SUMMARY OF COMMENTS & RESPONSES
DRAFT ORGANIC WASTE COMPOSTING PROJECT PROTOCOL

20 sets of comments were received during the public comment period for the Climate Action Reserve (Reserve) Draft Organic Waste Composting Project Protocol. Staff from the Reserve summarize and provide responses to these comments below.

The comment letters can be viewed in their entirety on Reserve's website at http://www.climateactionreserve.org/how/protocols/in-progress/composting/

COMMENTS RECEIVED BY:

1. Association of Compost Producers (ACP)
2. California Compost Coalition (CCC)
3. California Organic Recycling Council (CORC)
4. CalRecovery, Inc. (CalRecovery)
5. Carbon Solutions Group, LLC (CSG)
6. Cedar Grove Composting (CGC)
7. City and County of San Francisco, Department of the Environment (SF Environment)
8. Department of Resources Recycling and Recovery (CalRecycle)
9. Environmental Credit Corp. (ECC)
10. Mundus Aer, LLC (Mundus Aer)
11. NatureWorks LLC (NatureWorks)
12. Ohio Environmental Protection Agency (OhioEPA)
13. Recology (Recology)
14. Recyclers Global Warming Council (RGWC) of the California Resource Recovery Association
15. Riverside County Waste Management Department (RCWMD)
16. Solid Waste Association of North America (SWANA)
17. South Coast Air Quality Management District (SCAQMD)
18. TerraPass (TerraPass)
19. US Composting Council (USCC)
20. Waste Management (WM)

General Comments:

1. We object to the use of the quotation from the Inventory of U.S. Greenhouse Gas Emissions and Sinks about landfills being the second biggest U.S. source of methane – without also framing it in terms of total GHG emissions. While landfills may be the 2nd largest source of anthropogenic methane, overall GHG emissions from landfills are less than two percent of total U.S. GHG emissions. **(WM)**

   RESPONSE: Noted. Language will be revised for clarity.

2. While landfill gas production has been systematically studied, composting emissions of GHG have not. Without a life-cycle analysis, the true GHG emission potential of aerobic composting systems is unknown, and therefore, the GHG emission reduction conclusion in favor of composting has no sound scientific basis. To allow generation of carbon offset credits by the composting industry on the basis of an unproven hypothesis is not fair to the landfill industry, not a good practice for policy development, nor will it do justice to the course of reversing climate change/global warming, which is a primary objective of the Protocol. **(RCWMD)**

   RESPONSE: Noted. While there is scientific uncertainty regarding aspects of the quantification of landfill gas emissions and emissions from composting operations, the protocol consistently errs on the conservative side of the uncertainty therefore ensuring that the reductions resulting from projects using the OWC protocol are real. The Reserve will continue to follow developments in scientific understanding of landfill emissions and composting emissions and will update the protocol as appropriate moving forward.

3. While the Protocol is intended to promote composting of organic waste for the presumed benefit of GHG emissions reduction, it could have the unintended negative effect of discouraging the emerging new technologies for handling organic waste that combine landfill and composting operations into one common setting for landfill has harvest as an alternative energy source. Examples of new technologies include bioreactor and landfill-based anaerobic digester/composting. CAR should not shy away from broadening the scope of the Protocol and considering the merits of these new integrated waste management technologies in generating their own CRTs. **(RCWMD)**

   RESPONSE: Noted. The OWC protocol is the third in the line of waste-sector GHG reduction project protocols developed by the Reserve (following the Organic Waste Digestion and the Landfill Protocol). The Reserve acknowledges that there are additional technologies available for managing organic waste materials, and will continue to explore other waste–sector GHG reduction project types for potential methodology development in the future. The Reserve does not believe that the OWC protocol will disincentivize or discourage the development of emerging technologies for waste management.

4. CAR has adopted a highly standardized system for quantifying and verifying projects that will be eligible for its protocols. While this allows project proponents to follow a clear, straight forward approach in determining GHG emissions avoided by project type, the strict parameters of project eligibility negatively incentivize project developers from utilizing technological innovations and advancements being made in overall composting efficiencies. An overly standardized, or inflexible, approach does little to progress the efforts of the composting industry

in general and to maximize the amount of organic material aerobically composted.

A flexible mechanism would allow project developers the ability to prove the accuracy and efficiency of their process, while also leading to technological innovations and streamlined applications and combinations of BMPs.

Quantifying and valuing carbon is a way of reducing GHGs via market mechanisms. As such, the market should determine if a new methodology is appropriate and participants should be able to submit methodologies for review to the Reserve board. Allowing the market to participate in methodology development process will increase technological innovation and the economic efficiency of proposed projects, as well as provide an ongoing, open, public forum for industry participants to ascertain and adopt BMPs.

The Reserve would benefit greatly from a market participation approach as it would increase dialogue between CAR and potential project developers, while at the same time reduce the likelihood of project developers looking to other GHG registries that encourage more flexible problem solving solutions. **(ACP, CSG)**

RESPONSE: Noted. The Reserve is committed to a program-wide policy of developing standardized protocols for offset quantification and verification. This means that Reserve protocols do not incorporate project-specific "burden-of-proof" procedures for justifying alternative quantification measures or determining additionality. This approach is based on the need to reduce the administrative overhead of the Reserve's program (which is based on rigorous verification oversight) and to avoid the documented inefficiencies, evaluation and registration delays, and investment uncertainties created by project-specific (or "market participation") offset programs like the Clean Development Mechanism. For more on the rationale for this policy, please see the "Additionality" section of the Reserve's Program Manual.[1] The Reserve does not automatically approve or reject methodologies developed by industry groups or other third parties, however we do from time to time adapt and standardize such methodologies through a stakeholder-driven protocol development process.

5. We believe that the approach to the credits awarded is conservative in light of the many additional benefits which ultimately accrue from these projects, but that the conservative approach is appropriate when defining a protocol in this field. **(NatureWorks)**

   RESPONSE: Noted.

6. On composting and digestion. A waste management entity might begin a food waste collection program – adding the food waste to an existing compost operation – and then later decide that the collection volume warrants more advanced treatment methods. Under the current language in the OWD protocol, a digestion project which follows a successful food waste composting operation that has been in operation for more than one year would not be creditable. We propose that CAR make a specific exception, either as part of this protocol or as an addendum to the OWD protocols, which allows food waste composting offset projects to install organic waste digesters and be eligible to generate offsets under the OWD protocol for the remaining OWC crediting period for waste streams migrated from composting to digestion; and for the full

[1] http://www.climateactionreserve.org/wp-content/uploads/2009/04/Climate_Action_Reserve_Program_Manual_031610.pdf

ten years for any new eligible waste streams. **(TerraPass)**

RESPONSE: Agree. In the same way that a Livestock project can transfer to the OWD protocol for the remainder of their original crediting period, a Composting project could switch to the OWD protocol for the remainder of their crediting period. Language will be clarified in the protocol.

2.1 Background

7. The Protocol states that a majority of methane is lost before a landfill gas system can be installed. The Protocol provides no evidence of this whatsoever, except conjecture. (Page 2) **(WM)**

   RESPONSE: Noted. Language will be revised for clarity. However, recent research indicates that landfills that employ landfill gas collection typically do so using a phased approach that results in low collection efficiencies during the initial stages of waste decomposition following waste placement, with higher efficiencies only achieved after intermediate or final cover has been placed on the landfill cell.[2] This means that waste-specific gas collection rates depend on the decay rate of the type of waste landfilled. Food waste, having a high decay rate, will decay significantly before typical landfill gas collection systems are able to achieve high gas collection efficiencies.

8. If food waste decomposes "rapidly" as indicated in the first sentence, and the first 2 years of the new fill is generally considered to provide an aerobic environment for the wastes (i.e., it takes 2 years for that portion of the landfill to reach full anaerobiosis (the methane production phase)), then most of the carbon in the food waste would seem to have been emitted as carbon dioxide and, therefore, most of the carbon in the food waste would not be present later to form methane. Is that the intent of this paragraph? (Second paragraph.) **(CalRecovery)**

   RESPONSE: This is not the intent of the paragraph referred to in the draft protocol. The language will be clarified. According to research and existing methodologies reviewed by the Reserve, food waste would be expected to reach a highly anaerobic phase of decay rapidly after placement in a landfill. [3]

9. "Trace amounts" of these CH_4 and N_2O multiplied by their respective large GHG warming potentials may result in relatively large emission rates of CO_2 equivalents. Are the "trace amounts" described in the second sentence of this paragraph in reference to mass emission rates of the gas specie or equivalent rates based on global warming potential of each gas? (Third paragraph.) **(CalRecovery)**

   RESPONSE: Agreed. Language will be revised. While the total volume of N_2O and CH_4 released to the atmosphere would be expected to be much less than the volume of biogenic CO_2 released to the atmosphere from composting, the net GHG potential of the CH_4 and N_2O emissions could be significant. These emissions are included in the GHG assessment boundary and quantified in the GHG reduction calculation in units of CO_2-equivalents.

