



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION I

J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203-2211

July 31, 1995

Mr. Dennis aRusso  
Rhode Island Solid Waste Management Corporation  
Central Landfill  
65 Shun Pike  
Johnston, RI 02919

RE: EPA and RIDEM Review of the Draft Work Plan For Baseline Risk Assessments Of Operable Unit 2, Central Landfill, Johnston, Rhode Island, June 1995.

Dear Mr. aRusso:

EPA and RIDEM comments to the subject work plan are attached. EPA's review of the Ecological Risk Assessment section (Section 3.00) of the work plan is complete. EPA's review of the Public Health Risk Assessment section (Section 2.00) of the work plan has not been finalized. I will be sending you additional comments on Section 2.00 in the near future. The nature of our comments to Section 2.00 will not impact the SAP currently being finalized by GZA GeoEnvironmental Inc. EPA's comments are provided as Attachment 1.

The RIDEM's review is complete. Their comments are provided as Attachment 2.

If you have any questions, please call me at (617) 573-5779.

Sincerely,

James M. Brown, P.E., REM  
Remedial Project Manager

cc: Dick Boynton, EPA  
Al, Klinger, EPA  
Margaret McDonough, EPA  
Tim Prior, USFW  
Greg Fine, RIDEM  
Becky, Cleaver, HNUS  
Ed Summerly, GZA GeoEnvironmental Inc.



## Attachment 1

### REVIEW OF THE DRAFT WORK PLAN FOR BASELINE RISK ASSESSMENT PREPARED BY GZA GEOENVIRONMENTAL, INC., JUNE 1995 CENTRAL LANDFILL, OPERABLE UNIT 2, JOHNSTON, RHODE ISLAND

Review comments for the ecological risk assessment portions of the referenced document are presented below:

- 1) **General Comment:** Throughout Section 3.00 of the Work Plan (pages 24 through 35), and Section 4.00, paragraph 2, page 35 - The two stages identified in the Work Plan as Stage I and Stage II should be *integrated* into one single Ecological Risk Assessment, which shall constitute a single deliverable document. In this assessment, concentrations of contaminants of concern in the different media should first be *screened* against appropriate benchmarks available in the literature (Stage I); sediment and soil contaminants identified as potentially posing risk to ecological receptors should then be further assessed employing *food web modelling* (Stage II).

The Work Plan should be revised to be compatible with the preparation of a single "integrated" ecological risk assessment, and to indicate that a phased approach to the preparation of the Ecological Risk Assessment report will be utilized via the *submittal of interim deliverables* representing individual sections of the report, or other components of the assessment (e.g., analytical data) as requested by the U.S. EPA. Please make *all* the necessary revisions to address this comment.

- 2) **General Comment:** In several sections within the Draft Work Plan, the text refers to various documents or responses to comments as being prepared concurrently to the work plan. The final version of the work plan should reflect the status of such documents at the time of its preparation, and should also reflect all pertinent agreements from the meeting of July 12, 1995.
- 3) Figures 1 and 2: Based on agreements reached during recent meetings between EPA, RIDEM, U.S. Fish and Wildlife, RISWMC, GZA and HNUS, the boundary of the OU2 study area depicted in all Figures should be expanded to include the area of the Lower Simmons Reservoir which is to be sampled. In addition, the text in Section 1.00 (paragraph 2, page 1) and Section 1.11 (paragraph 2, page 2) should also be revised to reflect the expansion of the study area (See page 5, first paragraph).

