November 22, 2016

John J. Lanza, MD, PhD, MPH, FAAP, Director
Florida Department of Health in Escambia County
1295 West Fairfield Drive
Pensacola, Florida 32501

Re: Jackson Lakes/Former Clark Sand Pits Health Consultation

Dear Dr. Lanza:

At your request, the Florida Department of Health (DOH), Public Health Toxicology reviewed environmental data from the Jackson Lakes/Former Clark Sand Pits Site in Pensacola, Florida to address health concerns regarding future recreational use.

Based upon exceedances of monthly averages for fecal coliform bacteria in surface water of the two lakes, we find that accidentally swallowing the water during recreation could cause illness. We cannot evaluate the public health risk to the soil/sediment for future recreational use of this site. The environmental data are insufficient. Additional soil testing is necessary.

This assessment requires the use of assumptions, judgments, and incomplete data. These factors contribute to uncertainty in evaluating the health threat. Assumptions and judgments in this assessment err on the side of protecting health and may therefore overestimate the risk.

The following paragraphs explain how Florida DOH arrived at these conclusions.

Site Description and Background

The site is north of the intersection of North Ehrmann Street and Shadow Lawn Lane in Pensacola, Florida (Figure 1). Escambia County owns the site consisting of two parcels with a total of 56.68 acres. The site is vacant and has three small lakes: northeast (NE), southeast (SE), and the southwest (SW) (Figure 2). Nearby land uses is residential and commercial.

Demographics

Approximately 1,905 people live within one mile of the site. Seventy-three percent (73%) are white, 16% are African-American, 3% are Hispanic origin, and 7% report more than one race or some other race. Twenty-five percent (25%) are less than 18 years old. Fifty-three percent (53%) of those over 25 years of age have a high school diploma or less and 31% make less than $25,000 a year [EPA 2016].

Exposure Pathways

Potential Exposure Pathways

The potential exposure pathways of concern at the Jackson Lakes site are incidental ingestion (swallowing) of surface water and surface soil (Table 1).

In the future, people who swim or boat (exposed population) in the lakes (point of exposure) may accidentally swallow (route of exposure) small amounts of contaminated water (environmental media). The source of the contamination is unknown.

In the future, people who use the property (exposed population) near the lakes (point of exposure) may accidentally swallow (route of exposure) small amounts of contaminated soil (environmental media). The source of the contamination is unknown.

In the future, workers on the property (exposed population) near the lakes (point of exposure) may accidentally swallow (route of exposure) small amounts of contaminated soil (environmental media). The source of the contamination is unknown.

Eliminated Exposure Pathways

Groundwater Ingestion – Groundwater ingestion is an eliminated exposure pathway. Drinking water is municipally-supplied in this area.

Exposure to Subsurface Soil– Exposure to subsurface soil is an eliminated exposure pathway. Although contaminated subsurface soils may exist, future workers and recreational users will not likely have access.

Exposure to Submerged (below water surface) Sediment– Exposure to submerged sediment is an eliminated exposure pathway. Although contaminated submerged sediments may exist [Geosyntec 2009], future workers and recreational users will not likely have access.

Environmental Data

Between October 2015 and January 2016, Escambia County collected nine water samples from each of the six lake sample locations shown in Figure 2. They collected one surface (1 foot deep), one mid (10 feet deep), and one bottom (20 feet deep) water sample at each location during each of three events [Escambia Co 2015a, 2015b, 2016]. The County analyzed the samples for inorganic and organic chemicals, plus fecal coliform (Tables 2 and 3). For purposes of this assessment, the number of samples adequately characterizes the extent of surface water contamination.

Since no surface soil data are available, DOH cannot assess the health risk for this exposure pathway. The lack of surface soil testing is a data gap.

Additional soil testing is necessary to evaluate the public health threat. Before recreational use of the site, the responsible party should test surface soil (0-3 inches deep) for toxic chemicals associated with past land use [Cameron-Cole 2016]. Testing should concentrate on areas of future recreational use.

Public Health Implications

DOH provides site-specific public health recommendations based on levels of environmental contaminants, evaluation of potential exposure pathways, duration of exposure, findings from the toxicological literature, and characteristics of the exposed population. Whether a person will be harmed

depends on the type/amount of contaminant, how they are exposed, how long they are exposed, how much contaminant is absorbed, genetics, and individual lifestyle.

