CH2M
199 Falmouth Sandwich Road
Mashpee, MA 02649

30 October 2020

Ms. Rose H. Forbes, P.E.
Remediation Program Manager
AFCEC/JBCC
322 East Inner Road
Otis ANG Base, MA 02542-1320

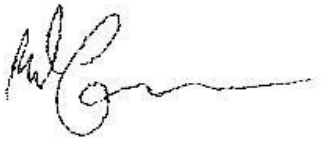
SUBJECT: AFCEC FA8903-18-F-0147; Task Order 0147
Emerging Contaminants Investigation
Responsiveness Summary for the Fact Sheet for No Further Action for 1,4-Dioxane at Chemical Spill-20

Dear Ms. Forbes:

As directed by the Air Force Civil Engineer Center (AFCEC), CH2M is hereby providing a copy of the document entitled *Responsiveness Summary for the Fact Sheet for No Further Action for 1,4-Dioxane at Chemical Spill-20* dated October 2020.

Sincerely,

CH2M



Brad Johnson
Project Manager

c: Jen DeAngelis, AFCEC/CZO
772d ESS/PKB (1 w/o attach.)

RESPONSIVENESS SUMMARY
for the Fact Sheet for No Further Action for 1,4-Dioxane at Chemical Spill-20

INTRODUCTION

The purpose of this *Responsiveness Summary* is to provide written responses to the comments received during the public comment period for the Fact Sheet for No Further Action for 1,4-Dioxane at Chemical Spill-20. The Public Comment Period started on 01 August 2020 and extended through 30 August 2020.

Comments	Responses
1) David Dow (public): I decided to comment as a retired marine scientist and grassroots activist that has participated in the JBCC Superfund/Safe Drinking Water Cleanup since the late 1980's. I have some concern that this potential contaminant of concern (coc) might be dangerous from reading the Environmental Working Group (EWG) evaluation that this is an above average threat for cancer and has low dosage effects in animal studies. The August 6, 2020 article in the Cape Cod Times by Christine Legere mentions multiple exposure routes for humans in homes: paint; adhesives; household cleaners; detergents; shampoos; deodorants and cosmetics; pesticides; etc. This raises concerns about cumulative environmental effects from exposure routes beyond drinking water. I represent the Sierra Club on the University of Rhode Island's STEEP (Sources; Transport, Exposure, & Effect of PFAS) grant Cape Cod Community Advisory Group. I recently participated in a Massachusetts Breast Cancer Coalition webinar on PFAS exposures via food and the atmosphere. Not being familiar with the organic chemical exposure pathways for 1,4-dioxane, I don't know whether a low level of exposure to this toxic chemical in public and private drinking water poses a serious threat to humans and their pets (high rate of cancer from drinking water). I will let Drs. Laurel Schaider and Amy Kyle comment on this issue.	1) The U.S. Environmental Protection Agency (EPA) establishes and enforces standards for drinking water and has set the site-specific federal risk-based remediation goal of 0.46 micrograms per liter (µg/L) for 1,4-dioxane for CS-20 groundwater. The remediation goal of 0.46 µg/L is set at an excess lifetime cancer risk level of 1E-06 (or one in a million). Additional information about the health effects of 1,4-dioxane, including information on its presence in common household products, is included in the EPA's *Technical Fact Sheet - 1,4-Dioxane* which can be found using the following link: https://www.epa.gov/sites/production/files/2014-03/documents/ffrro_factsheet_contaminant_14-dioxane_january2014_final.pdf The Chemical Spill-20 (CS-20) groundwater plume was determined to be detached from an unknown source area that was located on JBCC at the time of its initial characterization during the Remedial Investigation in 1998. Extensive records searches and field investigations did not identify the specific source of the CS-20 contamination. The CS-20 groundwater plume was defined as the extent of groundwater containing tetrachloroethene (PCE), the CS-20 contaminant of concern (COC), at concentrations exceeding the Maximum Contaminant Level (MCL) of 5 µg/L. By 2016, PCE concentrations were reported above the MCL of 5 µg/L at only one monitoring well (69MW1422) and PCE

