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IN THE MATTER OF:
REFLECTIONS PARK, INC.

Applicant

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* * * * *

OZAH Case No. 21-06

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Watershed Association

* * * * *

Before: Lynn A. Robeson, Hearing Examiner

HEARING EXAMINER'S REPORT AND DECISION ON REMAND

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I. STATEMENT OF THE CASE

Originally filed on January 21, 2021, Reflections Park, LLC, (hereinafter “Applicant” or “Reflections Park”) filed an application seeking a conditional use to establish a Cemetery under §59.3.5.4.A. of the Zoning Ordinance. Zoned R-C (Rural Cluster), the property is located at 16621 New Hampshire Avenue, Silver Spring, Maryland, and is further identified as Parcel 911, Tax Map KT 121.¹ On March 5, 2021, the Board of Appeals referred a variance associated with this application for hearing. Exhibit 26.

The Hearing Examiner approved the conditional use and recommended approval of the variance on October 11, 2021. *Hearing Examiner's Report and Recommendation in CU 21-06*, issued October 11, 2021 (HE Report). Mr. James Putman, who testified at the original hearing, and other individuals requested oral argument before the Board of Appeals.² Exhibit 116.

On November 17, 2021, the Board of Appeals held a worksession during which it decided to remand the case to the Hearing Examiner to take additional evidence (Exhibit 127):

...for the limited purpose of allowing one or more experts to present views counter to those that formed the basis for the Hearing Examiner's decision regarding the potential impact of necroleachate on groundwater, the Rocky Gorge Reservoir, and the Patuxent watershed, as well as to allow cross-examination of those experts and rebuttal testimony.

Afterward, the Applicant asked the Board to clarify that it could also present expert witnesses. The Board revised its original remand order to permit evidence (Exhibit 88):

...to be presented by the Patuxent Watershed Protective Association or the applicant, that is relevant to the potential impact of necroleachate on groundwater, the Rocky Gorge Reservoir, and the Patuxent watershed, including testimony and cross-examination of experts deemed qualified to offer opinion evidence on those issues, and such additional evidence from other parties as the Hearing Examiner deems relevant to the water quality issues raised in this case...

¹The original application listed the applicant as “Remembrance Park, Inc.”. Exhibit 1. The Applicant later changed its name to “Reflections Park” because there was another “Remembrance Park” already operating in Montgomery County. T. 178.

² Under Section 7.3.1.F.1.c of the Zoning Ordinance, filing a request for oral argument transfers jurisdiction of the case to the Board of Appeals.

After a pre-hearing conference with the parties, the Hearing Examiner issued a Notice of Hearing and Scheduling Order governing the remaining proceedings. Both parties were to submit expert reports no later than Monday, March 14, 2022. Rebuttal reports from both sides were due on March 28, 2022, and the public hearing was scheduled for April 12, 2022. Exhibit 94.

Both PWPA and the Applicant timely filed their expert reports and pre-hearing statements on March 14, 2022. Exhibits 97-106, 108. The Hearing Examiner forwarded copies of the expert reports to representatives of the Washington Suburban Sanitary Commission (WSSC) (which has jurisdiction over the Rocky Gorge Reservoir) and the Montgomery County Department of Environmental Protection (MCDEP), both of whom had provided comment in the original case.³ Exhibit 109.

Reflections Park also filed a Motion to Disqualify the Patuxent River Watershed Association (PWPA) from participating in the remand because it had forfeited its corporate charter in 2017. Exhibit 96. Shortly after (on March 16, 2022), Reflections Park requested that testimony and evidence from one of PWPA's identified experts be excluded because his expert report had not been filed by the date set in the Scheduling Order. PWPA filed an opposition to Reflection's motion to exclude them from the proceedings on March 24, 2022. Exhibit 112. On March 25, PWPA filed a letter explaining why one of their expert witness' report was delayed. Exhibit 113.

Reflections Park filed their expert rebuttal reports on March 28, 2022. Exhibits 118, 119. The opposition did not file expert rebuttal reports. The Applicant's rebuttal reports were forwarded to the WSSC and MCDEP. Exhibit 109.

The Hearing proceeded as scheduled on April 12, April 13, and April 14, 2022. Three expert witnesses appeared on behalf of PWPA. Five additional non-expert witnesses appeared in

³ The Hearing Examiner contacted both representatives on January 31, 2022, to let them know that she would be seeking further comment from them. Exhibit 92.

opposition. A representative of the Reflections Park and two expert witnesses testified on behalf of the Applicant. Their testimony is summarized below.

After the public hearing, those in opposition sought input on the questions that the Hearing Examiner would be forwarding to WSSC and MCDEP for review. The Hearing Examiner granted this request, and after revising some of her initial questions to address changes sought by both sides, she forwarded a final set of questions to the agencies on April 19, 2022. Exhibit 140. The WSSC and MCDEP timely responded with recommendations and analysis on May 10, 2022. PWPA submitted final comments on WSSC's and MCDEP's responses and the record closed on May 17, 2022.⁴

After very careful consideration of the expert and lay testimony in this case, the Hearing Examiner concludes that the weight of evidence and testimony in this case supports a finding that the proposed cemetery will not cause harm to nearby wells, streams, or the Rocky Gorge Reservoir and will be compatible with the surrounding area based on the limited environmental issues considered.

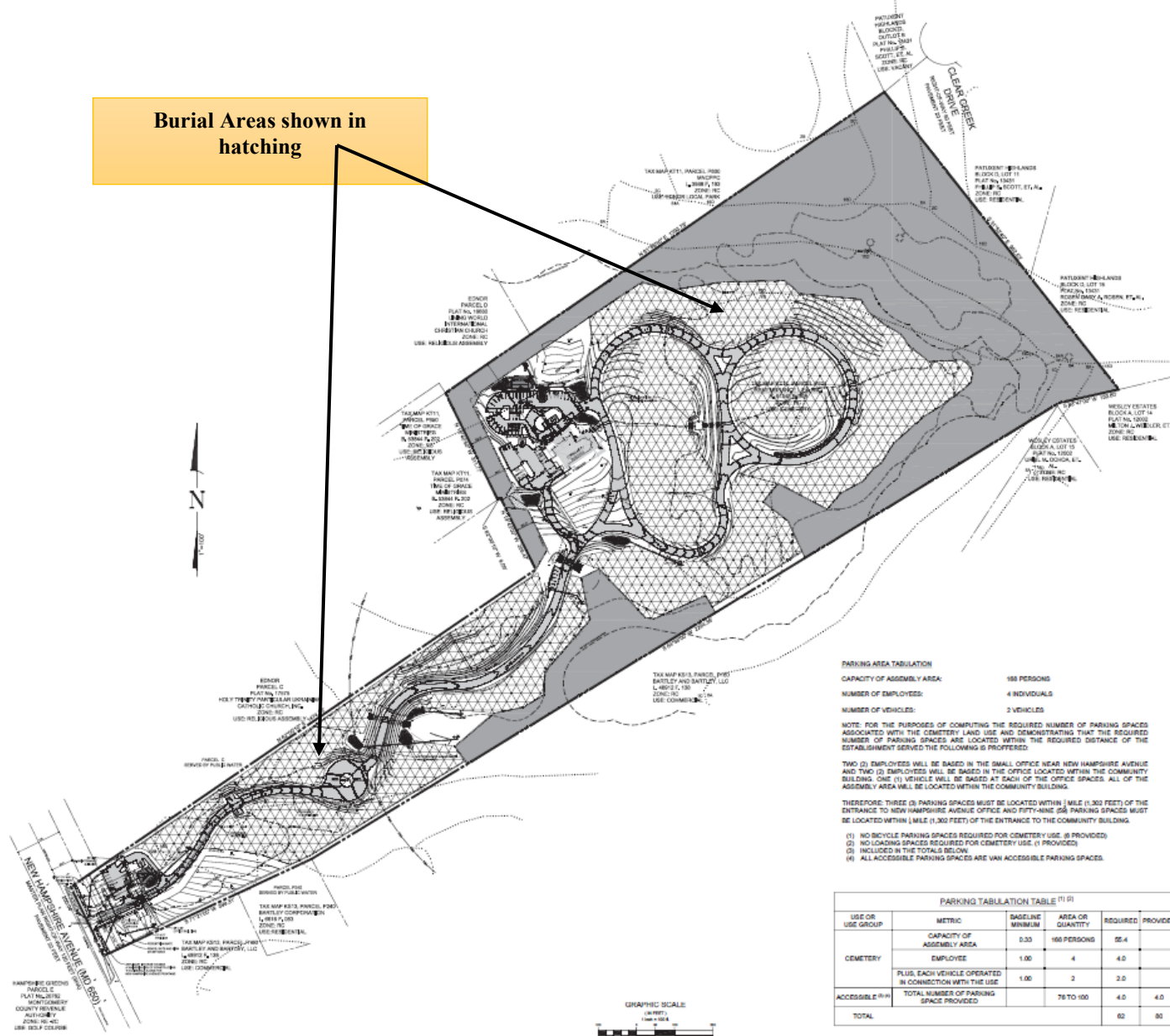
II. FACTUAL BACKGROUND

The factual background of the subject property, the surrounding area, and the proposed use were described in detail in the Hearing Examiner's Report and are not repeated here. For convenience, the Hearing Examiner includes the conditional use site plan proposed by the Applicant (Exhibit 38(b), on the next page).

III. PARTICIPATION OF PWPA AS A PARTY TO THE PROCEEDINGS

The main thrust of the Applicant's motion to prevent PWPA from participation was that it

⁴ The Applicant chose not to file a response to the comments from the WSSC and MCDEP. Exhibit 149.



had forfeited its corporate charter and therefore was without power under State law to pursue litigation. Exhibit 96, pp. 7-9. The motion also alleged that PWPA misrepresented its status as an environmental steward in Montgomery County in prior proceedings. Exhibit 96. During the first day of hearings, the Applicant maintained that the expert reports submitted by PWPA's witnesses should be excluded because they had been filed while PWPA's charter was forfeited.

Mr. James Putman testified that PWPA forfeited its corporate status in 2017. Once he realized that oversight, he immediately refiled all seven delinquent property tax returns with the State Department of Assessments and Taxation (SDAT). The returns were accepted the next morning. PWPA then hired an attorney to file articles of revitalization and PWPA paid for expedited review. The expedited review was completed on April 11, 2022 (the day before the first hearing on the remand). PWPA's status on SDAT's website was changed the afternoon of April 11, 2022 to a corporation in good standing. He had not yet received an email from SDAT confirming this but did print the screenshot from SDAT's website and submitted it into evidence. T. 8-9; Exhibit 129. Mr. Putman also submitted into the record the Articles of Revitalization of PWPA. Exhibit 131. At 2:00 p.m. on the day of the first hearing (April 12, 2022), Mr. Putman submitted an email from SDAT confirming that the Articles of Incorporation had been accepted. Exhibit 133.

Mr. Putman also addressed statements in the Applicant's motion alleging that his testimony before the Hearing Examiner prior to remand was inaccurate. He testified that, as a volunteer organization, they are not always "as tidy" as they should be. T. 14. PWPA is not a 501(c)(3) corporation as he originally thought. PWPA is a 501(c)(4). It's his understanding that the difference is that if PWPA was a 501(c)(3) corporation, individuals could deduct donations on their tax returns. He apologized for his mistake. T. 9-12.

The Applicant makes several arguments regarding PWPA's representations at the first hearing, its standing as a party to this proceeding, and whether the Hearing Examiner has authority to consider the expert reports filed by PWPA when its charter was forfeited. Alleged misrepresentations include: (1) PWPA's assertion that it is a long-standing spokesperson for environmental protection is incorrect, (2) that PWPA can't be an aggrieved party under *Bryniarski v. Montgomery County Board of Appeals*, 247 Md. 137 (1967) because it owns no property within the surrounding area, (3) that it hasn't been a long-standing spokesman on environmental matters because it wasn't included in the Citizen's Advisory Committee of the Cloverly Master Plan or the "Technical Advisory Group" that participated in development of the 1998 Patuxent River Watershed Functional Master Plan, and (5) that it wasn't an organization recognized by the Montgomery County Planning Department.

In response to its corporate authority, PWPA's attorney cites to *Md. Code Ann., Corps. & Ass'ns* § 3-512, which provides:

The reinstatement and extension of a corporation's existence under § 3-501 of this subtitle or the revival of a corporation's charter under § 3-507 of this subtitle has the following effects:

(1) If otherwise done within the scope of its charter, all contracts or other acts done in the name of the corporation while the charter was void are validated, and the corporation is liable for them; and

(2) All the assets and rights of the corporation, except those sold or those of which it was otherwise divested while the charter was void, are restored to the corporation to the same extent that they were held by the corporation before the expiration or forfeiture of the charter.

In Reply, the Applicant cites *Tri-County Unlimited, Inc. v. Kids First Swim Sch., Inc.*, 191 Md. App. 613, 622-23, 993 A.2d 146, 151 (2010), which holds that a complaint filed by a defunct corporation is a nullity as a matter of law. Exhibit 120.

The Hearing Examiner finds that the facts here are distinguishable from those in *Tri-County*. The *Tri-County* Court recognized that a corporation was free to sue again if the statute of limitations hadn't passed. *Tri-County, supra*, at 621 ("Tri-County certainly has the right to initiate a lawsuit now that its charter has been revived and it is a legal entity; in fact, the circuit court instructed Tri-County to re-file its complaint.") The Hearing Examiner finds credible Mr. Putman's testimony and evidence (the screen shot from SDAT's website) that PWPA was restored to a corporation in good standing as of April 11, 2022. Even were it not until April 12, 2022, the restoration permitted PWPA to continue to participate as a party to the proceedings.

At the hearing, the Applicant argued that the expert reports should still be excluded because they weren't filed within the time required in the Hearing Examiner's scheduling order. The Hearing Examiner disagrees. As of the first day of the hearing, PWPA had the ability to present and rely on reports, which it did at length during the public hearing. Therefore, the only technical defect at the time of the hearing was that the expert reports were presented late. Late filings may be subject to sanctions, but the Applicant did not make this motion, nor can the Hearing Examiner find any prejudice. The expert reports relied upon by PWPA were not changed at the time of the hearing from those submitted in March and the Applicant did, in fact, file lengthy rebuttals to them. The Hearing Examiner refuses to exclude them.

The Hearing Examiner finds that many of the allegations in the Applicant's motion are either irrelevant, or inaccurate, or both. She does not understand why accusations of past alleged misrepresentations relate to the legal issues surrounding the forfeiture of PWPA's charter.⁵ Some of the propositions in the Applicant's motion are inaccurate. Just as an example, the Hearing

⁵ If the Applicant intends to attack Mr. Putman's credibility based on the alleged misrepresentations in prior proceedings, the Hearing Examiner strongly disagrees. The Hearing Examiner has viewed Mr. Putman's demeanor and comportment on the stand in both the first hearing and this hearing and finds that he has never intentionally misrepresented facts to the Hearing Examiner, as his testimony demonstrates.

Examiner is unaware of any law that requires PWPA to be an “aggrieved party” under *Bryniarski* to participate in a hearing where OZAH exercises original jurisdiction.

V. EXPERT TESTIMONY

A. Opposition's Expert Evidence and Testimony (Day 1)

1. Dr. Luther King Abia Akebe (Dr. Abia)

Dr. Abia has a PhD in environmental microbiology and was recently appointed as an assistant professor of applied environmental microbiology at the University of KwaZulu-Natal. He is a member of the South African Council of Professional Natural Scientists, that researches environmental aspects, human aspects, and animal aspects from a microbiological point of view. T. 193-194. He recently joined the Aspen New Voice Fellowship, which is a platform that allows him to translate his research into popular articles that non-specialists may read. T. 196. From 2015 to 2018, Dr. Abia studied the impact of internment, or burials, on groundwater.⁶ Dr. Abia qualified as an expert in the field of micro-bio impacts of interments on water resources, including wells and water supplies. T. 195.

Dr. Abia testified that any form of cemetery or burial, whether traditional, green, or otherwise, is a bad idea in an area that serves as a water catchment for drinking water, as many of the articles in Exhibit 102(a) point out. T. 196. He opined that the natural environment contains innate processes for cleaning itself. T. 197. Anthropological activities, however, may upset that balance. Once humans alter the environment, it can change the natural system so that it does not function as normal. Dr. Abia's research focuses on bacteria. The environment can clean excretions from animals, birds, etc., because they excrete only small quantities. Human activities, however, change that setting. T. 197.

⁶ Dr. Abia's resume is Exhibit 101.

Dr. Abia testified that the first area of concern in human burials is that any decomposing bodies are a rich source of nutrients. However, not all organisms come from within the body. There are organisms that are already found in the soil and have developed ways of protecting themselves in the environment. T. 198. Interred bodies provide those bacteria with a rich source of nutrients that will allow them to grow more than they normally would. Apart from leaching into the ground water, the nutrient load will provide a high level of nutrients to bacteria already in the soil. T. 198.

Dr. Abia opined that high levels of bacterial nutrients can generate larger concentrations of antibiotic resistant bacteria. He explained that organisms in the environment are already in competition. They are forced into competing as a mechanism of survival. One of the mechanisms of survival is that they produce antibodies or antibiotics. These are meant to eliminate competitors to gain enough food to survive. Other organisms that are targeted by the antibiotics need to develop a defense mechanism, which means they automatically develop a resistance to the antibodies to survive. T. 198.

A problem arises when the resistant organisms have enough nutrients to grow faster than they could have grown with more limited nutrients in their environment. When the micro-load is boosted beyond the capacity of the environment to contain it, they leach down through cracks in the soil. Digging graves creates "cracks" in the soil and the soil can't be returned to its normal state. The decomposing leachate passes through and may create an underground stream that can get down to nearby waters. T. 199.