For surface water, DOH assumes exposure to adults and children (aged 6–21 years) 135 days per year (every other day for 9 months). DOH assumed adults and children will swim or play in the lakes in the warmer months (March to November). DOH expects the actual number of days per year will be less. DOH also uses a large, health protective estimate of swallowing lake water of 0.5 liters per day (L/day). The actual exposure is likely lower than the estimated exposure.

Exposure Level

To calculate the daily doses of each contaminant, the DOH uses standard factors [ATSDR 2005].

For an assessment of the noncancer health risk, DOH uses this formula to estimate a dose:

$$D = (C \times IR \times EF \times CF) / BW$$

D = exposure dose (milligrams per kilogram per day or mg/kg/day)
C = contaminant concentration (milligrams per liter or mg/L)
IR = intake rate (milliliters per day or mL/day)
EF = exposure factor (unitless)
CF = conversion factor (10^{-6} kilograms per milligram or kg/mg)
BW = body weight (kilograms or kg)

$$EF = F \times ED / AT$$

EF = exposure factor (unitless)
F = frequency of exposure (days/year)
ED = exposure duration (years)
AT = averaging time (days)

DOH uses the following equation to estimate increased cancer risk:

$$Risk = D \times SF$$

Risk = Cancer risk
D = Age specific non-cancer dose (mg/kg/day)
SF = Slope factor $(mg/kg\text{-}day)^{-1}$

Identifying Contaminants of Concern

DOH selects contaminants with maximum concentrations above comparison values for further evaluation (Table 2). Comparison values, however, are not thresholds of toxicity. We do not use them to predict health effects or to establish clean-up levels. A concentration above a comparison value does not necessarily mean harm will occur. It does indicate, however, the need for further evaluation. We do not evaluate further contaminants with maximum concentrations below comparison values. It is unlikely these lower contaminant concentrations would cause illness.

Bis(2-ethylhexyl) phthalate, also known as Di(2-ethylhexyl) phthalate (DEHP)

DEHP is a chemical that manufactures commonly added to plastics to make them flexible. DEHP is a colorless liquid with almost no odor. DEHP is present in plastic products such as wall coverings, tablecloths, floor tiles, and furniture upholstery.

At the levels found in the environment, health scientists do not expect DEHP to cause harmful health effects in humans. Skin contact with products containing DEHP will probably cause no harmful effects because DEHP does not easily pass through the skin.

The Department of Health and Human Services (DHHS) reasonably anticipates that DEHP is a human carcinogen. The Environmental Protection Agency (EPA) has determined that DEHP is a probable human carcinogen. DHHS and the Florida Department of Environmental Protection base these determinations entirely on liver cancer in rats and mice. The International Agency for Research on Cancer (IARC) cannot classify DEHP as to its carcinogenicity to humans [ATSDR 2002a].

DOH estimated lake user exposure using a maximum DEHP concentration of 7.87 micrograms per liter (µg/L) (Table 2).

Non-cancer risk – Lake users who incidentally ingest (swallow very small amounts of) water with the highest levels of DEHP are not likely to suffer any non-cancer illnesses. The maximum dose (4.7×10^{-5} milligrams per kilogram per day [mg/kg/day]) is less than the Agency for Toxic Substances and Disease Registry's (ATSDR) chronic minimal risk level (MRL) of 6×10^{-2} mg/kg/day [ATSDR 2002a] and thus unlikely to cause noncancer illnesses

Cancer risk – Lake user who incidentally ingest water with the highest DEHP levels over a 15-year period are at a "low" increased estimated risk of cancer. Multiplying the maximum DEHP dose (9.0×10^{-6} mg/kg/day) by the EPA cancer slope factor (1.4×10^{-2} mg/kg/day^{-1}) results in an increased estimated cancer risk of approximately 1 in 10 million (0.0000001 or 1×10^{-7}).

To put this "low" increased cancer risk into perspective, the American Cancer Society estimates the background cancer rate in the US is 1 in 3. That is, for every 10,000,000 people, on average about 3,333,333 will get some form of cancer during their lifetime. Exposure to this soil with the highest DEHP concentration would, at most, increase the lifetime cancer risk from 3,333,333 cases in 10,000,000 people to 3,333,334 cases in 10,000,000 people

Dieldrin

Aldrin and dieldrin are insecticides with similar chemical structures. Aldrin quickly breaks down to dieldrin in the body and in the environment. Pure aldrin and dieldrin are white powders with a mild chemical odor. Less pure commercial powders are tan. Neither substance occurs naturally in the environment. From the 1950s until 1970, aldrin and dieldrin were widely used on corn and cotton. Because of concerns about damage to the environment and potentially to human health, EPA banned all uses of aldrin and dieldrin in 1974, except to control termites. In 1987, EPA banned all uses.

