SAVE THE BAYS REPORT: *OCTOBER 10, 2019*

Equinor spilled 5 million gallons of oil over Grand Bahama's delicate pine forest and wetland ecosystems, causing untold damage which will take years of remediation to overcome. It could have been much worse.

We must learn our lesson from the catastrophe, pass far reaching environmental protection and disaster prevention laws, and rethink our relationship with fossil fuel facilities on the whole, before it is too late.

Oil soaked land outside Equinor's holding walls just after the passage of Hurricane Dorian

SAVE THE BAYS


Oil spill is a dire warning
"The beach in High Rock, east of the terminal, was befouled with oil for more than a mile and a half,. I have no idea how far the oil drifted south into the water, but it has impacted pine forests and wetlands for 7 miles to the north."
– STB Chairman Joseph Darville.

The disastrous impact of Hurricane Dorian on Grand Bahama, which caused 5 million gallons of oil to spill from the South Riding Point storage facility, should teach the government a lesson and lead to a definitive rejection of the notorious Oban refinery proposal before it is too late.

Fred Smith, legal director of of Save the Bays, said the government would be "insane" to continue courting another dangerous and reckless facility of this kind.

"The situation in Grand Bahama today, where a large swath of landscape is polluted with heavy, dirty oil, the water table is likely contaminated and residents have been told they must avoid the water supply, should serve as a dire warning," he said. "The time has come to close the door on this potentially disastrous flirtation with the Oban proposal.

"The government will have to ensure Equinor urgently cleans up the South Riding Point area. They would be insane to create an even larger threat to the pristine and ecologically invaluable eastern end of the island."

Smith said oil refineries are bastions of an outdated and defunct form of energy production and produce very few jobs for locals with the profits all being shipped overseas into the bank accounts of foreign owners.

"It is, and has always been a lose–lose scenario for Bahamians and the time has come to put an end to it. The government must tell Oban to take a hike," he said. "Climate change means that storms will only get stronger and more frequent; a disaster on the scale of South Riding Point or even greater is not a question of if, only a question of when."

The Norwegian oil company Equinor is now working to clean up the oil spilled from its terminal when Hurricane Dorian blew the tops off of 5 oil storage tanks, but according to STB chairman Joseph Darville, the work did not start in earnest for days after the spill.

"The beach in High Rock, east of the terminal, was befouled with oil for more than a mile and a half," he said. "I have no idea how far the oil drifted south into the water, but it has impacted pine forests and wetlands for 7 miles to the north.

Frederick R.M. Smith, QC

"More than a week after the hurricane, we saw no one doing any kind of clean-up," he said. "In fact the only people we saw were two security guards, who told us we were not allowed to fly our drone to take aerial shots of the spill.

"In the area immediately surrounding the plant, oil is settling into all of the puddles and low spaces. Worst of all, it has permeated our water table, which sits only three feet below the surface through porous limestone rock."

Darville congratulated the Grand Bahama Port Authority for recognising the danger this poses to the health and safety of the public, warning residents not to use the water supply for drinking or washing. But, he said, he knows of no plan in place to restore safe water supply to the island.

"I warned the Grand Bahama Utility Company that they needed reserve tanks for the island in case the water table became contaminated, but they ignored me. Perhaps they too would do well to learn a lesson from this," he said.

Regarding the proposed Oban oil refinery project in East Grand Bahama, Darville was adamant.

"This is a warning," he declared, "that we need to permanently shelve this foolish, asinine, ignorant proposal for good. It would be unconscionable for the government to move forward with this proposal now."

On August 31 Hurricane Dorian arrived in Grand Bahama after devastating Abaco. The Equinor above-ground storage tank (AST) facility was hit by the storm and 5 tank roofs were blown off, resulting in an oil spill.