[2] Barlaz et al. *Controls on Landfill Gas Collection Efficiency: Instantaneous and Lifetime Performance*. (2009).
[3] SAIC Issue Paper: Methane Avoidance from Composting, Ch.6.

2.2 Project Definition

10. One of the problems with the draft Protocol is the over-simplification of aerated static piles. In the most basic sense it involves intermittent on-off forced positive pressure aeration into the pile and an insulating cover that offers some treatment in addition to insulation (which was the original reason for the cover). Here are the variables that should be addressed to really describe aerated static pile. A well designed and operated ASP system can provide excellent GHG emission control.

    - Direction of airflow (negative/vacuum or positive pressure) through the pile
    - Cycle and frequency of forced aeration (on minutes + off minutes)
    - Collection and destruction of exhaust emissions (odor, VOC, ammonia, etc)
    - Aeration rate
    - Surface area to volume ratio
    - Type of cover material
    - Pile turning frequency
    - Pile turning method
    - Temperature and moisture operating metrics (they more or less covered this one) **(WM)**

    RESPONSE: Noted. The Reserve agrees that a well operated ASP system can provide excellent GHG emission controls, however the monitoring requirements in the OWC protocol represent a standardized approach that is intended to result in conservative GHG emissions assessments from composting technologies while also balancing monitoring burdens on the project.

11. Food waste Handling BMP Requirement: Add to definition, “unless in a control environment”. Many facilities have receiving buildings under negative air that vent to a biofilter thus preventing methane escape. **(CGC)**

    RESPONSE: Agreed. Language will be revised.

12. We support the recognition in the Protocol that a non-aerated static or passive pile compost facility is not eligible to generate GHG reduction credits. **(WM)**

    RESPONSE: Noted.

13. The Protocol claims composting facilities are generally designed and operated to minimize anaerobic activity. Again, no evidence or data to support this statement. We do not believe this is true windrow composting without forced aeration. (Page 2) **(WM)**

    RESPONSE: Noted. Aerobic composting operations do have significant motivation to ensure that the compost process results with primarily aerobic decay for numerous reasons. Some of the reasons include:

    - **Minimization of odors: malodors largely result from anaerobic decay as opposed to aerobic decay**

- **Process efficiency: anaerobic decay takes much longer, therefore decreasing treatment capacity**
- **Compost quality: proper pathogen reduction requires high pile temperatures, which are only achievable through aerobic decay**

Regarding turned windrow composting systems, the reason that windrows are turned in the first place is to introduce oxygen into the pile and ensure proper aeration. If windrow composters did not care to minimize anaerobic activity, there would be no reason to turn the piles.

14. The Protocol defines an eligible waste stream as one that "*consists* of food waste and non-recyclable food soiled paper waste…" We want to make sure that this is not meant to exclude materials such as certified compostable packaging. The language "consists of" could be changed to "comprises", which is a somewhat more inclusive term and would more clearly allow for the possible presence of other materials, such as compostable packaging. Alternatively, such recognition could be called out elsewhere in the text. **(NatureWorks)**

    RESPONSE: Noted. While the presence of compostable packaging in the waste stream would certainly not disqualify the waste stream, the compostable packaging would not be assessed as a separate eligible waste category. The presence of light weight compostable packaging will not impact the eligibility or quantification of emission reductions under the Protocol.

15. One question arose regarding how long should storage of incoming feedstocks be allowed to take place before they are considered a source of GHG emissions? 24 hrs? 48 hrs? We support a short 24 hour time period – so that the protocol does not encourage additional GHG emissions from the stored feedstock. **(WM)**

    RESPONSE: Noted. The Reserve will refine this language. See response to comment 17.

16. Most food wastes would be at least 48 hours old (and anaerobic) before they even arrive at the composting facility, and could be up to 7 days old. Thus, after 48 hours storage on the composting facility site (not an unusual occurrence) the food waste could have been anaerobic for 4 to 11 days before "aerobic composting" is finally initiated. Under these circumstances, how is the emission of CH_4 and N_2O judged insignificant or very small? It would seem that the statement needs support. **(CalRecovery)**

    RESPONSE: Noted. The Reserve acknowledges that food waste is likely to emit some quantity of methane prior to delivery to the facility in both the project and the baseline scenarios, however this quantity of methane emitted is likely to be insignificant in relation to the total methane potential of the waste. The anaerobic decay rates of food waste are such that significant anaerobic decay of food waste wouldn't occur until much more than 10-20days after disposal in an anaerobic landfill (or pile).

17. The protocol states that food waste must be incorporated into an active composting pile within 48 hours of delivery to the facility. Additional language should be inserted to clarify situations in which food waste is delivered on a Friday afternoon and unable to be actively composted until the following Monday, or in other cases in which a Friday delivery is followed by a Monday holiday where the facility may be closed. In these scenarios the 48 hour window to incorporate feedstocks into an active pile may be exceed unintentionally. Leeway should be provided to the project proponent in such circumstances. For example, allowing 72 hours for instances like

holidays and long weekends. We suggest the addition of language similar to what the US Composting Council suggests as an incoming materials management BMP: "If mixing isn't immediately possible, start by covering the load with a layer of high-carbon materials or finished compost until mixing and incorporating into permanent piles is feasible." **(OhioEPA, ACP, CSG, CCC, CORC)**

RESPONSE: Agreed. Language will be revised to provide flexible guidance for meeting this BMP requirement.

18. We support the change to BMP #1 as it provides flexibility, but establishes a BMP standard to follow when a state doesn't have a comparable standard. (Page 3) **(OhioEPA)**

RESPONSE: Noted.

2.3 The Project Developer

19. The Protocol requires the project developer to "own" the waste to get the carbon credits and they have to prove up ownership with legal documentation. We support such a requirement. **(WM)**

RESPONSE: Noted.

20. How can the project developer attest that no other entities are reporting or claiming GHG reductions caused by the project when they are not the landfill owner/operator? **(WM)**

RESPONSE: The Reserve does not currently foresee a situation where a landfill owner/operator could plausibly claim GHG reductions associated with the lack of delivery of waste to a landfill. Should such a situation arise in the future (e.g., if landfill emissions were to become subject to specific, absolute emissions targets or caps in such a way that waste diversion would contribute to compliance), the Reserve will consider modifying this policy as appropriate.

3 Eligibility

3.2 Project Start Date

21. Existing compost operations should get credit if they can show that some other "new" composter has taken their food waste away and they have to go look for new sources that were previously managed in a way that would generate greater emissions than the compost operation. We would support this provision for existing composters if the project developer can demonstrate that the new food waste they are receiving previously came from specific landfills or other facilities with documented emissions. **(WM)**

RESPONSE: Noted. Existing compost facilities can receive credit for any food waste stream composted at the facility, with the exception of grocery store waste streams that were previously composted at the facility prior to the project start date. This works to ensure that projects will not receive credit for the composting of food waste streams that

were already being composted in the absence of the GHG market incentive.

22. "Project start date" is not the beginning of operations, it is the beginning of operations under a formal "Monitoring Plan" designed to meet the requirements of the protocol. This will be important to document that all the controls are in place as required by the Protocol. **(WM)**

    RESPONSE: Agreed.

3.3 Project Crediting Period

23. The "project crediting period" is ten years, renewable for another ten years, and the only intervening factor is a change in legal requirements making your reductions no longer additional. CAR should consider also allowing protocol changes for new technology to be an intervening factor. This would force more "primitive" operations to upgrade their management technology to keep the stream of credits going. Ten years is a long time when technology is emerging quickly. **(WM)**

    RESPONSE: Noted. The Reserve will continue to follow emerging technology in this sector and may consider revising the project definition in subsequent protocol revisions with regards to which technologies continue to meet the project definition per the protocol.

3.4.1 The Performance Standard Test

24. CAR should add a provision that speaks to the current political initiative in some states to reverse bans on landfilling green waste, thereby increasing the amount of green waste landfilled and decreasing the amount of green waste that is composted. If enough states follow this trend the percentage of green waste, yard waste, or other vegetative waste composted could drop below a 50% threshold and thus warrant the inclusion of these feedstocks in future versions of this protocol. **(ACP, CSG)**

    RESPONSE: Noted. The Reserve will continue to monitor national and state-wide regulatory action related to waste diversion, and will continue to seek state-specific yard waste diversion data in order to make informed decisions regarding the eligibility of yard waste in future versions of the protocol.

25. Industrial sources of food waste should be included if the prior management of the industrial food waste can be documented. Although it is true that most of it is land applied or otherwise composted or used by the generator, there are some industrial food wastes that are not suitable for land application and end up in a landfill. **(WM, USCC, ACP, CSG, RGWC, SWANA, OhioEPA, ECC, Mundus Aer, SF Environment)**

    RESPONSE: Noted. The Reserve defined the performance standard and the eligible waste streams conservatively based off the best available information and data. The goal of the performance standard eligibility assessment is to include only waste streams for which the act of diverting the material to a compost facility constitutes a practice that goes above and beyond business-as-usual GHG management practice. There is a large

degree of regional and sectoral variation in the way certain potential waste streams are commonly treated/disposed, and the Reserve will continue to perform research on some of the materials that are currently not eligible in order to assess whether it is possible to include additional materials (possibly on a state or region specific basis).