In this environment, organisms produce extracellular proteins that allows them to bind and form a "mat." T. 199. This can be seen in sanitary filtration systems for water treatment. At some point, part of the surface needs to be removed because the mat formed by the bacteria allows these

organisms to slough off gradually and get into groundwater that is already treated. T. 199-200. This means that the ground's natural filtering capacity ultimately breaks down. Once the amount of bacteria present grows beyond the soil's capacity to filter them, they begin to peel off gradually and can contaminate water through runoff or other ways, depending on the soil type. T. 200.

Even if these bacteria die again, they are not completely dead. Their DNA is still available, especially with resistant genes. DNA fragments that carry resistant genes have been found in soil far before anyone examined the effect of antibiotics. If we create a huge concentration of these organisms, we have also created a huge DNA pool within the environment. Dr. Abia explained that DNA has been found in 30-year-old perma-frost. These DNA can be transferred to closely related organisms by conjugation, which is a form of mating, or by transduction, which is the transfer of DNA from special bacteria viruses that are in the soil. When these viruses feed on those bacteria, they can transfer that DNA to other bacteria. T. 200-201.

There is a third form of antimicrobial resistance called "transformation". In that method, the bacteria themselves pick up free DNA from the environment and, in the case of burial, is likely what will occur most often. Even though the bacteria will die, the DNA will be available. The DNA is much smaller than the bacteria and a very minute fraction may easily go through cracks and find itself at longer distances than intact bacteria. T. 201.

The DNA of resistant bacteria have already been found in groundwater sources, surface waters and wells. They can join non-resistant bacteria already present and develop resistance also. Microbial resistance is a very big problem and is being discussed at the U.N. and World Health Organization (WHO). There is no way to eliminate the threat that these bacteria pose to the environment. WHO advocates a "one-herd" approach to solving the problem, which means that the entire interaction between humans, animals, and the environment be considered, instead of

focusing only on human health. T. 202. There is no way that human health can be separated from the environment. *Id.*

According to Dr. Abia, this means that all human pollution will cause a problem downstream, especially if the source is not well-located. While Dr. Abia believes that green cemeteries are beautiful ideas, they should not be in a catchment that serves drinking water. In his opinion, that would be a “very bad” idea. T. 202.

On cross-examination, Dr. Abia testified that, in the cemeteries he has studied, the water table was low in some areas and high in others. Whether it was low or high, they were seeing comparable micro-communities. They were also seeing comparable disease-causing bacteria. T. 203. Bacteria and viruses have been found to attach more to smaller soil particles. However, even if they are smaller particle sizes, when they form the biofilm mat, the mat becomes like a reservoir, an environmental reservoir that constantly releases bacteria into the environment. T. 204. If clay soils exist under the graves, the water drains slowly and may return to the surface and runoff. T. 206.

Dr. Abia acknowledged that he had not done a site-specific analysis of the soils in this area. He believes that any digging that create cracks will yield the same problem. T. 208. He agreed that the best considerations would be depth to groundwater and burial depth. T. 210. A 6-foot depth has been held to be the best depth to ensure that nothing surfaces, although he did not know the basis of that calculation. T. 210. It should be deep enough to prevent scavengers from digging up the bodies. T. 210. However, we create cracks in the subsoil simply by digging the graves. In his opinion, the site-specific conditions have been reported in many other countries and he believes will be like this site. T. 210.

2. Dr. Theresa O'Keefe

Dr. O'Keefe is a scientist that develops drug therapies for humans. She specializes in cancer therapies and is concerned that there isn't enough consideration of the impact of pharmaceutical therapies on the environment. She has a master's degree in veterinary science and physiology and a PhD in molecular immunology. She received training from two Nobel Prize winners and has worked for we years in biotech companies. She has invented drug treatments for Chrohn's disease and ulcerative colitis. T. 148.⁷ She qualified as an expert in risks from hazardous drugs. T. 152.

Dr. O'Keefe opined that it is "critical" to keep hazardous chemicals out of the water supply because it is the best way to treat birth defects and cancer. Exhibit 106, p. 1. A woman is born with all her eggs formed; if a woman is exposed while carrying a fetus, both her child and grandchild can be severely injured. In her expert report, she states, "It is critical that pregnant women are protected from Hazardous Chemicals because almost ALL childhood cancers start before a child is born...a dose of Hazardous Chemical that can be tolerated by an adult (100+ lbs) is a disaster for a fetus that weights only a few ounces." *Id.*

Dr. O'Keefe testified that the typical focus on hazardous drugs is on the risk to the standard patient. A standard patient is considered to be a 70 kilogram (kg) adult, who has an A1c of less than 5.8 who is a non-smoker and who lived a perfect life.⁸ They are at a small risk of anything. T. 154.

As a prelude to her conclusions, Dr. O'Keefe explained the concept of "ADME", which

⁷ Dr. O'Keefe's CV is Exhibit 105.

⁸ 70 kg converts to approximately 154 pounds. "Convert Units - Measurement Unit Converter." ConvertUnits.com. Web. 8 Jun 2022. <https://www.convertunits.com/from/70+kg/to/lbs>.

stands for absorption, distribution, metabolism and excretion. An example is a medication administered in pill form: "Absorption" is the amount that passes from the gut to the blood. "Distribution" is the method by which the drug moves throughout the body into different organs. Metabolism is the process by which the body breaks down or changes the drug, and "excretion" is the process by which the drug is excreted from the body. Here, the key steps are metabolism and excretion because none of the drug will be excreted if it's completely metabolized by the body. *Id.*, pp. 1-2. She testified that most people don't realize that the majority of human drugs in the environment are excreted from our bodies. *Id.*, p. 2.

The National Institute for Occupational Safety and Health (NIOSH), the research arm of Occupational Safety and Health Administration (OSHA), creates a "Hazardous Drug List" based on information supplied by drug companies to the FDA, including extensive committee reviews. The goal of NIOSH is to provide information to health care workers about any drugs that could cause cancer, birth defects or serious injury. *Id.* The list is comprised of 200 drugs that are dangerous to humans other than the patient. The list includes several drugs used to treat cancer, including Cyclophosphamide and Tamoxifen, which are usually used acutely and "chronically", (*i.e.*, for five or more years). *Id.* Another chronically used hazardous drug is Valproic acid, which is used to treat epilepsy. All must be handled and disposed of using hazardous chemical disposal pathways and protocols. *Id.*

What causes the most concern in her area of expertise is the risk of harm from these drugs to fetuses. The hazardous drug list contains 188 drugs and 88 percent of those drugs ended up on the list because of the harm they do to fetuses. T. 154. So instead of the 70-year-old male, the focus is now on something that is less than 100 grams and under 2 ounces. Their liver is the size of an adult fingernail. This changes the level of risk. Lots of chemotherapy drugs, the old-

fashioned ones that are so potent, like cyclophosphamide, tamoxifen, or methotrexate, are used not only for cancer, but are very effective for rheumatoid arthritis. T. 155.

However, 25 to 80% of the drugs we give to those patients will be absorbed into the bloodstream. It will be distributed through the body and the metabolized. There are some parts that our digestive systems are unable to break them down. These are excreted from the patient as the original cyclophosphamide, methotrexate, and tamoxifen. T. 155.

These can contact the skin, drinking water and many other ways. They are found in wells of people on chemotherapy. Then, if a pregnant woman drinks even a tiny amount, can cause tremendous harm to fetuses. That is why these drugs are on the hazardous drug list. Sixty-four of the drugs on the list may cause cancer, birth defects, miscarriages, and many other adverse health effects on fetuses, children, and babies. T. 156.

She and other scientists are very worried about any of these chemicals getting into any water, any well, or anything else because in the U.S. The cost to treat childhood cancer is \$800,000. Almost all cancer in children begins before the baby is born. Childhood leukemia, one of the common forms of cancer in children, may require a T-cell treatment, which of itself is \$1,000,000. T. 156.

She recommends not taking any chances with excretion of these hazardous drugs. Cyclophosphamide used for breast cancer, ovarian cancer, lung cancer, and most types of blood cancer, is the chemical that causes hair loss. What people don't realize is that it also used for palliative care. If cancer is not remitted, that drug is used to reduce the size of tumors, so they don't metastasize, or grow so large that they press on nerves or even break bones. For this reason, a "lot of people" die with chemotherapy in their body. It is not used for treatment, but pain control. T. 157.

Tamoxifen is used for the entire life of a breast cancer patient who is not responding to treatment to keep the tumor volume down. There are other drugs that are not as much in her area of expertise. However, over 1 percent of people in the U.S. have epilepsy. Twenty percent of the drugs used today for this condition are using hazardous drugs, which are excreted in large quantities. T. 158. Those patients will be taking those drugs until the day they die. The drugs will get into the water after excretion from the body. T. 158. It takes "very, very little" of these drugs to cause childhood cancer because cells in fetuses have no immune system. T. 159.

Hormone therapy also has hazardous effects. Estrogen takes eight different mammalian enzymes to break down. These do not exist in bacteria. That is why estrogen is found in streams, waterways downstream of municipal wastewater treatment plants, and septic tanks. This has caused the feminization of fish. T. 159. Her research indicates that over 12 million patients in the U.S. are on estrogen drugs. Estrogen is "very, very hardy". T. 159. One of the first estrogen drugs, Premarin, has been found to cause cancer. It is now on the hazardous drug list because it is FDA pregnancy category X. There are 64 of these types of drugs, that can cause such damage in very tiny amounts. If you put these in the ground, they will come out of the ground. T. 160.

On cross-examination, Dr. O'Keefe testified that she has not analyzed the exposure pathway on the subject property. T. 162. However, the CDC, NIOSH and everybody worries about the exposure. It is one of the textbook things we must worry about. The presence of estrogen in drinking water is not from flushing pills down the toilet, it is from human excretion into the wastewater supply. Municipal wastewater plants cannot treat the estrogen. She does not know of a single study testing for the presence of estrogen that has not found it present. T. 163. Nor will septic systems degrade many of the drugs she's worried about. T. 164.

In her opinion, the volumes of drugs excreted from dead bodies compared to living bodies may be the same, depending on the dosage and the number of days before death the drugs were administered. Palliative care can continue until death. One of the drugs, Estramustine, is given to men with terminal prostate cancer for palliative care. It is equivalent to estrogen but is given in doses a “million times” the amount that a woman would produce in a day. It is given every day until death to prevent the tumors from pushing on the nerves. T. 165-166.

Dr. O’Keefe opined that the exact exposure pathway after excretion from the body is not as important with some of these drugs because they do not bio-degrade. To break down estrogen, you need eight mammalian enzymes. So, until the excretion becomes absorbed by a mammal, it will flow somewhere. T. 173. Mammalian enzymes in the dead bodies break down very quickly because they need oxygen. The enzymes will be destroyed “within minutes” after oxygen deprivation. That’s why industrial enzymes cannot be mammalian. If the PH becomes acidic, they’re destroyed. T. 174. The only items left in the body tend to be bacterial enzymes, which are not very efficient at destroying these hazardous drugs. T. 174. Estrogen and other mammalian enzymes are like the plastics of the drug world. *Id.*

These drugs are on the NIOSH list, which measures hazard levels for people to work with patients who work with the drugs. Despite this, they do not have to be exposed frequently. If they are pregnant, they only must be exposed once. T. 176.

Dr. O’Keefe testified that drugs that are in your body on the day of death remain in the body the following day and days beyond. In living persons, most drugs are excreted within 12 hours; some take 36 to 48 hours. Before death, metabolism slows and drugs taken the day of death will remain in the body and be excreted at a slower rate. Some cancer drugs are used for palliative care to keep the patients out of pain, and full doses may be within the body at the time of death.

T. 183. Hazardous pharmaceuticals are not just used for cancer patients, but also for patients with rheumatoid arthritis. More drugs may remain in the body of patients with renal failure because their normal metabolism does not work. T. 184.

Dr. O'Keefe acknowledged that she did not do an analysis of the exposure pathway on the subject property after excretion. She felt that there have been "too many" papers that already show these chemicals getting into the water supply. T. 160-161. According to her, environmental textbooks already document the problems with estrogen. T. 161. In her opinion, the nature of the drug is more important than subsurface conditions on the property. T. 172. It will not be degraded by other bodies because the mammalian enzymes break down very quickly because they need oxygen.

Dr. O'Keefe also acknowledged that she had not studied the subsurface conditions on the subject property. She testified that most of the drugs she described were excreted within a couple of days of someone taking them. In her opinion, septic systems will degrade a lot of substances, but not the ones she is most worried about. She analogized these drugs to "plastic". T. 164.

She testified that the amount of drugs excreted from a body at death varies with the number of days before death they received the dose and the size of the dose. One of the big issues of palliative care is that doses given are much higher. For instance, Estramustine is given to men who have terminal prostate cancer for palliative care. It is equivalent to estrogen but given in doses a "million times" the amount a woman would produce in a day. They give that drug to terminal prostate cancer patients to prevent the cancer from growing so big that it pushes on the nerves. T. 165. The amount excreted into the ground would be the equivalent of the dose administered just before death. T. 166.

Dr. O'Keefe acknowledged that the NIOSH Hazardous Drug List is a guide to assessing occupational risk. While most people must be exposed more than once, pregnant woman need only be exposed once. T. 177. She acknowledged that the risk potential of a person who handles hazardous drugs on a regular basis is different than someone who might drink the water once or twice.

3. Mr. James Mullooney

Mr. Mullooney worked for 35 years in the hazardous waste business⁹. Part of his work involved cleaning up hazardous waste sites. This included determining what needed to be removed, identifying the point source, and analyzing engineering reports on the groundwater flow. Once the point source was identified, they would remove it to enable them to clean up the groundwater. T. 215-216. He worked on diagnosis and remediation of the hazardous waste site at Love Canal. He has never analyzed a cemetery as a hazardous waste site. T. 216. Mr. Mullooney qualified as an expert in the risk of releasing toxic chemicals. T. 216.

Mr. Mullooney was directed to this project by Dr. Christian Daughton, who is the number one expert on drugs in the environment in the U.S. and one of the top in the world. T. 217. When he first started discussing this with Dr. Daughton 15 years ago, Dr. Daughton mentioned that no one is researching the discharge of chemotherapy drugs into the environment. As Mr. Mullooney began studying the issue, he believes that examining the dose of the drug given to patients has no bearing on the level of environmental pollution. T. 218.

This is because some of the cytotoxic chemicals are harmful even in minute doses. Unlike lead exposure, which becomes toxic when certain amounts accumulate, one molecule of these

⁹ Mr. Mullooney's resume is Exhibit 104.

drugs starts a chain reaction that alters DNA. All the cells in fetuses and children are dividing, so if one molecule gets in, it can block the replication. T. 218.

In chemo patients, these drugs can cause death. If they don't die, they become a mutation, which in a child is a birth defect. He became involved in preventing this hazard in 2007 when he realized how dangerous these chemicals are and how they can harm rapidly dividing cells at any level. T. 218. He also noticed among his friends a correlation between autistic children and parents that had chemotherapy treatment. This is a new field that is receiving a lot of research, but in Europe, it is part of the clean water directive. T. 219.

He testified that these concerns haven't been addressed in the U.S. due to confusion about the jurisdiction over these pharmaceuticals. The U.S. Environmental Protection Agency (EPA) will state that it is the Federal Drug Administration's (FDA) jurisdiction, and the FDA says it's the EPA's jurisdiction. As no agency takes responsibility for this, the problems with discharge of hazardous drugs is not being addressed in the U.S. as it is in the rest of the world. T. 219.

Under the CERCLA Super Fund regulations, the polluter pays for remediation. Mr. Mallowney holds a series of patents on mechanisms for collecting human waste from chemotherapy agents, so it doesn't travel through a septic system and get into water supplies. The goal is that it never goes down the drain. T. 220.

Mr. Mallowney opined that in future years, this type of waste will not flow into septic systems and will be handled like every other dangerous chemical. In his opinion, 10 years from now, this cemetery will be a superfund site that they will have to dig up because it will become the point source of pollution. T. 220.

Mr. Mallowney opined that putting a cemetery of any type in a watershed is a "bad idea". But a green cemetery is even worse because of the water drains so quickly and breaks down into

the water. These chemicals will go into the water and polluting Silver Spring is not a good idea.

T. 221. He works every day on getting people to control these genotoxic, cytotoxic chemo drugs, and once we solve that problem, the next will be the bodies that drain into the reservoir. T. 221.

Mr. Mallowney clarified that he is not opposed to green burial cemeteries outside of a watershed that does not drain to a drinking water supply. T. 222. There are "plenty" of places where it will not enter the groundwater. Some of these take 20 years to degrade and should not be in the drinking water. T. 221.

Mr. Mallowney gave an example of how protective disposal of hazardous chemical must be. He testified that when he worked at a hazardous waste facility in Framingham, MA, they were receiving drums full of syringes. They had to break the tip off and put it in a 5-gallon pail to go to the medical waste incinerator and placing the syringes in a 5-gallon pail to go to a non-regulated waste facility. The chemical used in the syringes was mustargen. It's a liquid mustard gas. In 2007, the EPA was starting to look at these drugs as environmental pollutants, but they stopped because it "terrifies" them. T. 222. In his opinion, it's irresponsible to place a cemetery in this location with the excuse that it's "no worse than a septic system." T. 222. He believes that governments that allow this to happen are "insidious." T. 222.

Mr. Mallowney testifies that for some drugs, more care is placed into how the drug goes into the human body rather than how it gets excreted. For instance, the wrapper from methotrexate is so toxic that the EPA makes it a felony to place it in the regular trash. However, 90 percent of that drug is excreted by the patient ungoverned by regulations. Methotrexate is used to terminate pregnancy and can kill the fetus within hours. These new drugs that can harm with such minimal dosages remain dangerous when excreted and he believes there will be more research on it. T. 224.