REPORT: Observations from the Equinor Oil Spill By Save the Bays

Figure 1 – Aerial photograph of the Equinor tank farm after Hurricane Dorian

1. VISUAL OBSERVATIONS

Equinor operates 10 crude ASTs, 6 of which sustained considerable wind damage during Hurricane Dorian. Satellite and aerial photographs show that the roofs of those 5 tanks were blown off, see Figure 1. It appears that the majority of the oil leak has originated from the second tank from the left in the middle row. The tank roofs were blown off the first 2 tanks from the left in the upper row, but no spillage can be seen. It appears that these tanks were partially filled. Had there been a more significant storm surge, these tanks would have collapsed, resulting from buckling of the tank shell.

It further appears that the first tank on the left in the middle row was empty at the time of the hurricane, and in fact probably has not been used in a while (evidence of rust inside the tank). The 2 tanks at the right in the middle row appear to be full, so although the roofs were blown off, little appeared to have been spilled from these 2 tanks.

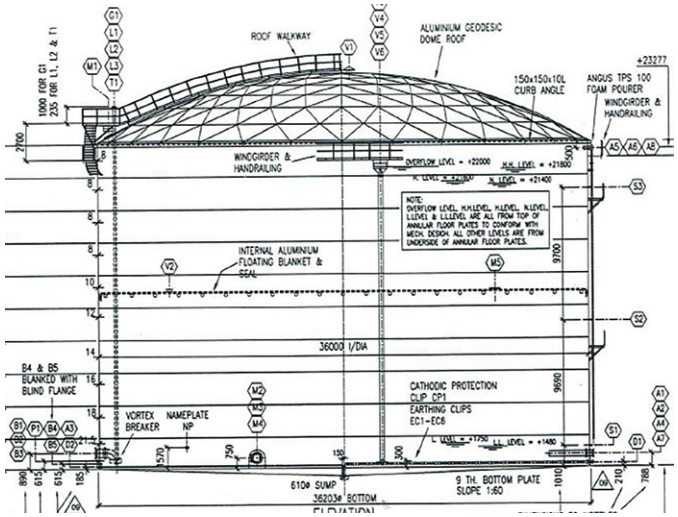
The bottom 3 tanks are intact. The photograph clearly shows the direction of the spill in the north-east direction. Note that during the second part of hurricane, the eye stalled around Freetown/High Rock with the winds coming from the south west. Probably it is at that point of the storm when the roofs blew off.

Figure 2. is a satellite photograph showing the extent of the crude oil spill. The direction of the spill suggests that at the moment the risk of contaminating the water is small as long as Equinor can stabilize the 2 tanks that are full but without roof. In the absence of a roof, the tanks must be emptied as soon as possible. Heavy rains could cause the tanks to overflow with a chance that the crude flow into the water.

Figure 2 – Satellite photograph showing the extent of the spill

2. TANK INTEGRITY

In the United States, welded ASTs are generally constructed in accordance with American Petroleum Institute (API) Standard 650 – Welded Tanks for Oil Storage and maintained in accordance to API Standard 653 -Inspection and Repair for Petroleum Tanks.



In order to assess the structural integrity of the 10 storage tanks, we need to understand whether indeed the tanks were built according to these standards or any equivalent British or Norwegian standards. To the extent that a lack of periodic maintenance and investment in the infrastructure may have played a part, this would fall on the shoulders of Equinor, but also the Government of the Bahamas for a lack of regulation requiring the same.

It wasn't just the tanks - homes, livelihoods and lives were destroyed across Grand Bahama by the monster storm

The broken tanks are marked by evidence of the spill, which was driven northward by the relentless winds.

3. EXTENT OF THE SPILL

According to the company, 119,000 barrels or 4,998,000 gallons of oil were spilled. Of this, 35,000 barrels, or 1,470,000 gallons have been recollected so far.

According to a communique from the Bahamas Government on October 7, 2019, it is estimated that the oil spill spread inland up to seven miles into coppice environments north of the facility. It is estimated that some 700 acres of pine forest have been affected. The Department of Environmental Health confirmed that the product that was spilled was Dopa crude oil. The spill proceeded in a northerly direction, meaning it may not pose a serious threat to the marine environment at this time.

