Mark Lichtenstein Written Testimony

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Response and Recovery to Environmental Concerns from the 2017 Hurricane Season

CONTACT INFORMATION

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SUMMARY

Vegetative waste from disasters should be mulched and composted, not burned.

Many local residents in Puerto Rico and the US Virgin Islands (USVI), and other off-island experts, have grave concerns regarding the potential ecological and human health impacts of the disaster debris management method of choice for vegetative debris by the US Army Corp of Engineers—Air Curtain Incineration (ACI). The majority of the debris from the recent hurricanes is clean wood from fallen trees and limbs, and other vegetation. There are serious and valid concerns that ACI will emit harmful chemicals and remove material that the soil and plants need to flourish.

ACI is a process has not been clearly explained to local decision-makers and the general public. There are no pollution controls on ACIs, and they can emit concerning levels of particulate matter and other air pollutants. The islands are a sensitive tropical ecosystem with high temperatures and high humidity. Residents who have asthma and other respiratory and cardiac diseases, could experience worsened conditions by increased air pollution. Many people on the islands have expressed worry about ACIs becoming a severe detriment to their health. In addition, it is absolutely critical that vegetative material from the hurricanes be kept on the islands and composted. Experienced experts from Puerto Rico, the USVI, and stateside have worked together to develop a plan that will ensure the process is done safely and efficiently.

The residents, tourists, and visitors of our American paradise—Puerto Rico and the US Virgin Islands—deserve clean air and a healthy ecosystem, and are asking federal representatives to help them implement more sustainable and healthy options. ***FEMA, the Army Corp, and other federal representatives can develop a new sustainable management scheme for debris on the islands that can be deployed in the future in other communities stricken by disasters.***

OVERVIEW AND INTRODUCTION

Qualifications

The primary author of this written testimony is Mark Lichtenstein who has more than 30 years of direct operations, planning, and leadership experience with solid waste management. This includes disaster experience related to major ice-storms, Superstorm Sandy, and post-Katrina reconstruction. Attachment A identifies other sources of information for this document.

Lichtenstein is currently based in Syracuse, NY, at the State University of New York (SUNY), College of Environmental Science and Forestry (ESF). He has been working in Puerto Rico and the US Virgin Islands (USVI) since 2009 to help advance sustainable approaches to waste management, and other initiatives, such as coral reef protection, marine debris management, and environmental education. He has been to the islands working on these issues numerous times. For the last two months, he has worked with local leaders and residents on both sets of islands, as well as the British Virgin Islands, to help devise a more sustainable approach to managing the massive quantities of storm debris.

Lichtenstein facilitated and helped the US Environmental Protection Agency (EPA) found the Puerto Rico and US Virgin Islands Recycling Partnerships in 2010. This week he was on the Puerto Rico main island, the Puerto Rico island of Vieques—very heavily damaged by the storms—and in the US Virgin Islands (USVI), where he also witnessed utter devastation on St. John and St. Thomas. He is a member of the Board of Directors of Island Green Living, an NGO based in the USVI, and has been working closely with people there to implement a composting/mulching solution to vegetative disaster debris.

As a Past President and Honorary Board Member of the National Recycling Coalition, Inc. (NRC), he helped found the NRC's Disaster Debris Sustainable Management Task Force as an immediate response to Hurricane Harvey.

The Situation on the Ground

After two months, Puerto Rico and the USVI are still in the midst of picking-up the pieces from the ravages of two back-to-back Category 5 hurricanes. Unofficial measurements on the ground on the USVI island of St. John had wind gusts approaching 275 MPH, and on the Puerto Rico island of Vieques, 250 MPH. The devastation in many locations is beyond belief. For the people on the islands, Irma and Maria were harrowing experiences for them; in fact, health workers on the islands are seeing cases of Post-Traumatic Stress Disorder. Children are now growing up fearing the rain while they sleep on the floors of their houses—houses that for all intents and purposes have no viable roofs.