26. Currently, the draft only allows credit for "food waste" composting. We believe this is appropriate due to the understanding that there is very little food waste composting currently being conducted. However, we would support allowing other organic material types (yard trimming, green waste) to be factored into the protocol if the project developer can clearly and unambiguously demonstrate that these materials were previously disposed in a *specific* landfill – and are now being diverted to a compost facility. We believe that such an approach would meet the requirement of *real, permanent, additional and verifiable* – provided an accurate assessment is made of emissions from the source of diversion as discussed above (i.e., landfills).

    Other waste can be composted with these, but credit will not be given. However, we request that any organic waste should be included provided the prior destination of that organic waste can be documented. **(WM)**

    RESPONSE: Noted. See response to comment 26.

27. We strongly urge CAR to consider other organic waste streams, such as (green) yard waste, for eligibility in this protocol. It would add very little extra burden to require the same performance standard and legal requirements tests that are required for MSW food waste to also determine the eligibility of yard waste. If it can be verifiably determined yard waste streams were landfilled for a period of at least 36 months prior to the project, and that there are no state or local diversion mandates for these waste streams (as is currently required for grocery store food waste), then eliminating these streams from eligibility for offset incentives based on a higher-tier "common practice" argument would be illogical. **(USCC, RGWC, SWANA, Recology, SF Environment)**

    RESPONSE: Noted. See response to comment 25.

28. The Reserve should reconsider the inclusion of biosolids or begin the process of creating a separate protocol for composting biosolids. The protocol should add verbiage that details the reasoning for not including biosolids in this protocol, recognizing the fact that it is a feedstock that has the ability to be composted. **(ACP, CSG, RGWC, SF Environment)**

    RESPONSE: Noted. See response to comment 25. Additionally, because the methane potential of sludge is much lower than food waste or other organic materials, the composting of sludge material does not result in significant GHG reductions according to the protocol's conservative calculation approach.

29. The protocol seeks to make grocery store food waste ineligible unless it can be proven that such wastes were landfilled for a period of 36 months prior to inclusion in the composting project. 36 months is a completely arbitrary number that makes no sense in the context of this protocol, and if such a stipulation is needed, 18-24 months would seem to be a more reasonable time frame. What happens if the grocery store is brand new and such historical waste hauling contracts are not in place, does this new stream of food waste remain ineligible? **(ACP, CSG, CalRecycle, Mundus Aer)**

RESPONSE: Noted. The 36 month look-back period for grocery store waste was deemed to be appropriate to minimize the risk of potential gaming of eligibility criteria. Language will be inserted to address new grocery stores, whose waste streams should be considered eligible.

30. Regarding eligibility and historically diverted wastes, please consider this scenario: At the start of a project, a grocer was already diverting 15% of the food scraps it generated, so this waste is not eligible. The reason they were only diverting 15% was because they didn't include any waste that was in plastic bags (ready to eat salads, breads, etc.) or in small plastic containers (yogurt, cottage cheese, etc.). Three years later all those bags and containers are made of compostable plastics so they can easily put them in the compostables bin. Now they can achieve diversion of up to 80% of their food waste. Can the grocer now apply to get credit for the 65% difference? Will this be considered a separate project or an amendment to a project? Is unlikely this scenario will happen in the next 2-3 years, but is not unthinkable that it could happen within the next 10. Please have this in mind for future revisions to the protocol. **(OhioEPA)**

    RESPONSE: Noted. As currently written, all waste from a grocery store would be ineligible if the store was diverting organics prior to delivery to the project composting facility, regardless of how much particular organic waste is diverted from the store. However, the Reserve will examine this issue and revise the protocol as is appropriate in future revisions.

31. The eligibility requirement to document grocery store waste has been landfilled for the prior three years works well except where a new or competing composting facility might take over the waste stream that has been composted in another facility. This situation could be resolved by adding language that allows waste streams that have met eligible requirements under the OWC rules to remain eligible if moved to another facility. This ties the eligibility of the waste stream to the source and once it qualifies under the OWC it would not have to re-qualify if moved to another facility. **(Mundus Aer)**

    RESPONSE: Agreed. Language will be inserted.

32. Food Soiled Paper Waste: It appears that this definition would include compostable packaging as long as the product had paper content in it. So PLA coated paper cups would count but PLA only cups that had no paper would not count. Cardboard is excluded under 5.1.1.2.2 but pizza boxes are included here? **(CGC)**

    RESPONSE: Agree that clarification is needed. Language will be revised. Regarding cardboard, recyclable corrugated cardboard is not an eligible waste, however food soiled paper products, including food soiled cardboard containers such as pizza boxes, are eligible because they are not recyclable. See response to comment 33.

33. One aspect of the issue which we did not see addressed in the protocol is the potential of packaging materials other than food-soiled paper. NatureWorks produces Ingeo™, a polylactide polymer (PLA) used extensively in fresh food packaging. Our vision is to see this used as an enabler of more extensive organic waste recycling/composting. The consumer will be able to dispose of both the soiled package and the waste food into a single stream which can then be

composted, whereas with the current non-compostable packaging (typically PET or PS), the food contaminated packaging would still be sent to the landfill. Our PLA resins have been extensively tested and certified as compostable according to ASTM D6400 and DIN CERTCO EN 13432. We have also done extensive testing under anaerobic conditions, to enable development of data for landfill simulations. With these data the framework of the existing draft protocol would allow inclusion of compostable packaging materials into the standard.

The direct contribution of emissions of the compostable packaging will be small, but contribution from the enablement of food diversion from the landfill is potentially very large. For the sake of completeness you may want to include language around this topic in the protocol. **(NatureWorks)**

RESPONSE: Agreed. Language concerning PLA products will be inserted for clarification.

34. We support the inclusion of the definition of "soiled paper waste", as it reflects standard practice and promotes additional diversion of organic wastes even if they might not be as much of GHG contributor as food scraps. We want to suggest that you add a clarification, a footnote, or expand the definition as to allow the inclusion of wax-coated-cardboard. Just like pizza boxes are difficult to recycle due to contamination with grease and food, wax-coated cardboard is also difficult to recycle with other corrugated cardboard due to the wax. Grocery stores and restaurants have significant amounts of wax-cardboard from the shipping of food items. The wax-cardboard is desirable in the collection as it adds bulk and can maintain aeration even if not much liquid is absorbed by it. Once received at the composting facility and everything is shredded, it will help meet the C:N ratios needed for aerobic composting. **(OhioEPA)**

RESPONSE: Agreed. Language will be clarified.

3.4.2 The Legal Requirement Test

35. No food waste compost project should be eligible for credits if there is any local or state mandate to compost food waste. **(WM)**

RESPONSE: Noted. Ignoring state and local mandates altogether when assessing the additionality of OWD projects is a policy that is not consistent with the Reserve's principle of crediting only those activities that go above and beyond what is required by law. However, the Reserve acknowledges that local food waste diversion mandates may be a necessary component of successful OWC project implementation in some cases. See response to comment 36.

36. Community based projects resulting from local food waste diversion mandates should be eligible for carbon credits. In CAR's recently approved Organic Waste Digestion Project Protocol (Oct 2009), a food waste stream subject to a local food waste diversion mandate passes the legal requirement eligibility test if the project start date is six months before or after the passage or enactment of the mandate. However, for reasons that are unclear, the same waste stream would not be eligible under the proposed Composting Project Protocol. Inconsistent application of eligibility requirements across organic waste management project types could create an unnecessary and arbitrary 'technology bias' by providing carbon incentives for anaerobic

digestion projects but not for composting projects, even though they would be avoiding the same landfill methane emissions. It is counterproductive to establish a protocol that in any way discourages the adoption of local food waste mandates. It must be noted that local mandates serve as an outreach tool to encourage participation in recycling efforts and are not a guarantee of 100% diversion of food waste from landfills. **(USCC, CCC, CORC, RGWC, OhioEPA, Recology, CalRecycle, ECC, SF Environment)**

RESPONSE: Agreed. This policy will be inserted into the protocol, maintaining consistency with precedent set in the OWD protocol.

37. A possible solution to the additionality problem for projects subject to local mandates could be to allow a project to occur within a certain timeframe, much like the Organic Waste Digestion protocol allows.

    1. A food waste stream subject to a local food waste diversion mandate passes the Legal Requirement Test if (and only if):

    a. The project composting the local food waste stream has an operational start date prior to, but no more than 1 year before, the date that the food waste diversion mandate is enacted by the local jurisdiction; or
    b. The project is implemented subsequent to, but no more than 1 year after, the date of passage into law of the local food waste mandate.

    For the purposes of this protocol, the date of project implementation may be defined with respect to the date at which the project first broke ground, began compost technology installation, purchased the food waste pre-processing equipment, began the permitting process for the facility, or otherwise financially committed to pursue the project. **(Recology)**

    RESPONSE: Agreed. Thank you for the suggestion, the Reserve will build in a mechanism similar to the OWD protocol. See response to comment 36.