However, in addition to affecting pine forests, the spill contaminated water in critical wetland habitat, including an area more than one mile away from the spill, according to sampling done by Waterkeepers Bahamas, Save the Bays, and Waterkeeper Alliance.

The groups took water samples at five locations near the Equinor/STATOIL spill, sending 54 individual water samples to Environmental Chemists, a certified water testing lab in Wilmington, N.C. The water sample analysis shows distinct petroleum constituents, including alkanes, terpenes, and organic acid which were well above natural occurrence levels.

The main concern is that the oil will eventually make its way deeper into the island's scarce freshwater resources. These wetlands serve as a place where water is filtered before entering the underground water table. The oil, however, can diminish the quality of the island's groundwater. Wildlife that call the wetlands home can obviously suffer, but so can people who depend on groundwater for drinking or freshwater resources for fishing.

4. OIL SPILL PREVENTION

The first and most obvious question is, how could the Bahamas have hosted oil bunkering facilities in the first place, without disaster response regulations and a comprehensive Environmental Protection Act to give them teeth? Without statutory authority, proper oversight and a disaster management plan, the government's response could not be anything but slow and ineffective.

If and when the Government decides to enact such legislation, certain international guidelines are available. For example, any oil spill prevention program should include the Spill Prevention, Control, and Countermeasure (SPCC) regulations and a Facility Response Plan (FRP). An SPCC helps facilities prevent a discharge of oil into navigable waters or adjoining shorelines. An FRP rule should require facilities to submit a response plan and prepare to respond to a worst-case oil spill or threat of an oil spill. The goal of the SPCC is to prevent discharges of oil into navigable waters, and one of the primary ways to achieve this goal is to require secondary containment.

Any SPCC regulations should cover two types of secondary containment requirements: general and specific. General secondary containment requirements should address the most likely oil discharge from a facility; specific secondary containment requirements — sometimes called sized secondary containment requirements — should address a major container or tank failure. All facilities must meet the general secondary containment require-

Workers clean up oil-covered debris.

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Workers are cleaning up what they can in South Riding Point, Grand Bahama.

OBAN MUST BE BLOCKED AT ALL COST

While Equinor is a reputable international oil company based in Norway, Oban appears to be an opportunistic company with little experience in operating complex facilities such as refineries. Oban must be stopped. Hopefully the Equinor oil spill can open the Government's eyes to the high risk they are taking in permanently destroying the fragile ecosystem of the Grand Bahama Island.

EQUINOR LOCATION JUST SIMPLY WRONG

The Equinor spill is but a small glimpse of the devastation that could happen if the $5 billion Oban refinery proposal is approved.

ments, while bulk storage containers and tanks must also meet the specific containment requirements. All areas of all facilities with the potential for oil discharge should be subject to the general secondary containment provisions, which should require that these areas be designed with appropriate containment or diversionary structures to prevent harmful discharges.

A good model for current SPCC and FRP regulations, which the Bahamas Government may want to look at, is provided by the United States Environmental Protection Agency (EPA).

Examples of general secondary containment are:

- Impervious dikes, berms, retaining walls, curbing.
- Culverts, guttering, or other drainage systems, including storm-water retention ponds.
- Weirs or dam-like structures generally used with skimmers.
- Booms and sorbent materials used to recover liquids.
- Barriers such as spill mats and storm drain covers.
- Areas where certain types of containers or activities occur are also subject to additional, more stringent specific containment requirements (40 CFR 112.8).
- In general, the specific containment provisions should require containment sized to capture the volume of the single largest tank.

For petroleum products, the most-widely recognised and instructive standard on secondary containment in the United States code NFPA 30, the Flammable and Combustible Liquids Code. This code provides that Class I through Class IIIA liquids (liquids with flash points below 200 degrees F, including most petroleum liquids other than heavy fuel oils) shall be contained in the event of a spill or rupture, and that the volume of the containment system be large enough to hold the contents of the largest tank. It further specifies that the containment area be constructed of earth, steel, concrete or solid masonry designed to be liquid-tight.