In many cases, the efforts of FEMA, the US Army Corp of Engineers, and other responders are successful and greatly appreciated by island citizens. During the current stages of recovery, however, there is grave concern from many local residents and other off-island experts regarding the potential environmental, ecological, and human health impacts of a disaster debris management "method of choice" of the Army Corp—ACI.

For instance, many citizens and organizations in the USVI, including Island Green Living Association, have asked Governor Kenneth Mapp, and members of the USVI Legislature to oppose the incineration of the debris. Much of the debris is clean wood from fallen trees and limbs, and it also includes other vegetation. There is serious and valid concern that this incineration will emit harmful chemicals and remove material that the soil and plants need to flourish.

Island Green has introduced a petition on Change.org to ask Governor Mapp to move forward with his original decision not to incinerate <https://www.change.org/p/governor-kenneth-mapp-ban-the-burning-of-us-virgin-islands-natural-resources>. Island Green has been

urging residents and others interested in the health and environmental wellbeing of the USVI to sign this petition, and call and write to the Governor and the members of the USVI Legislature.

The past practice of FEMA and the Army Corp in situations like this has indeed been to use ACI, and they are proposing this for the USVI, and possibly for Puerto Rico as well (that is unclear to key government officials in Puerto Rico at this point, and that lack of clarity is a concern as well). Air Curtain Incinerators are basically large metal containers (approx. 30 cubic yards) with fans blowing air across the container to accelerate the combustion process, and theoretically, to control air pollution (namely, particulates). In some cases, instead of an above-ground container, pits are excavated in the ground, and the material burned there with the air curtain above the pit. It is rumored that the pit method is the recommended path forward for some of the debris on the USVI. It has not been clearly explained to local decision-makers and the general public by the Army Corp that there are no pollution controls on ACIs, and that they often emit particulate matter and other air pollutants. Representatives from the Army Corp shared questionable positive attributes of ACIs as recent as November 6, 2017 at a town hall meeting on St. John sponsored by the USVI Legislative President. Nothing about the lack of air pollution control was mentioned at this meeting.

During Superstorm Sandy, US EPA Region 2 conducted air monitoring, which must also be done in Puerto Rico and the USVI. After Superstorm Sandy, the burning happened on federal land in Brooklyn, NY with the nearest home 0.8 miles away. The Army Corps planned to burn for four months, but they stopped after one month because they could not get the ACIs to function properly. Air quality was exceeded during days of high humidity. That was in November in New York. This is a critically important point, because in Puerto Rico and the USVI, humidity is routinely extremely high.

The National Recycling Coalition (NRC) has called for government officials to use the most environmentally responsible and ethical disposal of storm debris materials, especially through composting, reuse, and recycling. According to NRC President Bob Gedert (August 30, 2017, Minneapolis, Minnesota):

> "The NRC recognizes the crisis for the residents and businesses is—as it should be—everyone's focus of the initial recovery efforts. However, as we've learned from Katrina and Superstorm Sandy, the next stages by necessity have to involve a restoration of the infrastructure, which by necessity includes appropriately dealing with the tens of millions of tons of debris. There is an opportunity to recover some of the material if proper steps are taken in the recovery process."

The NRC recognizes that among the possibilities for recycling are huge piles of vegetative debris, as well as the concrete and metal. There is infrastructure in place, and time-tested technologies to handle that process. The NRC also strongly opposes the use of ACI to dispose of debris, as has been done with previous disasters, *and encourages the federal government to deemphasize that option.* The NRC argues that ACI releases millions of pounds of toxins into the air, which can have long-term deleterious health impacts on an already affected populace.

