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ENVIRONMENT
& HEALTH

Ms. Wanda Washington
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April 20, 2021

Re: Review of the Direct Push Technology Work Plan, Lockheed Martin Tallevast Site, Manatee County Florida

Dear Ms. Washington,

At your request I have reviewed the Direct Push Technology (DPT) Work Plan recently prepared by Lockheed Martin Corporation (LMC) for the Tallevast Site in Manatee County, Florida (the Work Plan). This Work Plan proposes an additional field investigation of ground water conditions in an area southeast of the LMC facility, in the vicinity of piezometer PZ-USAS-19. In this area, a chemical associated with the ground water plume from the LMC site (I,4-Dioxane) has been detected at low levels in the USAS aquifer, but above the state's ground water standard of 3.2 μg/L.[1]

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LMC began its investigation of this area by retesting all the available piezometers in the vicinity of PZ-USAS-19 in February 2021 for 1,4-Dioxane. The results of this testing are depicted in Figure 2 of its Work Plan. It shows a more-or-less continuous area of contamination, near the base (30-40 feet bgs) level of the USAS aquifer, extending from the north to the southeast, to at least the location of PZ-USAS-19. Concentrations in this area ranged from 39-11 μg/L. This area is likely a southeasterly extension of a "hotspot" of 1,4-Dioxane contamination currently found on the private property just east of the LMC facility near wells MW-27 and 28, as depicted on Figure 12A of the 2020 Annual Report. The fact that the concentration of 1,4-Dioxane has slowly risen in PZ-USAS-19 over the past two annual sampling events, and contamination is continuous across this area, suggests that the current pumping of ground water from the collection trench located about 1500 feet to the north of PZ-USAS-19 has not fully controlled migration of contaminants to the southeast.

In response to this new information, LMC is proposing an investigation of the USAS using a Direct Push Technology to delineate the extent of this contamination. DPT involves driving a hollow pipe into the ground to initially collect a soil core for logging, and then inserting a sampler to extract ground water samples from various levels of the aquifer for testing. In its Work Plan LMC is proposing to test ground water solely for 1,4-Dioxane, the chemical

[1] Over the past two annual monitoring events, concentrations have increased from 5.5-10 μg/L in PZ-USAS-19.

detected in PZ-USAS-19. Testing would begin with a line of locations surrounding PZ-USAS-19 to the SW-S-SE, with additional contingent locations further downgradient until the area of contamination has been fully delineated. An additional 3 monitoring wells would also be constructed in nearby wetlands to provide permanent locations to monitor water levels and chemistry. All these locations are depicted on Figure 2 of the LMC Work Plan.

Conceptually, this investigation plan seems sound, but I would offer some additional modifications/suggestions as follows:

- Because this new area of contamination near PZ-USAS-19 is depicted in the Annual Report as a southeasterly extension of a more prominent area of contamination east of the LMC facility, which still has significant levels of CVOCs such as TCE, I would include CVOCs in the testing of ground water in this new investigation.
- The levels of 1,4-Dioxane found in this new investigation area also raises a concern for the quality of water in the underlying LSAS aquifer. A nearby well nest (MW-167 and -168) shows an approximate 3-foot downward water pressure towards the LSAS, so there is clearly a potential for downward migration of chemicals from the USAS if the separating "hard-streak" is sufficiently permeable. Also, the boundary of the capture zone for the LSAS is depicted in the 2020 Annual Report (see Figure 8) as falling in the vicinity of PZ-USAS-19, raising the question if downward chemical migration is in fact occurring, whether it is being recovered and controlled by pumping in the LSAS further to the north. These issues can both be answered by installing new piezometers in the LSAS, nested with current piezometers PZ-USAS-17, -18 and -19.[2] These new piezometers would provide the opportunity to measure both water quality and gradient in the LSAS and thus ensure it is not also providing a pathway for spreading contamination to the southeast.