Comments	Responses
The one issue that I did want to address was that “natural attenuation” was mentioned as a elimination strategy for the groundwater sampling well 80 feet below the groundwater surface of CS-20. Since it seems unlikely that microbial degradation would remove 1,4-dioxane and the effects of surface water dilution at the depth would be very effective, what is the proposed mechanism for “natural attenuation”? Having participated in the EPA-lead Waquoit Bay Watershed Ecological Risk Assessment project and writing the section on JBCC and Ashumet Pond in the final report, I would like to see some type of analysis for this supposed "natural attenuation” for 1,4-dioxane. It doesn’t appear that this toxic chemicals is listed in the EWG Drinking Water Database for the Town of Falmouth drinking water at levels exceeding the Ma. DEP's mcl of 0.3 micrograms per liter or EPA's of 0.45 ug/L. **Was the CS-20 plume sources area treated to remove PCE (the major plume toxic contaminant)? Is this the same source area for the 1,4-dioxane?** One of the lessons that I have learned from the JBCC CERCLA/SDWA cleanup is that one has to treat both the contaminated source area and treat the coc’s in the groundwater before deciding that no further remedial action is required. The recent emergence of PFOS and PFOA as toxic contaminants in public and private drinking water wells in Falmouth and Mashpee has been handled well by the Air Force Civil Engineer Center (AFCEC). The Harvard University research group involved in the STEEP grant have found that both the water and sediments are sources of PFAS chemicals for the Ashumet Valley Plume (as well in other watersheds with no apparent sources like JBCC). Back in the mid-1970’s I participated in a Project at Hitman Associates on the fate & effects of EPA’s priority toxic chemicals (working on groups such as PCBs and PAHs). In the resulting 45 years much scientific progress has been made on the fate, transport, exposure and effects of toxic organic chemicals. The challenge is converting this	concentrations in that well decreased below the MCL in 2019. The CS-20 PCE groundwater plume has not been delineated since 2016. See Figure 2 in the Fact Sheet. The 1,4-dioxane detected in CS-20 groundwater is assumed to be associated with the same release that introduced the chlorinated solvents into the subsurface that created the CS-20 plume. As explained in the Fact Sheet, the specific location of the CS-20 source area was not identified. The primary industrial use of 1,4-dioxane was to stabilize solvents, particularly 1,1,1-trichloroethane (TCA), which is less chemically stable than other common solvents such as PCE and trichloroethene. Therefore, 1,4-dioxane is commonly associated with 1,1,1-TCA, or its breakdown product 1,1-dichloroethene (DCE). Both 1,1,1-TCA and 1,1-DCE have been detected in CS-20 monitoring wells in the past. Due to the association of 1,4-dioxane with chlorinated solvent plumes, a recommendation to perform sampling for 1,4-dioxane at CS-20 was included in the Final 4th Five-Year Review, 2007-2012 Massachusetts Military Reservation (MMR) Superfund Site Otis Air National Guard Base, MA. Following its release at the ground or near ground surface, the 1,4-dioxane would have migrated vertically through the unsaturated soils. The 1,4-dioxane likely sorbed to the soil and would have then dissolved into infiltrating water from precipitation and leached into groundwater quite readily due to its high aqueous solubility. Once in groundwater, the dissolved 1,4-dioxane would be transported concurrent with the other chlorinated solvents in the direction of groundwater flow with natural attenuation processes (primarily dispersion and dilution) reducing the mass, volume, and concentration over time. It is noted that biodegradation is also a mechanism for the natural attenuation of 1,4-dioxane in aerobic aquifers. Based on groundwater quality data collected over the long history of groundwater sampling at CS-20, the aquifer is considered highly oxygenated and aerobic. The following three references are provided as supportive information for the aerobic biodegradation of 1,4-dioxane in groundwater:

Comments	Responses
research into regulatory standards like mcls or technological effective cleanup approaches for sources areas (i.e. how does one remove PFOA and PFOS from the water and sediments in Ashumet Pond?). Thanks for your consideration of these comments. Dr. David D. Dow East Falmouth, Ma.	▪ Adamson, D.T., R.H. Anderson, S. Mahendra, and C.J. Newell. Evidence of 1,4-Dioxane Attenuation at Groundwater Sites Contaminated with Chlorinated Solvents and 1,4-Dioxane. Environ. Sci. Technol. 2015, 49, 6510−6518. ▪ Gedalanga, P., A. Madison, Y. Miao, T. Richards, J. Hatton, W.H. DiGuiseppi, J. Wilson, and S. Mahendra. A Multiple Lines of Evidence Framework to Evaluate Intrinsic Biodegradation of 1,4-Dioxane. Remediation Winter 2016. DOI: 10.1002/rem. ▪ Jackson, L.E. and L.D. Lemke. Evidence for Natural Attenuation of 1,4-Dioxane in a Glacial Aquifer System. Hydrogeology Journal. October 2019. https://doi.org/10.1007/s10040-019-02028-6. The decrease in 1,4-dioxane concentrations has been observed through the resampling of the CS-20 monitoring wells with the highest historical concentrations during the Supplemental Remedial Investigation and the subsequent interim monitoring program. Significant decreases in concentration (up to 80 percent) were observed within a two-year period at some locations. The limited area where 1,4-dioxane remains (see Figure 3 in the Fact Sheet) is expected to continue to decrease in concentration and extent through natural attention processes. Therefore, as concluded in the Supplemental Remedial Investigation Report and presented in this Fact Sheet, 1,4-dioxane should not be added as a CS-20 contaminant of concern. It is noted that Per- and Polyfluoroalkyl Substances (PFAS) contamination is present in groundwater at JBCC but is not associated with the CS-20 site. PFAS contamination from other adjacent JBCC sites are being investigated under separate ongoing programs which will be documented in future reports that will be subject to public comment.

Comments	Responses
2) S. Walker (public) "I agree with David Dow. Sue Walker"	2) Comment noted. Please see response to comment #1.
No other Comments were received for the CS-20 Fact Sheet.	