It is also absolutely critical that vegetative material from the hurricanes be kept on the islands and composted. Experienced composting experts from the USVI and stateside have worked together to develop a composting/mulching plan that will ensure the debris management process is done safely and efficiently including recovery of valuable hardwoods for wood crafts, chipping (mulching), and composting which then results in an organic material that can be made available to local residents, farms, schools and businesses for free. This is a process that nature has perfected over millions of years and one that has been successful in

many locations, and at large scales, including in subtropical/tropical areas like the islands, and with other disasters (like Superstorm Sandy).

The USVI is a sensitive tropical ecosystem with high temperatures and, as noted, high humidity. Many residents of the USVI have asthma and other respiratory and cardiac diseases that are made worse by air pollution. The extensive operation of diesel and gasoline generators, and exposure to indoor mold caused by the storms, are already aggravating existing respiratory diseases. It is an understatement to say that the air quality would be severely impacted if burning were allowed to happen. Many people on the islands have expressed worry about ACIs becoming a severe detriment to their health and to their number one industry, tourism.

The residents, tourists, and visitors of our American paradise—Puerto Rico and the US Virgin Islands—deserve clean air and a healthy ecosystem.

MULCHING AND COMPOSTING: A COMMITMENT TO SUSTAINABILITY AND RESILIENCY

Benefits of Composting and Mulching

Mulching and composting is the safest, most efficient, and most effective way to manage vegetative debris.

There is a substantial amount of herbaceous, softwood, and hardwood vegetative debris on the ground on the islands. Mulching and composting is the best possible way to help the islands with vegetative debris management well into the future (not only during this disaster response). It is a straightforward process that is easy, safe, and time-tested. Large and successful composting operations exist all over the US and world. More about the recommended mulching and composting process is in Attachment B.

The islands need the vegetative debris.

The integrity of the fragile and unique ecology of the islands—particularly the USVI, and the Puerto Rico islands of Culebra and Vieques—can be negatively impacted by removing the vegetative waste through burning or burying. The carbon associated with this debris needs to be put back into the soil. Much of the topsoil—the layer that includes the nutrients needed for healthy plant growth—have been lost through excessive stormwater runoff during the hurricanes and as a result of the heavy rains during the weeks following the storms. Because of this, mineral and nutrient deficiencies are likely to occur. Finished compost will help to rebuild depleted soils and improve soil quality and health. Mulch can be used to reduce water loss

through evapotranspiration from the soil, improve soil quality and health over time, and act as a buffer against heavy rains, thus reducing soil erosion.

Chipping, grinding, or shredding—and composting—of vegetative debris results in mulch and compost. These are commodities that are very badly needed throughout the USVI in particular, but also in areas around Puerto Rico, such as the islands of Culebra and Vieques. Compost and mulch also:

- Create a rich nutrient-filled material, humus (like potting soil), that has many uses
- Increases the nutrient content in soils and helps regenerate poor soils
- Helps soils retain moisture (compost holds five times its weight in water)
- Reduces or eliminate the need for chemical fertilizers
- Suppresses plant diseases and pests
- Promotes higher yields of agricultural crops
- Has the ability to cleanup (remediate) contaminated soil
- Improves soil's ability to store carbon, helping address climate change
- Improves plant growth
- Reduces energy use for irrigation, and need for irrigation water

All over the world—including in the sub-tropics and tropics—large quantities of wood and other vegetative waste are effectively composted in a manner that improves soil health.

There is concern about the air and surrounding waters of the islands.

Mulching and composting will greatly minimize the carbon's (smoke and particulates) accumulation in the atmosphere and ocean. Composting creates some methane, carbon

dioxide, and water vapor, but its emissions pale in comparison to ACI. Composting is not known to create particulates, dioxins, heavy metals, or other air pollutants.

This is an opportunity to establish post-disaster sustainable waste management.