38. What happens if a local jurisdiction enacts an ordinance after the protocol is established? Could it be a regional project? Looking ahead even further, what will happen to the protocol and CAR when banning organics becomes the social norm in the US, just like it is now in the EU? **(OhioEPA)**

    RESPONSE: See response to comment 36 regarding local mandates enacted in conjunction with a project. Regarding future regulations banning organics from landfills – should such bans be enacted, the waste streams originating from the jurisdictions or states that enact the bans will no longer be deemed eligible per this protocol.

39. Regarding the definition of “legally binding mandates”, it is essential that contracts between local jurisdictions and service providers do not constitute a legally binding mandate. Local jurisdictions must use metrics of performance to choose between service providers and to monitor performance and it should be stated in the OWCP that the Legal Requirement Test is not applied to contractual obligations. **(CCC)**

    RESPONSE: Noted. The Reserve will continue to explore and clarify this issue.

40. If a local mandate is in place to divert organic wastes from landfills, but actual diversion percentages are falling below those applicable legal mandates, it could then be argued that composting is itself beyond BAU (BAU being the noncompliance of such mandates).

    According to the IPCC's Additionality Tool, "If an alternative does not comply with all mandatory applicable legislation and regulations, then show that, based on an examination of current practice in the country or region in which the law or regulation applies, those applicable legal or regulatory requirements are systematically not enforced and that noncompliance with those requirements is widespread in the country. If this cannot be shown, then eliminate the alternative from further consideration." This passage from the IPCC Additionality Tool shows that when the local compliance levels are not being met, then it is the project proponents right to prove that their project is creating real and actual reductions of GHGs and that the regulatory body of the overseeing carbon program has a responsibility to review the application and make a judgment as to its accuracy and validity. Local mandates should not preclude a project from participation, but rather the level of compliance should be a determining factor. **(ACP, CSG)**

    RESPONSE: Noted. The Clean Development Mechanism's additionality tool was designed for a different policy context involving consideration of governance issues in developing countries. In a U.S. context, the Reserve does not provide credit for activities that are mandated by Federal, State, or Local regulations, regardless of the rate of compliance with these regulations. See response to comment 36 regarding local mandates enacted in conjunction with a project.

41. CalRecycle's Strategic Directives 6.1 and 8.3 coupled with local air district rules in California, will significantly limit the value of this protocol as a voluntary measure and have the effect of creating few GHG reduction credits from projects in the state of California. The current state of politics will prohibit the building of new composting projects, because the additional financial incentives needed by such facilities, in the form of CRTs, will not be available to them. The Legal Requirement Test may be overly restrictive and therefore a project killer. **(ACP, CSG)**

    RESPONSE: Noted. The Reserve will continue to follow regulatory developments in California and elsewhere.

42. In California, it would not be appropriate to give offsets for diverting waste from a landfill to a composting facility, as the landfill methane emissions are already very well controlled (in the SCAQMD jurisdiction) or will be soon due to the recent adoption of the California Air Resources Board Regulation to Reduce Methane Emissions from Municipal Solid Waste Landfills. This concept would also apply to other landfills throughout the United States that are receiving offsets through your Landfill Project Protocol. (SCAQMD)

    RESPONSE: Noted. While California will soon impose regulations mandating gas collection systems for most California landfills, the protocol baseline calculation accounts for and does not credit methane that that would have been controlled by LFG collection systems. The Reserve will refine landfill gas assumptions to reflect state-by-state landfill gas collection rates. The protocol calculation ensures reductions are real and valid for all states, even California. See response to comment 65.

3.5 Regulatory Compliance

43. We believe the unreported or misreported VOC emissions should be a regulatory issue. That is, the composting facilities should be required to properly report and permit their real VOC emissions to meet the regulatory test. **(WM)**

    RESPONSE: Agree. Per the Regulatory Compliance eligibility criterion (Section 3.5), projects must maintain compliance with all applicable laws relevant to project activities. Projects that are found to be in a state of recurring non-compliance or non-compliance that is a result of negligence or intent will not be issued CRTs for the period(s) of non-compliance. This would include VOC emissions violations if VOC emissions regulations are relevant to the project.

44. It would be helpful to include by reference, in an addendum, the current regulatory requirements for food waste composting by state. **(ACP, CSG)**

    RESPONSE: Agree. The Reserve agrees this would be beneficial, and will include information from the SAIC Issue Paper regarding relevant organics regulations in an appendix to the protocol.

45. Projects must attest to being in material compliance with all applicable laws relevant to the project activity (e.g. water quality, wastewater discharge safety, etc.). What does material compliance mean? How does it relate to air emissions? Notices of violation should not affect the facility's ability to get credit unless that violation directly reduces methane avoidance activity. **(CGC)**

    RESPONSE: One of the Reserve's underlying principles is to minimize negative impacts that might result from the implementation of a GHG reduction project. The Reserve thus imposes the requirement that projects comply with all applicable regulations (section 3.5). This includes any relevant air quality regulations or permitting conditions. All project developers must sign and submit an Attestation of Regulatory Compliance form after the conclusion of each reporting period. By signing this form, the project developer attests to the project's compliance status throughout the project reporting period. The form identifies specific dates during the reporting period over which the project was in material compliance with all laws. In addition, the form confirms that the project developer has disclosed to their verification body in writing any and all instances of non-compliance of the project with any law. Ultimately, it is the responsibility of the verifier and the Reserve to determine if a notice of violation would be considered material or immaterial on a case-by-case basis.

4 The GHG Assessment Boundary

46. The GHG assessment diagram and GHG Assessment Boundary does not acknowledge or account for GHG emissions from process liquids which are very likely generated as a result of aerobic composting operations, particularly liquids captured in surface impoundments (leachate storage ponds), which in many cases are anaerobic (generating CH_4 and CO_2) or aerobic (generating CO_2). Ponds, etc., for control and treatment of compost leachate are usual environmental control measures required by environmental regulations or as a result of other

requirements. If the liquid GHG emissions are considered insignificant to the total from other sources within the Boundary, then the basis of that judgment and the supporting data, it would seem, should be part of this protocol. **(CalRecovery)**

RESPONSE: Noted. The Reserve will research this issue and address this potential source as appropriate in future revisions to the protocol.

Table 4.1 Description of all Sources, Sinks, and Reservoirs

47. What is meant by "insignificant" and "very small" where mentioned in the Justification/Explanation column – less than 0.1%, 1%, 10%? Some context or preferably the percentage should be stated in the protocol. **(CalRecovery)**

    RESPONSE: The Reserve will revise language to add context to the statements in Table 4.1.

48. The SSRs identified in Table 4.1 are all GHG Sources, and none of them are GHG Sinks or Reservoirs. Therefore, it would be appropriate to eliminate the labels of Sinks and Reservoirs from the GHG categories in the Protocol. **(RCWMD)**

    RESPONSE: The SSR nomenclature is standard in the GHG accounting community, and is therefore used uniformly in all Reserve protocols.

49. Landfills should be assumed to have minimal N_2O emissions. We support this as the approach taken by IPCC, CDM and other protocols – based on available data. However, the CDM protocol *does* recognize N_2O emissions from composting as a source. Should N_2O be treated the same for both landfills and compost projects? Since CDM clearly recognizes composting as a possible source of N_2O and should be included in this CAR protocol. We have no objection to including N_2O emissions from landfills at a later date once further information is developed for this possible source – and individual landfills are assessed as to their ability to control such emissions. Unless CAR has specific info to warrant deviation from CDM protocols, N_2O should be included in the evaluation of composting operations. **(WM)**

    RESPONSE: Agree. The protocol does account for N_2O emissions from composting. This represents best practice GHG accounting. The exclusion of N_2O emissions from landfills will be re-assessed as scientific research progresses and quantification techniques become available.

50. In the Issue Paper – Methane Avoidance from Composting, literature sources are cited regarding nitrous oxide emissions from landfills with conclusion that; "… *the anoxic conditions required for N_2O formation are potentially likely to occur in a landfill environment.*" However, these emissions are excluded from the baseline emissions of the OWCP. Given its significance as a project emission using the currently proposed emission factors, its inclusion would be a more equitable representation of avoided emissions. **(CCC)**

    RESPONSE: Agree. See response to comment 49.

51. Only a very small portion of compost is currently used at landfills for cover or other beneficial use. However, this could potentially change significantly in the future as increasing data shows

that compost is excellent material for landfill cover and contributes significantly to reducing fugitive landfill emissions. Of course, projecting how future compost use in landfills may be used to further reduce landfill GHG emissions would be extremely difficult to project at this point in time. **(WM)**

RESPONSE: Agree. The Reserve will continue to follow research on this topic.

52. SSR 3 Waste Transportation: The Protocol excludes transportation emissions because they claim it will be comparable to baseline. This is completely unfounded. This should be determined on project-specific basis whenever distance will be greater than for landfill, including any mileage from extra route trucks because a separate collection round is needed for the organics. **(WM)**

    RESPONSE: Noted. Because it has been determined that it is nearly impossible to cost-effectively and reliably demonstrate and verify the fate of individual waste streams (i.e. demonstrating the specific landfill that the waste "would have gone to" in the absence of the project) it is impossible to accurately quantify the transportation emissions that would have occurred in the absence of the project. However, the Reserve has determined that waste can be transported a significant distance further in the project scenario than would have occurred in the baseline scenario without significantly altering the total emission reduction estimate associated with composting. The Reserve has therefore determined that changes in transportation emissions due to the project are insignificant when compared to the avoided methane resulting from the project. Also, see response to comment 57.

