may exist, the only entity in Connecticut that may determine an inland wetland regulated area through its interpretation of relevant information and definitions is the municipal inland wetland agency, i.e., the Fairfield Conservation Commission; which agency also uniquely determines what activities may be considered regulated activities in the context of the IWWC regulations.

When an activity is first proposed in Fairfield, the IW Agency initially relies on its official 100-foot scale IWWC Regulated Areas Maps to acknowledge regulated areas which consist of wetland soils, watercourses, and setbacks or upland review areas, often supplementing that mapped information with site inspections and the potential applicant's and IW Agency's soil scientists' delineations of the area in question. In areas influenced by tidal action the state has regulatory jurisdiction within which municipal regulation is excluded, and any municipal IWWC regulated areas will be determined to exist above the state's jurisdiction line which was previously defined as the elevation of property located one foot above local extreme high water, but is now defined by the Connecticut statutes to be a State Jurisdiction Line which has been recently established by the CTDEEP in each municipality along the Connecticut coast. Exide has not yet depicted the State Jurisdiction Line on any of its drawings, but it will need to do so on all maps so that the IW Agency may determine where its lower IWWC boundary may exist.

On its maps, Exide has apparently not yet depicted all wetland soil areas of the remediation project, nor identified the soil types that it has depicted, nor depicted the soil flagging by their unique numbers typically associated with a soil mapping effort. The Fairfield official IWWC maps depict wetland soils, watercourses and 144-foot setback upland review areas in and around the remediation project and neither set of maps, Exide's or the town's, depict the State Jurisdiction Line.

By essentially leaving the remediation project details up to the successful bidding contractors, Exide has not proposed any specific actions, structures, or locations to enable anyone to determine that a regulated activity is proposed in a regulated area and so may require an IWWC permit application. In light of these facts, Exide should provide the following to the IW Agency:

Provide preliminary IWWC compliance topographic maps/plans depicting all standard contours within the project area; depict the Connecticut State Jurisdiction Line (SJL); depict the regulated areas as indicated on the official IWWC maps of the Town of Fairfield; provide a composite map of Exide's soil map, and the surveyed numbered soil flags between the SJL and the 144-ft. buffer upland review area boundary as placed by a soil scientist retained by the IW Agency [the Agency to be reimbursed at Exide's expense]; depict the watercourses that exist within the 144-ft. buffer upland review area; depict all contractors' temporary and permanent activities and structures in their intended locations that Exide proposes to implement in this remediation project; depict any 10-ft. setback around all such activities and structures as required in the regulations of the Office of Long Island Sound Programs [CTDEEP General Permit for Coastal Remedial Activities Required By Order Sec. 3.(b)(2)(F). After reviewing these data and the site, the IW agency may then make a determination as to whether there are any inland wetland regulated activities in regulated areas and the need for any final plans and property owners' consent.

Page 76
Figure 14 Revised Implementation Timeline
Exide's timeline specifies remediation of river sediments in a generally downstream direction, Areas I, II, III, IV, and then upstream to Area V. Remediation activities in rivers typically proceed downstream in order to capture contaminants that may have been mobilized during the project. Exide should explain its objectives in the reversed sequence for Area V and describe its intentions with respect to capturing potential contaminated resuspended sediments downstream of Area V.

Although not addressed in its SedRAP, in its regulatory permit applications Exide proposes a nearly thirty percent increase in sediment volume to be dredged from the Mill River. Exide should explain its reasoning and sample data behind this significant increase in volume, and indicate its anticipated over-dredge volumes, and the resuspended sediment volumes discharged from the dredge cells.

Exide should revise this SedRAP to reflect the new thirty percent increase in sediment volume and the consequent significant changes to its remediation areas such as, depths, access points, silt curtain layouts, schedules, multi-year timelines, sediment treatment programs, base-line surveys of flora and fauna if new remediation areas are affected, replacement volumes of clean fill material for increased depths, and related project activities.

APPENDICES

Appendix I
Executive Summary of the Sediment Sample Collection and QAPP Report, June 2009

Appendix II
The Exponent, Inc. "Sediment Toxicity Study: Mill River, Fairfield, Connecticut", June 2009
While the chronic toxicity issues were addressed in the study report, there is no discussion concerning potential contamination of the dredge slurry or resuspended sediment in the mud wave and silt plume and related bioavailability or acute toxicity of these materials to protected spawning species and their related life forms

during the remediation project. Exide should provide this information for all remediation Areas and protected species.

Appendix III
Request for Natural Diversity Data Base (NDDB) State Listed Species Review in which Exide describes its proposed dredge project of ± 27,600 cu. yds.
Exide provides a copy of the CTDEEP August 18, 2011 response letter for a finding of no impact which was included in its October 2011 edition of the SedRAP. Exide should update the NDDB review and reflect the fact of NOAA's review of the river herring species for potential inclusion under the Endangered Species Act.