He believes that the green burial cemeteries will become a future pollutant point sources based on common sense. It doesn't make sense to place it in the water supply for drinking water. There's a tremendous amount of legislation on this in Europe. They already added chemotherapy drugs to Europe's clean water directive, although implementation has been delayed due to COVID. This is not true for every watershed, but it is true for watersheds that drain into a drinking supply. T. 225. There is a tremendous amount of information on fate and transport of cytotoxic drugs both through soil and wastewater throughout the world. T. 226. There are many studies that have confirmed that it is in the soil. T. 226. An example is cyclophosphamide. When the human body destroys a molecule, the first breakdown product, or metabolite, is acrolein. Acrolein is ranked as a high-level poison by the EPA. Cyclophosphamide is a lower level. The other byproduct of the drug is phosphine mustard that is used in chemical weapons. Drinking water is not completely screened for these byproduct. You must ensure that it doesn't get in the drinking water supply or you will never get it out again. T. 227.

Mr. Mallowney does not believe that the site specifics change is analysis. He believes it "fairly clear" from the literature that where there is flow of groundwater the chemicals will get to a drinking supply. T. 228.

B. Applicant's Expert Testimony (Day 2)

1. Dr. Richard Pleus

Dr. Pleus is a pharmacologist and toxicologist with 30 years of experience evaluating human exposures to chemicals in the air, in water, in food, in drugs, in consumer products and occupational environments. He has a bachelor's degree in physiology, a master's degree in public health, focused on environmental public health, and a PhD in pharmacology.¹⁰ Mr. Pleus testified

¹⁰ A summary of Dr. Pleus' qualifications is at Exhibit 119, p. 1.

that toxicology is the study of how chemicals adversely affect the human body. Pharmacology is a study of how chemical agents affect the body as well, although the focus is on the therapeutic intention or value. An example would be an opiate to relieve pain. When doing pharmacological research, he was looking to design drugs for therapeutic effects. Toxicology in contrast, studies the dosages of therapeutic agents that become toxic, such as lead or mercury in the environment. T. 260-261. Dr. Pleus qualified as an expert in the areas of toxicology and pharmacology and in the assessment of risks to human health from exposure to pharmaceuticals in drinking water. T. 265.

Dr. Pleus testified that PWPA's experts ignored the "dose response" concept critical to determining whether exposure to drugs is toxic. They failed to account for the exposure pathway of these drugs after excretion. In Dr. Pleus' opinion, the science behind the opposition's expert evidence and testimony was "was absolutely incorrect and poor." T. 270.

According to him, to measure potential toxicity, one needs to know the chemical, the dose, the exposure route, and the threshold. T. 270. According to Dr. Pleus, chemicals cannot be defined "cytotoxic" without knowing these factors. The term "cytotoxic" is a very general word that simply means that a chemical is affecting a cell. Every chemical has the potential to have a cytotoxic effect. A chemical is not toxic until it reaches a dose at which there is toxicity. None of the Applicant's witnesses used the term cytotoxic or genotoxic correctly. T. 272. Nor will exposure affect future generations. A teratogen is a chemical agent that affects the embryo in its development of the embryo. It does not affect future generations. T. 272.

Dose response is a fundamental principle in conducting a toxicology assessment. Mr. Mallowney correctly cited this for the proposition that everything has the potential to be a poison. What differentiates a pharmaceutical from a toxin, however, is the dose. Toxicologists worldwide

understand that everything has a potential to cause toxicity. At what point it does so depends on the chemical agent and the dose given to a patient. T. 269. A simple example is ethanol. If someone consumes a quarter of a teaspoon of ethanol, it will probably go into the body, be absorbed, distributed, metabolized, and a little will be excreted without any effect. If a cup of ethanol were given to an individual, the response will begin to affect the person. With increasing amounts of alcohol, things like social behavior begins to change. Increasing the dose further will begin to impair thinking, actions of appendages, and walking. Further increases will land a person in the emergency room and ultimate, with increased dosages, the individual will die. T. 270.

Another important component of measuring potential toxicity is exposure. Using alcohol as an example, an unconsumed bottle will not cause harm because there has been no exposure. The exposure route is oral, meaning one drinks it. Only once the chemical gets into the body does it does have an effect. So, exposure becomes important when measuring potential toxicity.

Threshold is the level at below which there are no adverse effects to the human. The threshold must be determined whether it's a toxic end point or the most sensitive toxic end point. Again, using alcohol, feeling social comfortable might be a threshold; the ability to walk a straight line would be a different threshold. T. 271. Thresholds are determined by the desired effect of the drug. In toxicology, they look for the most sensitive known health effect and use that to determine effect of increased dosages. T. 271.

Dr. Pleus disagrees with Dr. O'Keefe and Mr. Mullowney that there are drugs with no threshold exposures. Government agencies around the world perform a toxicological risk assessment to determine the health impact of potential drugs. It is a well-known quantitative process that is completely missing in Dr. O'Keefe's and Mr. Mullowney's testimony. T. 273-274.

Dr. Pleus also stressed the importance of examining the exposure pathway, or ADME, the acronym for absorption, distribution, metabolism, and excretion, in determining toxicity. Using alcohol as an example, Dr. Pleus explained that, first, it must be introduced into the body. Absorption means that if it's introduced orally, it travels to the gut and small intestine, and then is absorbed into the body. That is a complex physiologic process because sometimes gastric juices and materials in the gut will metabolize the compound taken orally. The gut has a micro biome, which is an active source of bacteria that help the body metabolize materials. T. 274-275.

Once a chemical crosses into the bloodstream, it will go to the liver and the liver metabolizes the material, after which it is distributed throughout the body. The purpose of the liver then is to help chemicals be excreted from the body by making them more available to be excreted in urine. A bypass puts the chemical into the feces, although the liver may do that as well. T. 275.

Chemicals contained in necroleachate have different ADME and metabolism continues after death. ADME begins before death. The first barrier is that it must be absorbed into the body. The second thing the body does is metabolize it, which means the body will use the chemical or get rid of the chemical. Once it gets metabolized, at least for ingested chemicals, it gets distributed to tissues in the body. Depending on the chemical, it may concentrate more in some tissues than others. Then the chemical passes through the kidneys and excretes through urine or feces. T. 276. A small portion may be exhaled through the lungs or excreted through sweat, but those are minor routes. T. 276.

Metabolism of chemicals in necroleachate continue as death occurs and after death. As the body begins to die, the systems start to shut down. Shortly after, the blood, fluids and tissues are redistributed. Those continue to work until the pH changes in the body, temperature decreases in

the body, or the energy sources stops. But that takes time for different tissues. It is not like a like a light switch going off but does continue for a short period of time. T. 277. According to Dr. Pleus, there are different varieties of estrogen compounds that are metabolized in the gut. T. 278. Upon death, the microbiome of the gut does not shut down immediately, but flourish. The decomposition of the body starts at that point. The same applies to the microbiome of the skin. *Id.* As the body begins to die, the systems start to shut down. Shortly after, the blood, fluids and tissues are redistributed. Those continue to work until the pH changes in the body, temperature decreases in the body, or the energy sources stops. But that takes time for different tissues. It is not like a like a light switch going off but does continue for a short period of time. T. 277.

In his opinion, the potential of *occupational* exposure, relied on by Dr. O'Keefe and Mr. Mullenney, is "vastly different" than potential exposure by other means and should not be relied on in this case. According to him, there "is no equivalent potential exposure or dose to a person drinking water from a reservoir." Exhibit 118, p. 7. Dr. Pleus stresses (Exhibit 119, p. 7):

By focusing solely on excretion of unmetabolized drugs and omitting absorption, distribution, and metabolism, the reader understands only a portion of the picture of the pharmacokinetic profile of drugs. Evaluating exposures from drinking water, the full ADME must be considered. This includes knowing the administered dose, half-lives, specific metabolic pathways...and distribution of the agents (*e.g.*, preferentially located in the bone or liver for example). Many chemicals have short half-lives (*i.e.*, the measurements of the time it takes to reduce its concentration by 50%), low dosage regimes, inactive metabolites, and other factors that would substantially reduce any potential leached from the deceased. If you have a concentration of chemicals in the drinking water,

Risk based on the toxicology of pharmaceuticals attempts to quantitatively determine whether there is going to be a potential adverse health risk. They look at scientific data to determine the most sensitive health end point that can be identified for a particular compound. T. 279.

For this reason, there is a lot of information about the potential toxicity of pharmaceutical compounds. Starting with the most sensitive adverse effect, they apply “safety” or “uncertainty” factors. T. 280. Safety factors can range anywhere from a ten-fold difference to thousands-fold difference. They employ a conservative approach by comparing water concentrations to determine whether there is a health effect. The process is transparent so that individuals and government agencies can review the data to determine whether the drug is safe at certain levels. T. 280.

Part of the risk assessment examines the “exposure pathway” between the chemical and person. For a green burial cemetery, the “exposure pathway” starts with a release from the body to individual water taps or faucets. Unlike the Applicant's experts, he finds that the dose and exposure pathway is key to determining the potential toxicity of the chemical. T. 282.

In his opinion, the body after death will retain some level of the chemicals. Further degradation will occur with metabolism outside the body through the exposure pathway. There are studies that demonstrate that fungi and bacteria in soil will continue to decompose molecules emitted from the bodies because they look at these as a source of food. They get energy by metabolizing or breaking the chemical bonds apart. Other pharmaceutical molecules will “adsorb” to soil particles. They bind together to produce a new entity. If that's the case, the molecule must “go with the soil”. If the soil is too big, it doesn't move. T. 283. Geologists and hydrogeologists study the movement of soil along the exposure pathway. T. 283.

Not all cancer patients will have chemotherapeutic drugs in their bodies at death. Many individuals stop chemotherapy at some point before death. Palliative care for then tends to be pain relief through opiates like methadone or morphine, as well as anti-anxiety agents. From a chemotherapeutic perspective, many (although not all) of the compounds have short half-lives, which measure how long a drug stays in the body, including absorption, distribution, metabolism,

and excretion. Half-lives for most of the chemotherapeutic compounds range in the hours to day level. If an individual decides to stop chemotherapy, metabolism of those agents decreases dramatically during that time. T. 286.

Dr. Pleus acknowledged that some individuals in particular situations are more sensitive to or susceptible to a chemical agent than an average person. A pregnant woman is one of these sensitive individuals. When determining toxicity to those individuals, they look at the potential impact on a developing fetus and take that into account when determining, or a government determines, what is a safe level. T. 287.

In his opinion, a person taking a drug while living will excrete more of a chemical than one who is dead. The body upon death has all the chemicals it will ever have. Additional metabolism of that compound continues until death and shortly after death because the microbiome continues to interact with the medication that's left in the decomposing body. T. 287-288. A dead body will continue to leech what's in the body at the time of death, and less after the time because of decomposition. In comparison, someone taking a daily dose of estrogen excretes more into a wastewater treatment or septic system. T. 288. The wastewater treatment plant does the best they can to remove those compounds, but they still get into the environment. A septic system releases those compounds in the soil as well. T. 288. A septic system will have a greater impact than a green burial cemetery because an individual taking certain drugs is continually releasing them into the septic system. T. 289.

Dr. Pleus opined that other sources are likely to be larger contributors of pharmaceutical pollution than a green burial site. T. 289. He bases this on Dr. Dawson's hydrogeologic study, as his expertise ends once the drug is excreted into the waste system.

Dr. Pleus testified that he performed a literature review of published studies regarding comparative impact of pharmaceutical pollution in proximity to cemeteries. He stated that it's an area of increasing interest. Those studies demonstrated that the amount released from cemeteries was below what is called "background". Background means chemical levels that are already in the environment. T. 295. That means that the environment already has these chemicals in it. These studies do show that there was detection of compounds like ibuprofen, fluoxetine, "cerataline [sic]". While these are not chemotherapeutic agents, they are not causing adverse health effects. Simply because these are in the ground does not mean that they cause adverse health effects. T. 294.

The "single molecule" dosage of pharmaceuticals mentioned by Mr. Mallowney is conservative method federal agencies use to protect against health. The presence of a single molecule in a water supply does not demonstrate that a risk is present. T. 295. The fact that a chemical agent can be detected does not mean it will produce an adverse health effect. T. 195.

Dr. Pleus opined that the cemetery proposed will not produce levels of chemicals that would cause adverse health risks. Basing their testimony on the NIOSH approach for occupational hazards is scientifically inaccurate. NIOSH publishes its list of hazardous chemicals for occupational health risks—the impact on the workers using the compounds. That is not the exposure pathway useful in conducting a risk assessment here. He has looked at the metabolism or ADME of these compounds and metabolism in the microbiome and the bacteria and fungi in the soils. He has also considered the exposure pathway described in Dr. Dawson on the components between the earth beneath the grave to the tap. T. 296.

Dr. Pleus acknowledged that none of the studies included in his literature review involved green burial cemeteries and that chemotherapies may be used in palliative care. T. 299-300.

He estimates that metabolism would continue after death for minutes to hours. T. 301. He has been involved in some forensic cases involving the death of chemotherapy patients. The amount in the body after death has been in a "broad range" of 10 to 90 percent depending on the circumstances. T. 302-303.

He is comfortable as a scientist that the pharmaceutical compounds will undergo further degradation into areas after death. One is the decomposition process of the body. Just the gut microbiota and then the biome on the skin will start the degradation. Any of the liquid material that gets released from the bottom of the corpse will undergo further degradation depending on soil conditions. But they will have organisms that further decay. By degradation, he means that the potential for harm is reduced by interactions. There are some public drinking water supplies in Fairfax County, the District of Columbia, and Los Angeles where pharmaceuticals have already been detected. They are below levels that would cause harm. T. 308-309.

There are studies that have been conducted where the authors placed materials like pharmaceuticals into soils and tested it to see what the degradation is. T. 310. Even though there may be many graves, it is extremely rare that a person will receive a full therapeutic dose and then die. He is also certain that the decomposition and adsorption will occur. T. 314. By degradation, he means that bacteria and fungi will begin tearing a chemical apart until it becomes simpler and simpler in terms of structure. That makes it more available for continued degradation. T. 308. Pharmaceuticals have already been detected in water supplies in Fairfax County and other jurisdictions. In all jurisdictions that have been found to be below harmful levels. T. 308.

Dr. Pleus reports that far more studies have been done on the presence of pharmaceuticals in municipal wastewater treatment and septic systems. The amount discharged from those systems is a "key difference" when comparing the potential toxicity of necroleachates because the dosages

excreted from septic systems and other household systems are far higher than those excreted from corpses. Corpses excrete only what is in the body at death. Excretions into water supplies and wastewater systems regularly with the potential for a greater volume of contamination. Exhibit 118, p. 18-19.

2. Dr. Helen Dawson

Dr. Dawson holds a bachelor's degree in science and geology from Stanford University, and a Master of Science and Geochemistry from the Colorado School of Mines. Exhibit 97, Dawson Expert Report, Exhibit A. She testified that geochemistry relates to the interaction of natural materials, like geologic materials with water that weathers rocks and then the chemistry releasing chemicals into that. Day 2, T. 319. She also has a PhD in environmental science and engineering from Stanford University. For her PhD, she focused on the transport of organic chemicals in porous media, soil, and sediments. After 10 years in academics, she worked for the EPA's Rocky Mountain Superfund region and was regional hydrogeologist for the Superfund program. Her responsibility was to ensure that EPA contactors or site principals were providing adequate and appropriate hydrogeologic investigations. Later, she returned to EPA headquarters to manage the Superfund science branch. Recently, she was asked to evaluate the contaminant fate and transport from a proposed cemetery in Stafford County, Virginia for the U.S. Department of Justice. *Id.*, T. 321.

Dr. Dawson qualified as an expert in hydrogeology and in the transport and fate of contaminants in soil and groundwater and exposure assessment related to contaminated solid and water. T. 322. According to Dr. Dawson, contaminant transport and fate refers "to the physical, chemical, and biological process that control the movement of contaminants in and through environmental media (such as soil, groundwater or surface water, and air) and how the

contaminants may be altered while they are transported.” Exhibit 97, *Dawson, Helen, In the Matter of the Application of Reflection Park, Inc. for a Conditional use for a Cemetery (Case No. CU 21-06) at 16621 New Hampshire Avenue, Silver Spring, Maryland, (March 12, 2022)* (Dawson Expert Report).