This is an opportunity to get a leg up on acquiring the infrastructure needed for comprehensive management of the islands' solid waste long-term, including vegetative and organic debris, which makes up around 50% of their normal waste stream. Both in Puerto Rico and the USVI, many of the landfills are overflowing, out of compliance with Federal rules and regulations, and posing many environmental and health threats. Aggressive and sustainable approaches to solid waste management have been on-going for the last seven years. Establishment of composting and mulching operations will continue the progress with more sustainable management of solid waste in the islands*. Importantly, it will serve as a model for many other communities across the US, both those that have suffered natural disasters, and others that have yet to fully address their solid waste challenges.*

Mulching and composting are very safe.

FEMA and the Army Corp have advised Governor Mapp and other USVI officials that mulch piles can spontaneously combust (burst into flame). This has occurred in other locations, but it is considered very rare. In those cases, it was due to a number of factors, including:

- The piles not being constructed properly
- Lack of moisture in the piles
- A dry climate

In the islands, fires do not spread easily, considering the high humidity (annual mean relative humidity is 75%; presently). There are numerous instances of landfill fires, and that too is used as an argument against mulching; however, when trash in a landfill is not mixed with copious amounts of soil, this allows fugitive methane to escape from the dump. A flammable brew is created, allowing for fire to start.

If aerated properly—through the simple mixture of chipped/shredded wood and other vegetative debris—this will allow for air circulation in a pile. In addition, compost only warms up to 140 to 150 degrees Fahrenheit. On rare occasions, it can reach 200 degrees F if it is mishandled. These temperatures are far too low to start a fire (water boils at 212 degrees F). Continuously aerated, wet wood chips are not a fire hazard. Dry chips can ignite. But again, humid air inhibits the spreading of fire.

Mulch and compost piles on the islands can be managed routinely for their moisture content in order to sustain the pace of decomposition (in the case of composting). Keeping the piles moist and aerated is the basic work of making mulch and compost. In addition, for the most part, the wood on the islands is of a low-risk grade; that is, it is not cone-bearing trees loaded with flammable resins. In sum, like any biomass material, piles won't combust spontaneously if they are kept moist and aerated.

Mulching and composing makes great economic sense for the islands.

Composting can create jobs and support the economies of Puerto Rico and the USVI:

- Composting can be small-scale and local, in addition to the large sites we'll need to create.
- Jobs will be local.

- Composting is importantly linked to urban farm production.
- Composting can diversify farm products and increase farm income.
- Compost products tend to be used locally.
- Use of compost products sustains additional businesses and green jobs.

On a per-ton basis, composting a ton of waste sustains four times as many jobs as sending that ton of waste to a landfill or incinerator. Positive economic arguments for chipping and composting (making valued commodities) do not stop with the debris removal, but continue beyond this disaster as basic infrastructure for comprehensive and sustainable solid waste handling well into the future.

All of the resulting compost and mulch can be used locally in Puerto Rico and the USVI.

On-island experts all agree that all of the compost and mulch produced from the disaster's vegetative debris can be utilized locally. Professional management of the mulching and composting will result in a more effective end result.

<u>Specific Concerns about Air Curtain Incineration</u>

Air curtain burning has great potential for negatively impacting the health of people already stressed by the storms and other factors.

Air Curtain Incinerators (ACI) do not burn at the same efficiency rate as other incinerators such as kilns or waste-to-energy facilities. In this case, efficiency is being referred to as the amount of unburned material that will end up in the air. No matter how efficient an

ACI is, particulate matter (small particles both seen and unseen) are produced. These are released into the air and could cause pulmonary aggravation, particularly for individuals with asthma. It is extremely important to point out that a host of other toxins are likely to be emitted into the air as well, and can have local and downwind impacts. These could include very toxic dioxins, furans, and heavy metals. Departments of health should be asked to address potential health issues especially for people with asthma, other respiratory disease, and heart conditions. Of particular concern, is that people are already breathing increased diesel and gasoline emissions from generators, and many are exposed to indoor mold.

ACI is particularly concerning in areas of high humidity and weather inversions. Failed air quality tests in New York City where air-curtain incineration was used was due to these factors. More analysis of ACIs needs to be completed by neutral organizations.