There is no conclusive evidence that dieldrin causes cancer in humans. Dieldrin causes liver cancer in mice. The IARC has not classified dieldrin as to human carcinogenicity. The EPA determined that dieldrin is a probable human carcinogen [ATSDR 2002b].

DOH estimated lake user exposure using a maximum dieldrin concentration of 0.0203 µg/L (Table 2).

Non-cancer risk – Lake users who incidentally ingest water from the lakes with the highest levels of dieldrin are not likely to suffer any non-cancer illnesses. The maximum dose (1.2×10^{-7} mg/kg/day) is less than the ATSDR's chronic MRL (5×10^{-5} mg/kg/day) [ATSDR 2002b] and thus unlikely to cause noncancer illnesses.

Cancer risk – Lake users who incidentally ingest water with the highest dieldrin levels over a 15-year period are at a "low" increased estimated risk of cancer. Multiplying the maximum dieldrin dose (2.3 x

10^{-8} mg/kg/day) by the EPA cancer slope factor (16 mg/kg/day^{-1}) results in an increased estimated cancer risk of approximately 4 in 10 million (0.0000004 or 4 x 10^{-7}).

To put this "low" increased cancer risk into perspective, the American Cancer Society estimates the background cancer rate in the US is 1 in 3. That is, for every 10,000,000 people, on average about 3,333,333 will get some form of cancer during their lifetime. Exposure to this soil with the highest dieldrin concentration would, at most, increase the lifetime cancer risk from 3,333,333 cases in 10,000,000 people to 3,333,337 cases in 10,000,000 people

Fecal Coliform

Fecal coliform are a specific kind of coliform bacteria. The feces (or stool) and digestive systems of humans and warm-blooded animals contain millions of fecal coliforms. *E. coli* is part of the fecal coliform group and may be tested for by itself. Fecal coliforms and *E. coli* are usually harmless. However, a positive test may mean that feces and harmful bacteria/viruses have found their way into the water system. These harmful bacteria/viruses can cause diarrhea, dysentery, and hepatitis [CDC 2013].

Chapter 62-302 of the Florida Administrative Code (F.A.C.) gives the Class III (recreation to include swimming, boating, and fishing) Standard limit (colony forming units per 100 milliliters (CFU/100 mL)) as: "most probable number (MPN) or membrane filter (MF) counts shall not exceed a monthly geometric mean of 126 nor exceed the Ten Percent Threshold Value (TPTV) of 410 in 10% or more of the samples during any 30-day period. Monthly geometric means shall be based on a minimum of 10 samples taken over a 30-day period."

DOH cannot strictly apply the monthly geometric mean since there were only six samples taken per lake (less than the required 10) during each of the three sampling events. However, there were instances when the monthly average either exceeded the TPTV of 410 CFU/100 mL or the Class II one day limit of 800 CFU/100mL (Table 3). Therefore, there are instances when incidental ingestion of surface water could pose a possible health risk.

Child Health Considerations

In communities faced with air, water, soil, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than adults for certain kinds of exposure to hazardous substances. Children play outdoors and sometime engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than adults are; this means they breathe dust, soil, and vapors closer to the ground.

A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body system of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, access to medical care, and risk identification. Thus, adults need as much information as possible to make informed decisions regarding their children's health.

This assessment considers risks to children, as ATSDR bases screening values on the safety of vulnerable populations, such as children.

Conclusions

DOH reached the following three conclusions:

1. The environmental data are insufficient to evaluate the public health risk from future recreational use of this site. Additional soil testing is necessary to evaluate the public health threat.
2. The levels of fecal coliform bacteria in the water of two lakes could cause illness if swallowed.
3. Accidentally swallowing very small amounts of chemicals found in the lake water is not expected to harm people's health.

Recommendations

DOH recommends:

1. Before recreational use of the site, the responsible party should test surface soil (0-3 inches deep) for toxic chemicals associated with past land use. Testing should concentrate on areas of future recreational use.
2. The responsible party should continue to monitor lake water for fecal coliform bacteria and warn site users when levels are likely to cause illness.

Please contact me toll-free at 877-798-2772 if I can answer any questions about this assessment.

Sincerely,

Alan Willett
Health Assessor

AW/aw
Enclosures

This report was supported in part by funds provided through a cooperative agreement with the Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services. The findings and conclusions in these reports are those of the Florida Department of Health and do not necessarily represent the views of the Agency for Toxic Substances and Disease Registry or the U.S. Department of Health and Human Services. This document has not been revised or edited to conform to ATSDR standards.