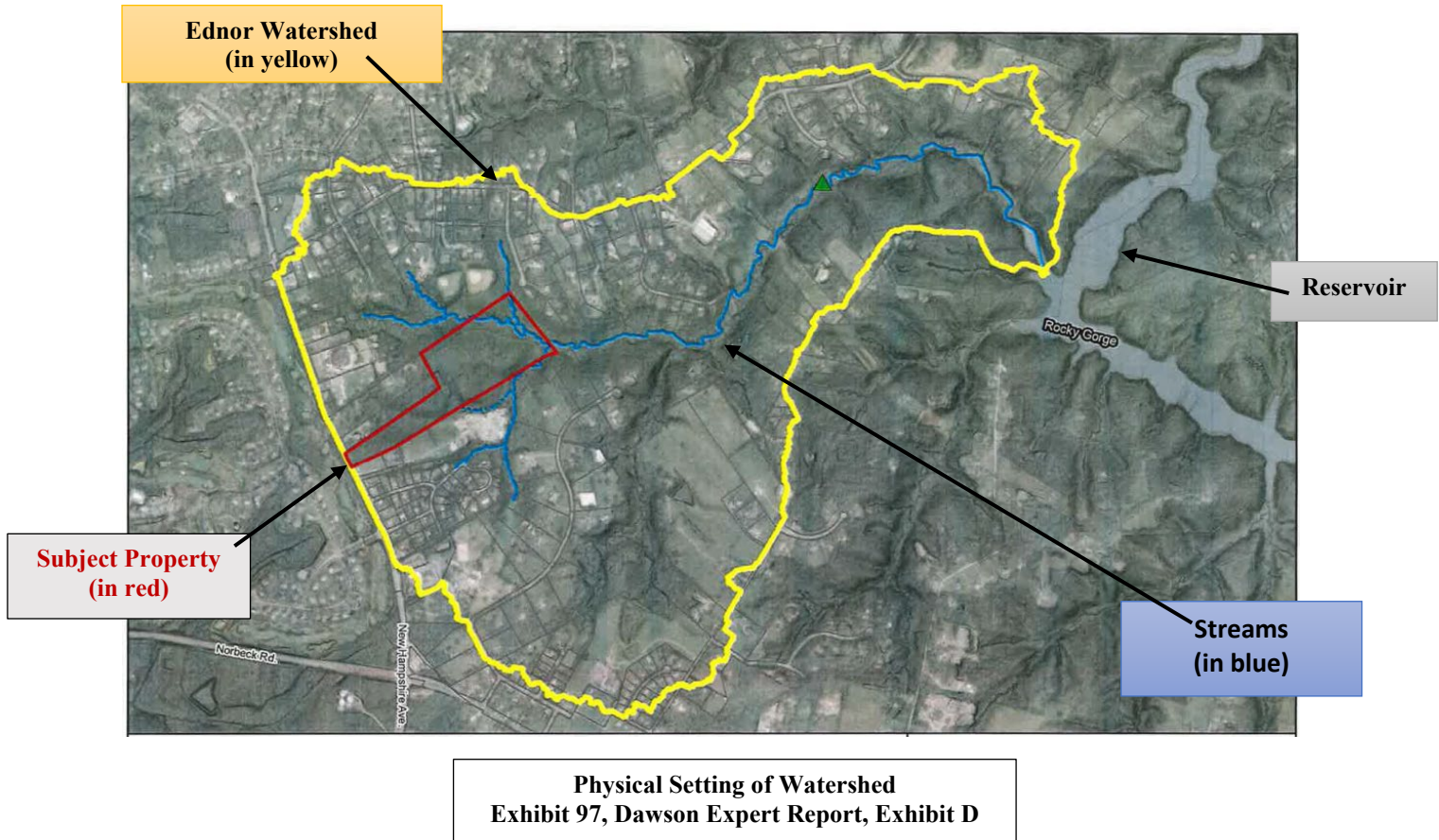
Based on the examination of the eco-geologic data for the site and modeling of contaminant fate and transport, Dr. Dawson opined that (1) the proposed cemetery would not pose a health and safety risk to adjacent properties, to nearby wells, to the streams, to the Ednor tributaries or to the Rocky Gorge Reservoir, and (2) that septic systems have a greater impact than will the cemetery. T. 324.

Dr. Dawson, who wrote an outline for the EPA on appropriate methods for hydrologic investigations, first explained the general process for hydrogeologic studies. Starting from the surface where the sources are, one must characterize the source and understand the potential contaminates that could be leached from the source. One also needs to understand the physical setting of the source, including the topography, whether forest is present, and types of soils. It is important to know the depth to groundwater and the material between the groundwater and base of the source. One must analyze the direction of the groundwater flow and the distance between the source materials and any areas or discharge points that may be available. Interactions between surface water and ground water should also be analyzed. T. 325; Exhibit 97, Dawson Expert Report, p. 4. Applying these methods to determine various ways that a contaminant may migrate from this site, she performed a site-specific review of existing conditions on the subject property. A Site Location Map from her Expert Report (Exhibit 97, Dawson Expert Report, Exhibit D) shows the physical setting of the subject property, including the boundaries of the Ednor

Watershed (in yellow), the streams on the property (in blue), and the subject property (in red). *Id.*, on the next page.

a. Surface Water Runoff

In her Expert Report, Dr. Dawson opined that no direct surface runoff is expected to occur because gentle slopes prevent erosion except near streams (where erosion is expected), the bodies



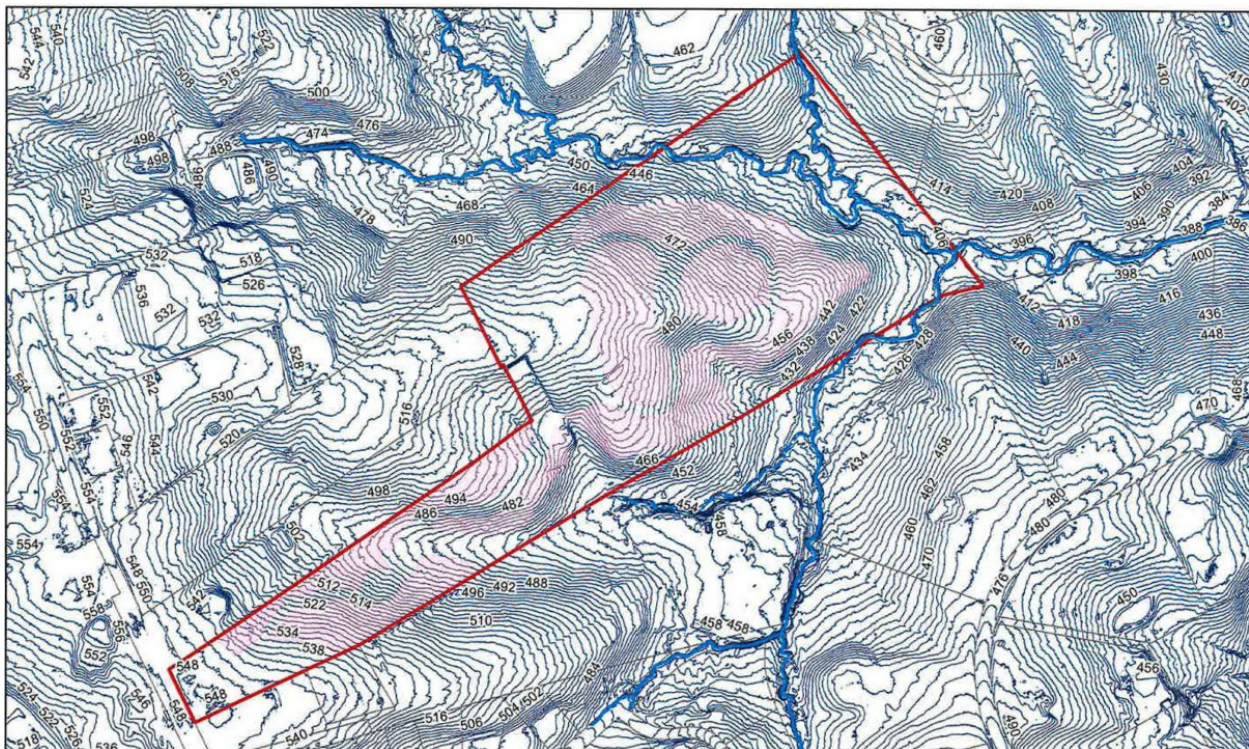
will be buried at least 3.5 feet below the surface, and the burial areas are outside flood zones. Exhibit 97, Dawson Expert Report p. 6.

Upon physical inspection of the site, Dr. Dawson testified that she observed water is flowing in both tributaries. The Ednor tributaries intersect immediately east of the western boundary of the site and flow approximately 1.5 miles downstream from the reservoir. The northern branch is shown on the USGS map as a perennial stream where water runs year-round.

The southern branch is an ephemeral stream above where it intersects with the single branch. T. 330. The reservoir has a maximum catchment of 5.5 billion gallons and spans 600 acres in Montgomery and Prince George's Counties. The Ednor tributaries constitute about 1% of the catchment area. The combined flow of the tributaries is less than 2% of the annual water discharge in the Patuxent River Watershed. Dawson Expert Report, pp. 6-7.

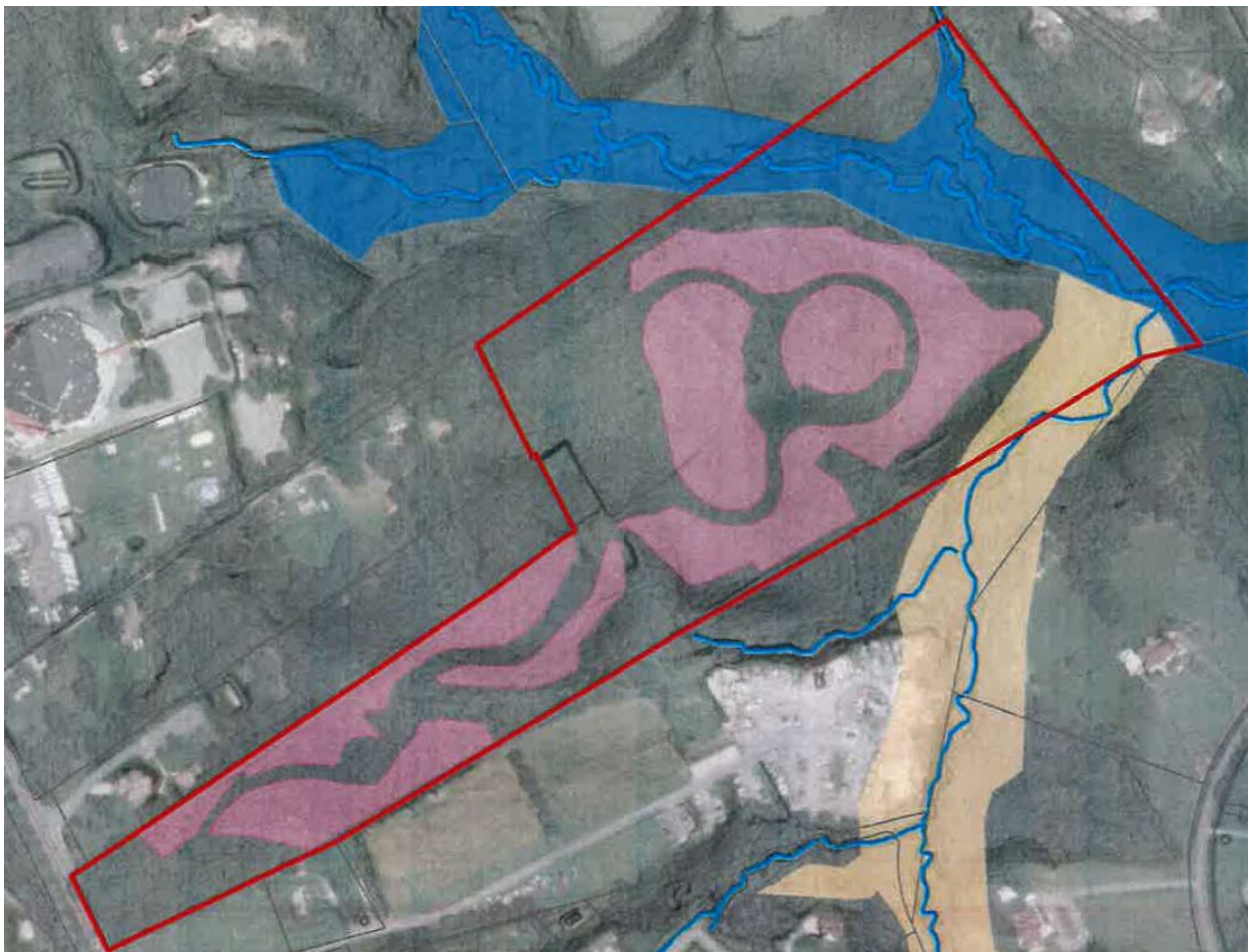
Dr. Dawson investigated whether water was flowing in the streams because shallow groundwater typically discharges into streams in the Piedmont regions. That is occurring here without erosion except near the stream bed, where one would expect it. T. 330.

The site is characterized by gentle slopes changing to moderate slopes closer to the streams. The gentle to moderate slopes help ensure that infiltration of surface water occurs rather than runoff leading to erosion. T. 333. The topography map in her report (Exhibit 97, Dawson Expert Report, Exhibit E, below), shows the topographic contours:



Dr. Dawson testified that a ridge runs east-west through the wider portion of the site. The slope from the ridge runs downward to the each of the stream branches. The pinkish shaded areas are the planned burial areas. These are located on the gentler slopes away from the streams, at least 100 feet from the streams. Slopes range from gentle slopes to more moderate slopes as one gets closer to the streams beyond the burial grounds. T. 332. The burial areas (shown in pink) are in gently sloping areas and are outside the floodplain (*Id.*, T. 334, on the next page).

Dr. Dawson also presented evidence that none of the burial areas were within the 100-year floodplain (T. 334, shown in blue on Exhibit 97, Dawson Expert Report, Exhibit F, below):



According to Dr. Dawson, no decomposition products will rise to the surface because the bodies are buried at a depth that animals cannot excavate them. T. 335-336. Most of the surface

runoff that occurs will infiltrate into the soil because the slopes are gentle and there is no erosion, although there may be some surface runoff if there is a "large rain" that could reach the streams.

T. 335-336.

Nor will surface runoff impact the water quality of adjacent properties or nearby properties. The properties near the "handle" of the site (the narrow strip on the western side of the subject property) do not have wells immediately adjacent to the subject property. The properties a little further away from those immediately adjacent are uphill of the subject property. T. 336. Since there is no impact on to the streams or other tributaries, there is not impact from surface water on the Rocky Gorge Reservoir. T. 337/

b. Groundwater Impacts on Private Wells and Reservoir

i. Groundwater Mapping

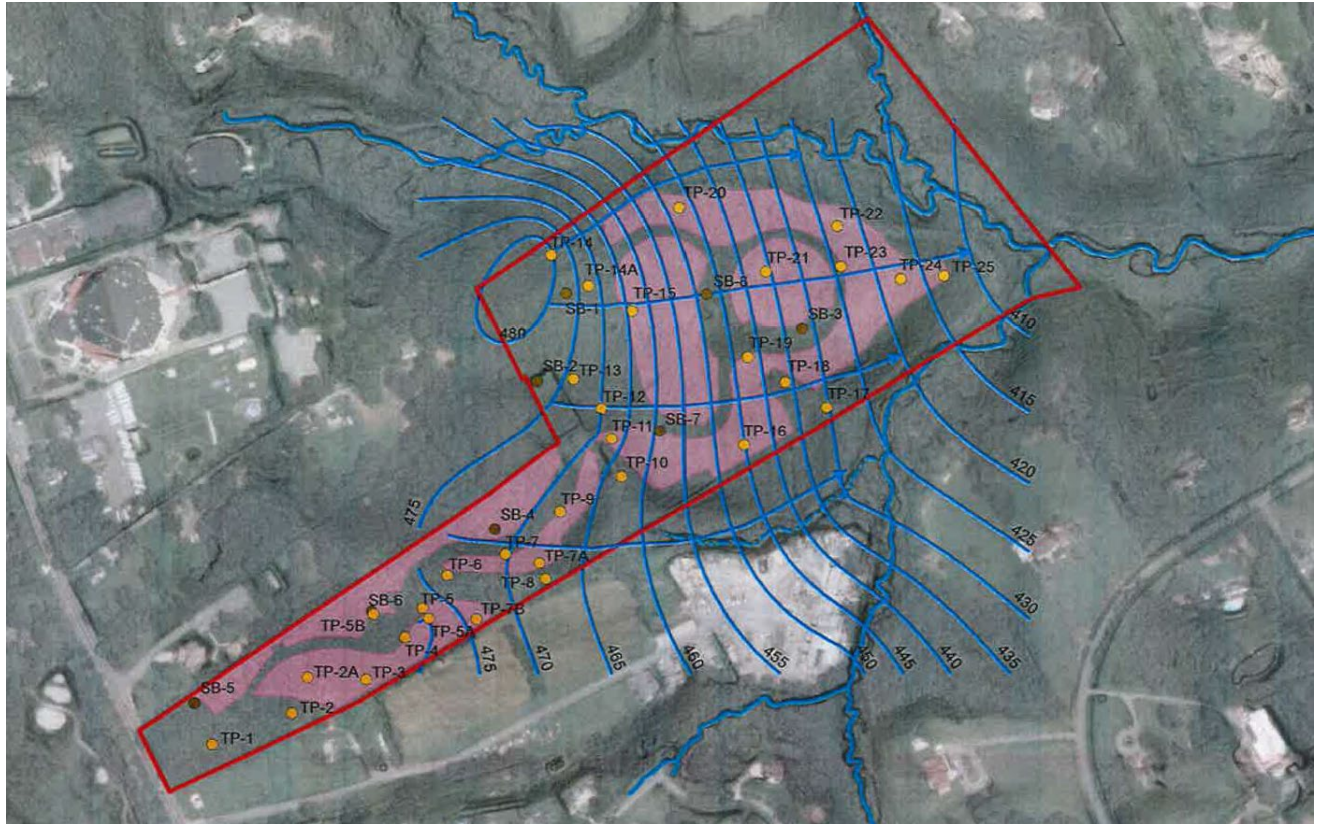
Dr. Dawson opined that groundwater from the area of the proposed cemetery would not create a health or safety impact to nearby wells, streams, or the Rocky Gorge Reservoir. T. 326-327. To formulate her opinion, she used the data obtained from test pits and soil borings to determine groundwater levels and directional flow on the subject property. There are 8 borings and 31 test pits taken for the property. Soil borings are conducted by using a drill rig with a core barrel to drill down and extract a sample of the soil to whatever depth is chosen. The rig brings the sample to the surface, where a geologist logs it and identifies the soil type present. Any indication of moisture or presence of wet soil means that you have intercepted groundwater. T. 338-339. Any historic evidence of a water table is determined by examining changes in oxidation levels. Red to black transitions in soil, can give an indication of a high-water table. T. 339.