The requirements stated in other fire codes such as the United States' Uniform Fire Code (UFC) are similar to those in NFPA 30. Some NFPA 30 and UFC requirements are duplicated in the federal Occupational Safety and Health Administration's (OSHA's) Flammable and Combustible Liquids Code (29 CFR 1910.106).

5. RESPONSE TO AN OIL SPILL

Tank owners should bear the financial responsibility of spills and be required to respond to and mitigate a worst-case discharge of oil or other hazardous substances.

Once the crude has spilled, there are various response methods available. These are:

a. Shoreline Flushing: This method uses water to remove or re-float stranded oil, which allows it to be more easily recovered as a slick on the water. One of the lessons learned from the 1989 Exxon Valdez oil spill was to be very careful about water pressure and temperature to avoid causing more harm to the shoreline.

Experts brought in to clean up the spill. Equinor has been criticized for taking too long to start remediation in earnest.

b. Booms: These long, floating barriers are used to keep spilled oil off the beach, or to collect it after being flushed from the beach into the immediate waters.
c. Vacuums: Large industrial vacuums can suction oil off the beach or shoreline vegetation.
d. Sorbents: These specialised materials, which can take forms such as square pads or long booms, are engineered to absorb oil but not water.
e. Shoreline cleaners and bioremediation agents: There are a variety of chemical cleaners for oiled shorelines that usually require special approval for their use. Surface washing agents are used to soften and lift oil off of surfaces or structures that have been oiled, such as beach rocks, docks, and riprap. Bioremediation agents on the other hand, often take the form of fertilisers that help speed up natural microbial degradation processes. However, conventional cleanup methods (e.g., booms and sorbents) typically are used first to their fullest extent to remove the worst oiling, while these alternative measures usually play a secondary role.
f. Burning: Responders sometimes will perform controlled burns, also referred to as "in situ burning" of freshly spilled oil floating on the water's surface or on marsh vegetation.

g. Manual recovery: This method involves using buckets, shovels, rakes, and other hand tools to remove oil from shorelines. It is very labor-intensive but is often a primary tool for a response when access for larger equipment is impractical, such as on remote beaches or those without road access.
h. Mechanical removal: When access is possible and won't cause too much damage to the shoreline, responders may bring in heavy machinery, such as back-hoes or front-end loaders, to scoop up and haul away oiled materials in bulk.

6. WHAT IS NEXT?

The previous sections provide some superficial background on suggested design, maintenance & inspection, oil spill prevention, and oil spill cleanup, based on which, a plan going forward should be developed to ensure increase integrity of the ASTs, which includes securing the tank roofs and avoiding buckling and tank collapse, which fortunately due to the lack of a storm surge did not happen.

Tank Integrity:

a. While a category 5 hurricane results in extremely high forces, the roof on each tank should have been designed such that it could withstand the wind force, particularly in light of the fact that the tanks are in an environmentally sensitive area. The tank roofs must be able to withstand 200+ mph winds.

An important part of spill prevention is secondary containment in the form of walls or levies. It appears that the secondary containment was not sufficient to contain the content of one tank.

b. It was observed that some of the tanks were only half full. In this case that prevented additional spillage. However, if there had been more storm surge, these half-filled tanks would have collapsed. This can be avoided by filling the tanks. The best way is to empty the tank when a hurricane is approaching and fill with water.
c. It must be determined to what standard the tanks are constructed (API 650 or equivalent), and to what standard the tanks are inspected and maintained (API 365 or equivalent).

Oil Spill Prevention:

a. An important part of spill prevention is secondary containment in the form of walls or levies. It appears that the secondary containment was not sufficient to contain the content of one tank. Moreover, Figure 2 shows that 2 tanks (2 right-side tanks in the middle row) were within one retaining wall. If one tank would have collapsed the second tank would have surely failed and the existing wall would be insufficient to contain the crude oil.
b. The tanks appear to be too close together.

