Glynn Environmental Coalition
P. O. Box 2443
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November 15, 2013

Galo Jackson
Superfund Remedial Project Manager
U. S. EPA Region 4
61 Forsyth Street, SW
Atlanta, Georgia 30033

Re: Comments on the Draft Feasibility Study for the LCP Chemicals Superfund Site, Brunswick, Glynn County, Georgia, for the National Remedy Review Board.

Mr. Jackson,

Enclosed, please find the comments by the Glynn Environmental Coalition (GEC) and Dr. Peter deFur, the Technical Advisor for the LCP Chemicals Superfund Site (Site) through an EPA Technical Assistance Grant (TAG). There are some differences in the comments of the GEC and our Technical Advisor, Dr. Peter deFur, but the GEC does substantially agree with the comments of Dr. deFur. As the Technical Advisor of the Site, it is the responsibilities of Dr. deFur to provide his best analysis and professional opinion on the documents produced during the Superfund Process and provide this information in a manner suitable and understandable for the general public. Dr. deFur need not support or agree with the opinions or positions of the GEC. The GEC is advocating for natural recovery after excavation instead of back filling with a material potentially incompatible with the Bohicket Soil Series typical in coastal Georgia estuaries.

Thank you for the consideration of the GEC comments and those of Dr. deFur by the National Remedy Review Board.

Sincerely,

Daniel Parshley, Project Manager

Enclosures

Glynn Environmental Coalition

Re: Comments on the Draft Feasibility Study (FS) for the LCP Chemicals Superfund Site, Brunswick, Glynn County, Georgia, for the National Remedy Review Board. November 2013.

Comment 1. Mink are suggested as the species to use to extrapolate the effects of PCBs in other species such as Bottlenose Dolphin (*Tursiops truncatus*). Using mink could be problematic for several reasons.

- Using data from the Upper Hudson River, a freshwater environment, might not be transferable to an estuarine and salt water environment like the LCP Chemicals Superfund Site (Site).
- Even though mink are indigenous and wide-spread in coastal Georgia, mink are noticeably missing from the Site marsh. Furthermore, no mink analysis is presented in the Estuary Baseline Ecological Risk Assessment, Revision 4 (BERA). The reasonable assumption is the Chemicals of Concern (COCs) levels are sufficiently high around the Site to prevent reproductive viability in mink. **The range of mink should be established as a baseline before the Estuary Remedial Action (RA) is implemented.** The RA should sufficiently reduce COCs to allow, at a minimum, a viable reproducing mink population in the Site area.

Comment 2. In the Estuary BERA, Table 4-6b, the PCB levels in *Spartina alterniflora* (cordgrass) were reported for the leaves, which were harvested >100 cm above ground level. Notably missing are the PCB data for the roots, rhizomes, and stems. In the same estuary, Robert J. Reimold, Univerity of Georgia Marine Institute, found toxaphene in *Spartina* to be orders of magnitude higher in the rhizomes than the leaves. Like PCBs, toxaphene is a chlorinated ringed chemical. **The roots, rhizomes, and stems of *Spartina* in the Site area must be sampled for PCB levels to determine if a significant amount is present. Furthermore, if the *Spartina* is bioaccumulating PCBs, the thin capping will not work since the PCBs will continue to the surface and distributed in the *Spartina* detritus.**

Comment 3. The Bottlenose Dolphins (*Tursiops truncatus*) in the St. Simons Sound estuarine system have been extensively studied (Hart LB, 2012; Balmer BC, 2013; Schwacke LH, 2011; Pulster EL, 2005, Balmer BC, 2011 and others). The empirical evidence from the Site area should be considered whenever present rather than extrapolating from models or other species. Empirical scientific evidence always trumps models or extrapolated data and projections about how an ecosystem should behave.

Comment 4. The FS should propose a Remedial Action Plan sufficient in scope to foster recovery of the Bottlenose Dolphin population, which has been documented to be under stress and lower in number than other estuarine systems on the Georgia Coast.

Comment 5. Back filling excavated areas might cause more harm than good. The following should be taken into consideration before any back fill is placed into excavated areas.

- Sand or soil from barrow pits will likely be dissimilar to the existing Bohicket Soil Series in grain size, pH, organic matter, and other physical characteristics.
- Dredge Spoils will likely be from underlying strata removed during harbor channel maintenance activities. Bohicket Soil Series is described as the upper 65 inches, or less, of the *Spartina* salt marsh soils.
- Excavated areas or cut off rivers are accumulating sediment within the St. Simons Sound estuarine system. The majority of areas proposed for excavation at the Site are in the headwater of small tidal streams. Excavation will enhance slow water movement in the tidal stream headwaters allowing sediments to settle out.
- Materials already found in the marsh, like oyster shell, could be used to stabilize, increase sedimentation, and provide suitable strata for marine life. The Clam Creek area at Jekyll Island is a good example of placed oyster shell in a tidal creek and the sedimentation that can be expected.

Comment 6. Contaminated sediment and biota removal (excavation) should take priority over capping since future natural events can compromise the integrity of the cap. Excavation will remove contaminated and toxic materials from the marsh whereas capping has the potential to fail and re-contaminate biota. Furthermore, capping will raise the marsh elevation, which will increase the potential for Salt Pan formation or stunted *Spartina* growth. The areas around the numerous dredge spoil areas (marsh hammocks) in the St. Simons Sound estuarine system are good examples of the effects to expect from raising the level of the marsh surface by placement of capping material.