53. SSR 4 Waste Disposal at Landfills: This SSR identifies the anaerobic decomposition of eligible organic wastes as the only emission source of anthropogenic GHG and ignores the GHG emissions from landfill equipment that performs the waste disposal operation, as well as the general landfill construction and maintenance functions. A fair share of the equipment GHG emissions from handling the eligible organic waste should be included in the baseline emissions, because landfill equipment, like composting equipment, is a direct source of GHG emissions from the organic waste management practice. In addition, the Justification/Explanation for this SSR to be included in the baseline emissions states that these emissions (i.e., from anaerobic decomposition of eligible organic waste) are avoided by an organic waste composting (OWC) project. This justification statement is not a proven fact since an OWC project can also generate anaerobic emissions of GHG, as indicated in SSR 5, Temporary On-site Storage, where anaerobic composting could occur, and even in SSR 7, Aerobic Composting, since pockets of anaerobic decomposition are known to occur within aerobic composting piles. It is recommended that this justification statement be corrected to read: "These emissions are expected to be reduced by an OWC project." **(RCWMD)**

    RESPONSE: Noted. The language in Table 4.1 will be revised for clarity.

54. SSR 6: It appears the process starts by premixing material and thus would have entered the processed but not actually on the active compost pad. Thus would premixing count as in process? **(CGC)**

    RESPONSE: GHG emissions from fossil fuel combustion in any mixing or pre-mixing equipment must be included.

55. SSR 7 Aerobic Composting: If an operator meets BMPs, then they can avoid reporting. This must be measured on a site-specific basis to prove whether these emissions are occurring. The Protocol's assumptions are completely unfounded. **(WM)**

    RESPONSE: Noted. All project must meet the BMP requirements, however this does not preclude the project from the requirement to quantify and report GHG emissions from composting. All projects must quantify emissions from the project according to Section 5.2.

56. SSR 8 Finished Compost Storage: The Protocol claims methane is gone after 4 weeks, but again no evidence is provided. The SCAQMD studies found significant Voss during curing and storage of final compost and no aeration or turning occurs on these finished product piles, so it is much easier for them to go anaerobic. **(WM,RCWMD,SWANA)**

    RESPONSE: Noted. According to peer-reviewed research cited in the SAIC Issue paper, fugitive gas emissions from storing finished compost are likely minimal. The readily decomposable fractions of the finished compost will have largely decomposed during the active composting phase. Furthermore, the emissions factors used as reference for this protocol are intended to represent emissions from the entire composting process, including the active and curing phase. The Reserve will continue to follow GHG emissions research developments in order to ensure that the protocol represents the best available science with regards to compost emissions.

57. SSR 9 Finished Compost Transportation: The Protocol excludes emissions because they claim it will be insignificant. This is completely unfounded. This should be determined on project-specific basis. Some compost can go from metropolitan areas into rural agriculture areas, which could be significant. In some studies, other things balance out and the transportation emissions were a deciding factor whether composting was net benefit or detriment in terms of GHG emissions. **(WM, RCWMD, SWANA)**

    RESPONSE: Noted. Compost is typically applied on lands in close proximity to the compost production site due to high transportation costs of the material. Additionally, numerous studies indicate that compost is a net GHG sink when applied as fertilizer and mulch for agricultural and horticultural uses. These LCA studies typically include GHG emissions from the transportation of the compost to the site. Given that this product is considered to have a net GHG benefit in the scientific community, it is consistent with best practice GHG accounting to exclude the secondary emissions and sinks from transportation and application of finished compost.

58. CAR has drawn its boundaries so tightly that many important aspects of the composting process and methane avoidance approach have been neglected. For example, carbon sequestration in landfills, and in soils as a result of the use of compost as a fertilizer (SSR 11) should be considered. **(SWANA)**

    RESPONSE: Noted. Carbon sequestration in landfills is excluded, as is increased carbon sequestration from soil application of finished compost. Table 4.1 will be clarified with respect to carbon sequestration.

59. The protocol should not include GHG benefits that are derived from the use of the compost product itself. CAR has chosen wisely to not include these in the protocol as such benefits

would likely be outside of the control of the compost project or facility developer who sells the compost product for use by another party. In addition, soil carbon storage benefits associated with compost use would also require that the protocol include landfill carbon storage reductions that would occur as a result of diverting the food waste (or green waste) from landfill disposal. This would significantly complicate the protocol and are best avoided for the time being. **(WM)**

RESPONSE: Noted.

5 Quantifying GHG Emission Reductions

60. The First Order Decay Model (FOD) should not be used to estimate GHG emissions from the landfills from which the food waste is being diverted – nor as a method to estimate methane emissions from the compost operations. There is ample discussion in the technical literature that the FOD model may be off by an order of magnitude (in either direction) for emissions from specific landfills. We suspect the same would be true for composting operations as well. **(WM, RCWMD)**

RESPONSE: The Reserve agrees that the FOD model has considerable uncertainty when estimating fugitive emissions from an entire landfill for inventory purposes, largely due to the many assumptions that must be made to parameterize the model, including:

- **The waste characterization of the entire landfill (often going back 50 years or more)**
- **The waste in place at the landfill (again, going back 50 years or more)**
- **The decay rates given the climate and the characterization of the waste.**

When applying the FOD model for the calculation of emissions for a given homogenous waste type, the uncertainty regarding the quantity and type of waste is alleviated. According to the IPCC, "the main source of uncertainty lies in selection of values for parameters for the model, rather than with the methodology of the model itself." [4] The Reserve addresses this uncertainty by using conservative default parameters, and by calculating the emissions out for a limited time interval (10 years). It is not conservative to sum the FOD equation out beyond this time frame.

61. Because the Methane Emission Factors for landfilled waste are provided in Table A.3, and are calculated using parameters that are fixed in the OWCP, it doesn't seem as if there is any need to apply the FOD equation. **(CCC)**

RESPONSE: Technically it is correct that the FOD model can essentially be 'pre-calculated' using the supplied parameters and the resulting factor (in units of $MTCO_2e$/ MT waste) can essentially be used as an emission factor to calculate the baseline emissions from each waste stream. However, for transparency, the full FOD model used to develop the 'emission factors' in Appendix A is included in the baseline quantification section.

[4] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 3, pg. 3.25.

5.1 Quantifying Baseline Emissions

62. The Protocol assumes fugitive emissions of 100% of CH_4 generated in the first 2 years of landfill residency of the organic waste and prescribes the use of the FOD model, which is subject to contention in the science community, for estimating GHG emissions to the atmosphere. The obvious drawbacks of this standardized approach are an incomplete accounting of GHG emissions from the full composting process and, likely, an overestimate of GHG emissions from landfills. **(RCWMD)**

RESPONSE: Noted. The protocol does not assume that 100% of the CH_4 generated in the first 2 years of landfill residency is emitted to the atmosphere. Rather the protocol assumes that 100% of the non-oxidized CH_4 generated in the first two years is emitted to the atmosphere. This is based on a phased gas collection efficiency approach.[5] See response to comment 65.

63. Although we support the general approach taken to quantifying baseline emissions for organic materials diverted from landfills, we feel that the use of highly conservative default estimates for several individual parameters, compounded with a model correction factor 'to account for model and waste composition uncertainties', leads to overly conservative estimates of project related emission reductions (see below), which undervalue the actual greenhouse gas reduction benefits of composting projects.

a. In particular, the default values provided for landfill gas collection efficiency (LCEx) of 25%, 50% and 75% are not well supported by scientific literature: no references are cited for the 25% and 50% values (presumably these represent CAR's judgment following technical workgroup discussions) and the citation for the 75% value appears to be inaccurate. Given that the total national landfill methane recovery rate is currently under 50%, it is difficult to justify a standardized baseline that assumes 50% collection efficiency only 3 years after waste disposal and 75% thereafter for all diverted food waste.

b. The selection of default values for degradable organic carbon of food waste (0.137 for $DOC_{FW,S}$ and 0.83 for $DOCf_{FW,S}$) derived from a bench-top study, although an improvement on IPCC Tier 1 default values, would yield baseline emissions ($BE_{FW,S}$) that are about 12% less than if using food waste-specific factors from the most recent EPA National Inventory (0.26 for $DOC_{FW,S}$ and 0.5 for $DOCf_{FW,S}$). The use of such factors would be consistent with EPA National GHG accounting methodologies, and might be more appropriate as a Tier 2 approach under IPCC guidelines. **(USCC, ECC)**

RESPONSE: Noted. Regarding overall conservativeness, the Reserve feels that the calculation must be very conservative given the highly standardized approach to project accounting utilized in this protocol. The Reserve is adapting a new Landfill Gas Collection system approach that utilizes the latest academic understanding of phased landfill gas collection as well as state-specific landfill gas collection practices to refine the approach so that the LCE parameter is state-specific. This is a revision that will increase the overall accuracy of the accounting. The Reserve will also explore which

[5] Barlaz et al. *Controls on Landfill Gas Collection Efficiency: Instantaneous and Lifetime Performance*. (2009).