The experience of Air Curtain Incinerators after Superstorm Sandy needs to be considered.

ACIs were used at Floyd Bennet Field in New York City after Superstorm Sandy, as noted above, a process that failed some air quality tests. This is a very large parcel of federal land, and the closest residence was 0.8 miles away. The operation did not go well. It is claimed that when the New Jersey Department of Environmental Protection travelled to NYC to view the operation, they decided not to allow the use of ACIs in New Jersey to deal with storm debris in that state. That should be confirmed, and if true, the reasons why explored.

When considering the cost of options like burning, it is critically important to incorporate "externality costs."

Externality costs are those costs for which it's hard to put an immediate number. This includes the health impacts of air pollution, the effect of particulates from burning deposited on land and surrounding waters, long-term management of leachate from landfills where burner ash will be deposited, and the increased cost of landfill closure and monitoring due to ash disposal.

It is possible that ACIs can have flames and embers that could escape the burning unit.

This has the potential for a surrounding fire hazard. See Appendix C for images of air-curtain incineration.

ACI ash should not be put back onto the ground and in soils without first a very extensive testing protocol implemented.

The ash could potentially have a high pH (9) which will not be beneficial to many island soils, which have a high pH already. In addition, it is unknown whether other material would be burned with the vegetative debris. If so, there is great potential for other toxics and contaminates to be left in the ash. Even if other debris is not burned, it will be nearly impossible to keep from the ACIs plastics (like bags, tarps, etc.) that are tangled in the green waste. ACI ash is not like char one would get from burning wood in kiln.

Wood and organic material are resources that should not be destroyed through burning.

Open burning of wood and woodchips simply creates pollution that affects living organisms, and as noted, this is particularly problematic in the islands due to humidity and the elevated ambient air temperature. *Any type of incineration to manage the material is not beneficial at any level when considering numerous negative effects.*

Climate impacts need to be considered.

Climate is impacted by excessive carbon released into the atmosphere. ACIs release carbon dioxide and other climate impacting constituents into the atmosphere. Efforts should be made to reduce these inputs where other viable options exist, like mulching and composting.

There are a number of other important unanswered questions about the use of ACI in the islands and elsewhere that should be answered.

See Appendix D for these questions.

Attachment A: Information Sources for this Document

Citizens Speaking at St. John Town Hall Meeting: November 6, 2017

Stephen Bantillo: Developer and manager of government sustainable materials management systems including organics and compost. Director of national building materials management certification protocol, Executive Vice President National Recycling Coalition (NRC), Chair of the NRC's Disaster Debris Management Task force. Extensive disaster debris management experience.

Jean Bonhotel: Expert compost and organic management expert with decades of experience, including with animal mortality composting. Leads the highly renowned Cornell Waste Management Institute. Has designed and implemented numerous composting systems in the sub-tropics and tropics. Familiar with the islands.

Jim Doersam, P.E.: 30 years of large-scale composting facility design and operations experience, including in Texas. Member of the USVI Recycling Partnership and familiar with the islands.

Judith Enck: Previous EPA Region 2 Administrator, Co-founder of the US Virgin Islands Recycling Partnership, sustainable materials management and recycling expert.

Bob Gedert: President, National Recycling Coalition, Inc. (NRC)

Greg Gunnel: University of the Virgin Islands Caribbean Green Technology Center

Dawn Henry, Esq.: USVI Commissioner of Department of Planning and Natural Resources

Senator Hon. Myron D. Jackson: President, USVI Legislature

Mark Lichtenstein: Composting expert having designed and operated compost and sustainable wood management systems for nearly two decades (for a 900 square-mile region). Solid waste and sustainable materials expert, facilitator of the USVI Recycling Partnership since 2010, and

has disaster debris management experience from Superstorm Sandy and multiple ice-storms. Co-founder of the NRC Disaster Debris Management Task Force, and helped with sustainable rebuilding efforts in the Lower 9th Ward in New Orleans after Hurricane Katrina.