Comment 7. An armored cap might be appropriate for high velocity channel areas in deep water. The potential for the redistribution of contaminants will be high regardless of the technology used during a removal action in these high velocity/deep water areas.

Comment 8. The FS appears to rely heavily on monitoring and institutional controls. The lack of good baseline monitoring data should be a troubling indicator of the likelihood viable monitoring will take place in follow-up to the RA. Noticeably missing from the Site documents are baseline data on the benthic community (micro and macro), invertebrates, and biological diversity of the existing marsh. At a minimum, baseline monitoring stations with data from one meter square areas should be obtained. Empirical data about the depth of burrows in the marsh should be obtained instead of guessing the depth of bioturbation. The PRPs should demonstrate the ability to produce scientifically viable monitoring by developing the monitoring plan and implementing the plan now to obtain baseline data before the Remedial Action. Furthermore, an Estuary Monitoring Plan and obtaining baseline data can be done independently of the Remedial Design.

Comment 9. Dioxin and Furan data are noticeably missing from the estuary. Dioxin and furans are known byproducts of Chloro Alkali facilities, were found on the uplands, and can reasonably be expected in the estuary via the documented discharges. The structure of Dioxin and Furans are similar to PCBs and the toxicological effects can be synergistic.

The Site documents have been extremely myopic on the toxicological properties of Aroclor 1268 to the exclusion of COCs of similar structure and toxicology. While it is likely the PCB, Dioxin, and Furans are co-located, this can not be assumed. Sampling and analysis for Dioxin and Furan are needed, and the additive nature of the chemicals' toxicological properties analyzed for potential impacts to ecological and human health risks.

Comment 10. Remedy Cost – The LCP Chemicals Superfund Site was operated in a manner that was found to be illegal. Furthermore, maintenance was not performed, which resulted in an unfair economic advantage over market and business competitors. Undoubtedly, millions upon millions of dollars of profits were extracted from the facility as it was quite literally "run into the ground". The cost of a remedial action in the estuary will be high, but likely will not be as high as the profit extracted from the facility as a result of the manner of operation. The cost to the community through ecological damage and ongoing human health threats is high and will remain high until the Site is remediated. The remediation should not just reduce the ecological damage or reduce the probability of human health risks. The remedial action should be sufficient in scope to assure ongoing ecological damage and human health risks are highly unlikely.

Comment 11. Repeatedly, bioassays have found adverse lethal and sublethal effects to shrimp from the Site sediments. The Georgia coast is known for wild white shrimp, which is the key species harvested by the commercial shrimp industry. White shrimp use the estuary extensively during their life cycle. In addition, coastal Georgia has a commercial blue crab fishery based in the estuarine system. The sediment removal action should be sufficient to assure the Site is no longer a contributing risk factor to the viability of the coastal Georgia commercial seafood industry.

Comment 12. The Site remedial action should be sufficient in scope to produce a very high likelihood of the current seafood advisory being lifted within a few years after the conclusion of the remedial action. An ongoing health threat to the subsistence fisher population is unacceptable and institutional controls should not be relied upon for the protection of human health and the environment.

ESC Comments on:
Revised Draft Feasibility Study LCP Chemical Superfund Site Operable Unit 1 (Estuary) Brunswick, GA

Dolphins as the Apex Predator

Atlantic bottlenose dolphins are an apex predator in the US Southeastern coastal waters (Balmer et al. 2011), including the Turtle River estuary. Thus, the remedial plan for the LCP site must be fully protective of bottlenose dolphins. Dolphins are accumulating PCBs from the LCP site and the population is not recruiting (all summarized below).

Bottlenose dolphins should be included in the ecological risk assessment for the LCP Chemical Superfund site. They are a protected species under the Marine Mammal Protection Act of 1972, a depleted species in western North Atlantic coastal areas, and are currently experiencing unusual mortality attributed to infectious viral and bacterial agents. Recent studies show polychlorinated biphenyl (PCB) exposure increases vulnerability to infectious disease through reduction of immune-suppression systems and other general health factors (Schwacke et al. 2012, Hart et al. 2012). Georgia dolphin populations have a much lower neonatal survival rate compared to dolphins in the Charleston, SC population, also attributed to PCB exposure (Balmer et al. 2011). The population health of this marine mammal is threatened and is a better representative of the ecological risk associated with the aquatic environment than the aquatic exposure associated with mink and river otter. Within the confines of a risk analysis, the bottlenose dolphin is the more accurate aquatic apex species for which data exist.