DOC value is most appropriate to use for food waste and consider updating the protocol as appropriate.

64. Applying a factor to reduce total eligible feedstocks by the percentage that waste is sent to a waste-to-energy facility on a statewide basis is inappropriate. There are some 85 waste-to-energy facilities in the United States – some in large-area states and some in small-area states. To penalize a composter because there is a waste-to-energy facility many hundreds of miles away in the same state is inappropriate. Composters should only be disqualified if there is a waste-to-energy facility within a reasonable haul distance, and there should be an opportunity for the composter to demonstrate that the otherwise eligible waste was in fact diverted from a landfill within that radius, if possible. **(SWANA, Mundus Aer)**

RESPONSE: Noted. The standardized approach utilized in the baseline calculation is necessary because of the difficulty of tracking where waste 'would have gone' in the absence of the project. With regards to WTE facilities, it is necessary and conservative to use a standardized state-specific value for accounting for the percentage of waste that would have gone to a WTE facility.

Equation 5.3 Baseline Methane Emissions from Eligible Food Waste, by Waste Stream

65. Definition of LCE: The whole basis for collection efficiency is unfounded and must be project specific. The Protocol must evaluate the actual landfill the waste is being diverted from and determine a site-specific collection efficiency. There should be incentive to divert waste from landfills without collection and a reduction in benefit for diversion from sites with good GCCS and energy recovery. [Comment also for Box 5.1.] **(WM, SWANA)**

RESPONSE: Noted. Because it has been determined that it is nearly impossible to cost-effectively and reliably demonstrate and verify the fate of individual waste streams (i.e. demonstrating the specific landfill that the waste "would have gone to" in the absence of the project) a conservative standardized approach is required for calculation of baseline emissions from diverted waste. The landfill gas collection efficiency assumptions will be further refined using data from the EPA Landfill Methane Outreach Program (LMOP) in order to determine state-specific landfill gas collection assumptions.

Box 5.1 Composting Protocol Treatment of Landfill Gas Collection Systems

66. We have concerns about using default assumptions based on EPA models regarding landfill emissions. Individual landfills are capable of achieving far greater than 75% methane capture during their operating life and more than 10% oxidation of methane in cover and cap materials. The California Air Resources Board (CARB) has recently adopted new regulations to further control emissions from landfills – in California. US EPA is contemplating similar regulations nationwide. It is our understanding that CARB/CalRecycle now uses an 83% control efficiency rather than the EPA 75% for California landfills subject to, and compliant with, the new CARB landfill rule. As we have stated repeatedly, we request that the CAR Compost Protocol accurately reflect the conditions at the specific landfill or landfills from which the waste is being diverted to composting. Otherwise, we believe the protocol fails to meet the requirements: *real,*

permanent, additional, verifiable.

There is considerable evidence in the literature that oxidation of landfill methane in cover and cap materials is much greater than the 10% US EPA default assumption; 30% methane oxidation in cover/cap materials is not unusual and could push overall landfill methane control in California to approaching 90%. Unfortunately, the compost protocol does not recognize the level of methane control that can be achieved many landfills – such as those subject to stringent California regulations. As a result, the Protocol will assume greater GHG reductions associated with compost diversion operations than are actually achieved. **(WM, SWANA)**

RESPONSE: Noted. See response to comment 65 regarding landfill gas collection assumptions. Regarding landfill oxidation rates, the Reserve will continue to follow ongoing research regarding oxidation levels resulting from various types and applications of cover materials and will update all three waste-sector protocols as appropriate. This process of reviewing and updating oxidation assumptions will be carried out in future versions of the protocol.

67. We were unable to confirm that the 75% LFG collection efficiency default value was taken from the *EPA Inventory of US Greenhouse Gas Emissions and Sinks, 1990-2007 (2009)*, as cited in footnote 23 (p. 18). Perhaps this was either a derived value, or the authors meant to cite *EPA Climate Leaders GHG Inventory Protocol for direct emissions from landfills (Oct 2004)* (p. 13), or EPA's *U.S. Methane Emissions 1990-2020: Inventories, Projections, and Opportunities for Reductions (September 1999)*. However, neither of these references cites support for the 75% value other than "waste management industry assumption." The most commonly cited reference for the use of 75% as default LFG collection efficiency appears to be an unpublished EPA internal draft memo from 2002. However, a recent MSW (industry sponsored) review also proposes 75% as a default for landfills with an intermediate soil cover and active LFG collection system, but only 60% for landfills or portions of landfills with daily soil cover and active LFG collection systems. **(USCC)**

RESPONSE: See response to comment 65.

Equation 5.5: Determining Weight of Eligible Food and Soiled Paper Waste

68. Equation 5.5 appears to be incomplete or requires further clarification. It is possible that a facility might receive an eligible waste stream and compost only some fraction of the waste received (e.g., for facilities that plan to use anaerobic digestion but may also compost some of the waste stream for timing or capacity reasons). In this case, the total weight of waste delivered to the facility ($W_{T,S}$) multiplied by the food waste fraction of that waste stream ($F_{FW,S}$) would not be equal to the weight of food waste that is composted by the project ($W_{FS,S}$).

An additional parameter should be included that represents the fraction of waste stream 'S' that is composted during the reporting period, or else the definition of parameter $W_{T,S}$ should be modified accordingly. However, the former would be more consistent with CAR's treatment of material flow quantification as in their livestock protocol (i.e., $MS_{AS,L}$ for manure). (Same thing for soiled paper waste in Equation 5.5(b)). **(ECC)**

RESPONSE: Agree. Equation will be clarified.

5.1.1.2.1 Residential SSO Waste Stream Characterization

69. The CCC recommends reducing the number of hand sorting events to one per quarter following 8 in the first year to establish a baseline. It is also recommended that photo documentation be required of the waste from which the sample is obtained, the sample itself, and the categories into which it is divided. **(CCC)**

    RESPONSE: Agree. Language will be revised.

70. We find 80 residential SSO waste stream characterizations over the 10-year span of a project crediting period to be excessive. We recommend a mitigated sampling protocol such as 8 samples in the first year to determine seasonal trends, and then once per quarter thereafter when the trends have been established and less frequent calibration is required.

    The resources required to conduct perpetual WCs could result in a negative economic impact over the long term for both projects and their clients through increased processing fees and increased costs to end users.

    In the event this requirement remains as written, we feel it is necessary to define the WC protocol and reporting procedures required for projects to comply with the requirement. We would like to applaud the protocol for including the provision that obviates this requirement in the presence of regional WC data. **(CORC, SWANA)**

    RESPONSE: Agree. Language will be revised.

71. We very much support the site-specific waste sampling requirements. They are simple to do and will provide the information in an uncomplicated manner. As many municipalities and companies put more emphasis on measuring their progress in environmental sustainability, waste sorts or characterizations are becoming common practice. Waste characterizations are the simplest and more accurate way to obtain this data. After a few years, we will be able to have enough data as to be able to extrapolate general content rates. In the mean time, this is the most sensible and meaningful approach to quantify food scraps for the protocol. **(OhioEPA)**

    RESPONSE: Noted.

5.1.1.2.2 Commercial SSO Waste Stream Characterization

72. "…projects may apply the default factors in Table 5.1 or may use generator provided waste characterization data …" The OWCP should also provide the possibility for the project to do their own waste characterization, as with the Residential SSO Waste Stream, rather than rely on the generator or default factors for the information. **(CCC)**

    RESPONSE: Agree. Language will be revised.

73. We suggest the same requirements as residential are offered as an option for the commercial SSO characterization, for the "generator provided waste characterization" alternative. This will give them guidance and ensure everyone is doing it the same way. Long term it will allow you to

determine if there are any significant differences in composition between residential and commercial with real comparable data. You will most likely be the only ones with such information! **(OhioEPA)**

RESPONSE: Agree. Language will be revised.

5.2 Quantifying Project Emissions

74. The protocol does not reflect the emission levels from poorly controlled compost facilities. According to one Danish study, a 17,000 ton/year windrow operation emits 1,136 – 1,725 tons/year of CO_2e. Our business partner, Harvest Power, also did a comparison of a Riverside Co ASP methane emission vs. the Danish windrow methane emission and it appears the *ASP emitted 11% of the methane the windrow was emitting*. This is a significant reduction due to the application of improved composting technology. **(WM)**

    RESPONSE: Noted. The protocol utilizes BMP requirements to ensure that compost operations are not poorly controlled or operated. The protocol does distinguish between turned windrow composting and ASP composting, providing lower emission factors for ASP composting systems based on scientific evidence that ASP systems are better at controlling GHG emissions than turned windrow operations.