Roger Merritt: Executive Director of Virgin Islands Waste Management Authority.

Dr. David Minner: Composting expert for Iowa State University and Gifft Hill School EARTH Program.

Susan Parten, P.E.: Civil and environmental engineer. Practices in both USVI/Caribbean (15 years) and Texas (more than 30 years). St. Thomas property owner, and experienced with developing design and operational plans for municipal scale composting operations, centralized and decentralized wastewater systems, storm-water management, and low impact development practices.

Brenda Platt: Executive Director of the Institute for Local Self Reliance, sustainable materials management and composting expert

Dr. Gary Ray: A USVI resident, USVI Recycling Partnership member since its founding in 2010, Island Green Living Association co-founder, and scientist specializing in ecology.

Carlos Robles: USVI Commissioner of Agriculture

Lisa Ruggero: Sustainable materials management expert, and member of the USVI Recycling Partnership since 2011. Experienced with Superstorm Sandy debris management.

Carly Swope: Sustainable Tourism Intern, Island Green Living (USVI) from Temple University.

Harith Wickrema: Resilient and Sustainable Visionary/Thought leader. President of Island Green Living, Chairman of Board of Virgin Islands Waste Management Authority. Earned EPA Region 2 Environmental Champion Award in 2017.

Melissa Young: Master composter and sustainable materials management expert. Experienced with Superstorm Sandy debris management. NRC Board Member.

Attachment B: Steps for Sustainable Vegetative Debris Management on the Islands

1. **Segregate precious tropical hard woods like Mahogany:**

   It makes the most sense to first, segregate tropical hard woods for use by local woodworkers, artisans, and students. This can take place through education so people sort it at their residences, and then at the mulching/composting locations (set aside for beneficial use). This will take care of a very small percentage of downed trees.

2. **Chip into wooded areas where it is feasible:**

   Where it is appropriate, pull-behind chippers should be used to blow chips directly back into the adjoining wooded areas from the roads (such as the National Park lands on St. John). This eliminates the need to move the unprocessed/downed wood or chips to central locations. It also puts the nutrients directly back into the ecosystem where they are needed. The chips will be beneficial to next generation plant growth and it will help build soil. It should be distributed in thin layers when blown through the chipper chute. Likely, this can only be done on some roads through wooded areas. The chute will have to be maneuvered back and forth to create a thin layer of chips in the vegetated area. Piles of chips are not recommended.

3. **Federal officials should encourage a systematic RFP process for mulching and composting services before other management methods such as ACI are pursued:**

   A process of static windrow composting is best for the storm debris on the islands. The optimum goal is to keep as much of the vegetative debris near the locations where it was created (limit moving it to other locations). There are many qualified companies in the US that can establish professionally-operated composting operations, which will provide clean compost from three to 12 months. The RFP should identify contractors who have

experience composting untreated wood waste and green debris in a manner that will result in a valuable end product. It can be the responsibility of the selected contractor to offer the end-product compost, with support for the government. Government agencies should be given priority in providing the end-product compost for use on public land.

4. **Collection and chipping:**

The vegetative debris needs to be collected and size reduced, which is happening in some locations around the islands already. This is accomplished with chainsaws, tow-behind chippers, tub grinders, or shredders and can employ local people to collect the debris, run the machinery, and convey chips and grindings if equipment is allocated to the islands, or contract services are secured. Chipping, grinding, or shredding the material once is most efficient. It is important to chip the material to the right size the first time. If chipping cannot be coordinated within the islands, other contractors may be available to size reduce the material. Island-based trucks would need to convey and dump material into "windrows" in designated areas for mulching and composting. Areas need to be chosen and managed so as to limit wood chips from being washed into the ocean.

5. **Mulching:**

Mulching and distributing wood chips could address about 20-40% of the vegetative waste in the islands.