Dolphins have shown long-term affinity and residence within specific estuaries and bays, as evident in the significantly higher PCB levels found in dolphins from the Turtle/Brunswick estuary area compared to those from other nearby Georgia locations (Balmer et al. 2011, Balmer et al. 2012, Pulster & Maruya 2008). Balmer et al. (2011) found PCB concentrations of 2,870 μg/g in male Brunswick dolphins, just 333 μg/g for Sapelo Island males, and 756 μg/g for males traveling between the two sites. Pulster & Maruya (2008) reported that dolphins sampled from the Turtle/Brunswick estuary had total average PCB concentrations 10-fold higher than those from the more northern Savannah area. These elevated PCB concentrations, are attributed to bioaccumulation from contaminated fish, demonstrated by Pulster et al. (2005) study of the prey fish preferred by Georgia and Florida coastal dolphins, noting significantly higher concentrations in Brunswick estuary fish over two other sites (42.0 ± 48.3, 1.59 ± 1.24, and 0.281 ± 0.075 μg/g lipid for Brunswick, GA; Jacksonville, FL; and Savannah, GA, respectively). Three studies (Balmer et al 2012, Pulster & Maruya 2008, and Pulster et al., 2005) noted the distinct highly chlorinated signature of Aroclor 1268 in the Brunswick estuary populations, indicating that exposure was predominantly from a single point source at the Brunswick site. Interestingly, "The maximum PCB concentration measured in a Brunswick male was over 1.5 times greater than the maximum PCB level measured in transient, male Pacific killer whales, which were previously reported to have the highest PCB levels of any cetacean" (Balmer et al 2011). Studies from the last 5 years provide sufficient data that show Atlantic Bottlenose dolphin, the apex predator of this ecosystem, is already being harmed across multiple generations (Balmer et al. 2011, Pulster and Maruya 2008) and should be a central consideration in the ecological risk assessment and remediation of the LCP site.

General Comments

The Draft Feasibility Study (FS) covered the remediation options for the estuary that comprises Operable Unit 1 (OU1) of the LCP Site. Several items still raise concern and warrant attention in the final FS and in the remediation work that follows.

Comment 1. Of particular concern are the multiple instances where relevant items have been removed or moved in the report rather than addressed. Removing previously noted data from this draft of the FS does not eliminate the existing concern, the necessity of more explanation, and/or the need for additional data collection. One example of this trend is the removal of any reference to the landfill found in the area "Domain 3". ESC, LLC agrees with the initial concern that this landfill needs to be sampled, especially where waste is still visible, and properly closed so as not to continue to be a source of contaminants and a long-term stressor to the Site. Further, the EPA comments requested a discussion of the potential for outside areas to be a continued source of contaminants, so it follows that the landfill is clearly a valid concern requiring a response, not omission.

Comment 2. The cleanup levels based on Surface-weighted average concentrations (SWACs) and Benthic Community Remedial Goal Options (RGOs) need to be chosen before the analysis of alternatives and remedial technologies. In reviewing this FS, we found the approach of differing cleanup options, total acreages, and cleanup levels to be an inappropriate analyses of the Site. The alternatives should not be a choice between acreage of cleanup, cleanup levels, and the appropriateness of the remedial technologies to achieve that cleanup. The cleanup levels need to be set first, and then the alternative remedies that meet the requirements presented and evaluated on the basis of the CERCLA criteria.

Comment 3. Sediment removal is identified as being implementable at the site, therefore, a greater focus on the permanence that sediment removal offers, compared to capping or thin-cover, should have greater emphasis in the alternatives. A thin-cover of six inches at the site will do little to keep contamination from becoming biologically available as clams and polychaete worms, common benthic invertebrates, can burrow to these depths and have been shown to re-suspend contaminants, making them biologically available to re-contaminate the Site and its wildlife (Sizmur 2013, Millward 2005). While the topic of bioturbation is now addressed in the FS, stating that most organisms won't burrow more than 4 inches (10 cm) (pg 53) and that bioturbation "beyond the cover depth does not diminish the effectiveness of the remedy (pg ES-10)", these statements ignore the nature of the persistent COCs onsite.

Comment 4. This salt marsh experiences high tidal ranges (10 feet or more), flooding, and the same type of dynamic physical change as other east coast salt marshes. These dynamic changes still do not seem to be considered in the FS, and are incorrectly dismissed as rare events (see Figure 1).

Comment 5. A re-planting program of *Spartina* post-remediation should be a first step in the monitoring efforts to speed up ecosystem recovery and attract other native plants and wildlife. The FS relied mainly on a study that indicated un-assisted marsh plant re-growth within two years. However, native plant re-growth should not be the only measure of marsh "health." Another indicator of marsh health and the ability to buffer against environmental stressors is the total organic content of the marsh sediment, which remains low in a region of a re-grown marsh area. A further indicator of marsh health is the diversity and abundance of the benthic community. Therefore, the presence of marsh grasses is not the only indicator for a healthy, functioning marsh ecosystem.

Comment 6. The FS and previous investigations do not provide any data on dioxins and furans, known contaminants from chlor-alkali plants and previously measured in the Turtle river estuary system.

Comment 7. Data are needed on PCB levels in *Spartina*, including rhizomes as well as stems. Previous investigations indicate that chlorinated organic chemicals can accumulate in rhizomes.

Comment 8. In a memo from 2005, the state of Georgia observed that monitoring results from sediment sampling in the 2003-05 era indicated increases in PCB levels, raising serious questions about sources and dynamics of the system.

Comment 9. Thin Layer Capping (TLC) is a technique which uses a thin layer of capping material, usually with a high sorption capacity, to reduce contaminant bioavailability (Naslund et al. 2012). Thin Layer Caps should not be confused with sediment caps, which are predominantly thick (50-100 cm) and more comprehensively studied and utilized at contaminated sites (Palermo et al. 1998). While the FS claims that TLC is a well studied technique, according to McDonough et al. (2006), fewer than ten thin layer caps or sorbent-amended caps had been placed at contaminated sites in the US. Many of the best examples of TLC are actually lakes or bays, some in northern climates and offer little insight into the conditions in Turtle River salt marshes. The 8 examples of estuarine, river, and tidal flats cited in FS Appendix I, (section 2) are all geologically stable environments, often with greater water depths and faster currents than those of a typical Southeastern coastal salt marsh. As it is stated in the Appendix I (section 6), OU1 is "most comparable to southeast riverine salt marshes", not lakes or bays, so these results may be inconclusive for a salt marsh environment.