- 4) Figure 2: The Quarry Stream, Swimming Hole and Sedimentation Ponds should be identified in the figure.
- 5) Page 1, Section 1.00, paragraph 2: The text indicates that Figure 1 shows the location of the CLF, however the referenced figure fails to identify the CLF proper and instead presents the boundary of the study area for OU2. Please rectify.
- 6) Page 5, Section 1.21: The text does not include pesticides as contaminants that may have migrated from the site. Please clarify/revise.
- 7) Page 5, Section 1.22, paragraph 2, lines 4 and 5: The text should be revised to read as follows: "... as dissolved or particulate-bound **contaminants (not metals)** in surface water; ..."
- 8) Page 7, Section 1.22.1.1, paragraph 1: A reference(s) should be provided to support the statements in this paragraph, particularly those referring to the volumes of groundwater discharging to the Upper Simmons Reservoir.
- 9) Page 7, Section 1.22.1.1, paragraph 2: Revise the text referring to additional sediment sampling at the Upper Simmons Reservoir to reflect the agreements reached during the meeting of July 12, 1995.
- 10) Page 8, Section 1.22.1.2: The text should be revised to indicate that sufficient surface water and sediment sampling of the Swimming Hole and the wetlands to its west *will* be performed to properly confirm that landfill-related contaminants have not migrated to these areas. Also, the potential consideration of these areas as *background* sampling locations if the absence of landfill-related contaminants is confirmed, should be discussed.
- 11) Page 8, Section 1.22.1.3, paragraph 1: The text referring to the volume of groundwater flow towards the Almy Reservoir should be supported with an appropriate reference(s).
- 12) Page 8, Section 1.22.1.3, paragraph 3: The sampling and analysis of surface water and sediment from the Almy Reservoir and associated wetlands will not only serve to identify contaminants that may have migrated from the landfill via surface water, but can also identify contaminants potentially migrating with groundwater. The text at the end of the paragraph should be revised to clarify the latter scenario as part of the goal of the sampling and analysis activities.
- 13) Page 17, Section 2.42.1, paragraph 1: The OU1 RI conclusions regarding steady state are not as conclusive as the statement in this paragraph,

especially for SVOCs. Review the conclusions in Section 10.3o of the OUI RI Report.

- 14) Page 24, Section 3.00, paragraph 1: The overall objective for the Ecological Risk Assessment should be stated in this section. Also, please rectify the typographical error (the year on the reference identified as "Supplemental Risk Assessment Guidance for the Superfund Program (EPA, 1998)").
- 15) **General Comment:** In bullet 4 of Section 3.10 (page 25), the text refers to "estimated daily doses". Estimated daily doses are usually the result of complex modelling which would be beyond the scope of the Stage I **screening** assessment as described in Sections 3.00 (page 24) and 3.14 (page 32). This comment also applies to Section 3.12 (paragraph 2, page 26), and to Table 2 (see last issue on comment for Table 2).

In the Stage I assessment, contaminant concentrations in soil should be directly compared to appropriate conservative concentration guidelines for soil found in the literature, and in the Stage II assessment food chain/web modelling should be used to further assess the risk posed by those soil contaminants identified in the Stage I assessment as posing a potential risk to ecological receptors (NOTE: Food web modelling would be preferred over food chain modelling - See General Comment for Section 3.13.3/Evaluation of Food Chain Effects). The following are two useful references for an initial screening of contaminant concentrations in soil: *Beyer, W.N., 1990 (July), Evaluating Soil Contamination, U.S. Fish and Wildlife Service, Biological Report 90(2)*, and *Ministère de L'Environnement, 1988, Contaminated Sites Rehabilitation Policy, Direction des Substances Dangereuses, Gouvernement du Québec, Canada*; however, additional references exist.

Contaminants determined to pose a potential risk during the *Stage I* screening assessment should be evaluated in the *Stage II* assessment. In general, during the *Stage I* assessment, contaminants known to undergo bioaccumulation and biomagnification should *not* be eliminated from future evaluation in the *Stage II* assessment.

These comments equally apply to the use of food chain/web modelling for *sediment-bound* contaminants.

Please make all necessary revisions to address this comment (also, please see the General Comment on the integration of the Stage I and Stage II assessments into a single Ecological Risk Assessment).

