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Mrs. Laura Ward, Executive Director
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**Subject: Independent Review of 2022 Remedial Action Summary Report
Lockheed Martin Tallevast Site (Former American Beryllium Company Site)
1600 Tallevast Road
Tallevast, Manatee County, Florida
E Sciences Project Number 1-1440-004**

Dear Mrs. Ward and Mrs. Washington:

RES Florida Consulting, LLC dba E Sciences (RES) is pleased to submit this letter outlining the findings and our resulting opinions from review of the Remedial Action Status Report (RASR) dated October 27, 2022 and related regulatory correspondence for the Lockheed Martin Tallevast (former American Beryllium Company) site ("the Facility"). The Site consists of both the Facility and the surrounding area where groundwater is impacted by the chemicals of concern.

INTRODUCTION

RES' understanding of the project is based on litigation support that we provided to FOCUS as part of an administrative challenge on the Site Assessment Report (SAR) and Remedial Action Plan (RAP) and Addenda that were prepared regarding the contamination caused by the former operation of the Facility. The RAP and supporting RAP Addenda (RAPA) were approved by Florida Department of Environmental Protection (FDEP) and since that time, Lockheed Martin has proceeded with remediation implementation. At the conclusion of the administrative challenge, the judge suggested that once the remediation system operated for a period of five years, it would be a good time for FDEP and FOCUS to evaluate the system performance and address potential issues at that time. FOCUS members reviewed the October 29, 2019 RASR, which contained the updated five year groundwater model and noted that Lockheed Martin stated that the groundwater recovery and treatment system was meeting or advancing the remedial action objectives, except for the hydraulic control along the southeastern capture zone boundary in the Upper Surficial Aquifer System (USAS). FOCUS observed that the plume maps showed substantial contamination migration beyond what had been predicted by Lockheed Martin.

These concerns prompted FOCUS to request that we review the RASRs that had been prepared to date to assist the community in understanding the technical issues and deficiencies that were contained within the report and evaluate how those issues may be affecting the community. Since that time, we have provided on-going support to FOCUS to compile information and opinions regarding the ongoing remediation progress and regulatory reporting.



Recently, Lockheed Martin issued a Remedial Action Summary Report (RASR) dated October 27, 2022, that summarizes the remedial activities conducted from September 1, 2021, through August 31, 2022. Our findings related to the review of this document are presented herein.

RESULTS OF REVIEW

Review of the 2022 RASR revealed three major area of concern:

- Additional assessment conducted in the upper surficial aquifer system (USAS) has further confirmed the inadequacy of the vertical assessment downgradient of the source property and failure to provide data to evaluate the plume stability in this area.
- The remediation system modifications have had a long-term detrimental impact on the only remaining wetlands within the remediation system's capture zone that is being monitored.
- FOCUS, as a directly impacted community, has provided comments on each RASR issued since 2019. There have been no direct responses to FOCUS' comments and there is no evidence in the RASR that the community's comments are being taken into consideration.

These concerns are outlined in the paragraphs below.

Inadequate Downgradient Assessment to Evaluate Vertical Extent and Plume Stability-Subsequent to the groundwater remediation treatment system being designed and approved by FDEP, the contamination plume within the USAS was detected in groundwater samples collected substantially southeast and outside of the original plume configuration.

PZ-USAS-19 which was the southernmost monitoring point was sampled for the first time in 2019. It was this first sampling event that showed detections of 1,4-dioxane above the cleanup target levels. In 2021, Lockheed Martin conducted additional assessment in this portion of the plume and identified concentrations of 1,4-dioxane in samples collected from piezometers PZ-USAS-15, PZ-USAS-17 and PZ-USAS-18. Although these piezometers were installed in 2014 and 2015 for the purposes of water level monitoring, they had never been tested before 2021. Therefore, it is impossible to know if the plume existed in that previously unassessed area during the site assessment or remediation phase or if the plume had continued to migrate to the southeast.