Comment 10. Naslund et al. (2012) studied the effects of thin layer capping with many types of media on the benthic ecosystem and several laboratory studies have reported moderate negative effects on benthic organisms from thin-layer capping, including disrupted feeding behavior, reduced growth rate, and increased mortality on individual species (Millward et al. 2005, McLeod et al. 2008, Jonker et al. 2009, Paller & Knox 2010). It is important to note that the TLC remedy relies heavily on bioturbation to mix the clean cap material with underlying chemically impacted sediment and facilitate natural recovery (Merritt et al. 2009). “Natural recovery” for metals and PCBs means burial because these contaminant do not break down The FS indicates reliance on bioturbation to jump start natural recovery (Appendix I, section 2 and Appendix J), but then argues that it will occur only in the upper 15 cm of sediment, primarily only in the upper 3-10 cm (Appendix I, section 7). This change adds a layer of uncertainty to the effectiveness of bioturbation as a part of natural recovery. If bioturbation occurs at unexpected levels, whether it is too much or too little, it could negatively affect the remedy. As the LCP site has many persistent contaminants including PCBs and toxaphene, the long-term concerns of bioaccumulation and recontamination, regardless of the depths regularly accessed by organisms, could render any short term benefits immaterial for the long term health of the ecosystem.

Comment 11. While the studies cited in the FS Appendix I, sections 2 and 3, appear very positive, they focus on the short term regrowth of plants and marsh cover. While short term growth rates are one possible indicator of site recovery, it is important to look at the long term sustained growth. Case studies indicate a fertilizer effect is noticeable for approximately three years after placement of cover materials (King et al 1982). In the future, marsh dieback, noted as prevalent in portions of the estuary in the FS (p 98), may hinder the marsh vegetation recovery, and the fertilizer effect is not a long term guarantee for recovery.

Specific Comments

2.2.3 Estuary Hydrology

- “The marsh removal action included backfill to pre-excavation elevations and replanting, so hydrologic changes were temporary.”
    - The FS needs to present data to support this assertion.
- “These major alterations occurred more than 10 years ago, and the Site is currently assumed to be in a state of geomorphologic equilibrium.”
    - An equilibrium state is unlikely in just 10 years, and some data need to be provided to support this point.

2.2.4 Estuary Sediment Transport Processes

- This draft has removed a statement about Turtle River being the dominant source of suspended sediment, but ignores stormwater runoff from the site.
- “Deeper bed scour may occur in some localized areas of the creek channels during rare storms (e.g. hurricane storm surge).”
    - Unfortunately, hurricanes and large storm surges are not rare in the Brunswick region and will likely become more common as global warming brings about an increase in large storm events (Figure 1, USGS, 2012).

2.2.5 Site Uses

- “Recreational and navigational use of OU1 is infrequent due to the difficulty in navigation of small crafts; the effects of remedial actions on those types of uses do not need to be evaluated.”

    - The FS has added information on Purvis Creek residences with access on the north end of OU1; quantifiable data are still absent in support of the conclusion that recreational and navigational usage is infrequent.

2.3.1 OU1 and Wildlife

- References to "visual observations" and "functioning habitat" have been removed from the latest draft, but this rudimentary method of assessing a marsh is still the basis for evaluation. Elaboration is still needed, as a single observation in a January 2012 site visit (pg. 13) still does not provide much information and cannot address energy flux, species abundance and diversity, and the biological condition of the flora and fauna (disease, parasitic loads, growth rates, etc.), which are necessary data for assessing this marsh as a functional habitat. The documents also need to note the presence of manatee in the system, as these mammals are part of the wider system.
- The Horne et al. (1999) and Black and Veatch (2011) references to the low representation of amphipods in the total community at the site has been removed from this draft. However, this finding still remains a concern requiring further research as amphipods have a high sensitivity to environmental contaminants. Removing the statement does not remove the impact this finding has on assessing the health of the site.

2.3.3 Marsh Dieback

- Compared to the earlier draft, reference to the landfill found in Domain 3 has been removed from this section. Removing mention of this landfill does not eliminate its potential long-term impact on the site, especially when it has not been properly closed and it is uncertain or unknown what waste it contains.

2.3.4 1998-1999 Remediation, Restoration, and Recovery in Domain 1

- The comparison of ecosystem function at this site with similar marsh habitats was removed; however, "… *t*otal *o*rganic *c*arbon (TOC) is low (<2.5%) when compared to other areas of the marsh. The percent of fine materials in the sediment of the remediated area is also low relative to other areas of the marsh; percent fines influence the benthic community habitat."
    - Function of a marsh ecosystem includes the presence of a viable invertebrate community, which is still not properly referenced in this FS. As demonstrated in a previous benthic survey in 2000, no amphipods were found at the Site. This result indicates a lack of function in the marsh. "Facilitative interactions may occur among salt marsh fauna when *S. alterniflora* is present, in the form of a "habitat cascade" that increases invertebrate abundance and biodiversity in a positive feedback loop. For example, *S. alterniflora* facilitates the presence of mussels in New England salt marshes, which in turn facilitates the presence of other invertebrates (e.g. barnacles and amphipods) through increased attachment and crevice space. (McFarlin thesis)