References

[ATSDR 2002a] Agency for Toxic Substances and Disease Registry. Toxicological Profile for Di(2-ethylhexyl)phthalate (DEHP). Atlanta: U.S. Department of Health and Human Services; September 2002.

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[Escambia Co 2016] Escambia County, Natural Resources Management Department, Water Quality & Land Management Division. Clark Sand Pits / Jackson Lakes – Surface Water Quality Monitoring – Summary Report for Monitoring Event #3. Escambia County, Florida; October 2016.

[Geosyntec 2009] Geosyntec Consultants. Sediment Characterization Report – Bayou Chico Maintenance Dredging Project – Pensacola, Florida. Geosyntec Consultants Project Number FR1653B; November 2009.

Table 1. Potential Human Exposure Pathways

Potential Pathway Name	Exposure Pathway Elements					Time
	Source	Environmental Media	Point of Exposure	Route of Exposure	Exposed Population	
Recreational user ingestion of surface water	Unknown	Surface water	On-site	Incidental ingestion	Lake users	Future
Recreational user ingestion of surface soil	Unknown	Surface soil	On-site	Incidental ingestion	Recreation area users	Future
Worker ingestion of surface soil	Unknown	Surface soil	On-site	Incidental ingestion	Workers	Future

Table 2. Jackson Lakes Water Quality: Chemicals

Contaminants of Concern	Concentration Range (µg/L)	Screening Level [1] (µg/L)	Source of Screening Guideline [2]	Number of Samples Above Screening Guideline/Total Number
Bis (2-ethylhexyl) Phthalate - DEHP	BDL – 7.87	2.5	CREG	1/54
Dieldrin	BDL – 0.0203 I	0.002	CREG	11/54

Source of data: [Escambia Co 2015a, 2015b, 2016]
BDL = below detection limits
CREG = Cancer Risk Evaluation Guide
EMEG = Environmental Media Evaluation Guide
I = the reported value is between the laboratory method detection level and the laboratory practical quantitation limit
µg/L = micrograms per litter
[1] Guidelines only used to select chemicals for further scrutiny, not to the judge the risk of illness.
[2] Agency for Toxic Substances and Disease Registry Drinking Water Comparison Values

Table 3. Jackson Lakes Water Quality: Fecal Coliform Bacteria (CFU/100 mL)

Northeast Lake							
Parameter	Class III Standard [f]	NE-W (S)	NE-W (M)	NE-W (B)	NE-E (S)	NE-E (M)	NE-E (B)
		10/9/2015	10/9/2015	10/9/2015	10/9/2015	10/9/2015	10/9/2015
Coliform, Fecal	800 *	10	45	12	20	32	9
		11/4/2015	11/4/2015	11/4/2015	11/4/2015	11/4/2015	11/4/2015
Coliform, Fecal	800 *	600	66	100	22	55	400
		1/20/2016	1/20/2016	1/20/2016	1/20/2016	1/20/2016	1/20/2016
Coliform, Fecal	800 *	27	12	8	24	22	18
Southeast Lake							
Parameter	Class III Standard [f]	SE-W (S)	SE-W (M)	SE-W (B)	SE-E (S)	SE-E (M)	SE-E (B)
		10/8/2015	10/8/2015	10/8/2015	10/8/2015	10/8/2015	10/8/2015
Coliform, Fecal	800 *	27	14	55	15	23	19
		11/3/2015	11/3/2015	11/3/2015	11/3/2015	11/3/2015	11/3/2015
Coliform, Fecal	800 *	190	530	370	> 600 Z	390	390
		1/19/2016	1/19/2016	1/19/2016	1/19/2016	1/19/2016	1/19/2016
Coliform, Fecal	800 *	90	72	37	300	67	1,140
Southwest Lake							
Parameter	Class III Standard [f]	SW-W (S)	SW-W (M)	SW-W (B)	SW-E (S)	SW-E (M)	SW-E (B)
		10/8/2015	10/8/2015	10/8/2015	10/8/2015	10/8/2015	10/8/2015
Coliform, Fecal	800 *	33	53	37	53	41	18
		11/3/2015	11/3/2015	11/3/2015	11/3/2015	11/3/2015	11/3/2015
Coliform, Fecal	800 *	>600 Z	102	114	>600 Z	180	240
		1/19/2016	1/19/2016	1/19/2016	1/19/2016	1/19/2016	1/19/2016
Coliform, Fecal	800 *	34	19	13	30	25	5