75. The protocol will estimate the amount of GHG emissions (CH_4 and N_2O) that are emitted from a compost project facility (but not the compost product) – based on the nature of the compost operation and the degree of control measures used to mitigate GHG emissions. We support this approach and believe that these two GHGs should be included in evaluated compost facility emissions. **(WM)**

    RESPONSE: Noted.

76. For calculating emissions from the composting activity for subtraction from baseline, protocols are provided for turned systems and forced aeration systems, with "additional credit" for optional process controls such as applying finished compost to windrows or using a biofilter, aerated static pile, covered aerated static pile, Gore covered aerated windrow and in vessel composting using a biofilter as a means of odor filtration should set the standard. **(WM)**

    RESPONSE: Noted.

77. The type of process that is used in compost operations can strongly influence GHG emissions. There are variable processes that can be used, such as in-vessel, ASP and windrow. CAR should recognize the GHG emission potential of each of these and rank them accordingly. **(SWANA)**

    RESPONSE: Noted. This is essentially the approach taken in the protocol, however the types of composting operations are divided into only two main categories, forced aeration and non-forced aeration (turned windrow). Many workgroup members were of the opinion that further refinement of the categories is not appropriate or necessary at this time.

5.2.2 Project Emissions from the Food Waste Composting Process (SSR 8)

78. No credits should be given and a facility does not pass performance test criteria if they are not using forced aeration. Forced aeration is essential to proper facility operation. **(WM)**

    RESPONSE: Noted. While the protocol distinguishes between ASP and turned windrow composting systems, there is not a valid reason at this time to exclude turned windrow composting from eligibility.

79. In the landfill protocol, the SSR 4 which establishes the baseline landfill emissions excludes nitrous oxide emissions but the formula for the OWC protocol explicitly includes it in the calculation. Additionally, the factors for nitrous oxide and methane are not consistent with the landfill protocol factors for nitrous oxide and methane. We believe that projects should be able to use site specific emissions data if available. We suggest the following language to be added as a footnote to the equations in the OWC protocol:

    1. If available, the official source tested emission data shall be used in place of the default emission factors. Otherwise, project developers have the option to use either the default emission factors provided, or the site specific emission factors as provided by a state or local agency accredited source test service provider, for each factors used in the project case. **(Recology)**

    RESPONSE: Agree. The suggested language will be incorporated into the protocol to allow for official source tested emission data to be used in place of the default factor.

80. Biofilter systems vary wildly in performance. These must be tested for emissions before any credit can be given for reductions. If you review some the facility specific emission data, you can see that different types of covers vary quite a bit in performance. Also, testing on biofilters should be on outlet of biofilter – that is, source testing should be required to confirm control efficiency. **(WM)**

    RESPONSE: Noted. There is scientific evidence that the use of biofilters greatly reduces the risk of GHG emissions. If utilizing a biofilter, the protocol requires that there is documentation that the biofilter system is appropriately designed and implemented. However, even if utilizing a biofilter, it is assumed that there are still significant emissions of CH_4 and N_2O emitted from the system. This is a conservative assumption. See response to comment 79 regarding source testing options.

Table 5.2 CH_4 and N_2O Emission Factors

81. This section is very generic and really only covers two types of systems. There are many more in-vessel and synthetic covered systems that operate actually better than these two categories with respect to GHG reduction. Rather than try to list all the current systems or contemplate new systems coming on line. A statement needs to be made that: “Variations of these systems can also be included at the rated values and when evidence is available may increase the offset credits.” **(CGC, Mundus Aer)**

RESPONSE: Agree. Language will be revised to indicate that the protocol may be updated in the future to further refine the compost system categories.

82. More investigation is needed on the emission factors for CH_4 and N_2O. We do not believe these are from food waste composting. Because food waste will degrade faster, it will go anaerobic faster and create more emissions in the anaerobic phase. Just like we have seen higher VOCs and odorous emissions from the food waste compost, you will see higher CH_4 and N_2O. Project proponents must test this on site-specific basis. And when you look at the SCAQMD studies (which were not food waste), there was a huge range of values. For example, the factors range from 0.03 to 0.09 $MTCO_2e$/MT of compost. SCAQMD factors (on either green waste or co-compost with biosolids) are 2.23 lb/ton methane (0.025), 33.4 lb/ton methane (0.35), and 0.83 lb/ton methane (0.008). This is a huge range, much bigger than assumed in the Protocol and we would expect food waste numbers to be higher across the board. **(WM)**

RESPONSE: Noted. The Reserve acknowledges that the range of composting emission estimates is large, and that there is uncertainty involved with emissions estimates. However, the Reserve feels that the emission factors utilized in the protocol, combined with the required BMPs imposed on all projects, ensure that the calculation results are ultimately conservative. The Reserve will continue to follow research on compost emissions quantification and update the protocol as appropriate in future revisions.

83. Depending on various technology options implemented in the project, the emission factors for the CH_4 and N_2O added together range from 0.09 to 0.18 $MTCO_2e$/MT of eligible waste. If it is assumed that an eligible waste stream is 75% food waste and 25% soiled paper, then the amount of avoided landfill emissions is 0.393 $MTCO_2e$/MT of eligible waste. Using the proposed emission factors, project emissions from CH_4 and N_2O emissions constitute a range of 23 to 46% of the avoided methane. Although these values are within the range of available data in the current literature, CAR should continue to seek better information as it is developed to improve the protocol. **(CCC)**

RESPONSE: Agree. The Reserve will continue to follow scientific research regarding GHG emissions from composting and will update the protocol as appropriate in future revisions. The emission factors utilized in the current protocol are conservative due to the uncertainty in the scientific understanding of composting GHG emissions.

84. The default composting process emission factors in the protocol are largely consistent with EPA National Inventory factors and even add welcome refinements based on composting process types. However, there is a wide variety of in-vessel and synthetic covered systems that are not included or well anticipated by the categories in Table 5.2. For example, some forced-aeration systems with synthetic covers may perform as well as, or better than, systems with compost covers. We recommend that project developers should have the opportunity to utilize site- or technology-specific emission factors for CH_4 or N_2O if sufficient evidence is available. Incentives for composters to optimize their process to further reduce GHG emissions should be enhanced, not removed, by the protocol. **(USCC)**

RESPONSE: Agree. See response to comment 79 regarding source testing options.

85. We would like to challenge the emission factors assumed from project-specific composting practices. While we are not in the position to offer alternative figures, we recognize there is, to

date, insufficient research in this area. As more accurate, peer-reviewed data becomes available, we would like to see that data reflected in the emission factors and similarly incorporated into the calculations for Project Emissions.

We recommend a clause be included in the protocol to allow for updates in emission factors as more accurate, peer-reviewed data becomes available. We believe that creating this type of flexibility in emissions accounting will allow this protocol to remain relevant over time and not become outdated as a result of new data. **(CORC)**

RESPONSE: Agree. The protocol will be updated as scientific understanding improves.

6.1 Monitoring Incoming Eligible Waste Streams

86. A weight scale is the most accurate and preferable method, but not all facilities have the funds to install them. A couple years ago, the Ohio EPA Environmental Education Fund gave a grant to the Organics Recycling Association of Ohio and the Ohio State University to prepare a manual on best practices for measuring materials at composting facilities through various methods. Hopefully this document can help you decide if you want to include additional methods. Alternatively, you could add language similar to the time and temperature BMP footnote allowing other methods as allowed in their states. **(OhioEPA)**

RESPONSE: Noted. Given the uncertainties involved, the Reserve is not comfortable allowing for quantification of in-coming eligible waste weight by means other than weigh scales at this time.

6.3.1 Time, Temperature, and Turning Frequency BMP Monitoring

87. There is no evidence from actual testing data that the temp and turning frequency cited will reduce methane and N_2O. This must be proven first. If they do these things, they can report zero emissions of these pollutants, so testing is critical prove of performance. We have reviewed many compost emission testing studies and none documented any comparison between what happens at different temps and most did not test for methane and N_2O. **(WM)**

RESPONSE: Noted. There is scientific evidence that providing adequate aeration to the compost pile does reduce the potential for both CH_4 and N_2O formation in the compost pile. The two basic methods for aerating compost piles are forced aeration with a blower, and pile/windrow turning with mechanical equipment. If utilizing a turned windrow system, a frequent turning schedule decreases the overall risk of GHG emissions due to inadequate aeration. With regards to pile temperature, again there is scientific evidence that high pile temperatures (of 55°C or higher) indicate that decomposition is occurring under highly aerobic conditions.[6]

88. We agree that time, temperature and turning frequency BMP monitoring is an appropriate and practical method for ensuring aerobic composting. However, in cases where batch oxygen concentrations are directly monitored on a daily basis, documenting that oxygen concentrations

[6] SAIC Issue Paper: Methane Avoidance from Composting. Pg. 58, 62.

remain above 8% should be sufficient to demonstrate aerobic status, regardless of temperature. **(USCC, CGC, ECC)**

RESPONSE: Noted. The Reserve will continue to look into oxygen measurement techniques to determine how to build oxygen sampling into the protocol in a future revision.