In response to the recently acknowledged contaminated area to the southeast, FDEP issued a letter dated November 24, 2020 requiring additional assessment in the lateral and downgradient direction (southeast of the facility). Lockheed Martin collected groundwater samples using direct push technology for initial screening and then installed monitoring wells based on the results of that screening. The new monitoring wells defined the horizontal extent of the contaminant plume toward the southeast in the USAS. However, the interior of this section of the migrating plume is not being monitored as part of the remediation progress. As a result, the true stability of the plume in this area cannot be evaluated. No trends can be determined and when Lockheed Martin updates their plume stability analysis, data points from this area will not be included because Lockheed Martin does not include data where there are less than four sampling events.

Further there is no vertical or horizontal delineation in this area of the plume. There are no monitoring wells in the Lower Surficial Aquifer System (LSAS) beneath the 1,4-dioxane plume. In fact, the LSAS 1,4-dioxane plume is arbitrarily extended about 1,000 feet southeast of the furthest southeastern LSAS monitoring point with detections. There is no delineation monitoring well located due south of the LSAS plume. **We strongly recommend that FDEP require that Lockheed Martin define the horizontal and vertical extent of the contamination in the LSAS in the southeastern area of the plume and require regular monitoring of PZ-USAS-15, PZ-USAS-16, PZ-USAS-17 and PZ-USAS-18. An additional concern is that Lockheed Martin requests that PZ-USAS-19 be removed from the monitoring schedule. This monitoring well location provides a critical indicator to plume movement and it should continue to be monitored regularly.**



Remediation System Adjustments Are Causing Detrimental Impact to Last Remaining Wetlands Being Monitored by Lockheed Martin-

We note that the information reviewed indicated that the remediation system is having a detrimental effect on the last remaining wetland that is located in the capture zone that is being monitored. In response to the acknowledgement of the lack of hydraulic control along the southeastern capture zone boundary in the USAS, Lockheed Martin made system adjustments to expand the reach of the capture zone in the southeastern portion of the USAS. Lockheed Martin made these system adjustments in 2019 to improve the system's ability to retain and recover the edge of the plume. This intent to increase the area of hydraulic control is being conducted using a combination of increasing pumping and reducing groundwater recharge.

According to the 2022 RASR, discharge to infiltration gallery RC-7002 was "temporarily" discontinued in June 2019 to facilitate drawdown of the USAS for capture zone adjustments in the southeast portion of the Site. More than two years later this "temporary" adjustment is still in place and there is no recommendation to place the infiltration gallery back into use. Additionally, pumping-rate increases, installation of larger diameter in-vault piping at extraction wells EW-2103 and EW-2104 and a installation of a larger submersible pump in extraction well EW-2014 have been implemented. These adjustments were made so that the system will pump more groundwater from the aquifer and recharge less groundwater back into the aquifer, thus creating an additional burden on the natural water balance in this area. There are no additional adjustments recommended in the 2022 RASR.

One of the impacts of these system modifications is that an average of 8.7 million gallons of recharged groundwater that was being returned to the groundwater annually is being diverted from recharging the aquifer and the last remaining wetland located within the capture zone that is being monitored. Section 2.2 of the RASR indicates that most of the treated water is discharged to a publicly owned treatment works (POTW) facility rather than recharging to the wetlands or aquifer. Of the 6,252,700 gallons of groundwater removed, only 10% is returned to the groundwater via injection wells (<2%), infiltration galleries (7%) and irrigation (1%).

According to the Wetlands Monitoring Plan dated July 14, 2009 (that was included as part of the FDEP-approved July 14, 2009 Remedial Action Plan Addendum) four target wetlands and four reference wetlands were to be monitored as part of the remediation project. Over time, Lockheed Martin has recommended wetlands to be removed from monitoring and FDEP has accepted those recommendations. Currently, Lockheed Martin conducts annual wetlands monitoring of only two wetlands: TW-6 and RW-3. TW-6 is located within the capture zone and RW-3 is a reference wetland that exists outside of the reported capture zone. In Lockheed Martin's 2022 Annual Wetlands Monitoring Report dated August 31, 2022, they document the 13th wetland monitoring event conducted pursuant to the July 2009 Wetlands Monitoring Plan. Water levels in TW-6 reportedly remained below the ground surface elevation throughout the monitoring period. Based on water level data collected during the current monitoring period, the decrease in water levels at TW-6 can be attributed to the lack of water recharged through infiltration gallery RC-7002, which did not buffer the wetland from drawdown associated with the groundwater treatment system. The report states that the results of the quarterly water level monitoring and annual wetland assessment provide evidence that although TW-6 has experienced drawdown from the groundwater treatment system, the overall vegetation across all strata within TW-6 has not been negatively affected by the groundwater withdrawal associated with the groundwater treatment system.