Oil spill Clean-Up and Restoration

Once the crude oil has spilled, a clean-up and restoration process must be initiated. As late as September 8, there was no evidence that clean-up had commenced. When work did begin, it was sparse and not in accordance with International best practices. The Bahamas Ministry of Environment only reported on September 18 that clean-up crews had arrived on-site.

Figure 3. – Restoration process

On October 2, STB president Joseph Darville visited the site and noted that a number of Bahamians had were engaged in clean-up exercises without having been issued any protective gear. The company has since denied that any workers were in danger.

We understand that now, several international experts are on-site and working on the clean-up. These include Polaris Science, a provider of oil spill evaluation services and countermeasure equipment; as well as CTEH, a team of crisis management and disaster response experts. STB is pleased both with the clean-up effort that is now underway, and with the transparency the company is now showing. Clearly, the teams on the ground have a good awareness of the various ecosystems impacted.

However in our view, full scale cleanup should have begun sooner. Equinor should have had a clean-up plan in place, which should have been required by regulators.

Rashema Ingraham of Save the Bays (at front, right) and members of the Waterkeeper Alliance tour the oil spill site

Figure 3. shows a possible sequence to follow to achieve complete restoration. The process consists of 4 steps. Step 1 is the pre-assessment to determine the extent of the damage inflicted to the environment. Step 2 is the assessment what can be restored and plan for the implementation. Once the planning is completed, a decision has to be made who will pay for the restoration (remember that clean up alone may not be sufficient). The clean-up and particularly the restoration cost will be very expensive. Hence, there will be a step where a settlement is made between the Bahamian Government and Equinor or the issue will be litigated. The final step will be restoration.

According to a communique from the Bahamas Government on October 7, 2019, it is estimated that the oil spill spread inland up to seven miles into coppice environments north of the facility. It is estimated that some 700 acres of pine forest have been affected. The extent of the impact on wetlands remains unknown.

7. OBSERVATIONS

In the opinion of STB's expert advisors, the Equinor tank farm is in an environmentally sensitive location and in reality should have never been built there, also considering the fact that it is in a region with frequent hurricanes. No matter how strong the tanks are made, there is a considerable probability that the tank wall will rupture and that collapse will occur; the consequences of such an occurrence is extremely high. In other words, the risk of severe damage to both the onshore and aqueous ecosystems is very high.

Understanding the high risk of having any oil processing or storage facility at this location (particularly the environmentally sensitive east side of the island), the Equinor facility must be strengthened and the secondary containment must be improved significantly. Removing the facility would be the best option.

However, the construction of the Oban refinery/mixing facility must be blocked at all cost. While Equinor is a reputable international oil company based in Norway, Oban appears to be an opportunistic company with little experience in operating complex facilities such as refineries. Oban must be stopped. Hopefully the Equinor oil spill can open the Government's eyes to the high risk they are taking in permanently destroying the fragile ecosystem of the Grand Bahama island.

The Department of Environmental Health confirmed that the product that was spilled was Dopa crude oil. The spill proceeded in a northerly direction, meaning it may not pose a serious threat to the marine environment at this time.

Figure 4: Oil settling into crevices and holes in the pine forest north of the spill site