89. Sampling measurement per volume should be amended to allow that other sampling volumes are acceptable were a system, usually in-vessel, can demonstrate through studies less sampling is still indicative of temperature or oxygen throughout the pile. **(CGC)**

RESPONSE: Noted. Given lack of existing data, at this time the Reserve is not comfortable allowing alternative sampling requirements for ASP systems.

90. There is a disconnect between 6.3.1 Temperature and 6.4.1 Monitoring: Temperature in section 6.3.1 says monitor temperature after 55°C until the temperature falls below 50°C. Whereas section 6.4.1 Positive ASP System: for the first 2 weeks of active compost cycle. Most systems take a few days to heat to above 55°C but then may take 30 days to drop below 50°C. This issue causes a conflict between Section 2.2 where Force Aeration Systems only needs to be above 55°C for 3 days. **(CGC)**

RESPONSE: Agree. Language will be revised.

91. This section does not assume Positive ASP System could have a synthetic cover as opposed to a finished compost cover. **(CGC)**

RESPONSE: Agree. Synthetic covers will be considered and the language will be revised.

92. Monitoring the temperature of an aerated static pile below the interface of the cover may not be an appropriate standard if there is no cover. **(SWANA)**

RESPONSE: Agreed. Language will be revised.

93. Monitoring temperature between 12 and 24 inches below the surface of a windrow may or may not be appropriate. We believe the temperature should be monitored close to the core of the windrow, regardless of size. **(SWANA)**

RESPONSE: Agree. Language will be revised.

94. The temperature measurement requirements in the Draft Protocol are highly prescriptive with regard to location and depth, and may not be appropriate for all situations. They should probably be indicated as general guidance rather than absolute requirements. Furthermore, the draft calls for daily temperature monitoring until below 50°C, which may be unnecessarily onerous for many operations. Instead, after a batch has reached its 55°C time and turning requirements, weekly monitoring until the temperature drops below 50°C should be sufficient to ensure an aerobic process. **(USCC)**

RESPONSE: Agree. Language will be revised.

95. The 50°C requirement is beyond what state regulations stipulate. In the absence of a compelling reason for the 50°C requirement, the protocol's time and temperature monitoring should work with existing state regulations developed to monitor existing compost facilities. **(CORC)**

RESPONSE: Agree. Language will be revised.

96. An exception to daily temperature monitoring should be allowed when the facility is closed (weekends, holidays). The monitored temperatures don't normally show much variation over periods of a couple of days. **(CCC)**

RESPONSE: Agree. Language will be revised.

6.4.2 Monitoring Requirements for Documenting Use of Biofilter Exhaust Gas Control Systems

97. Excellent addition, since biofilters can be run very poorly and in fact are a very difficult system to maintain at even close to optimum. It is very common for these system to run anywhere from 40% to 85% efficient thus not really treating the compounds they are suppose to control. In addition, drastic changes can occur in less than 24 hours within these control units. **(CGC)**

RESPONSE: Noted.

98. In addition to those data elements listed, moisture content should be measured to show the filter is working properly: too little moisture, no scrubbing action; too much moisture, air cannot move through the media. **(CGC)**

RESPONSE: Agree. Language will be revised.

99. The destruction efficiency of these filters is only part of the story; the bigger issue sometimes is the capture efficiency. If the fans are too small they are not pulling air out of the pile therefore poor capture. So even if the filter is working well, the system is not capturing any air to be treated in the biofilter. **(CGC)**

RESPONSE: Noted. The protocol requires biofilter systems to document the exhaust rate.

Table 6.1 Organic Waste Composting Project Monitoring Parameters

100. The VMT and total fuel consumption for transportation of finished compost to final destinations should be added to the Monitoring Requirements and monitored for assessment of total and net Project Emissions. **(RCWMD)**

RESPONSE: Noted. See response to comment 52 and 57.

101. The k (i.e., decay rate) values for the eligible wastes to be chosen from Appendix A, Figure A-2 should be applicable to the County where the wastes are disposed of, and not originated. It is because the decay rate is determined by the climate of the disposal site and not the waste

generation area. (Equations 5.3 and 5.4) **(RCWMD)**

RESPONSE: Noted. This comment is accurate; however, the Reserve has acknowledged that it is not viable to determine the specific landfill that material would have gone to in the absence of the project. Thus, it is assumed that the waste would have been disposed in the county of origin. The Reserve acknowledges that this is not a perfect solution, however the application of this assumption will result in a reasonably accurate characterization of decay rates the vast majority of the time.

102. Parameter EL_{PR}, Description "Total Electricity Consumed by the Project Landfill Gas Collection and Destruction System." This description is erred in that the parameter is for measurement of electricity consumption at the composting project facility and not at the landfill. (Equation 5.7) **(RCWMD)**

RESPONSE: Agreed. Thank you for pointing this out.

7.2 Record Keeping

103. Maintaining all gate records for a period of ten years is burdensome and of questionable value. We recommend that the document retention period should be shorter, such as no more than five years. **(SWANA)**

RESPONSE: Noted. The Reserve prescribes standardized data retention requirements across protocols to ensure consistency and transparency across project types.

8 Verification Guidance

104. We support the current approach of using source specific verification. This is important to the environmental integrity of the CRTs and a more accurate approach to qualifying the waste stream. **(Mundus Aer)**

RESPONSE: Agree that waste does need to be assessed on a source-specific basis to determine eligibility and characterization of the waste stream.

Appendix A Data Lookup Tables

105. Appendix A should clearly discuss how an existing compost facility must determine the historical maximum amount of food waste they previously composted so as to know how much new food waste is "additional". **(WM)**

RESPONSE: Noted. The protocol does contain a mechanism ensuring that the majority of the food waste that is previously composted by a project will not be credited, due to this activity. The performance standard contains language specific to grocery store waste streams, as it was determined by the Reserve that the majority of the food waste that is currently being composted nationally originates from grocery stores. Per the performance standard, all grocery store waste streams that are composted at the project

facility prior to the project start date are considered ineligible. Additionally, all new grocery store waste streams composted by the project must demonstrate that the previous waste management method for the waste stream was landfill disposal, going back at least 36 months prior to the date that the waste stream is first delivered to the facility. These two requirements ensure that the majority of the food waste that has historically been composted in the absence of GHG market incentives is not eligible under this protocol.

106. Decay constants (k) for food waste and soiled paper are provided in Table A.2 and are a function of climate. The decay constant for food waste in temperate dry areas, of 0.06, results in a half-life of about 12 years and a period of 40 years to reach 90% waste decomposition. For temperate, wet areas the k of 0.185 results in a half-life of about 4 years and 13 years to 90% decomposition. We understand that there is not a lot of applicable data available on decomposition of specific waste components in landfills. However, the k values seem low for food waste, particularly in dry areas. This is particularly relevant due to evidence that temperature conditions are relatively constant in landfills regardless of ambient conditions, and the high moisture content of food waste. CAR is urged to revisit this issue as data becomes available to refine these parameters. **(CCC)**

RESPONSE: Agreed. While there is evidence that temperature conditions are relatively constant in landfills regardless of ambient conditions, there is also evidence that supports the assumption that decay rates and methane production at landfills are dependent on local climatic variables. The Reserve will continue to follow scientific research and will update the protocol appropriately in future revisions.

Table A.3. Methane Emission factors from the anaerobic decay of food and soiled paper wastes using Equation 5.3 and 5.4 ($MTCO_2e$/MT Food Waste (wet)

107. Do you mean per metric ton of "Food Waste (wet)" or "Combined Food and Soiled Paper Waste (wet)"? **(ECC)**

RESPONSE: It should be combined food and soiled paper waste on a wet basis. Thank you for pointing this out.

Table A.5. CO_2 Emission Factors for Fossil Fuel Use

108. There are fuel sources that are missing emission factors, like diesel and biodiesel fuel. **(Recology)**

RESPONSE: Noted. Table will be revised.

Appendix B Summary of Performance Standard and Regulatory Research

109. We agree with the statement in Appendix B regarding potential inclusion of specific "niche" industrial food waste streams into food waste offset methodologies, but feel that it would be

entirely appropriate to do so in this current protocol. However, we disagree with the conclusion reached in Appendix B that a performance standard for yard waste "cannot be established", since the project-specific eligibility tests required for grocery store food waste could just as easily be applied to yard waste, thereby ensuring additionality of any credits issued. **(USCC)**

RESPONSE: Noted. This was the conclusion from SAIC based on the available data at the time. The Reserve will continue to research data indicating state-by-state yard waste diversion rates and will consider adding yard waste as an eligible waste type in subsequent protocol updates.

B.4 Barriers to Composting Project Implementation

110. Another barrier is problems in permitting (where required) and public problems due to odor. Odors should be controlled and any compost process that is not sufficient to control odors should not qualify for carbon credits. Odors need to be controlled – a combination of GHG measures and measured odor levels should set the bar. **(WM)**

RESPONSE: Noted. The Regulatory Compliance requirements (Section 3.5) specify that projects must comply with all applicable laws and permitting requirements pertinent to the project activities. This requirement effectively bars projects from receiving credits during periods of non-compliance. This would include periods on non-compliance regulatory requirements related to site permitting and/or odor issues.