2.4 Summary of Remedial Investigation Results

- As suggested by ESC, reference to the rate of cancer in the US has been removed because of its lack of relevance to site-related cancer risk, or an entire section on cumulative risk assessment could be added to the RI/FS. The following reference to the rate of cancer in the US was removed **within this section**: "When reviewing the results of any risk assessment it is important to recognize that the risk estimates are intended to facilitate those determinations, but are not necessarily predictive of adverse health effects for any person or ecological receptors. For example, given that the current rate of cancer in the US is between one-in-two and one-in-three, predictions of cancer risks associated with chemical exposures within the acceptable range of one-in-ten-thousand to one-in-one-million are not discernible from the background incidence of cancer." However, reference to the ACS 2011 statistic is mentioned in the section on Human Health Risk Assessment, but not accompanied by a discussion on cumulative risk assessment.

2.4.1 OU1 Delineation of Chemicals in Sediment and Surface Water

- Elevated mercury levels are found near the landfill. This area should still be investigated for depth and breadth of contamination. Depth profiling efforts up to 8 feet only occurred in Domain 1 in 1997, whereas the rest of the site has not had any testing greater than 1 foot in depth. These Domain 1 depths were also not analyzed for polycyclic aromatic hydrocarbons (PAHs). Further sampling still remains to be done here.
- *C*ontaminant *o*f *C*oncern (COC) concentrations in surface water: Table 2-3, Figure 2-18
    - This entire section would still benefit from more explanation and more explanation on the accompanying data presentations.
    - The section on COCs in surface water remains limited to two compounds or groups: Aroclor 1268, *P*oly*c*hlorinated *B*iphenyl (PCBs) and mercury, yet Table 2-4 indicates 10 chemicals or groups in sediments and/or fish tissues. The text needs to at least explain how many and which chemicals were on the list to be measured, but not found, or why the other chemicals were not measured.
- There are too many elements in Figure 2-18. The two graphs and the table should each have titles. The scale of the y-axis on each graph (as well as Figure 2-19) should be abbreviated to show the relevant data.
- Initial statistical analysis of the data in 2-18 indicates a significantly higher total of dissolved mercury in the study creeks compared with the reference creeks, which remains an important point not made in the text.
- The EPA NRWQC (*N*ational *R*ecommended *W*ater *Q*uality *C*riteria) is 37.6 times higher than the Georgia standard and the FS still does not note why there is such a large difference.
- The tabular data on Figures 2-18 needs more explanation on the figure so that the reader does not need to look elsewhere for explanation; the figures need to stand alone.

2.4.2 Human Health Risk Assessment

- "Sediment samples from Purvis Creek and the Turtle River were excluded as these areas remain inundated at low tide and afford no opportunity for human exposure."
    - Sediment contact may still take place among fishermen and waders at low tide; therefore, sediment samples should be taken and included in the final RI and FS.

- "The biological dataset used in the HHBRA (*H*uman *H*ealth *B*aseline *R*isk *A*ssessment) included samples of finfish and shellfish likely to be consumed (e.g. spot, striped mullet)."
  - The study should also indicate if these consumable fish were of legal catch size.
- "The biological dataset also included samples of breast tissue from clapper rail, a small game bird inhabiting coastal marshes, where were collected from the estuary adjacent to the Site in 1995 (i.e. prior to remediation of Domain 1)."
  - This species should be re-sampled for levels after Domain 1 remediation.
  - If clapper rail is not commonly consumed, as noted in the FS, why is it being considered?
- High quantity fish consumer (40 meals per year for 30 years for adults) is not that much more consumption than the Recreational fish consumer (26 meals per year for 30 years for adults).
  - The High quantity fish consumer number of meals should be increased based on detailed surveys of local fishermen at the Site. This number is based on a DHHS (*D*epartment of *H*ealth and *H*uman *S*ervices, 1999) survey based on mercury and not PCBs.
  - What is the number of meals for each child receptor?
- Shellfish consumer (19 meals per year for 30 years for adults) should also be broken down into Recreational and High quantity consumers.
  - What is the number of meals for each child receptor?

2.5.2 Migration Pathways

- "…sediment bed in the creeks is predominantly composed of clayey silts (i.e. cohesive sediment bed), minimal erosion expected to occur during typical tidal conditions within the creek channel. Bed scour may occur in some localized areas of the creek channels during rare storms (e.g. hurricane storm surge)."
  - Strong storms, and their storm surges, are no longer that rare due to climate change (refer to Figure 1, USGS, 2012).

3.2 RAOs (*R*emedial *A*ction *O*bjective)

- "RAO 1. Mitigate potential COC releases of contaminated in-stream sediment deposits and prevent such releases from entering Purvis Creek"
  - This text remains somewhat vague without a timeline: What are the evaluation endpoints to achieve this RAO? More specificity is needed to determine the achievement of this RAO. There is no "Evaluation of this RAO includes…"
- "RAO 2. Reduce exposure to piscivorous bird and mammal populations from ingestion of COCs in prey exposed to contaminated sediment in the estuary to acceptable levels considering spatial forage areas of the wildlife and movement of forage prey"
  - Monitoring to what end? More specificity required, such as that seen in RAO 5
- "RAO 4. Reduce ecological risks to benthic organisms exposed to contaminated sediment to levels that will result in self-sustaining benthic communities with diversity and structure comparable to that in appropriate reference areas"