However, Appendix B of the report contains the Wetland Assessment Procedure (WAP) forms which document the conditions observed in the field. The groundcover assessment indicates that "species have moved in two zones in high numbers and distribution, and some species with an upland classification have moved into the Deep Zone in enough numbers and distribution to be of concern." This may be in reference to Caesar's weed (*urena lobata*) as this is the species with the highest percent cover of 20% in each zone. According to the University of Florida IFAS Center for Aquatic and Invasive Plants, *urena lobata* invades disturbed areas, pastures, perennial crop plantations, forests, hardwood hammocks, and coastal habitats. With an aggressive habit, it grows rapidly and can reach 2 to 7 feet by the end of the first year. It can form dense thickets, outcompeting native plants and altering ecological community diversity and function. Similarly, the WAP form indicates that



for shrubs/small trees, “species have moved in one zone in high enough numbers and distribution to be of concern, and/or species with an adaptive classification are in high numbers and distribution in the transition zone.” We note that Brazilian peppertree (*schinus terebinthifolia*) now makes up 20 to 25% cover in the transition and outer zones and 5% in the deep zone.

Lockheed Martin states that the WAP scores provide evidence that TW-6 continues to function as it has during the previous monitoring period. Implementation of a mitigation plan will be discussed with FDEP if the water level elevation remains below normal pool threshold throughout the entirety of the next two monitoring periods or if the health of TW-6 declines. Therefore, TW-6 will continue to be evaluated during this upcoming monitoring period. Because the other target wetlands that were to be monitored are within the capture zone of the system and Lockheed Martin is no longer monitoring the impact of the remediation system on those wetlands, it is unknown if the remediation system has had long term detrimental impacts. **We strongly recommend that Lockheed Martin evaluate the wetland impact relative to its baseline rather than the results of the last monitoring period and that a wet and dry season monitoring of the eight wetlands (four target and four reference) proposed in the original wetlands monitoring plan be conducted. Additionally, Lockheed Martin should evaluate the project impact to wetlands in a manner consistent with rules, requiring avoidance and minimization of impacts and mitigation as appropriate.**

HISTORIC CONCERNS

Several areas of concern that we raised during our review of the 2021 RASR and before still have not been addressed. Without Lockheed Martin conducting further evaluation of these areas of concern, we are unable to assess their impact to the community and Lockheed Martin is unable to determine if adjustments to the remediation system or other measures should be implemented.

- **Unassessed Residential Area and Potential for Vapor Encroachment**-An area of particular concern that has not been addressed is potential shallow groundwater impacts in the residential neighborhood located immediately south and east of the source property in the apparent downgradient direction of the shallow plume movement. Although supplemental assessment was conducted by Lockheed Martin to evaluate the leading edge of the 1,4-dioxane plume to the southeast of the neighborhood, in this residential area closer to the source facility no additional assessment has been conducted to evaluate if the upper portion of the USAS is impacted or if the lower aquifers have been impacted. In a FDEP February 4, 2021 memorandum, FDEP commented that there are several hot spots where contaminant concentrations remain quite a bit above the cleanup goals. Undetected hot spots in the shallow groundwater could be a source of vapor encroachment into homes and cause community exposure to volatile contaminants of concern. **We recommend additional assessment in this area be conducted to evaluate the potential pathways for exposure, to better define the horizontal extent of the contamination, and to confirm the vertical extent of the contamination plume in this area.**
- **The “updated” model does not take into account the system adjustments made before the report was published**-System adjustments that have substantially changed the remediation system pumping and recharge system reportedly began in June 2019. However, Lockheed Martin provided an “updated” model to FDEP after the system adjustments. The “updated” model was run in August 2018 nearly a year before the system adjustments were made but included in the October 2019 RASR to “summarize the current status of the model, describe the evolution of the model between 2009 and 2019, and present material to support the viability of the model as a Remedial Action Plan Addendum system operation and management tool.” We know, however, that this modeling update showcased simulated water levels and capture zones which represented conditions prior to the implementation of remedial action adjustments. Similar to the previous RASRs, the 2022 RASR states “Based on professional judgment, the localized effects of extraction wells, infiltration galleries, wetlands areas, and stormwater control features, and modeling information, were considered when contouring.” No updated modeling of the



capture zone or contaminant transport has been provided since the system modifications that began in 2019. **We recommend that the model be updated to include the changes to the plume and capture zone and that FDEP engage an expert to conduct an independent evaluation of the model and the capture zones.**