The test pits are dug with a backhoe or shovel. The test pits on the subject property were 10 feet deep. Geologists evaluate the soil taken from the pit as well as the pit itself for any signs of a high-water table. T. 339.

Dr. Dawson opined that, in her experience, the number of test pits and soil borings performed on this site were “pretty robust.” T. 340. Because of the density of the pits and borings, she is more confident that the ground water levels are correct because they have actual soil descriptions at each location. In addition, Reflection Park had infiltration tests conducted to understand the rate the soils allow water infiltration. That varied between 2 to 17 inches per hour, which is a rate that they look for. T. 340. For cemeteries, one wants to have soil that has enough infiltration to avoid surface runoff, but not so fast that it doesn't give time for the soil to address contaminants released from the burial site. T. 343. The presence of shallow ground water generally mirrors the surface water. So, one can use groundwater topography to inform how to draw the potentiometric surface. They took the actual measured levels where groundwater was found, considered where the high groundwater table occurred and whether the streams were running, signaling the discharge of groundwater. T. 341-342. The stream elevation is a very firm point of the groundwater level. T. 342.

The map below, from her Expert Report, shows the results of the groundwater mapping (Exhibit 97, Dawson Expert Report, Exhibit G, on the next page). The test pits (in yellow), soil borings (in darker brown), and groundwater elevations and flows on the subject property (in blue lines).

The mapping demonstrates that the groundwater is flowing east across the property; it flows slightly more to the northeast on the north side and slightly more directly east on the south



**Groundwater Flow
Dawson Expert Report, Exhibit G**

side of the central ridges. T. 342. Generally, the groundwater is flowing toward the streams, so the streams serve as a “sink” to the shallow groundwater in the area. T. 342.

ii. Depth of Groundwater

Dr. Dawson disagrees with Mr. Mullowney’s testimony that the groundwater was 2-4 feet below the surface. The test pits and borings were between 8.5 to 20 feet from the surface. The test pits and borings show that there were only seven locations out of 39 with any evidence of the presence of a historical water table. T. 343. The shallowest water table depths were at TP-6, at a level of 7 feet below ground surface, TP-8, that showed a depth of 8 feet, and TP-14. At a depth of 4.7 feet. The latter is because TP-14 was in a swale. T. 344. Groundwater was not encountered in the remainder of the 37 borings or pits.

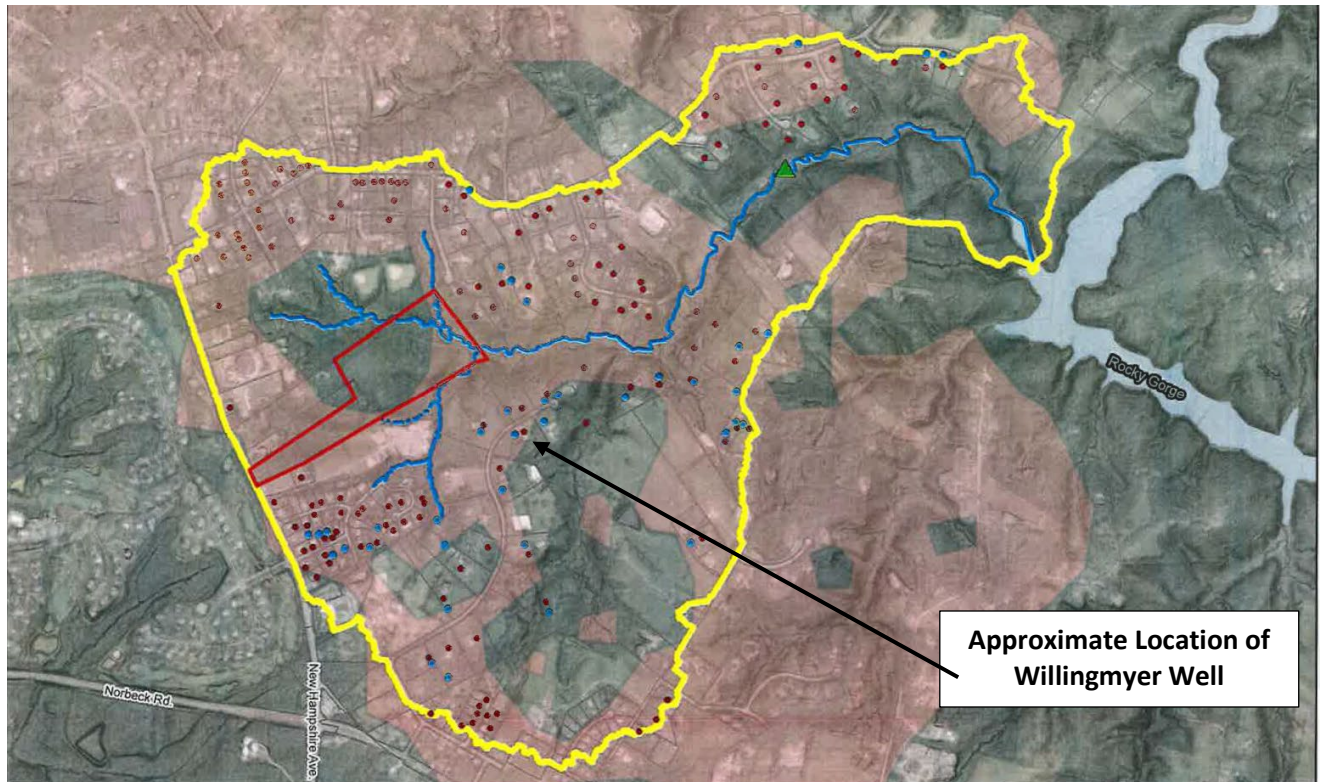
The borings showed that soils upper layer (about 5 feet) of soil is silty, sandy clay. It's finer grained in the upper 5 feet and is less permeable than the deeper material until you get to bedrock, which is approximately 18 to 25 feet below the surface in some areas. In ridge areas, it's a little deeper. T. 344. One of the hydrogeologic reports conducted for the site opined that the groundwater level measured at TP-14 could be "perched" water. That means it may not be a real reflection of the depth of the groundwater; it might have been that some water sat there for a while because that soil tends to be a little less permeable. T. 344-345. To be conservative and protective of health, she used the 4.5 depth at that location when creating the contours of the groundwater levels.. T. 345.

Dr. Dawson testified that all the test sites that show groundwater shallower than 10 feet below the surface are outside of the areas planned for burials. This means that there are at least 6 feet of sandy silt between the base of burial (at 4 feet) and the water table. T. 346. The planned burial areas were purposfully sited outside the shallower groundwater areas. T. 346.

iii. Impact of Groundwater on Private Wells

The key factor in determining whether wells would be impacted is where the wells are relative to the direction of flow. T. 348. A graphic from her Expert Report (Exhibit 97, Exhibit I, on the next page) shows the location of septic tanks (in red) and wells (in blue).

In addition to the flow, most drinking water wells in the Piedmont draw their water from deep groundwater located in a layer of "crystalline" rock, which is deeper than the groundwater table. Groundwater can occur in the "saprolite" bedrock lying above the crystalline bedrock. Maryland regulations require that wells be screened through the saprolite layer to avoid contamination from shallow groundwater. T. 351; Exhibit 97, Dawson Expert Report, p. 8. Maryland requires a protective casing be placed along the well through the saprolite layer to avoid



contamination from shallow groundwater. Shallow groundwater may be contaminated from either nearby septic tanks, which is the greatest danger to private wells. T. 351.

Some older wells that are grandfathered under current regulations (mostly from the 1970's and 1980's) do not have the protective casing. Where this happens, one must calculate the "capture zone" of shallow groundwater entering the well. T. 351.

The capture zone for a well has a certain width and extends upgradient for some distance towards the direction from which groundwater is flowing. The distance depends on how quickly the well is pumping. These wells she identified service a single home, which Montgomery County data states use about 177 gallons per day. She can use this information to calculate the width of the capture zone. In this case, the total width is approximately 30 feet, or 15 feet on either side. The capture zone distance upstream is generally 50 to 100 feet. Soil types also provide information on the rate of water flow through the soil. She cross-checks her site-specific results with

information on soils from the USDA. When two sources of data give you the same information, that adds confidence to the overall evaluation. T. 354.

The capture zone for this area is approximately 15 feet on either side of the well perpendicular to the water flow. T. 355. She estimated that the closest wells are to the south of the property and are approximately 750 from the southern property boundary. That distance is far greater than the width of the capture zone and would not be intersecting any water from the site. The general regional groundwater flow in the crystalline layer is from west to east. For that reason, the three closest wells are simply not intersecting in any way groundwater from underneath the subject property. T. 356.

Dr. Dawson testified that Mr. Willingmyer's well towards the western side of the property is at least 750 feet away from the property. Because the groundwater is flowing from west to east on the property none of the groundwater underneath the site could reach those private wells to the south. Any contaminants migrating from the cemetery would be in the shallow groundwater that discharges into the streams. It would not intersect with any of the wells that are further downstream. T. 350.

iv. Impact of Groundwater on the Rocky Gorge Reservoir

Dr. Dawson opined that groundwater from the proposed cemetery will not adversely impact the Rocky Gorge Cemetery. Several factors influence potential contaminant fate and transport, including factors that influence the concentration of the contaminant leaving a source and factors that influence transport as it moves away from the sources. T. 360.

According to Dr. Dawson, one important factor is the rate of infiltration, as the contaminant cannot travel faster than the groundwater carrying it. Other factors may slow the rate or decrease the concentration of the contaminant. One of these is adsorption. The solid particles of soilglom

on to the contaminant as its migrating. The chemical properties of the contaminant are what dictate whether it adsorbs. Two factors in the soil lead to adsorption. One is the amount of organic matter in the soil because it acts like a sponge. The organic matter grabs to organic contaminants, which adsorb to the organic materials. T. 360.

Soil types are an important factor as well. Clays absorb metals and some organic chemicals if they have a molecular charge. Both slow the motion of the contaminant through the soil. The last factor considered is degradation. Some compounds break down (tearing apart of molecules), changing them into something that is different, or in some cases precipitating that chemical. T. 360.

To assess the potential fate and transport of contaminants from this site, Dr. Dawson used a computer program called "SEVIEW" that models contaminant transport vertically through soil and laterally in groundwater. Exhibit 97, Dawson Expert Report, p. 10. She testified that the SEVIEW model combines another model called SESOIL, developed by the EPA in 1981, and a model called AT123D that predicts groundwater concentrations at distances from the soil leachate source. She used this combination when working as a Superfund Hydrogeologist for the EPA. Many states also use this model. T. 361. The models use many of the factors that control contaminant transport and is the basis for EPA soil cleanup levels. T. 361.

Modeling is used to assess the potential risk of groundwater contamination because regulators and others do not want to wait until contamination has occurred to examine its impact. The EPA requires modeling for the clean-up of Superfund sites. In those cases, even when they know there is contamination, they model the migration of the contaminant over time to determine potential risk. EPA must assess a risk level before remediation, which requires them to compare concentrations of contaminants to risk-based (potentially unsafe) concentrations. T. 367.

There are several factors that must be considered when modeling the transport and fate of any chemical. These include the source concentration, the timeframe over which the source will exist, the “loading”, or the concentration over time, and the rate of groundwater flow. If one spreads the source mass over a longer time is concentration is lower. For her modeling, she used conservative estimates of these factors. T. 368. Dr. Dawson testified that her model assumes that contaminants release over the shortest time that was reasonable and considered all the burials, instead of just one burial site. T. 371. Her model assumed that all burials would take place in each phase over the planned time frames.

They also use conservative estimates of factors affecting the “fate” of chemicals. These include adsorption and degradation. They use the lower end of adsorption because the less adsorption the faster the chemicals may migrate. They also use the lower end of the degradation range that is published for a chemical or a zero. In her model, she assumed zero or no degradation for two of the three contaminants she considered. She did factor in adsorption for one of the chemicals. T. 369.

Dr. Dawson input into the model relevant site-specific information, including soils, the rate of both vertical and lateral infiltration, data on the depth of the body from the surface of the ground and the distance between the body and the water table that serves as a filtration medium. For her model, she required input that was a conservative “worst case” scenario. For instance, she they assumed that there was approximately 6 feet of soil between the bottom of the grave and the water table or a minimum of 6 to 16 feet, although in some parts of the property, the groundwater is more than 20 feet below. T. 361-364.

Dr. Dawson modeled three chemicals. The first was nitrate. The reason she chose nitrate is that bodies are composed of a considerable amount of nitrogen that occurs in bones, muscles,

and connective tissues. T. 370. As the body decomposes, nitrate produces ammonia, which can emit gas. She estimated that very little of the ammonia was gassed. The majority becomes a nitrate. This is the source that is most typically used to understand contaminate transport from organic matter because it acts as a "tracer." T. 372. Soil that is not in groundwater is porous and contains oxygen. This produces nitrate, which is a small molecule that moves at approximately at the same rate as groundwater. It is subject to what is called "denitrification" if it gets into an anaerobic environment. T. 372. Anaerobic environments occur in areas such as tree roots that have experienced the flow of groundwater for some time. T. 373. Their model assumes that the release of the contaminant occurs in the first few years after death, although Dr. Abia is correct that it can occur for 20 years. T. 374.

Conservatively, the modeling assumes no degradation of nitrate other than where the groundwater discharges to the stream. She based that on a report prepared by the U.S. Geologic Survey that shows that nitrate concentration decreased through denitrification, largely because it passes through tree roots and vegetation. T. 375.

Dr. Dawson also looked at some heavy metals that are released from the body after death, including zinc, cadmium, lead and some chromium. These are ingested through drinking water, supplements, and food. T. 374.

Another contaminant she studied is mercury. Mercury is not found in septic systems but is found in corpses. T. 374. Mercury leaches from fillings in the teeth, which can take a long time. T. 374-375. For their model, they conservatively assumed that all the mercury is leached at once. T. 375. That is very conservative, but with modeling they assume the most conservative data, and if there are no impacts, there is no need to redo the model. T. 375.

Finally, Dr. Dawson also modeled a non-reactive “tracer” in her Report to provide a conservative estimate of bloodborne constituents such as pathogens or pharmaceuticals. She included that because there is very little published research about the characteristics of these drugs that are relevant to the modeling, for instance, how likely it is to adsorb. Some of these chemicals degrade and some degrade at different rates. Some might adsorb to organic matter at different rates. To address this, she assumed that everything in the body from whatever source in whatever concentration is present at the time of death. She then projected transport and fate assuming there was no adsorption or degradation. It’s like putting food coloring in the water and measuring how strong the color is downstream. T. 376.

Dr. Dawson opined that there will be no impact to public health or water quality from migration of contaminants through groundwater to the reservoir. T. 378. A table from her Export Report (Exhibit 97, Dawson Expert Report, p. 12, below) shows the results of the modeling.¹¹

Constituent	US EPA Drinking Water Standard (mg/L)	Maximum Concentration in Groundwater Discharging to Ednor Tributary (mg/L or %)	Maximum Concentration in Surface Water Discharge to Rocky Gorge Reservoir (mg/L or %)	Travel Time (first arrival to Ednor Tributary) (years)
Nitrate	45	38.3	1.5	3
Mercury	0.002	0.0015	0.000052	4
Tracer	n/a	4%	0.17%	2

¹¹ At the public hearing, Dr. Dawson corrected the results shown for mercury, stating that the maximum concentration in groundwater discharging to the Ednor Tributary should be 0.0013 mg/L rather than 0.0015.

She explained that the table does not show the heavy metals she modeled (zinc, cadmium, lead and chromium) because they did not reach the groundwater through four feet of soil. There was just a concentration in the groundwater directly under the body. T. 379.

Even with the very conservative assumptions of a high source concentration, short time release, no degradation other than at the very end, and minimal volatilization, levels of both nitrate and mercury are well below the drinking water standards when it discharges to the on-site streams, well before it reaches the reservoir. For nitrate, there is an immediate dilution to 1.5 kg per liter once it enters the stream, well below the nitrate standard and within the background levels for nitrate. Nitrate occurs naturally in the soil when fungi decompose organic matter. Typical background concentrations of nitrate in stream waters are somewhere between 1 and 3 mg per liter. Here, the worst-case scenario of nitrate released from all bodies buried results in nothing above background by the time it reaches the Rocky Gorge reservoir. T. 380. After it enters the reservoir, it would be further diluted by the amount of water in the reservoir and the influx of water from the Patuxent River upstream. T. 380-381. The reservoir has a volume of 5.5 billion gallons of water. The reservoir's rate of flow is about 100 times greater than the flow rate of the Ednor tributaries, which causes dilution below background levels. T. 381.

The modeling for mercury produces the same result. The drinking standard is .002 mg per liter with the very conservative assumptions in the model. The modeled results of mercury levels when reaching the reservoir are .0013 mg per liter, under the drinking water. T. 381.

Any bloodborne chemicals would be reduced by a factor of at least 500 at the discharge point into the Rocky Gorge Reservoir and by thousands within the reservoir if any tracers actually made it through. That is not counting any adsorption, degradation, filtration, or dilution that would occur. The amount in the reservoir would be almost "homeopathic", which means there might be

a molecule or two. This does not account for treatment by WSSC before entering the water supply. T. 383.

For these reasons, she opined that the contaminate released from burial sites at the proposed cemetery will not pose a health and safety risk to any adjacent properties, nearby streams, or the Rocky Gorge Reservoir. T. 383.

c. Comparative Impact of Septic Systems

Dr. Dawson opined that potential impacts from the cemetery will be less than the impact from the nearby septic tanks in the watershed. T. 324. In her opinion, the comparison is important because the contaminants associated with dead bodies are very similar to contaminants discharged in septic systems. It is instructive because potential contamination from septic systems has been extensively investigated and there is a lot of literature on the subject. T. 386.