    - This still requires more specificity than “Evaluation of this RAO involves monitoring biological communities following remedy implementation.” Monitor communities until what? The selection of reference areas becomes an issue, as often is the case.
- “RAO 6. Meet and sustain the applicable USEPA and State of Georgia Water Quality Standards for protection of aquatic life in the estuary”
    - The RAOs have not consistently met the PCB standards for either the USEPA NRWQC of the Georgia *W*ater *Q*uality *S*tandards (WQS), or the results have been unclear, primarily because laboratory detection limits routinely exceed the criterion.
    - What is the action to be taken to resolve this? It would seem that the samples need to be measured using another lab or better techniques, or with specifying lower detection limits (in the contract?).
    - The text does not include a discussion on how the dissolved phase mercury meet Georgia standards

3.3 Remedial Goal Options (RGOs)

- The FS text at this point still does not give any explanation why there is no SWAC RGO for lead or PAHs, please explain or insert.

4.0 Identification and Screening of Remedial Technologies

- “This FS assumes that the current fish advisories will be used in conjunction with other remedial actions at the site”
    - This FS then assumes that Institutional Controls for fish consumption will remain in effect in perpetuity and not on the temporary basis which CERCLA Guidance is often interpreted. If the agencies and *p*otentially *r*esponsible *p*arties (PRPs) are going to assume permanent fish consumption advisories, then additional community education and remediation, perhaps, needs to be considered.

4.2.3 Natural Recovery

- Applicability to site is low; deposition rates are low; only source of uncontaminated suspended sediment to the estuary is Turtle River; *M*onitored *N*atural *R*ecovery (MNR) has not adequately reduced surface sediment to achieve RAOs in those areas
    - So it would make sense that MNR should be dropped entirely from consideration and not used in combination with other remediation technologies.
- Evaluation against major screening criteria
    - Effectiveness….“If combined with other remedial technologies that are effective at reducing exposures to COCs, the effectiveness of MNR can be targeted for less-contaminated areas and can be demonstrated by long-term monitoring of sediment, chemical, geochemical and biological conditions”
        - This statement does not mesh well with previous section on lack of MNR effectiveness in a marsh setting, a point with which this review by ESC, LLC agrees entirely.
    - Implementability… “MNR is readily implementable for this site because upland contaminant sources have been controlled, and because it requires

no action beyond detailed site characterization, monitoring, and possible execution and maintenance of institutional or engineering controls."

            - Also, doesn't match with "Applicability to Site" info.

    - Cost… "MNR has a relatively low cost compared to other, more active remedial technologies. However, monitoring costs associated with MNR can be significant, particularly if monitoring is required over a large area and long duration. Even when considering monitoring and institutional control costs, costs for MNR are generally low compared to other sediment remedies."
        - Lower cost has not proven true at other sites, largely due to monitoring, sometimes in perpetuity, only low up-front costs

- MNR: not retained as sole remedy but may be evaluated as a component of other remedies, particularly for long-term management of areas with relatively low COC conc.
    - A caveat should also note that MNR does not work in a low deposition marsh!

4.2.4 Thin-cover placement

- "Bioturbation associated with these organisms is primarily confined to the upper 4 inches (10 cm) of sediment and thus does not contribute to substantial mixing of buried contaminated sediment with the clean cover material when the thin-layer cover is 6 inches (15 cm) thick (Appendix I). However, some mixing with underlying contaminants can occur—the intent of most thin-cover placement remedies is to create an acceptably clean sediment surface, not to create an impenetrable surface sediment barrier."
    - Persistent contaminants do not degrade naturally or at all, such as mercury and PCBs, and mercury, when stirred up, creates the chance for methylation by bacteria to make the mercury bioavailable again within the benthic environment, resulting in biomagnifications of methyl mercury up the food chain (Sizmur 2013 and Millward 2005).
- "Dredged sediment is likely to be better suited for marsh restoration than quarried sand. Dredged sediment is more likely to be organic-rich and will likely contain nutrients that support plant and wildlife growth; quarried sands tend to be virtually absent of natural organic matter."
    - Appropriate chemicals/contaminant testing of this location where the dredge material will be taken from needs to take place to ensure the use of clean sediment.
- "Monitoring program needed; includes bathymetric surveying and visual observation to evaluate thin cover integrity and the potential for displacement, shifting or erosion; biological monitoring may be conducted to evaluate biological recovery of the thin cover surface, and surface sediment sampling may be conducted to monitor surface sediment deposition and recontamination potential."
    - Time scales for thin-cover monitoring and biological monitoring should be decided and put in place previous to thin cover being used. As with statistics, the monitoring should be designed before the work is initiated.