Mulch consists of wood chips or shredded wood, which is piled and distributed to users right away. If clean (no plastics or other materials mixed-in), this material can be used immediately once chipped. Some mulch (wood chips) need to be saved to provide a base for the composting operation. If the mulch piles are not distributed immediately, they then should be managed for composting.

Some example uses for mulch (wood chips):

- Offered to local residents and businesses for free
- Stabilizing slopes
- Utilize at hotels for mulching around horticulture
- Rebuild government green infrastructure (stormwater management) projects

6. Composting:

Composting could take up the remainder of the vegetative waste (60 to 80%). [Some heavily contaminated material would have to be managed through other means.]

Island-based trucks would need to convey and dump material into "windrows" in designated areas. Composting materials through "passive aerated static windrows" would be most efficient and beneficial in the long run. Equipment is not available on the islands to manage turned windrows (such as windrow turners). Passively aerated windrows are a lower tech solution that rely on larger wood chip sized to allow air to travel through the pile, promoting the breakdown of vegetative debris. Much of the vegetation will be herbaceous with softwood and some hardwoods. This plant material ground and mixed together will create a very good mixture for successful passive composting.

This really is just about properly designing the windrows, and then managing the incoming material so that the windrows can be piled and spaced appropriately.

- It does not take that long to make a product: from three to 12-months depending on the mixtures of waste (more fruit, leaves, grass, and vegetables will speed-up the process).
- Rain, humidity, and the normal temperature in the islands is good for the piles.
- The piles don't need to be turned.

- There should be no problem with the carbon to nitrogen (C/N) ratio, important for an effective composting process. Along with periodic monitoring of moisture (a very basic and easy process), keeping the piles moist, and constructing the piles according to prior recommended dimensions, this C/N ratio will help reduce the possibility of spontaneous combustion.
- A screening machine would be beneficial at the end of the process to make the compost finer, and to screen out remaining wood chips or any plastic. These seasoned wood chips will help accelerate the composting process (they include bacteria and other organisms that will help kick-start new composting).

Some example uses for compost:

Finished compost is beneficial for erosion control, roadside use and new construction, trees and shrubs, landscaping and container mixes, agriculture, fruit and vegetable crops, turf establishment and maintenance, sports fields, around the two airports and building topsoil anywhere where soil structure has been compromised. Using composted product as a soil amendment would also avoid use of fertilizers, and their accompanying impacts on watersheds, and helps to retain water and reduce erosion. Composted product could be mixed with pulverized glass to make an excellent backfill material. Compost could also be mixed and used for utility trench backfill.

Composting will result in a 50% reduction of material. Arguably, the best air-curtain incineration will do is maybe 90% reduction, with 10% ash remaining (which needs to be disposed-of, and likely will contain higher concentrations of contaminates). The remainder of the burned wood will have been wasted into unused heat and emissions, such as carbon monoxide, carbon dioxide, other oxides, particulates, and other constituents that could negatively impact the environment and human health. Composting has some emissions

(heat, moisture, carbon dioxide), but not on par with incineration. The difference between the two options is that there will be 40% net material (composting vs. incineration) which will be distributed as final produce anywhere from three to 12 months, and the key is that material has multiple beneficial uses vs. air pollution and wasted heat. However, there will be some noise from chippers and grinders, and use of diesel fuel for machinery.

Eventually, other materials can be composted. In the longer-term, bio-solids processed at the sewage treatment plant and food waste from restaurants and institutions could be added (both are consistent supplies of nitrogen needed for effective composting). This will further reduce the impact of waste on island (and other) landfills, and create even better-quality compost for residents and agencies to use.

The goals here are immediate (manage the disaster debris), longer-term (provide for long-term organics management on the islands) and development of best management practices for disaster debris management elsewhere.

How much will composting cost?

Until an RFP is issued, it is difficult to identify an overall cost, but experts agree that immediate costs will be competitive with the estimate for air-curtain incineration on the islands. In addition, however, it is critical to consider three important points:

- Externality costs for air-curtain incineration can dwarf the costs for composting and mulching.
- Composting and mulching produces a product that will have many important uses on the islands.