A comparison of potential contamination from septic systems is also important because many of the studies performed that did find some migration of chemicals were located in “karst”, which means there were open tunnels in limestone or very coarse gravel. T. 385. Even those studies acknowledged that the contaminant migration could have been due to septic systems in the area. T. 385.

Dr. Dawson testified that every State and local jurisdiction that she's looked at identifies private septic systems as significant sources of groundwater contamination, especially contamination caused by nitrates. Even properly functioning septic systems are designed to release nitrate into the environment. Septic systems ensure that there is some vadose zone that can degrade, filter, or dilute the nitrates so it doesn't pose a problem for downgradient wells. T. 386. Montgomery County's 2018 Comprehensive Water Supply and Sewerage System Plan reports that one primary cause of contamination in rural areas stems is bacterial leakage from failing septic

systems. Day 2, T. 386; Exhibit 97, Dawson Expert Report, p. 15. Dr. Dawson estimated nitrate leaching from septic systems in the Ednor tributary watershed amounts to 860 kg per year. Since the Ednor watershed is only 1% of the reservoir's catchment area, nitrogen contaminants could be 100% higher, or 860,000 kg per year, assuming that all wells are properly functioning. Exhibit 97, Dawson Expert Report, p. 16. In comparison, the amount of nitrate loading from bodies buried at the scheduled proposed (300 bodies per year) is 90 kg per year, a "vanishingly small" amount when compared to the impact of septic systems. *Id.*

C. Applicant Testimony

Dr. Haroon Mokhtarzada testified on behalf of the Applicant. He stated that he was saddened by the insinuation that they might cut 25 acres of trees because this is an environmental project. It is a non-profit project because both principals have full-time jobs. Of the 48-acre parcel, they are proposing 18 acres of burial land that will take 36 years to fill. By the time they complete the project, the trees will have grown back into the burial areas. The purpose of the project is in part to create a park where people can walk. They proposed to have wooded trails where people can walk. Day 2, p. 415-416. They discussed with Planning Staff the possibility that trees existing now may not even exist 36 years from now. Most of the trees there now are Poplar and they plan to introduce other native hardwood trees after completing each section of burial grounds, which will improve the quality of the forest. While Dr. Matrusada acknowledged that the Preliminary Forest Conservation Plan states that they will be clearing 25 acres for the burial sites, it does not mention that they plan to replant those areas with native hardwoods. T. 420.

IV. AGENCY COMMENTS

A. WSSC Analysis

In response to questions posed by the Hearing Examiner (in black), the WSSC filed the following responses (in blue). Exhibits 146, 149):

Gentleman, I am writing to request your recommendation and analysis on whether the green burial ground proposed in CU 21-06 will render the drinking water in the Rocky Gorge reservoir unsafe for human consumption both immediately and over time in the future.

WSSC Water does not expect that the green burial ground proposed in CU 21-06 will render the Rocky Gorge reservoir unsafe as a drinking water supply, now or in the future. The concerns expressed were pharmaceutical and microbial contamination from necroleachate. Our conclusion is based on the following:

- All information provided indicates that the site's soil type is suitable for septic systems and green burials. The depth to groundwater in areas planned for burial sites provides adequate separation between bodies and groundwater. Migration through soil and/or groundwater provides attenuation over time and distance. If any chemicals make it to the surface water, the reservoirs provide a large amount of dilution.
- A 1997 study estimated that there were ~6,600 septic systems in the entire Patuxent Reservoir watershed (both the Triadelphia and Duckett Reservoirs). Despite routine pharmaceutical and other organic chemical discharges to groundwater from these septic systems, occasional screening for pharmaceuticals and hormones has shown only extremely low levels of any pharmaceuticals or hormones, with most results below analytical detection limits:
 - The hormones listed below were included in the Third Round of the US EPA Unregulated Contaminant Monitoring Rule (UCMR 3) and were monitored from 2013-2017. None were detected in the Patuxent Water Filtration Plant (WFP) treated water in 18 sampling events.
 - 17- β -estradiol
 - 17- α -ethynylestradiol
 - Estriol (16- α -hydroxyestradiol)
 - equilin
 - estrone

- testosterone
- 4-androstene-3,17-dione
- WSSC Water participated in a 2002 study with NASA/United States Geological Survey that screened for 29 selected pharmaceuticals and 35 other common prescription and nonprescription drugs. Only three of the 64 compounds were detected, at levels just above the laboratory method detection limits, but below laboratory reporting limits. Results are shown below noted as estimates (“E”) because the results were below the laboratory reporting limits:
 - Carbamazepine – E 0.0033 parts per billion (ppb)
 - Caffeine – E 0.0027 ppb
 - Cotinine – E 0.0023 ppb
- For perspective, the daily therapeutic dose of carbamazepine (anti-epileptic) is 200-1,600 milligrams. At the level detected, a person who drank two liters of water a day for 70 years would consume less than 0.2 milligrams of carbamazepine, less than 0.1% of a single daily minimum therapeutic dose of 200 milligrams. At the level of caffeine detected, a person who drank two liters of water a day for 70 years would consume about 0.14 milligrams of caffeine, about 0.14% of the caffeine in a single cup of coffee (about 100 milligrams).
- WSSC Water does not expect that the green burial site will result in microbial contamination of the Duckett Reservoir. Please see additional information below in response to Question 3.

I am also asking for your analysis and recommendation on (1) whether, if approved, any additional conditions should be imposed on the conditional use that would ensure that the drinking water supply remains safe, or (2) whether, if approved, concentrations of certain chemicals should be regularly monitored beyond WSSC's existing monitoring programs.

WSSC Water does not recommend any additional conditions or monitoring requirements.

I also have the following specific questions:

1. Please clarify the difference (if any) between the Duckett Reservoir and the Rocky Gorge Reservoir. Are they the same body of water? Are they connected?

Officially WSSC Water refers to the reservoir into which the Ednor tributaries discharge as the T. Howard Duckett Reservoir. Before about 1967 it was called the Rocky Gorge Reservoir. Some maps and many people use the names Duckett Reservoir and Rocky Gorge Reservoir for the same water body.

2. Does WSSC regularly monitor the drinking water for the presence of drugs listed on the NIOSH hazardous drug list and specifically those identified in the expert reports of Dr. O'Keefe (Exhibits 106, 106(a) and 106(b)) and Mr. Mullenney (Exhibit 100)? Does it monitor regularly for nitrogen and estrogen levels?

WSSC Water has not monitored for drugs on the NIOSH hazardous drug list and in the expert reports of Dr. O'Keefe (Exhibits 106, 106(a) and 106(b)) and Mr. Mullenney (Exhibit 100). We have monitored for some common drugs and hormones as described above, with few detections. We regularly monitor for nitrogen in the forms of nitrite and nitrate, which are regulated under the Safe Drinking Water Act. Nitrite is limited to 1 mg/L as N, and nitrate is limited to 10 mg/L as N. Patuxent WFP raw and treated water nitrite levels have not exceeded 0.1 mg/L as N in the last five years, and raw and treated nitrate has not exceeded 2.5 mg/L as N for the last five years.

3. Does the WSSC regularly monitor the drinking water for microbial contamination (described in Dr. Akebe's expert report (Exhibit 102))?

WSSC Water monitors Patuxent WFP raw and treated water for total coliforms and Escherichia coli as indicators of microbial contamination. Compared to WSSC Water's Potomac River source, Patuxent WFP raw water total coliforms and Escherichia coli levels are very low, despite septic system discharges and domestic and wild animals in the watershed. The Patuxent WFP treatment process provides disinfection with both chlorine and ultraviolet light. The treated water is tested about 10 times per week and total coliforms and Escherichia coli are always absent in the treated water.

4. Does the WSSC have safe drinking water standards for the presence of the above-described drugs and anti-microbial contaminants? If so, what drugs/contaminants does WSSC have standards for?

None of the chemicals in Dr. O'Keefe's list (106b) are regulated under the Safe Drinking Water Act (SDWA). WSSC Water does not have any voluntary standards for pharmaceuticals or other

chemicals. WSSC Water has never exceeded a SDWA standard for any regulated contaminant. As described above, some pharmaceuticals and hormones have been included in the UCMR monitoring list, but there has been no federal determination to regulate those compounds.

5. What steps does the WSSC take if the drugs and other contaminants near the minimum safe water drinking standards? If the chemicals reach peaks years in the future, how do you determine when to take remediative steps?

If levels of pharmaceuticals in the water supply increased in the future, and were shown to have toxicological significance, the primary strategy would be to advocate for and work towards source prevention, i.e. reducing the circulation and use of such chemicals. If found, these chemicals tend to be at extremely low concentrations, and the other constituents in water (natural organic matter, metals, particles) interfere with their removal. This makes monitoring, pretreatment and removal processes inefficient and costly. The Patuxent WFP was designed to allow upgrade to ozonation if needed for any reason. Ozone can break down many organic chemicals.

6. Do you have any independent verification of the number of bodies buried with chemotherapy drugs?

No.

I've also been asked by those in opposition to posit the following question:

Please confirm (or correct) that you will not be (a) providing well owners in the vicinity of the cemetery any remediation assistance, financial or otherwise, in the event of well contamination from the cemetery or (b) conducting any groundwater monitoring for contaminants in the vicinity of the cemetery."

WSSC Water does not have jurisdiction over private wells or groundwater

I am unaware of any authority that would permit you to install wells on property's near the cemetery, but if you wish to confirm that, you may. I am also unaware of any legal requirement whereby the WSSC would be required to remediate damage to wells caused by a private property owner. As this question includes legal issues that may arise in litigation, I am not mandating an answer, although you may respond as you deem appropriate.

WSSC Water respectfully declines to answer or comment.

B. MCDEP Comments

MCDEP submitted the following comments (Exhibit 147):

DEP has reviewed the documentation provided. The issue of whether or not any additional conditions should be imposed on the conditional use that would ensure that the public drinking water supply remains safe, is a determination best left to WSSC Water as they are responsible for providing safe public drinking water. DEP also defers to WSSC Water on the issue of whether or not concentration of certain chemicals should be regularly monitored beyond WSSC's existing monitoring programs with regards to the drinking water reservoirs.

The information provided by those in opposition was very general in nature and not specific to the site. The information provided by the applicant used sound engineering and scientific principles to draw their conclusions that were site specific. Based on the soil testing, test pits, and perc test results, DEP does not anticipate any offsite impacts to surface water quality or groundwater quality (private drinking water wells) from the cemetery, and thus do not think any additional conditions be imposed on the conditional use. We also do not see the need for additional monitoring of surface water or ground water in the area in proximity to the cemetery.

C. Opposition Response to Agency Comments

Both parties were offered the opportunity to comment on WSSC's and MCDEP's recommendations. The Applicant chose not to submit follow-up comments. Exhibit 149. The opposition took issue with many of the agencies' findings, arguing that (Exhibit 148, paraphrased by the Hearing Examiner):

PWPA argues that their expert evidence is site-specific due to the property's location in a watershed that supplies drinking water, that non-degradable pharmaceuticals will existing in "a certain percentage" of the bodies buried, that multiple bodies will be buried in close proximity, that PWPA's experts expressly considered site topography and soil conditions, and that "the law of gravity" dictates that leachate from dead bodies will percolate through the ground or surface waters and eventually reach the reservoir. *Id.*, p. 2.

Impact on Reservoir

1. WSSC's reliance on migration through soil or groundwater, and dilution in the reservoir to adequately attenuate any contaminants reaching the reservoir is misplaced. PWPA agrees that this may be true for some bioorganisms, it does not

apply to chemotherapy drugs and hormones, microscopic amounts of which may harm fetuses, pregnant mothers.

2. Reliance on modeling is misplaced. An example is weather forecasting. These models are “big, complex” and frequently wrong.
3. The 1997 study is too old to be probative of current amounts of chemotherapy agents and hormones in the reservoir given that usage may have increased since then. WSSC does not detail how often it monitors for this.
4. The 2002 study cited by the WSSC doesn't identify the pharmaceuticals and hormones tested. New pharmaceuticals may have been developed since that time.

Hearing Examiner's Specific Questions:

Question No. 2: PWPA believes that failure to monitor for the chemicals listed on the NIOSH Hazardous Drug list is a “violation of its charter to protect the public drinking supply.” Exhibit 148, p. 6. They base this on the testimony of Dr. O'Keefe and Mr. Mullaney on the potential harm from minute dosages on sensitive individuals and fetuses.

Question No.3: PWPA argues that monitoring for total coliforms and E. coli are not “a proxy” for monitoring the microbial contamination described in Dr. Abia's report. Dr. Abia submitted the following written comments:

- a. Even when bacteria die, their DNA remains in the environment and the water. This DNA is called Environmental DNA (eDNA).
- b. With the well-recognized and growing antimicrobial resistance problem, eDNA could transfer resistance genes to human pathogens.
- c. Water treatment plants are not designed to remove DNA, and eDNA can easily be carried farther than live bacterial.
- d. Testing for molecular materials is done through molecular techniques, and not standard culture techniques used to detect E. coli and coliforms.
- e. Although E. coli and coliforms can be absent or filtered, this may not be the case with DNA carrying resistant genes.

PWPA argues that federal standards for nitrogen are “below more modern safety limits.” *Id.*, p. 7. PWPA concludes that each body will excrete 6 lbs. of nitrogen which, when multiplied by 8,700 bodies, “presents a significant risk of the exceeding the federal nitrogen pollution standards. *Id.*, pp. 7-8.

WSSC's comments do not address the possibility of the formation of a biofilm "mat" that allows DNA to travel in surface water.

Question No. 4: WSSC's position that it will not monitor for drugs on NIOSH's Hazardous Drug List violates its duty to protect the safety of drinking water supplies.

Question No. 5: PWPA characterizes the WSSC's response as "internally conflicted" because it does not test for NIOSH-listed drugs but asserts that its primary prevention policy is to work toward source prevention. According to PWPA, "[b]y the time their non-testing somehow invokes their 'primary strategy', it would be way too late for the remedy." *Id.*, p. 9.

PWPA also argues that there are limits on the amount of chlorine that can be added to the drinking water because of two carcinogenic biproducts. Adding ozone will neutralize cell-based organisms but is ineffective in neutralizing chemotherapy or hormone therapy pharmaceuticals. *Id.*

Question No. 6: PWPA understands that WSSC does not have the number of bodies buried with chemotherapy drugs but asserts that the record contains the "extensive spreadsheet submitted by PWPA (scepura studies biblio.xlsx) listing without subsequent interpretation the conclusions of 97 peer-reviewed studies, a large number of which were US-based, by reputable institutions and scientists regarding very early mortality in patients after receiving chemotherapies.

V. COMMUNITY TESTIMONY

PWPA urges that the Hearing Examiner follow the precedent set by the Baltimore County Zoning Ordinance regulating natural burial cemeteries the RC (Resource Conservation) Zones. The regulations, adopted in 2021, permit natural burial grounds by approval of a special exception only in the RC-6 and RC-8 Zones.¹² According to Mr. Chamberlin in the RC-6 Zone, natural burial cemeteries are permitted only within an area of the Patapsco/Granite community plan. That area is at least 5 miles or more from the Liberty Reservoir. The ground and surface water in that

¹² The 2014 Montgomery County Zoning Ordinance changed the term "special exception" to "conditional use." *Montgomery County Zoning Ordinance*, §59.1.4.2 ("Conditional Use").

area flow into the Patapsco River into the Chesapeake Bay and is not a source of drinking water.

T. 97. In RC-8 (Environmental Enhancement) Zones they are permitted by special exception.

Exhibit 136. PWPA submitted a chart from Baltimore County's website listing the zones in which natural burial cemeteries are permitted (Exhibit 136, on the next page).

RC Zone	Title	Cemeteries Allowed?		Remarks
		By Right	By Special Exception	
RC-2	Agricultural Protection	NO	NO	Cemeteries deleted by Bill 178-1979
RC-3	Deferral of Planning and Development	NO	YES	RC-3 is large not yet planned or developed agricultural land.
RC-4	Watershed Protection	NO	NO	
RC-5	Rural Residential	NO	YES	
RC-6	Rural Conservation and Residential	NO	YES	certain exempt cemeteries only, as amended by Bill 76-2021
RC-7	Resource Preservation	NO	NO	
RC-8	Environmental Enhancement	NO	YES	Conservation and Natural Burial Grounds only, as amended by Bill 76-2021
RC-20	Critical Area	NO	NO	
RC-50	Critical Area Agricultural	NO	NO	
RCC	Resource Conservation Commercial	NO	NO	

According to Mr. Chamberlin, the Baltimore County special exception standards for natural burial cemeteries are more stringent than Montgomery County's standards for the same use. The Baltimore County regulations require more land area for natural burial cemeteries as well as an actual hydrogeologic study, including underground water flows, rather than a study-based simulations and modeling. T. 99.

The maximum density is minimum acreage is 150 acres and overall grave density is 500-600 graves per acre. Regulations also require the applicant to place a permanent environmental trust to ensure long-term maintenance. T. 97. PWPA also submitted the requirements for approval

of a special exception (*i.e.*, conditional use) for a green burial cemetery, which they believe are more stringent.

Despite searching diligently, Mr. Putman testified that he could find no commercial cemetery located within a watershed that supplied drinking water. T, 65. The Baltimore County White Paper from 2015 mentions that there is a scarcity of information on the impact of green burial cemeteries. T. 66. The paper recommends that no burial grounds be approved until regulations governing the operation and location were adopted by the Baltimore County DEP. T. 67. Even after that agency adopted regulations, Baltimore County adopted zoning regulations that prohibited cemeteries in the zones surrounding three reservoirs. T. 67.