- **The model conflicts with Lockheed Martin’s finding and this information was never reconciled.**-Concerns in the area north and west of the site became apparent during our review of the updated 2018 groundwater model because it forecasted that contamination existed outside of the northwest area of the predicted USAS capture zone. There is no monitoring well located within that specific gap of capture zone coverage. **We recommend that after the model is re-run, additional assessment based on the results of the model be conducted.**
- **There is insufficient information to substantiate the capture zone boundaries**-Figure 9 of the 2022 RASR shows the LSAS potentiometric elevations measured, potentiometric elevation contours and the estimated/inferred edge of the capture zone. The capture zone should be determined based upon a variety of information but in a simplistic view, the potentiometric elevation of the outside edge of the capture zone is at a higher elevation than the potentiometric elevation within the capture zone. In the case of this figure, the inferred capture zone extends to outside of all of the monitoring points. This is also the case for the Arcadia Formation Gravels (Figure 10) and the Salt & Pepper Sands (Figure 11). The report simply indicates that capture boundaries shown on figures are estimated using data from monitoring wells, stilling wells, and piezometers, and by applying professional judgment. It is unclear how these “inferred” capture zones can be estimated without data to support them. Using the same concept, we evaluated the groundwater elevations toward the northwest of the composite plume in the USAS depicted on Figure 8. We note that the monitoring wells that are located north of the plume are several hundred feet beyond the northern edge of the capture zone and some of them show a decrease in groundwater elevation further away from the plume. The RASR does not provide sufficient rationale or substance to these capture zone lines. Because there are insufficient data points to judge these grade lines, there is no basis for them. **We urge an independent expert review of the potentiometric figures and groundwater models to confirm the extent of the estimated capture zones and to evaluate if additional piezometers should be installed to substantiate the estimated capture zone configuration.**
- EWPARM extraction well sampling sheets continue to be omitted from the sampling log appendix. Large volumes are pumped from these samples prior to sample collection, and it is still suspected that the samples are dynamic. Without the data, FDEP cannot judge if appropriate quiescent sampling techniques were used and is making decisions without the benefit of that information. Updated sampling should be conducted using quiescent purging methods suitable for monitoring wells. Lockheed Martin has for the second time, excluded that information to show monthly data only for the reporting period. This makes it more difficult to conduct a thorough evaluation when Lockheed Martin recommends discontinuing extraction wells. **We recommend that FDEP request that Lockheed Martin provide the sampling methods of EWPARM wells. All sampling data sheets should be provided, with sampling methods clearly described in RASRs. Future sampling methods should be modified, as appropriate. EWPARM wells should be resampled using appropriate methods if quiescent sampling was not conducted.**
- **Lockheed Martin has eliminated monitoring nearly all of the private wells in the area without providing justification.**- Of the eight private wells that were being monitored as of 2012, only two private wells continue to be monitored. We were able to identify Lockheed Martin acknowledging a rationale for removing wells from monitoring some of the time, but not in each instance. We have noted several additional instances where private wells were removed using justification that other wells would suffice for providing plume monitoring coverage. A closer review revealed that private wells being removed were screened in completely different stratigraphic zones and at considerable distances from the monitoring wells being cited as providing duplicate coverage. **The reason for removing these wells from monitoring and the impact of loss of those data points should be provided by Lockheed Martin.**



In summary, we are concerned that these ongoing concerns continue without any evidence of consideration by Lockheed Martin or FDEP. The FOCUS community is largely affected by the contamination and the remediation system. We strongly recommend that FOCUS' concerns be taken into consideration by FDEP and Lockheed Martin and addressed.

We appreciate the opportunity to offer our professional services to you. If you have any questions concerning our evaluation, please contact us at 954-484-8500.

Sincerely,

RES Florida Consulting, LLC

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