- Composting and mulching keep the organic material in the vegetative debris on the island to improve soil, vs. burning which does not eliminate or destroy the vegetative debris, it only transforms it into air pollution, ash, and waste heat.

Attachment C: Images of Air Curtain Incinerators

Note and Credits: The US Army Corps of Engineers performing an Air Curtain Burning of over 77,000 cubic yards of vegetative debris, mostly tree branches downed by Hurricane Sandy at Floyd Bennett Field in Brooklyn, N.Y., Nov. 28, 2012. Source: Chris Kleponis, https://www.dvidshub.net/image/790740

Note and Credits: A US Army Corps of Engineers air-curtain burning pit in Savannah, Georgia. Source Savannah division of Army Corps.

https://www.flickr.com/photos/savannahcorps/12074999196/in/photostream/

Attachment D: Important Questions Regarding Air Curtain Incinerators on the Islands

1. What are the locations where the incinerators will be sited?
2. How many incinerators will be used at each site?
3. Will constructed pits or containers be used for the burning?
4. What will be the hours of operation?
5. What are the meteorological conditions at each site?
6. How will wind and temperature conditions be factored? For instance, after Hurricane Sandy, the Army Corps of Engineers burned wood at the Floyd Bennett field in NYC during the month of November. On the warmer and more humid November days, air quality exceedances took place. Those days are much cooler than what is experienced every day in USVI. Is there a temperature level at which the burning would cease? Same question for wind conditions.
7. How much material will be burned at each site?
8. What material will be burned (just vegetative waste, or mixed debris)?
9. How long will the incinerators operate? Approximate start date and approximate end date.
10. What local and or federal air permits are needed? Have permit applications been made?
11. Will local agencies or EPA conduct air monitoring immediately downwind of the incinerators?
12. Will there be a commitment of not operating the incinerators until the air monitoring equipment is set up and operating?
13. After Superstorm Sandy, EPA did air monitoring and found some violations of air quality standards. However, EPA tested quite a distance away from the air curtain incinerators.

Will local agencies or EPA commit to establish the monitors immediately downwind from the air curtain incinerators?

14. What will be tested as part of the air monitoring (dioxins, furans, heavy metals, particulates, etc.)?

15. When reporting air test results, EPA used 24-hour averages, even when the incinerator did not operate 24 hours each day. Will there be actual test results shared with the public and not just 24-hour averages?

16. Will DPNR or EPA post air monitoring results on a publicly available website?

17. How much ash is produced from each air curtain incinerator?

18. Where will the ash be disposed of?

19. Will there be ash testing, and if so, what testing practical will be used?

20. Will a private contractor operate the air curtain incinerators? Was an RFP issued and what contractor(s) was selected? Copies of the RFP and background on the contractor should be made public, if one has been selected.

21. Will the cost comparison of mulching, composting, and incineration be made public? c

22. Burning plastic creates dioxin and other air contaminants. What will be done to ensure that plastics and other non- wood waste are burned in the incinerators?

23. In addition to plastics and non-woody debris, what controls will be used to make sure that contaminated wood waste such as treated lumber is not burned?

24. Is there the ability to add pollution controls to the air curtain devices?

25. After Hurricane Sandy, the state of New Jersey would not allow the use of air curtain incinerators. They were used in NYC at Floyd Bennet Field, federal land that was a long distance from homes. The Army Corps of Engineers planned to burn for 16 weeks but stopped after four weeks. Why?

26. The burning at Floyd Bennet Field occurred during the month of November. Burning in the USVI will be in a hot and humid environment. How will that affect local air quality?

27. The Army Corps of Engineers was in charge of the air curtain incinerator operation in New York City after Hurricane Sandy. When that was completed, what percentage of wood was burned and what percentage was composted?