He disagrees with Dr. Eldadah's testimony at the previous hearing that there is no documentation of harm from green burial cemeteries.¹³ Immediately afterwards, Mr. Putman searched the internet and discovered a significant amount of information.

Mr. George Willingmyer lives on Parrs Ridge Drive in Spencerville, Maryland. He believes that the comments submitted by MCDEP before remand are not persuasive because they do not mention a 1998 WHO report on the impact of cemeteries on the environment and public health. T. 234. That took him less than 10 minutes of internet browsing time. Day 2, T. 234.

According to the WHO study, human or animal remains must not be buried within 25 meters of any well, borehole, or stream on which a potable water supply is drawn. Twenty-five meters equals 820 feet.¹⁴ He believes that his well is within this distance at the closest point to the property line of the subject property. The potability of his well could be adversely affected if burials were made to the property line of the cemetery. T. 244

¹³ Dr. Basil Eldadah is a principal of the Applicant. His testimony is summarized in the Hearing Examiner's Report on pp. 12-13 and 34-35.

¹⁴ The transcript cites Mr. Willingmyre's testimony as 25 meters. T. 244. He may have meant 250 meters, as 25 meters is 82 feet.

He believes that there are better alternatives for citing cemeteries. Montgomery County should have a requirement that any burials at the cemetery must be 250 meters from the property line of the cemetery. A second alternative would be for Montgomery County to require that a survey be done to establish that no wells were within 250 meters of the burial sites. He believes that many wells fall into this category if the location of burials was chosen to be the property line. T. 244. The cemetery burial sites would have to be limited to certain locations. No wells will be allowed in this zone thereafter. This would be an absolute requirement that would apply to any wells planned and portrayed on a map. T. 245.

A third scenario would be to require cemetery burials to be more than 850 feet away, or 1,000 feet. Again, an additional survey would have to be completed to determine the nearest wells where proposed burials would be limited. T. 245.

Mr. Quinton Remein is President of the Cloverly Civic Association. He testified that the Association became aware of the application when invited by Mr. Kline to a presentation in October 2020. They had mixed reactions, but there some were enthusiastic. However, the Association never passed a resolution supporting the project. T. 248. Later, as more information became available, they reviewed the project again and discussed at an Association meeting. The Association decided to oppose it based on the potential harm to environmental resources. T. 248.

There are two factors leading to that position. The Cloverly Civic Association has been involved with a contamination of their wells by a gasoline leak at Cloverly Shell station in 2002. They were apprised by informants, and it took "a while" for the State to become involved. When the State finally determined the severity of the leak, they did become involved. T. 248.

Several wells were contaminated with MTBEs, a gasoline additive that was banned in 2006 because it was carcinogenic. These wells were closed. As part of an enforcement action by

Maryland Department of the Environment, Shell finally agreed to reimburse the neighbors who had been damaged. The MTBEs percolated to the ground water and began to surface at various points. Remediation of the spill has been very difficult. When MDE first met with Shell Oil, it was stated that the leak would be cleaned up in seven years. T. 249.

After more than seven years, Shell came to the Association to give a report on the remediation. They said they were still removing a large plume that covered about three quarters of a square mile on Branch Nursery Road. Shell determined that it would take another 2 to 4 years to complete the removal of MTBEs to a safe level, which is 20 ppb. Any well contaminated above that level was unusable. T. 249—250.

Shell issued another report in May 2022. Leakage from the spill is still polluting wells. It's not very comforting to know that you are showering in water that contains 20 ppb of MTBEs. Many of their neighbors are still "on the brink." T. 250.

Cloverly does not want to reintroduce another potentially toxic contaminant source into the community. They want to the Applicant to give 100% assurance that something like this will not happen. No one has offered to put up a bond that would dig up the entire burial area to ensure that, if something did happen, it could be removed. As a civic association, they don't feel safe.

He also testified that he participated in the development of the Cloverly Master Plan. They created the first special protection area in Montgomery County in the Paint Branch area to protect the watershed. They also identified the reservoir as a protection area. The primary reason was to protect the water supply that serves the Washington metropolitan area including about half of the Cloverly Master Plan area. T. 252.

At the time the Master Plan was adopted, the reservoir had no contamination. Now, WSSC recommends that if you encounter the water, rinse it off right away. They also recommend that

dogs should not swim or drink the water, humans should not eat fish livers or digestive organs from fish caught in the river. The reservoir is not safe. T. 252.

While they can purify the water to bring it to drinking standards, he believes that we will be in deep trouble if more pollutants come in. Once in the ground, they will be leached for years—they are still aggressively campaigning to remove the MTBEs from the Cloverly Branch Nursery Road. T. 252.

VII. FINDINGS OF FACT AND CONCLUSIONS OF LAW

A conditional use is a zoning device that authorizes certain uses provided that pre-set legislative standards are met. Pre-set legislative standards are both specific to a use (in Article 59.3 of the Zoning Ordinance) and general (*i.e.*, applicable to all conditional uses, in Division 59.7.3 of the Zoning Ordinance). The specific standards applied in this case are those for a cemetery, contained in §59.3.5.4.A of the Zoning Ordinance.

Weighing all the testimony and evidence of record under a “preponderance of the evidence” standard (*Zoning Ordinance*, §7.1.1.), the Hearing Examiner concludes that the conditional use proposed in this application, with the conditions imposed in Part IV of this Report and Decision, satisfies all the specific and general requirements for the use.

A. Baltimore County Zoning Ordinance and Executive Regulations

To understand the parties’ arguments and the Hearing Examiner’s findings in this case, the Hearing Examiner includes a description of the Baltimore County Zoning Regulations governing “Conservation Burial Grounds.”

On July 6, 2021, Baltimore County adopted Council Bill 76-21, which added a “Natural Burial Ground” as a permitted use in several zones. Exhibit 130. Among the County’s Resource Conservation Zones, the use is permitted in the RC-6 (Rural Conservation and Residential Zone)

and RC-8 Zones (Environmental Enhancement Zone) by special exception,¹⁵ although in the RC-6 Zone, it is limited to the area within the "Patapsco Granite Community Plan." Exhibit 130.

Mr. Putman testified that the land surrounding the three Baltimore County "watersheds" is zoned RC-4, watershed protection, and no cemetery is allowed. Standards to rezone a parcel to the RC-4 Zone include the following (*Baltimore County Zoning Regulations*, §:

- A. The parcel of land under petition lies at least 200 feet from the property line of any public water reservoir;
- B. The parcel lies at least 300 feet from any first or second order or greater stream that flows directly into a public water reservoir;
- C. That the parcel lies at least 300 feet from any third order or greater stream that flows directly or indirectly into a public water reservoir;
- D. No more than 30 percent of the parcel has a slope of more than 20 percent;
- E. The parcel does not lie within a 100-year floodplain; and
- F. As shown by an environmental impact statement, the manner in which proposed reclassification will affect water quality in the watershed or any public water reservoir.

The special exception standards for "natural burial grounds" in the Baltimore County Zoning Regulations are (Exhibit 134, *Baltimore County Zoning Ordinance*, §401.1.2):

A natural burial ground is permitted subject to the following conditions:

- A. A natural burial ground shall be designed, operated, and maintained in a manner that produces a natural appearance, by using plants and materials native to the region and landscape patterns derived from and compatible with regional ecosystems.
- B. A natural burial ground shall be located on a minimum tract of 150 acres in single ownership.
- C. Memorial grave markers may not be raised above the ground. Markers shall consist of natural and native materials that will not impede the natural landscape.

¹⁵ Under the 2014 Montgomery County Zoning Ordinance, a special exception is now referred to as a conditional use. *2014 Montgomery County Zoning Ordinance*, §59.1.4.2."Special Exception."

D. The maximum overall density shall be 500 burials per acre. In certain areas where burial may not occur due to sensitive area analysis, burial density may be transferred to a less restricted area in which burial density shall not exceed 600 burials per acre.

E. A natural burial ground shall comply with all requirements of state law, including the registration requirements of Title 5, Subtitle 3 of the Business Regulation Article of the Annotated Code of Maryland.

F. The owner of a natural burial ground shall record in the land records of Baltimore County a record plat of the boundaries of the areas to be used for burial as approved by the Department of Permits, Approvals and Inspections and the Department of Environmental Protection and Sustainability.

G. The owner of land on which a conservation burial ground is to be located shall, at the time of application for the special exception, submit to the Department of Environmental Protection and Sustainability a hydrogeologic study completed by a hydrogeologist, or similarly qualified consultant, that includes the following:

1. A scaled site plan showing the proposed location of the areas to be used for burial, property boundaries, topography, water bodies, USDA soil type, existing and proposed wells and septic systems on and within 200 feet of the property line, and existing and proposed structures on and within 200 feet of the property line; and
2. A determination of the depth to bedrock and depth and flow direction of groundwater beneath the area proposed as a burial ground; and
3. An assessment of proposed burial practices and the potential impacts of burial remains on groundwater quality, surface water quality, and domestic water supplies in relation to human health and the environment; and
4. Recommendations as to the appropriate number, and the location and placement, of burial sites on the land based on the findings in Paragraphs G.1, 2 and 3.

H. The Director of the Department of Environmental Protection and Sustainability shall adopt regulations to administer and enforce the provisions of this section, including but not limited to consideration of potential impacts to human health and the environment related to a conservation burial ground.

As required by the Zoning Ordinance, the Baltimore County Department of Environmental Protection has adopted standards for the hydrogeologic studies required by the Zoning Ordinance. Exhibit 135; COBAR 01.03.04. Among other items, these require submission of a scaled plan showing well and septic systems within 200 feet of the subject property, a determination of soil

type, depth to bedrock, and groundwater flow direction. These may be based on available scientific literature and county records but must be verified by soil borings and test pits. *Id.* The study must also include (*Id.*:

An assessment of the proposed burial practices, density of burial pits and potential impacts of the buried remains on groundwater quality, surface water quality and domestic water supplies as it relates to human health and the environment. This assessment should include consideration of the site specific findings for soil type, slope, depth to groundwater, bedrock, and groundwater flow direction...

The Baltimore County regulations also mandate that burial pits be a minimum of 6 feet above the seasonal high water table or bedrock, and at least 3 feet of cover. *Id.* In the Piedmont area, burial areas must be setback 100 feet from upgradient wells and 300 feet from downgradient wells. *Id.*

B. Findings and Opinion

1. Compatibility and Potential Harm

Colloquially, the key standards to approving a conditional use are whether the proposed development will be compatible with the surrounding area or whether will it cause harm. This is reflected in the "Necessary Findings" for approval of a conditional use in Section 59.7.3.1.E.1 and 2. of the Zoning Ordinance:

Section 7.3.1.E.1. To approve a conditional use application, the Hearing Examiner must find that the proposed development:

*** * ***

d. is harmonious with and will not alter the character of the surrounding neighborhood in a manner inconsistent with the plan;

*** * ***

g. will not cause undue harm to the neighborhood as a result of a non-inherent adverse effect alone or the combination of an inherent and a non-inherent adverse effect in any of the following categories:

i. the use, peaceful enjoyment, economic value or development potential of abutting and confronting properties or the general neighborhood;

- ii. traffic, noise, odors, dust, illumination, or a lack of parking;
or
- iii. the health, safety, or welfare of neighboring residents, visitors, or employees.

* * *

Section 59.7.3.1.E.2. Any structure to be constructed, reconstructed, or altered under a conditional use in a Residential Detached zone must be compatible with the character of the residential neighborhood.

Limited use standards for a cemetery (Section 59.3.5.4.A) likewise require analysis of compatibility with the surrounding neighborhood:

Section 3.5.4.A.2. Use Standards

Where a Cemetery is allowed as a conditional use, it may be permitted by the Hearing Examiner under Section [7.3.1](#), Conditional Use, and the following standards:

- a. The proposed location must be compatible with adjacent land uses, and will not adversely affect the public health, safety, and welfare of the inhabitants of the area.**

* * *

- c. Where the subject property is located in an area not served by public water and sewer, water table tests must be conducted to assure that there is adequate filtration of drainage between burial depth and the level of high-water table.**

a. Scope of Review

Under the limited purview of the Board of Appeals' remand, the above standards require the Hearing Examiner to determine whether the proposed cemetery will adversely affect surface water runoff, private wells in the surrounding area, and the drinking water supply at the Rocky Gorge reservoir. The Hearing Examiner applies the above standards from the Zoning Ordinance to determine whether to approve this use.

The analysis of potential harm in a conditional use case must focus on adverse impacts caused by the specific use at the specific location proposed. The "Necessary Findings" for approval of a conditional use require the Hearing Examiner to review the impact of the "proposed development" on the "surrounding neighborhood." This is reinforced by the Court of Appeals

holding in *Montgomery Cty. v. Butler*, 417 Md. 271, 304-06 (2010). In *Butler*, the Court found Montgomery County's Ordinance to be consistent with prior case law defining the scope of review in a conditional use:

... in allowing the board to consider any "adverse effects created by the unusual characteristics of the site" is entirely consistent with *Schultz* and its progeny. We explain.

In *Schultz*, the Court wrote that an applicant for a special exception "does not have the burden of establishing affirmatively that his proposed use would be a benefit to the community. If he shows to the satisfaction of the Board that the proposed use would be conducted *without real detriment to the neighborhood* . . . he has met his burden." *Schultz*, 291 Md. at 11, 432 A.2d at 1325. The phrase "detriment to the neighborhood" implies necessarily that the Board's task is to determine if there is or likely will be a detriment to the surrounding properties. The Court did not mean that the Board, hypothetically, must measure and assess what the adverse effects of a proposed use would be on an idealized or even *average* neighborhood or property in the zone. Rather, as Judge Rita Davidson explained for the Court, it is for the zoning board to ascertain in each case the adverse effects that the proposed use would have on the *specific, actual* surrounding area... (emphasis in original).

Butler, supra. The site- and use-specific inquiry that must be made is reinforced in Montgomery County's mandate to determine "inherent" or "non-inherent" physical or operational characteristics of the use in the proposed location. The following passage from the Hearing Examiner's Report and Decision in CU 20-08, Application of Martha B. Gudelsky Child Development Center, p. 36 (November 24, 2021) is an example of standard language applying §59.7.3.1.E.1.g included many times in OZAH decisions:

This standard requires consideration of the inherent and non-inherent adverse effects of the proposed use, at the proposed location, on nearby properties and the general neighborhood. *Inherent adverse effects* are "adverse effects created by physical or operational characteristics of a conditional use necessarily associated with a particular use, regardless of its physical size or scale of operations." Zoning Ordinance, §59.1.4.2. *Non-inherent adverse effects* are "adverse effects created by physical or operational characteristics of a conditional use not necessarily associated with the particular use or created by an unusual characteristic of the site." *Id.* The Hearing Examiner may deny a conditional use where the combination of inherent and non-inherent impacts causes undue adverse impact on the surrounding area.

Analysis of inherent and non-inherent adverse effects must establish what physical and operational characteristics are necessarily associated with a child Day Care Center for more than 30 children. Characteristics of the proposed use that are consistent with the characteristics thus identified will be considered inherent adverse effects. Physical and operational characteristics of the proposed use that are not consistent with the characteristics identified *or* adverse effects created by unusual site conditions, will be considered non-inherent adverse effects. (Emphasis in original).¹⁶

In this case, the Hearing Examiner is faced with competing expert reports and testimony on the potential risk of locating this cemetery in a watershed that drains to a public drinking supply. She finds that the probative weight of the Applicant's expert testimony far outweighs that of PWPA's, because PWPA's relies on virtually no factual or operational characteristics of the use proposed and the subject property. In contrast, Dr. Dawson's expert testimony and evidence provides the *only* analysis estimating the actual impact of the fate and transport of contaminants from corpses buried at the proposed cemetery.

While the Hearing Examiner is not required to accept expert testimony merely because it is the only directly probative evidence in the record, her conclusions are by far the most factually supported and well-reasoned that use accepted scientific methods for analysis.¹⁷ They also that directly relate to the factual issues the Hearing Examiner must resolve.

b. Surface Water Runoff

To support her opinion that surface runoff would not contaminate the streams on the site, Dr. Dawson supplied factual data (from personal observation) on whether the Ednor tributaries were flowing and whether erosion was occurring outside of the riparian areas where this would be

¹⁶ In the original case, the Hearing Examiner concluded that the only non-inherent physical characteristic of this use was the flag-pole shape of the lot. HE Report, pp. 29-30. There is no testimony or evidence in this hearing identifying another non-inherent physical or operational characteristic of the site. Because the Hearing Examiner finds that the proposed cemetery will not results in undue harm at this location, she does not need to revisit the issue.