- 16) Table 2: In the box "Aquatic Organisms" under the column entitled "Receptor", include in parenthesis the main representative examples of this

group of receptors; in the box "Higher Trophic Level Organisms", revise the text in parenthesis to read "(vertebrate predators: fish, amphibians, reptiles, birds, and mammals)". In the "Exposure Point" boxes for *benthic* and *aquatic* organisms, please revise the text to clarify the scenario of "wetland soils" as exposure points since there is an apparent conflict among the type of receptors (*i.e.*, aquatic) and the type of habitat normally associated with soil as the environmental medium (*i.e.*, terrestrial); it is suggested that the text be revised to read: "..., Almy Reservoir, Intermittent Stream Channels, **and temporarily and permanently flooded wetlands.**" In the box "Chronic Toxicity" as the assessment endpoint for "Higher Trophic Level Organisms", the derivation of *food chain model* benchmarks is beyond the scope of the Stage I *screening* assessment as described on page 24; please revise the text as necessary (please refer to the previous general comments regarding the use of food chain/web modelling in the Stage I *screening* assessment).

- 17) Section 3.12 (paragraph 2, page 26), Section 3.12.2 (paragraph 2, page 27), and Section 3.13 (paragraph 1, page 27): Please refer to previous comments regarding the use of food chain/web modelling in the Stage I *screening* assessment. Such comments equally apply to the use of food chain/web modelling for *sediment-bound* and *soil-bound* contaminants as discussed in Sections 3.12 and 3.12.2. Revise the text as necessary.
- 18) Page 26, Section 3.12.1: Given the importance of the process of selection of contaminants of concern in the risk assessment, please expand the text to restate and clearly explain in Section 3.12.1, in a manner *specific* to the *ecological* risk assessment, the "statistical evaluation" currently referred to in the text as being described in Section 2.20 of the human health risk assessment. In addition, the selection of contaminants of concern, indicator species, and ecological endpoints should be presented as part of Problem Formulation, prior to the Exposure Assessment (Section 3.12) and Ecological Effects Assessment (Section 3.13).
- 19) Page 27, Section 3.12.2, paragraph 1: Please revise the text to clarify the scenario of "wetland soils" as exposure points since there is an apparent conflict among the type of receptors (*i.e.*, aquatic and benthic organisms) and the type of habitat normally associated with soil as the environmental medium (*i.e.*, terrestrial); it is suggested to revise the text to read: "..., Almy Reservoir, **intermittent stream channels, and temporarily and permanently flooded wetlands** between Central Landfill and the Almy Reservoir."
- 20) **General Comment** - Page 27, Section 3.12.3: For a screening level assessment, calculation of the 95 percent upper confidence limit on the

arithmetic average is not required, and the maximum detected concentration should be used (U.S. EPA. 1989. RAGS, Vol.I, Human Health Evaluation Manual (Part A), Interim Final, EPA/540-1-89/002). In addition, in the case of ecological risk assessments, it is particularly useful to determine *both* the maximum *and* mean (arithmetic average) concentrations for use as exposure point concentrations.

*Maximum* and *mean* risk estimates can be generated with the quotient method for each medium-specific contaminant of concern (COC) by using the maximum and the mean exposure concentrations, respectively. If the maximum risk estimate for a specific COC is greater than one, but the mean risk estimate is below one, adverse effects due to that contaminant may be less likely to occur than if *both* the mean and the maximum risk estimates for a given COC are greater than one. In addition, a maximum risk estimate greater than one along with a mean risk estimate below one, may indicate that potential adverse effects due to the COC may be of a somewhat localized nature, whereas values greater than one for both the maximum and the mean risk estimates may indicate that the potential adverse effects are more widespread.

When the arithmetic mean for a contaminant is calculated by considering positive detections in combination with half the Sample Quantitation Limit (SQL) for non-detections, then the resulting mean value *may* occasionally be greater than the maximum detected value. In such cases, the mean for the specific contaminant should be calculated based only on positive detections.