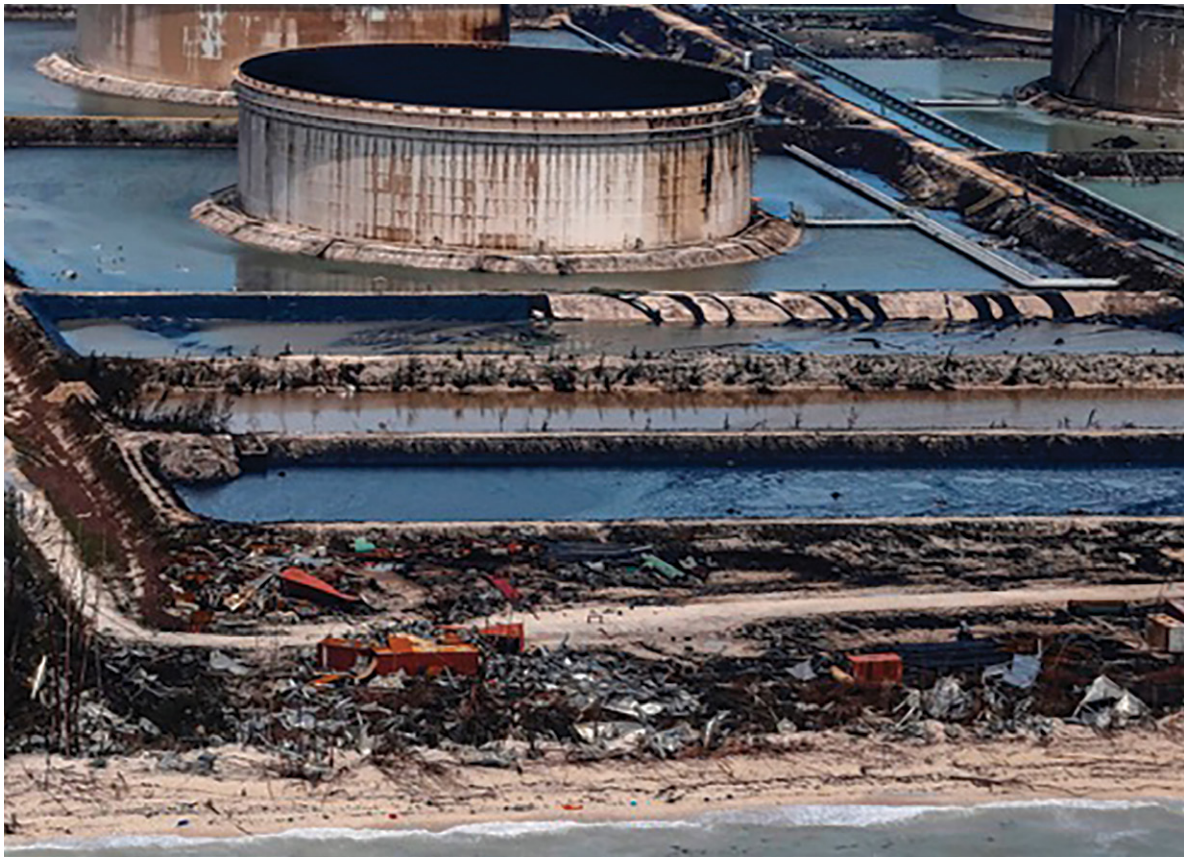

Figure 5: One of the tanks that lost its roof during the storm.