¹⁷ *CSX Transp., Inc. v. Miller*, 159 Md. App. 123, 203 (2004), citing, *Beatty v. Trailmaster Prods., Inc.*, 330 Md. 726, 741, (1993), quoting, *Surkovich v. Doub*, 258 Md. 263, 272 (1970) ("Our cases hold that " 'an expert's opinion is of no greater probative value than the soundness of his reasons given therefor will warrant.'"). y

expected. Other site-specific data included the topographic contours of the site and the burial depths of the proposed graves, and location of the graves outside floodplains. She also identified the location of wells in the vicinity and determined the nearest wells were upgradient of the site. With these facts she considered operational details specific to this use, such as the proposed depths of the graves and locations of burial grounds. Dr. Dawson then combined this factual and operational bedrock with her expert knowledge that shallow groundwater typically discharged into streams in the geographic region. All these physical and operational characteristics directly support her conclusion that no contaminants will not rise to the surface either through scavengers, erosion, or inundation.

c. Impact on Private Wells

The same combination of site-specific factual and operational data, expert knowledge, and accepted methodology (mathematical calculations of a well's capture zone) supports Dr. Dawson's conclusion that private wells will not be impacted. The site-specific factual data is impressive and includes mapping of wells within the Ednor tributary watershed. It also includes groundwater mapping based on the results of a "robust" number test pits and soil borings, infiltration tests, topography, and stream levels on the site to determine the depth and direction of groundwater flow. The results demonstrate that none of the groundwater from the subject property will flow toward nearby private wells. Even if the well is older and not capsulated, as currently required by Maryland regulations, the wells do not fall into the "capture zone" of any of the wells identified, including Mr. Willingmyre's.

d. Impact on Reservoir

The same analysis applies to Dr. Dawson's conclusion, supported by WSSC and MCDEP, that there will be no adverse impact on the Rocky Gorge Reservoir. While those in opposition

dismiss the use of “modeling” to analyze future impacts, the Hearing Examiner agrees with Dr. Dawson’s statement that modeling must be used to predict potential harm from contaminants in the soil. Otherwise, we must wait until the harm occurs to gain insight into its causes. The record demonstrates that the models used by Dr. Dawson are a scientifically accepted method of analyzing the risks from contaminant fate and transport. They are applied by the EPA at Superfund sites, situations where potential harm is as serious (if not more) as the risk of harm posed here. Certainly, there is nothing in the record to demonstrate that the combination of models she used are inaccurate. The Hearing Examiner finds from the weight of testimony and evidence that the model used by Dr. Dawson is an accepted means of forecasting migration of contaminants.

This modeling, combined with factual data obtained from the site and operational aspects of the use (phasing, depth of graves, and total number of graves) were all considered and input into the model. The Hearing Examiner found credible Dr. Dawson’s testimony that her modeling assumptions were extremely conservative based on her uncontroverted testimony explaining exactly why this was the case. In addition, Dr. Dawson modeled the results of the total number of burials at the phases described by the Applicant in the prior hearing. The resulting conclusions are that the amount of any modeled contaminants entering the reservoir will be below safe levels or, like the heavy metals she traced, will not be statistically present at all. Dr. Dawson acknowledged that there is much to be learned about the ADME in the soil of pharmaceuticals and hormones used in chemotherapy treatments. However, she addressed this concern by including a “tracer” of bloodborne pathogens in her study. The study assumes that the “tracer” did not biodegrade. The resulting conclusion was that the amount in the reservoir would be almost “homeopathic” or as low as a one or two molecules

One method used by both WSSC and Dr. Dawson to assess potential risk is to compare potential contamination from the cemetery to existing contamination produced by discharges from septic systems. Dr. Dawson estimates that leaching from septic systems in the Ednor tributary watershed currently amounts to 860 kg per year, which, by the time it reaches the reservoir could be as much as 860,000 kg per year. WSSC advises that, even with 6,600 septic systems in the watershed that regularly discharge pharmaceuticals and hormones into the reservoir, these chemicals are present at “extremely low levels of any pharmaceuticals or hormones, with most results below analytical detection limits...”

Both these conclusions are consistent with Dr. Pleus' testimony that dosage, exposure pathway and threshold are key to determining potential risk from contaminants. The WSSC's example of the intake needed to reach a single therapeutic dose of carbamazepine (*i.e.*, it would not reach a therapeutic [as opposed to a toxic]) dose in 70 years of drinking two liters of water a day) reinforces Dr. Pleus' testimony. The Hearing Examiner finds that the amount of dosage and the exposure pathway *does* matter when assessing the toxilogical risk of exposure in the reservoir and that Dr. Dawson's report is the best evidence of the level of this risk.

e. Opposition's Expert Testimony

In contrast, PWPA's expert evidence can be characterized as general proposition that it is a “bad idea” to locate any cemetery in a watershed that drains to a drinking water supply.¹⁸ This type of argument has been rejected by Maryland Courts as a basis for denying a conditional use. *Anderson v. Sawyer*, 23 Md. App. 612, 618 (1974)(expert testimony that it is undesirable to increase traffic on a 30-foot-wide road in a residential neighborhood in which parking is permitted

¹⁸ The Hearing Examiner does not intend to denigrate the expertise of those testifying, which was at a very high level on both sides. She merely weighs the probative value of the competing evidence on the issue of potential for harm to streams, wells, and the reservoir from the proposed cemetery at the proposed location.

on both sides of the street, without specific factual data, was insufficient to support denial of special exception).

While PWPA argues that its expert evidence is site-specific, the only truly site-specific information it presents is the property's location in a watershed that drains to the Rocky Gorge Reservoir. This blanket assertion is not significantly probative of the issue the Hearing Examiner needs to resolve, because it merely opens the *possibility* that harm may occur but fails to address *probability* that this will happen. Given the detailed factual and scientific evidence that harm will *not* occur, this is an insufficient bases on which to deny this conditional use. *Miller v. Kiwanis Club of Loch Raven, Inc.*, 29 Md. App. 285, 296, (1975)(possibility as opposed to probability that wells would run dry cannot be deemed substantial or probative evidence to support denial of a conditional use).

Neither Dr. O'Keefe or Mr. Mullowney addressed the dosage, exposure pathway or threshold of the NIOSH-listed. Mr. Mullowney asserts that a "single molecule" can be harmful but fails to show how, when, where, or in what form the drug would reach, as Dr. Pleus called it, the "tap." As Dr. Pleus, Dr. Dawson, and the WSSC point out, Mr. Mullowney ignores the various process by which contaminants in corpses may be filtered, degraded, absorbed, dilution or any other process that might mitigate toxic effects. The more concrete testimony and evidence and the credibility (in terms of being more reasoned and precise) of Dr. Dawson and Dr. Pleus persuade the Hearing Examiner that the dosage and exposure pathway for drugs in an occupational setting are very different than that of bodies buried in this. As Dr. Dawson points out, "Mr. Mullowney appears to rely entirely on his stated specialization regarding chemotherapy drug excretion—a subject that is relevant to wastewater and septic system discharges but not to buried corpses, which no longer consume and excrete." Exhibit 118, pp. 4-5.

The Hearing Examiner finds this distinction important, as the evidence and testimony demonstrate that septic systems contain far more contaminants than corpses because contaminants may be discharged daily. Dr. Dawson estimated nitrogen loads from human remains buried on the subject property over 6 years to be 90 kg per year.¹⁹ She estimated that nitrates discharged from all septic systems in the Patuxent River watershed would be approximately 860 kg per year. Exhibit 97, Dawson Expert Report, p. 16. With the disparate loads, the Mr. Mallowney's conclusion of harm are less persuasive.

Aside from dosage, Dr. O'Keefe and Mr. Mallowney provide no details on the exposure pathway. Dr. O'Keefe opined that contaminants would enter the groundwater simply because they travel downward and must end up somewhere. Mr. Mallowney addressed the actual transport and fate of contaminants only by stating "the water drains so quickly and breaks down into the water." There is a plethora of credible expert testimony in this case that the "law of gravity" does not warrant a conclusion that harm will occur. While Dr. Abia did address transport and fate of contaminants from some cemeteries, he did not look at the contaminant load, soils, and exposure pathway of this one. Dr. Dawson correctly points out that even Dr. Abia's conclusion of potential harm depends on site specific factors. Dr. Abia's written testimony quotes from an article identifying the risk of harm from cemeteries, "especially if poorly located or incorrectly managed." Exhibit 106. While Dr. Abia uses the cemetery's location upstream from a reservoir to opine that the proposed cemetery is in a "poor location", Dr. Dawson notes that he fails to include other key factors listed in the article he cited (Exhibit 118):

... which specifically refers to critical parameters that should be considered when evaluating the pollution potential of a cemetery (i.e., to ascertain whether it is poorly located), including: "inhumation depth, geological formation, depth of the water table, density of inhumations, soil type and climate." Evaluation of these

¹⁹ That annual amount will likely be smaller, as Dr. Dawson conservatively assumed that all nitrates would be loaded within 6 years. Both Dr. Abia and Dr. Dawson testified that it can take as much as 20 years for nitrate leave a corpse.

parameters is also recommended by other sources (e.g., Dent, 2002; WHO, 1998), which I relied upon in preparing my Expert Report. I considered each of these site-specific parameters in my hydrogeologic evaluation and demonstrated that contaminant release from burial sites at the proposed Reflection Park cemetery will not pose a health and safety risk to adjacent private properties, nearby streams, or to the Rocky Gorge Reservoir. Dr. Abia considered none of these parameters.

Dr. Pleus blanketly contradicted some of Mr. Mullowney's stronger conclusions, clarifying that the danger of exposure to NIOSH listed drugs is to the mother and does not transmit to the mother's grandchildren. While she understands that Mr. Mullowney is passionate about his subject, she found some aspects of Mr. Mullowney's testimony somewhat hyperbolic and unsupported.

Both Dr. O'Keefe and Mr. Mullowney worry about cumulative effects of these contaminants over time but are not specific to the setting. Dr. O'Keefe points to the overall need to handle pharmaceuticals used in cancer treatment conservatively, a proposition with which few could disagree, but does not answer specifically why this use could cause harm. However, Dr. Dawson conservatively modeled full long-term impact of this use; her model assumed the full occupation of all graves at the phases proposed. She also assumed that all corpses would be adults, each with a nitrogen-loading level with adults,

PWPA relies heavily on recent Baltimore County Zoning Regulations that prohibit natural burial cemeteries from uses permitted in its RC-4 (watershed protection) zone. While they recognize that these regulations are not controlling in this case, they argue that it, "[I]n the end, the Hearing Examiner should ask why, if a green burial cemetery is as risk-free as the Applicant would like to believe, Baltimore County concluded that green burial cemeteries so proximate to a major public drinking water supply would never get in the ground." T. 467.

The answer to PWPA's question is that there is nothing in this record that tells us explicitly why Baltimore County chose a blanket prohibition of cemeteries near water supplies if they even

did so. Council Bill 76-21 sets up only the criteria to petition for the Zone. There is nothing in the record to show which properties, if any, have been rezoned to the RC-4 Zone or whether there remain properties close to reservoirs that are zoned RC-8. If properties near cemeteries were permitted to remain in the RC-8 Zone until the owner requests the RC-4 Zone, a much different connotation ensues.

Even assuming, without deciding, that the burial areas in the Baltimore County bill meet the requirements for RC-4 Zoning, the Hearing Examiner simply cannot apply a policy that hasn't been adopted in Montgomery County. There is virtually no evidence in this case that harm from the cemetery at this location will occur. PWPA's testimony focuses primarily on harm that can occur in other settings, such as contamination from septic systems, occupational exposure, and water treatment systems. The Hearing Examiner cannot adopt a policy that she must divine from a single bill adopted by another jurisdiction to overrule the very strong evidence here that the cemetery will not have an adverse impact on the surrounding area.

Moreover, even though the Montgomery County Zoning Regulations don't have as detailed requirements for a hydrogeologic study as the Baltimore County regulations, a review of the latter demonstrates that the study performed by Dr. Dawson either meets or exceeds or exceeds the Baltimore County requirements. Baltimore County requires an analysis of wells within 200 feet of the property boundary; Dr. Dawson assess the impact on wells at least 750 feet of the property. The components required by the Baltimore County regulations have been included in Dr. Dawson's report. Whether or not Baltimore County would absolutely prohibit a green cemetery on this property is not clear from the evidence; the evidence is clear that the cemetery proposed here will not cause harm to streams, wells, or the reservoir.

The Hearing Examiner does not rely heavily on many of the comments submitted by PWPA in response to the analysis of WSSC and MCDEP because they are not supported by the record in this case. This includes references to the “not-yet-updated federal safety standards” and the “more modern safety standards”, which the PWPA fails to identify Exhibit 148, p. 10. It also contains comments from its expert witnesses that were not under oath, subject to cross-examination, or presented to the WSSC for response. Those in opposition had the opportunity to present rebuttal evidence but chose not to do so. Day 2, T. 422-423.

The Hearing Examiner understands entirely the concerns of the Cloverly Association of about any additional contamination in this area. However, nothing in this record supports a finding that the same scenario will occur. There is nothing to demonstrate similarity in release of contaminants, similarity in contaminants, or similarity in the exposure pathway.

The Hearing Examiner understands the concerns of the Cloverly Civic Associations. There is nothing in this record, however, that the dose, contaminants, transport, and fate of the Shell leakage of MTBE's that occurred in their neighbor will occur on this site.

2. Requested Conditions

Finally, PWPA asks for several conditions if the Hearing Examiner approves this case. According to PWPA, the “scope of devastation” in tree removal (over 25 acres), should be minimized. T. 467. To mitigate for that, there recommend the following condition:

(1) Removal and replanting of trees in the actual burial areas should be closely regulated for the foreseeable future to continually maximize forest cover. Once forest cover is removed, it should be reforested with diverse hardwoods at a scale comparable to the Applicant's original submission to the Planning Board. T. 467.

To assure that Dr. Dawson's findings remain valid, PWPA also recommends there should be an ongoing “reality check” and that monitoring wells should be placed and operated within

and around the cemetery to provide continuous evidence of the presence or absence of bio-contamination. T. 468.

As Dr. Matrusada testified in this hearing, the record for the hearing before remand documents the Applicant's intent to replant each burial section with a mix of reforestation (with native hardwoods) and other vegetation. Exhibit 47. Reflections introduced a "Master Plan for Burial and Reforestation that included "Cemetery Section Development and Field to Forest Sequencing Strategies." *Id.* WSSC recommended "It is preferred that the site be cleared progressively in smaller areas or phases and re-planted (limited clearing if possible), that erosion/sediment control measures be implemented during all land clearing, and small streams on the property be protected from disturbance with a forested riparian buffer." Exhibit 66(b). The Hearing Examiner found that the Applicant's testimony credible (and still does) and that the burial section phasing plan met WSSC's concerns. HE Report, pp. 42-43. However, to make this more concrete, the Hearing Examiner will add following the following conditions to those in the original report:

The Applicant shall clear no more than one burial section (shown on the Applicant's Master Plan for Burial and Reforestation) at a time.

The Applicant shall replant all burial sections utilizing the Cemetery Section Development and Field to Forest Sequencing Strategies shown in Exhibit 47.

All reforested areas shall be consistent with the Reforestation Planting Concept shown on p. 12 of Exhibit 47.

Those in opposition supply no detailed reasons why the site needs continuous monitoring, a condition also deemed not necessary by the WSSC. Dr. Dawson's report modeled the entire load of the cemetery with all burials completed. Without more evidence of why continuous monitoring is needed and where and how monitoring should occur, the Hearing Examiner does not impose this condition.

VIII. CONCLUSION AND DECISION

As set forth above, the application meets the Zoning Ordinance standards for approval pertinent to this approval. Based on the foregoing findings and conclusions, the Hearing Examiner hereby **GRANTS** the Applicant's the application for a conditional use under Section 59.3.5.4.A. of the Zoning Ordinance to build and operate a cemetery at 16621 New Hampshire Avenue, Silver Spring, Maryland, subject to the same conditions stated in her Report dated October 11, 2021 and the following additional conditions:

1. The Applicant may clear no more than one burial section (shown on the Applicant's Master Plan for Burial and Reforestation) at a time.
2. The Applicant shall replant each burial section utilizing the Applicants Cemetery Section Development and Field to Forest Sequencing Strategies (Exhibit 47).
3. All reforested areas shall be consistent with the Reforestation Planting Concept shown on p. 12 of Exhibit 47.

Issued this 15th day of June 2022.



Lynn A. Robeson
Hearing Examiner

RIGHT TO APPEAL

Any party of record may file a written request to appeal the Hearing Examiner's Decision by requesting oral argument before the Board of Appeals, within 10 days issuance of the Hearing Examiner's Report and Decision. Any party of record may, no later than 5 days after a request for oral argument is filed, file a written opposition to it or request to participate in oral argument. If the Board of Appeals grants a request for oral argument, the argument must be limited to matters contained in the record compiled by the Hearing Examiner. A person requesting an appeal, or opposing it, must send a copy of that request or opposition to the Hearing Examiner, the Board of Appeals, and all parties of record before the Hearing Examiner.

Additional procedures are specified in Zoning Ordinance §59.7.3.1.f.1. Contact information for the Board of Appeals is:

Montgomery County Board of Appeals
100 Maryland Avenue, Room 217
Rockville, MD 20850
(240) 777-6600
<http://www.montgomerycountymd.gov/boa/>

PLEASE NOTE THE FOLLOWING BOARD OF APPEALS FILING REQUIREMENTS DURING THE COVID-19 PANDEMIC:

Persons submitted requests for reconsideration, requests for a public hearing, or requests for oral argument/appeal regarding a conditional use decision by OZAH are also required to dual file their request, and should email a scanned copy (or photograph, if a scanner is not available) of their submission to BOA@montgomerycountymd.gov and then either mail the signed hard copy, **via U.S Mail**, to the following address: Montgomery County Board of Appeals, 100 Maryland Avenue, Room 217, Rockville, MD 20850 or make an appoint to hand-deliver the request between the hours of 10:00 a.m. and 4:00 p.m. on Tuesday and Thursday.

If you have questions about how to file a request for oral argument, please contact Staff of the Board of Appeals.

The Board of Appeals will consider your request for oral argument at a work session. Agendas for the Board's work sessions can be found on the Board's website and in the Board's office. You can also call the Board's office to see when the Board will consider your request. If your request for oral argument is granted, you will be notified by the Board of Appeals regarding the time and place for oral argument. Because decisions made by the Board are confined to the evidence of record before the Hearing Examiner, no new or additional evidence or witnesses will be considered. If your request for oral argument is denied, your case will likely be decided by the Board that same day, at the work session.

Parties requesting or opposing an appeal must not attempt to discuss this case with individual Board members because such *ex parte* communications are prohibited by law. If you have any questions regarding this procedure, please contact the Board of Appeals by calling 240-777-6600 or visiting its website: <http://www.montgomerycountymd.gov/boa/>.

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