4.2.5 Sediment Cap

- While the comment that "Capping is a relatively mature, proven technology" was removed, the concern of applicability when much of the application of capping has been in open waters, rather than in intertidal salt marshes, remains unaddressed.
- "For complex contaminants – reactive caps involving reagents (activated carbon, organo-clays, or other natural or synthetic sorbents) added to decrease contaminant flow through the cap, enhance certain physical or geochemical properties or otherwise treat target contaminants. For the purposes of this FS, geosynthetics and reactive cap materials are not considered necessary and thus are not included in the evaluation of sediment caps."
    - Activated carbon should still be considered, as this treatment seems to enhance cap effectiveness
- "A monitoring program is commonly required when a cap is used to remediate contaminated sediment sites"
    - Same comments here as for those listed above for thin cover
- "Sediment capping leaves contaminants in place and could result in potential restrictions on future use of the Site. Because sediment caps are thicker than thin covers, impacts to site hydrology and ecology (Footnote 6) can be more significant and can have a longer lasting impact than MNR or thin cover placement"
    - Footnote 6: "Sediment capping can impact the site hydrology and ecology if bed-elevations change (e.g. subtidal areas may be converted to intertidal areas and intertidal areas may be converted to upland areas). Initial impacts to marsh ecology would result from placement material, though the marsh could recover with time."
        - Source for this assertion? Over what time scale? Thick layer or conventional capping could also be used to create grass hummocks and provide additional habitat complexity, a point still not considered in the FS.
- "Sediment capping results in unavoidable disruption of the benthic environment; incorporating reagents add implementation challenges (e.g. placement of geosynthetics or reagents, blending of reagents with cap materials)"
    - There is no basis given for these "implementation challenges"- some reference is needed for this assertion. The text omits the context that any and all options for remediation, including no action will have an impact.

4.2.6 Sediment Removal and Disposal/Treatment

- The following statements within this section indicate more of a focus on a cost analysis (which has its own section) rather than a method analysis for this site's cleanup:
    - "Dewatering, treatment and disposal of dredged materials to process the sediment may be the rate-limiting step when planning the overall schedule"
    - "Dredged sediments dewater using passive or active methods"
    - "Additives may enhance dewaterability, but expensive"
    - "Ex situ sediment treatment technologies have limited proven reliability at full-scale and tend to be have very high costs"

- “However sediment removal typically relies on natural recovery processes or post-removal backfill to achieve long-term, site-specific RGOs… However, considering that natural deposition rates at OU1 are slow, the removal alternatives proposed for the Site do not rely on natural recovery. Instead backfilling is proposed to accelerate natural recovery and achieve RGOs”
    - As described in the text, this issue remains obscure.

5.0 Development of Remedial Alternatives

- The cleanup levels that would determine the areas of cleanup (the Sediment Management Areas in this report) should be determined BEFORE and screened AGAINST the alternatives, not used within the confines of the Remedial Alternatives.
- SMA-1 through SMA-3 were described in depth, but then Domain areas are referenced in this section instead. This is confusing to the reader and consistency should be maintained throughout.

5.1.1 SMA Identification Approach

- “Post remediation SWACs were estimated by replacing current surface sediment concentrations in areas targeted for remediation with values representing postremedy surface sediment conditions. For post-remedy surface sediment COC concentrations, regional background values were employed. The regional background value was based on data from the Blythe Island marsh located across the Turtle River. Regional background values were 0.3 mg/kg for mercury and 0.2 mg/kg for Aroclor 1268.”
    - These questions remain unaddressed: Is Blythe Island far enough away to be used as background? Affected by any other industry? The "regional background levels have not been adequately determined here.

5.2.2 Marsh Creeks and Ditches

- “Sediment removal is a viable technology for all creeks and ditches, and sediment capping is feasible for creeks and ditches provided that its implementation does not restrict water conveyance capacity; The results of the hydrologic model analysis indicate that cap armoring is generally needed in the creeks, rendering thin-covering placement ineffective for creeks and ditches”
    - If sediment removal is viable in the creeks, why make an argument for the cap armoring instead which is not as reliable or permanent a remedial solution.

5.3.6 Sediment Remedy alternative 6: Sediment Removal, Capping, and Thin-Cover Placement in SMA-3

- The analysis in Appendix G shows that a 6 inch base chemical isolation layer with up to 6 inches of coarse sand to gravel armoring adequately protects against chemical migration through the cap, as well as erosive forces under extreme storm events.
    - Has there been a biological impact assessment in terms of whether it is conducive to re-growth of plants and re-population by native organisms? It may withstand the flow/hydrologic issues, but has it been tested to indicate whether it will successfully become biologically active?
- Although caps are designed to withstand high-energy event flows, they may require repair or periodic replenishment if damaged by erosion or unexpected

environmental conditions (e.g. extreme storms), particularly if such events occur before marsh grasses are restored.

  - Re-planting should be put in place to accelerate this recovery process and ensure success of the caps. In addition, fewer caps with higher elevation, creating grassy upper intertidal habitat would address this issue in part.

5.3.7 Elements Common to All Remedial Alternatives

- "Institutional Controls, namely fish advisories already in place for Purvis Creek and the Turtle River system and an existing commercial fishing ban for Purvis Creek, will be maintained. With time, if and when fish chemical concentrations fall below the criteria to maintain the fish advisories and/or commercial fishing ban, the State of Georgia may elect to remove the advisories and/or commercial fishing ban."
  - Why is the fishability of this marsh still not a priority? Cleanup standards specifically based on reduction of fish concentrations, as done elsewhere, should be the goal here.
- "Where incorporated as part of a remedial alternative, sediment removal entails the excavation or dredging of 18 inches of sediment and backfilling with 12 inches of clean material."
  - Sediment removal should be based on "dredge till clean." There has been no discussion of this different approach.
  - There is no explanation why the original marsh grading is not restored.

5.4.1 Sediment Removal and Backfilling

- Why remove 18 inches of sediment and only put back 12 inches in backfill? To maintain appropriate hydrology of the marsh, original grading should be restored.