Appendix IV
CCA, Inc. Health and Safety Plan
Exide proposes to use organic cationic coagulants (Solve 416) and anionic flocculants (Solve 9330) that may be harmful to aquatic organisms in the concentrations proposed for treatment of the dredge slurry. Exide should provide information on these constituents in the sediment treatment process and document their neutralization prior to discharge.

Appendix V
Federal Wetlands Delineation Report by Environmental Planning Services March 2009
Exide conducted federal wetland delineation transects for remediation Areas II, III, IV, and V, but did not do so for Area I; nor did it complete the soils mapping and delineation for Area I. Exide should explain this omission or revisit the site and provide these data for an accurate and complete delineation.

Appendix VI
Dewatering Trial Performance December 2009
Exide provides useful information on its dewatering treatment alternatives and their total suspended solids and residual filtrate lead concentrations for all chemical conditioners in the sample trials. Exide does not indicate if its consultants conducted any analyses of the raw (untreated) sample sediment as a composite of sample containers after homogenizing/blending to approximate dredging resuspension of sediment and what that resuspended solid material contained in terms of lead concentrations. If such data are available to Exide, the data should be included in the SedRAP.

Drawing Set
(N.B. All drawings should be revised as needed to reflect the thirty percent increase in sediment volumes to be removed in the remediation project.)

Dwg. #1 & 2: Inventory of Physical Features
The Figure 2 color aerial photograph, Mill River Sediment Study Area (11 X 17), depicts two more pipe outfalls than are indicated on Dwg. # 2 in the area northwest of I-95 north of the siphon sewer and south of Outfall #26. Exide should explain this discrepancy as it may be relevant to its remediation activities.

Dwg. #3 & 4: Mill River Water Column Thickness
Depicts the depth of the river in the remediation Areas

Dwg. #5& 6: Final Intended Dredging Depths (in feet below river bottom) based on the clean-up criteria of 220 and 400 mg/kg of residual lead in sediment.

Exide depicts the areas where new anaerobic sumps or holes in the river bottom will be created or enlarged by the remediation activities. Exide should provide related drawings depicting the restoration of the river bottom profile wherever it is altered by the remediation activities.

Dwg. #7, 8 &9: Dredge Prisms illustrating lead concentration at depth.

. #8 – Explain why there are no dredge prisms and no pre- or post-dredging sampling data for the large bottom area (approx. 80' X 150') in the I-95-culvert river crossing. Exide should provide pre-disturbance sampling data for this area as well as include it in its post-dredging confirmation sampling activities.

#9 – Exide should explain why Area V sample location F-17 with a third level lead concentration of 440 mg/kg (in excess of the target of 400) has no dredge prism associated with it.

Dwg. #10: Dredging Depth Cross Sections

In addition to the representative sample locations depicting existing and proposed grades with material to be removed, Exide should provide revised drawings depicting the bottom profile and X-section views of all created or enlarged anaerobic sumps or holes in the river bottom as well as the suitable clean material required to restore the river bottom to predisturbance conditions wherever altered by Exide.

Dwg. #11 & 12: Edge of Mill River Survey Showing Federal Wetlands

Exide should revisit Area I and provide the missing transect and soils data for the Area. Exide should revise the drawings for local, state and federal regulatory agencies and depict the topographic contours for the project area and uplands at a uniform contour interval and in their entirety within the project areas; the State Jurisdiction Line; the IWWC regulated areas as depicted on the official IWWC maps of Fairfield; the IWWC soils as mapped by Exide's and the Wetland Agency's soil scientists; the CTDEEP GP Required by Order Section 3(b)(2)(F) 10-ft. setbacks; upland property lines and in-water property lines where located above the head-of-navigation; and all regulated activities within any regulated area.

Dwg. #13 & 14: Potential Dredge Cell Layout Non-Restrictive of Anadromous Fish Runs

As a performance standard to be applied to the in-water activities and structures of this remediation project, Exide should consult with anadromous fisheries experts and define the parameters, such as width and depth, as needed to satisfactorily allow spawning fish passage through artificial structures (silt curtains, bridges, etc.) without adversely affecting their behavior and ensure that it is provided. With respect to the Tidemill Dam and its spillways being available for fish migration during the remediation project and deployment of obstructing silt curtains, it should be noted that the river herring congregate and pass the dam from the easterly spillway far more frequently than from the westerly spillway.

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tjs

cc: K. Money, J. Fallon, Esq. Exide; C. Fusaro, T. Selmeski, CTDEEP; M. Tetreau, First Selectman; D. DA-BA; Marine Fisheries; COE; TU

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