In the cases where individual data points are evaluated as separate exposure point concentrations, an overall mean value should still be calculated and evaluated for each contaminant. In the case of contaminants detected in the sediments of the Upper Simmons Reservoir, in addition to risk estimates for the individual data points, risk estimates should also be prepared for the *overall* mean value for each sediment COC, as well as for the *individual* mean concentrations for the *original bottom* sediments and for the *landfill-derived* sediments.

Please make all necessary revisions to address the issues presented in this comment.

- 21) Page 29, first item in first and second bullets: Given the presence of only freshwater within the study area associated with the site, please clarify what is meant by "... for a **marine** or freshwater organism, whichever is appropriate for the site." Data for freshwater organisms should be

preferentially used. If NOELs and/or LOELs for marine organisms will be used as surrogate values, please explain the rationale and circumstances for such approach, and acknowledge the associated uncertainty.

- 22) Page 30, Section 3.13.2.1, paragraph 2: The text indicates that "Persaud *et al.* [1992] note that a number of the **LELs exceed typical pre-industrial concentrations** in Great Lakes sediment". This text appears to be misquoted, as it is opposite in meaning to the following statement from Persaud *et al.* (1993, *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario*, Ontario Ministry of Environment and Energy, page 22): "..., natural sediment levels can vary considerably from one region of the province to another as a result of differences in local geology. Therefore, the Ministry realizes that certain sites will **naturally exceed the Lowest Effect Level**. In such cases, the local background levels, based on the pre-colonial sediment horizon, will form the practical lower limit for management decisions ...". In addition, the text as currently written in the Work Plan, does not support the rationale presented in the text that follows at the end of paragraph 2 of Section 3.13.2.1: "This suggests that these metals may occur naturally at concentrations that can cause adverse effects to sensitive organisms." Please rectify.
- 23) Page 30, Section 3.13.2.1, paragraphs 3 and 4: The determinations made by Ankley *et al.* (1993) were for **copper** only, not for several cations as stated in the text. Therefore, results from the work by Ankley and collaborators should be correctly quoted, and the rationale stated at the end of paragraph 3 should be properly qualified. In addition, the approach expressed in paragraph 4 regarding the significance of SEM/AVS ratios greater than 1 for metals in freshwater sediments, should be revised and/or properly supported with additional references.
- 24) Page 31, Section 3.13.2.2, paragraph 1: Revise the text to read "... in pore water (*i.e.*, water held in the pore spaces between **sediment or soil** grains), ...".
- 25) Page 31, Section 3.13.2.2, paragraph 2: EPA has derived Sediment Quality Criteria (SQC) for **five** organic compounds: acenaphthene, fluoranthene, **phenanthrene**, dieldrin, and endrin. The final SQC documents for each of these compounds were published in September **1993** (Document numbers EPA-822-R-93-012 through -016). Please revise the text as necessary, and include the latest SQC references.
- 26) Page 31, Section 3.13.3, paragraph 1: The word "constituents" is not an appropriate substitute for the word "contaminants", and should be avoided

in such context. Please revise the text at the end of the paragraph and elsewhere in the report, as necessary.

- 27) **General Comment** - Pages 31 and 32, Section 3.13.3: In general, this section should be revised to further clarify concepts, as well as assumptions and their rationales, and should include appropriate supporting references. Also, as per previous comments, this section should be transferred and integrated into the Stage II assessment; food chain/web modelling should be the *central component* of the Stage II assessment.

In addition, the following specific issues regarding the food chain/web model should be addressed:

- a) It is doubtful that contaminant exposure via water ingestion would necessarily be "minimal" in comparison to intake of contaminants via *incidental* ingestion of soil or sediment as stated in the text of paragraph 3 and, therefore, such assumption for the food chain/web model appears to be incorrect. Please revise the text (and the food chain/web model) as necessary, and provide supporting references for the proposed food chain/web model.
- b) Bioaccumulation Factors (BAFs) should be used instead of Bioconcentration Factors (BCFs), since BAFs account for the presence of contamination in organisms as a result of uptake from *all* routes of exposure, including trophic *and* nontrophic, while BCFs only consider nontrophic routes of exposure (See, for example, Maughan, 1993, *Ecological Assessment of Hazardous Waste Sites*, Van Nostrand Reinhold; and Suter, 1993, *Ecological Risk Assessment*, Lewis Publishers). In addition, the text in paragraph 3 states "The exposure model estimates dietary concentrations for indicator species using exposure point concentrations for each medium and published BCFs for **earthworms**." The use of BCFs for earthworms does not appear to be a valid approach for assessing aquatic routes of exposure and modelling aquatic food chains/webs; please revise or clearly explain and properly support in the text the rationale for such approach.
- c) The text in paragraph 3 indicates: "The exposure model for the heron and the shrew will predict doses of constituents based on the consumption of aquatic and soil invertebrates and incidental ingestion of soil and sediment." The text should be revised to clearly establish the correct relationship between each indicator species and the appropriate prey species and environmental medium of concern. In

addition, the great blue heron has diversified food habits in which fish are the preferred prey, but may also consume other vertebrate organisms as well as invertebrates (U.S. EPA, 1993, *Wildlife Exposure Factors Handbook*). Thus, the text in the Work Plan, as well as the food chain/web model itself, should be revised to properly take into consideration the food habits of the heron.

- d) Food **web** modelling, as opposed to food **chain** modelling, would be more appropriate. Additional indicator species should be considered in the proposed modelling. The selection of indicator species should consider the following criteria: the species should have been observed or should be potentially present in the study area; the feeding habits of the species should be representative of other species within the food chain/web; the habitats and feeding habits of the species should be associated with different routes of exposure within the food chain/web; information on toxicological and ecological effects should be available on the contaminants of concern in relation to the selected species or appropriate surrogate species; and the species should represent food chain/web links towards top-level predators, which may be exposed to potentially toxic concentrations of certain COCs due to bioaccumulation and biomagnification through the food chain/web.
- 28) Page 32, Section 3.14, paragraph 1: Expand the following text to read as follows: "TQs greater than 1 indicate that the benchmark has been exceeded **and therefore a risk of potential adverse effects exists.**"
  - 29) Page 32, Section 3.14, paragraph 2: The Stage I *screening* assessment should be able to identify those contaminants that are posing a potential ecological risk, so they can be further evaluated in the Stage II assessment. Consequently, the end result of the Stage I assessment as currently stated in the text would be deficient and should be revised.
  - 30) Page 33, Section 3.22: The criteria for selection of COCs based on the Stage I assessment results are somewhat vague and should be more clearly defined.
  - 31) Page 34, Section 3.25: The characterization of receptors (including the selection of indicator species) and the selection of ecological endpoints should be performed prior to the Ecological Effects Assessment (Section 3.23, page 33) and the Exposure Assessment (Section 3.24, page 34). As indicated in a previous comment, the selection of contaminants of concern, indicator species, and ecological endpoints should be presented as part of

Problem Formulation.

- 32) Sections 3.24 (page 34) and 3.26 (page 35): The Exposure Assessment and Risk Characterization sections for the Stage II assessment should be expanded to clearly identify the procedures to be followed, including the way in which the information derived from the Stage I assessment will be used. Also, as per previous comments, these sections should reflect the integration of food chain/web modelling removed from the Stage I assessment and transferred into the Stage II assessment.
- 33) Page 35, Section 3.26: The Risk Characterization of the Stage II assessment should be able to further define the potential risk posed by the contaminants selected during the Stage I assessment. The results of the Stage II assessment, in combination with those from the Stage I assessment, should be able to support conclusions regarding the overall magnitude of potential risk to ecological receptors, the main risk contributors and associated exposure scenarios, the main areas of concern, the ecological receptors subject to the greatest potential risk, and the major potential ecological adverse effects. Please revise the text as necessary.

- 34) Page 35, Section 3.30: Uncertainty Analysis should be performed as part of **each** of the following: Exposure Assessment, Ecological Effects Assessment, and Risk Characterization. Please revise the work plan as necessary.