Source of data: [Escambia Co 2015a, 2015b, 2016]
*** =** Number per 100 mL
[f] = Chapter 62-302 Florida Administrative Code
(B) = Bottom sample, depth approximately 20 feet
CFU = Colony forming units
(M) = Mid-depth sample, depth approximately 10 feet
mL = Milliliters
(S) = Surface sample, depth approximately 1 foot
Z = Too many colonies were present, the numeric value represents the filtration volume

Figure 1. Jackson Lakes Site in Pensacola, Florida

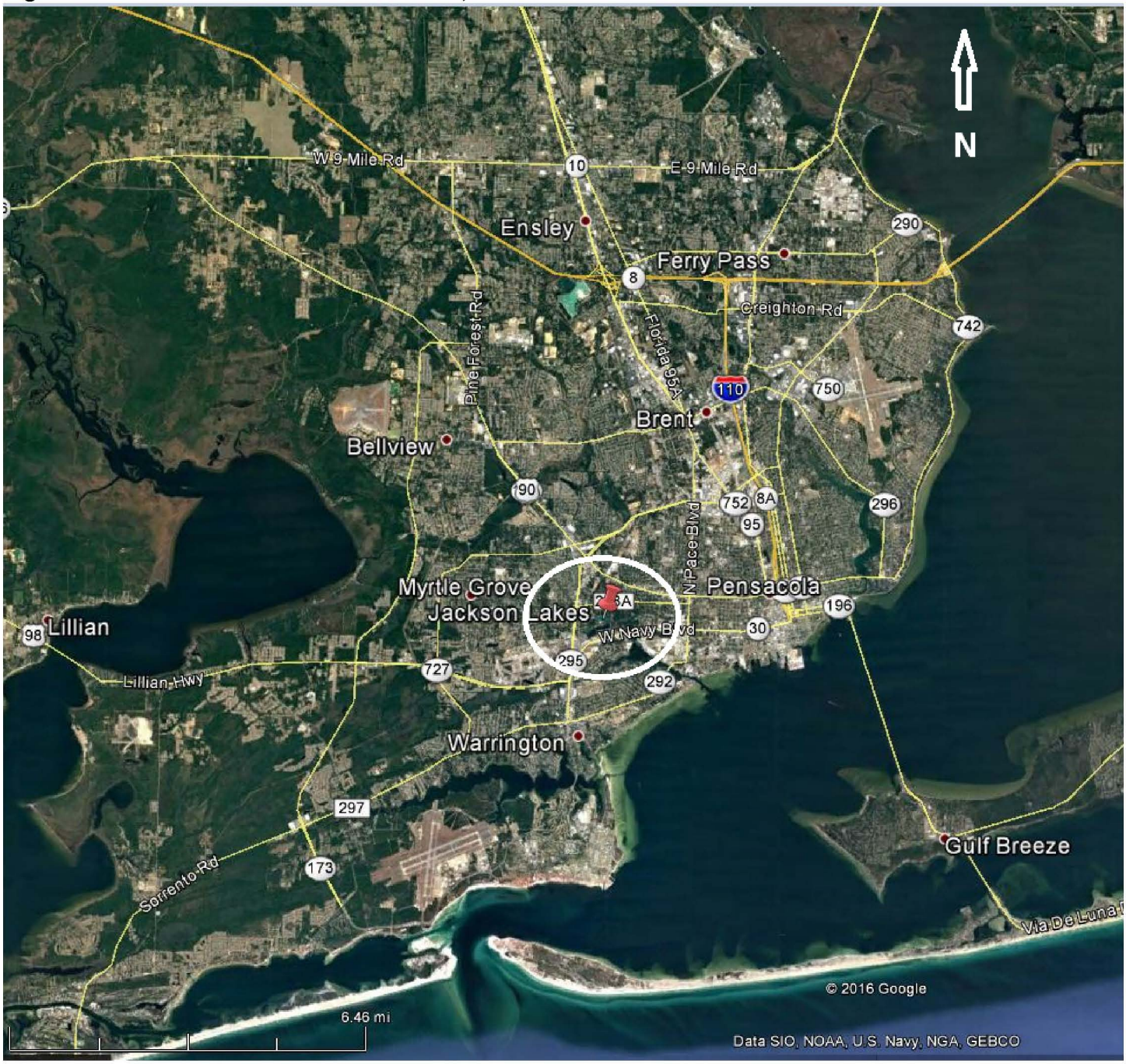

Figure 2. Jackson Lakes Surface Water Sample Locations