7.2.3 USEPA Risk Management Principles and Consistency with Site-Specific Risk Assessments

- "The SMA-1 alternatives (Alternatives 2 and 3) address larger areas and thus have the potential for greater risk reduction, but more substantially impact the existing vegetated marsh habitat than the SMA-2 alternatives (Alternatives 4 and 5) and the SMA 3 alternative (Alternative 6). Furthermore, whereas the dredging-only remedies (Alternatives 2 and 4) remove a larger mass of contaminants from the Site than the remedies that integrate dredging, capping, and thin-cover placement (Alternatives 3, 5, and 6), the dredge-only remedies also have a more destructive impact on the vegetated marsh habitat. In summary, habitat disturbance is proportional to the remedial footprint and is more substantial for removal and capping compared to thin-cover placement."
  - Faulty logic rephrased but still remains incomplete and inaccurate.

Appendix A

- "At five of the new well locations (DP-1, DP-2, DP-3, DP-5, DP-6), paired wells were completed, with one set at approximately 14 ft below ground surface (ft bgs), the "A" well, and one set at approximately 28 ft bgs, the "B" well.
  - The reason for these specified depths should still be discussed and what hydrogeologic layer they are sampling from, as well as the depths of the already in place monitoring wells.

FIGURES

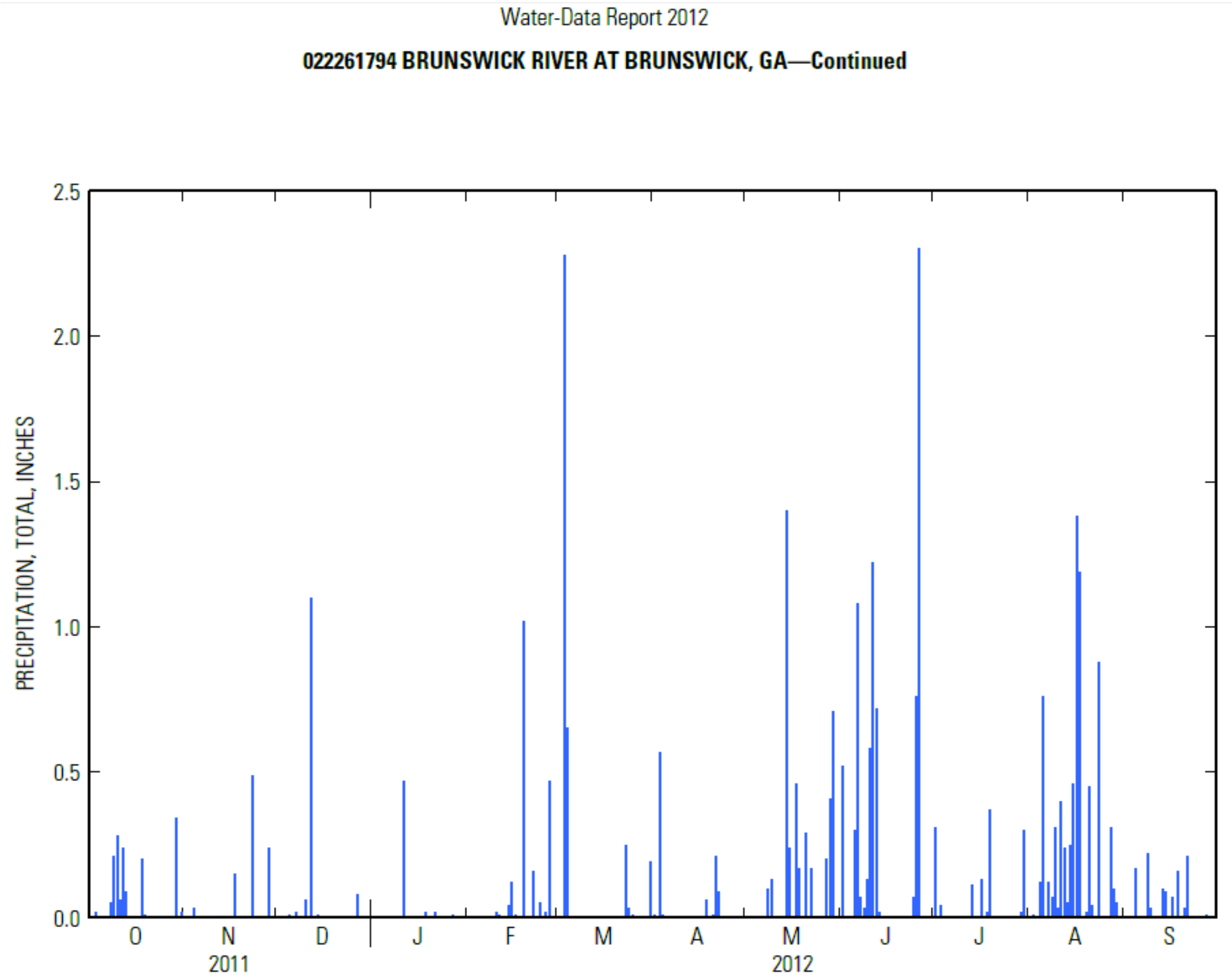

Figure 1: USGS Precipitation Graph (October 2011-September 2012 (USGS, 2012)

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These comments are being submitted to the EPA. A copy of these comments will be posted on the *G*lynn *E*nvironmental *C*oalition (GEC) website (http://www.glynnenvironmental.org/).

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