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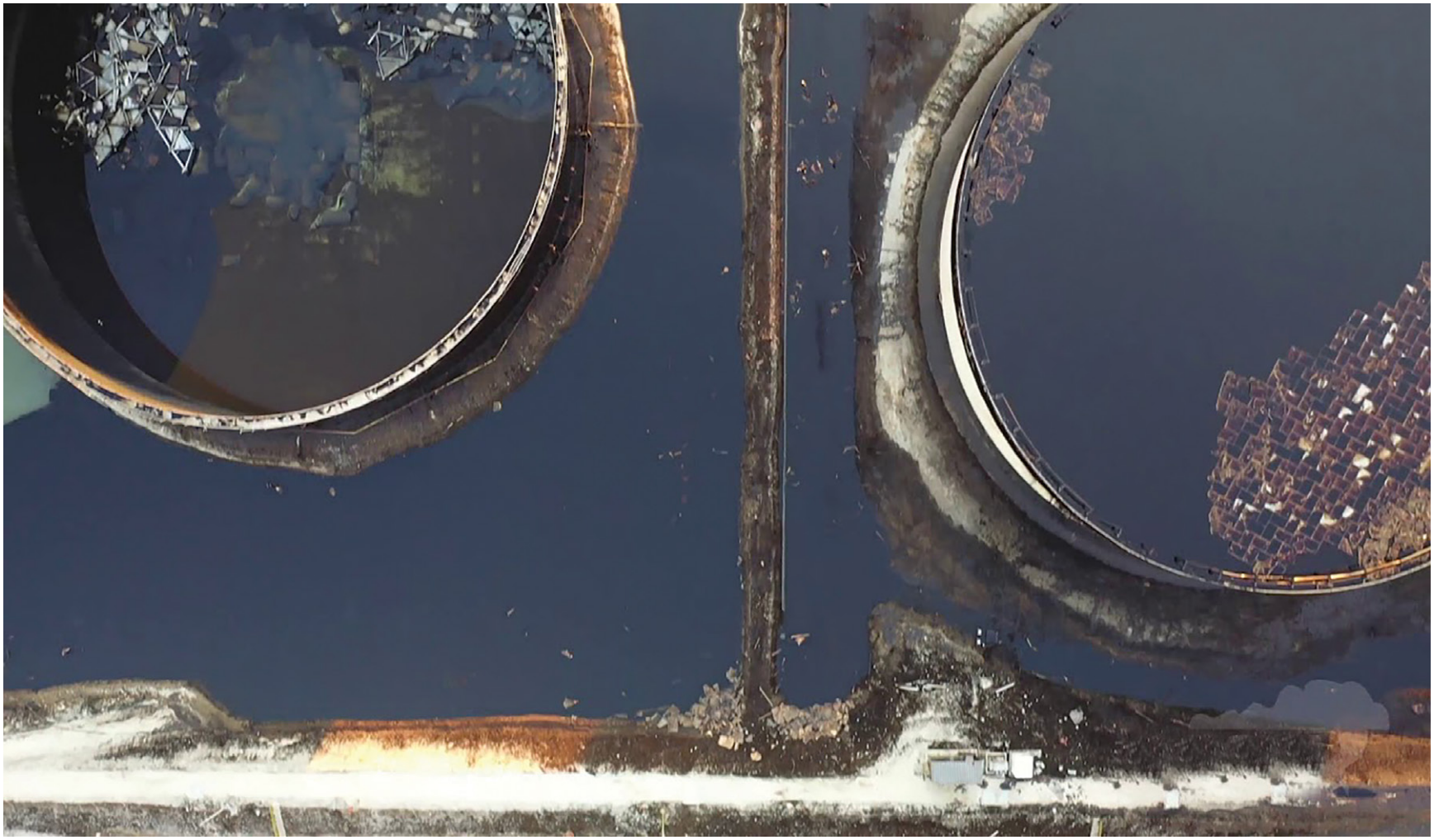
THE FUTURE

In light of this spill, it is important to consider the relationship between the Bahamas and such facilities in general going forward. This applies to Oban as well as any other fossil fuel bunkering or refinery operation that may be proposed.

There is convincing evidence that around the world, fossil fuels are declining as a source of primary energy, from 29% of world primary energy use today, to 17% in 2050. This reduction is largely due to the rapid electrification of the world's road transportation fleet. In aviation and shipping, biofuels will drive de-carbonisation. Oil is expected to peak in 2022 and fall off sharply from there.

In light of this, it would only make strategic sense for the island of Grand Bahama, and the country in general, to begin to change its relationship with oil bunkering and refining facilities, and evolve its energy policy to focus on investing in renewables instead. This should also be the case when it comes to production of the domestic energy supply, which should move to incorporate solar and other renewable options as soon as possible.



STB Chairman Joseph Darville (center) tours the site of the spill with other environmentalists.

Certainly, the Government of the Bahamas should cease granting approval to all potentially hazardous industrial projects until the current proposed suite of environmental Bills is amended to take into account the lessons learned from Hurricane Dorian, and then passed by Parliament. Those Bills must be reviewed to include a comprehensive disaster management plan with fully outlined and mandated SPCC and FRP provisions. Finally, Grand Bahama, the industrial capital of the country, should have its own fully staffed and equipped Department of Environmental Health, capable of both aiding in disaster response and ensuring that all such facilities adhere to the standards set out in the law.

SAVE THE BAYS