I also note that Figure 2 of the Work Plan depicts a significant new commercial development immediately to the north of PZ-USAS-19 with a large storm water pond along its southern boundary. This unlined pond is apparently intended to capture storm water runoff for adjacent parking lots, which will then percolate into the USAS aquifer. This will likely raise and cause mounding of the water table in the USAS particularly during the summer, rainy season, potentially pushing the contamination even more rapidly and further to the south. While the presence of this new pond does not have a direct effect of the immediate DPT investigation, it is something that will need to be considered as LMC subsequently evaluates its options to more effectively control chemical migration in this area.

Additionally, two other areas of the LMC site which I have raised in prior letters were not addressed in the immediate LMC Work Plan. One is the area immediately east of the LMC facility where 1,4-Dioxane and CVOC are found in the lower levels of the USAS aquifer at levels well in excess of the DEP's cleanup standards. Concentrations in this area have remained stubbornly high and actually increased in certain wells over the past few Annual Reports. I have previously suggested that treatment of the USAS in this area with chemical oxidizers might help to accelerate the cleanup. I understand LMC is currently conducting a plume stability evaluation to

[2] From a recent discussion with Paul Calligan (LMC) I understand that DPT is unable to penetrate through the hard streak. Also, DPT would not provide a subsequent opportunity to measure water levels and gradient in this area of the LSAS.

consider the progress of its cleanup efforts and provide the framework for any necessary modifications to its remediation strategy. I would reiterate here that some additional monitoring points in this region to more fully vertically and horizontally delineate this stubborn hotspot region could be beneficial to that evaluation. The immediate DPT investigation provides a perfect, timely opportunity to undertake this work.

Second, I have previously noted there is an area north of the LMC facility (near extraction well EW-2012) where 1,4-Dioxane has remained elevated above cleanup goals. The highest 1,4-Dioxane measurements have been in the extraction well, but the actual concentrations in the aquifer in this vicinity are unknown, as some dilution in the extraction well samples is likely occurring. The drawdown the extraction wells are creating appears to be very limited laterally (narrow cones of depression) in the USAS aquifer, and nearby monitoring wells are not indicating any appreciable depression of the surrounding water table in spite of the pumping.

It is not apparent why these extraction wells are having such a limited impact on water levels[3] , but the absence of appreciable drawdown of the aquifer raises a concern with the position of the capture zone that controls chemical migration in this area. The current capture zone is shown to be north of the extraction wells, but this is a computer model simulation that is not validated by actual field measurements demonstrating a reversal of the natural gradient to the northwest. Also, there is nearly a 600-feet span between where 1,4-Dioxane is currently found at 15 μg/L (EW-2012), and where is it is reported as ND (MW-115). The actual boundary of the zone that exceeds the states standard is currently unknown, but may lie somewhere in between those two points.

Again, the DPT sampling program affords an opportunity to more accurately delineate the 1,4-Dioxane boundary in this area, with a series of new sampling points on the property to the north of the current extraction system. It also provides an opportunity to collect soil samples of the lower USAS in this area so that a new sieve analysis can be conducted, data from which could then be used to reevaluate whether the gravel pack and screens used to build the current extraction wells were appropriately sized for efficient water recovery. If 1,4 Dioxane is found further to the north of the extraction wells, then I would also follow up with additional piezometers north of the extraction wells to document if there is gradient reversal to the south. Ultimately it may also be necessary to rebuild or supplement the extraction wells in this area if a firm gradient-reversal control of the 1,4-Dioxane plume cannot be demonstrated.

[3] It is possible that the wells screens/gravel packs are too fine to allow water to freely enter the well casing, the wells screens may be clogged with sediment or scale that blind the openings, or the aquifer is very "tight" in this area and will not produce much water.

If you have any questions regarding these thoughts and comments, I would be happy to discuss them with you further.

Very truly yours,

Robert L Powell, PhD, PE
Principal