BEFORE THE ENVIRONMENTAL REVIEW APPEALS COMMISSION

STATE OF OHIO

CLUB 3000, ET AL.	**:**	**Case No ERAC 795307-795320**
VILLAGE OF BOLIVAR	**:**	**Case No. ERAC 795323**
STARK-TUSCARAWAS-WAYNE	**:**	
JOINT SOLID WASTE	**:**	
MANAGEMENT DISTRICT	**:**	**Case No. ERAC 795334**
	:	
Appellants	**:**	
	:	
v.	**:**	
	:	
CHRISTOPHER JONES, DIRECTOR	**:**	
OF ENVIRONMENTAL PROTECTION,	**:**	
ET AL.	**:**	
	:	
Appellees	**:**	**Issued: June 27, 2007**

FINDINGS OF FACT, CONCLUSIONS OF LAW
AND FINAL ORDER
AND
RULING ON MOTION TO SUSPEND PROCEEDINGS AND TO REMAND PROCEEDINGS

THE ENVIRONMENTAL REVIEW APPEALS COMMISSION:

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SHILLING, COMMISSIONER

These matters come before the Environmental Review Appeals Commission ("ERAC," "Commission") upon three Notices of Appeal filed by various individuals and entities. Appellants Club 3000 ("Club 3000"), the Village of Bolivar ("Bolivar," "Village") and the Stark-Tuscarawas-Wayne Joint Solid Waste Management District ("District") timely filed appeals on June 24, 2003, June 27, 2003 and July 1, 2003, respectively.[1] The action underlying the instant appeals arises from the final action of Appellee, Christopher Jones, Director of the Ohio Environmental Protection Agency ("Agency," "Director," "OEPA," "Ohio EPA"), in issuing a Permit to Install an expansion to a solid waste landfill to Appellee Republic Waste Services of Ohio II, LLC, d/b/a Countywide Disposal and Recycling Facility ("Republic," "Countywide"), on June 2, 2003.

Mr. Richard Sahli, Esq., Columbus, Ohio represented Appellant Club 3000. Messrs. Terrence L. Seeberger, Esq. and Victor R. Marsh, Esq. of the law firm of Black, McCuskey, Souers & Arbaugh, Canton Ohio represented the District. Mr. Peter A. Precario, Esq., Columbus, Ohio represented the Village. Ms. Maureen A. Brennan, Esq. and Mr. Jason P. Perdion, Esq. of the law firm of Baker & Hostettler, LLP, Cleveland, Ohio, represented Appellee Republic. And, Assistant Attorneys General Ms. Melissa Yost, Esq. and Mr. James A. Carr, Esq. represented the Ohio EPA.

The *de novo* hearing, held before the full Commission, commenced on October 4, 2004 and proceeded for nine days, during which time the parties indicated that additional days of testimony would be necessary to fully adjudicate the matter. This first segment of the hearing recessed on October 15, 2004, the second segment began January 31, 3005 and recessed on February 4, 2005, and the final segment commenced on February 22, 2005 and concluded on February 25, 2005.

Subsequently, on June 22, 2006, the Commission conducted a site visit at the Countywide facility, where it toured the existing operations and observed construction of the expansion area.

On August 16, 2006 the District filed a Motion to Submit Newly Discovered Evidence. Both the Director and Republic opposed the District's motion and on August 31, 2006 ERAC found the motion not well taken and ruled to Deny the District's Motion to Submit Newly Discovered Evidence. (ERAC Case No. 79334, Case File Items OOOOO, PPPPP, QQQQQ, RRRRR.)

On November 20, 2006, in ERAC Case No. 795323 [*Village of Bolivar, et. al. v. Christopher Jones, Director of Environmental Protection, et al*], the Village filed a Motion to

[1] Club 3000's Notice of Appeal also included the following individual Appellants: Michael Abicht, Marie Burleson, Brenda Charton, Fred Charton, Dwayne Kevin Flickinger, Maryann Fearon, Dick Harvey, Linda Harvey, Karen McDonnell, Tom O'Dell, and Lawrence Township Trustees - Ted Finlayson, Mark Haueter and Fred Pedersen. (Case Nos. 795307-795320, File Item A.)

Suspend Proceedings and to Remand Proceedings. Similarly, on December 26, 2006, the District filed a Motion to Suspend Proceedings And To Remand Proceedings in its own case, ERAC Case No. 795334 [*Stark-Tuscarawas-Wayne Joint Solid Waste District, et. al. v. Christopher Jones, Director of Environmental Protection, et al*]. (ERAC Case No. 795323, Case File Item JJJJJ; ERAC Case No. 795334, Case File Item YYYYY.)

Appellees Director and Republic filed responses in opposition to each Appellant's motion in the respective cases. On February 25, 2007, the Commission heard oral arguments on the pending motions. (ERAC Case Nos. 795323, 795334.)

Based upon the Certified Record, evidence adduced from the hearing, relevant statutes, regulations and case law, the Commission's visit to the site, and post-hearing argument regarding the current status of the landfill, the Commission issues the following Findings of Facts, Conclusions of Law and Final Order AFFIRMING the Director's Final Action issuing a permit to install to Republic for expansion of its landfill site.[2] Correspondingly, Appellants' Motions to Suspend and Remand Proceedings are hereby DENIED.

FINDINGS OF FACT

I. INTRODUCTION

1. The essence of this case is best characterized by the Director. In a letter responding to a concerned citizen regarding Republic's proposed landfill expansion, the Director summarized his duties in permitting and regulating solid waste landfills. The Director stated:

> Ohio's landfill regulations are designed to protect ground water and surface water resources and are more stringent than federal landfill regulations. A solid waste landfill permit application must contain detailed hydrogeologic information demonstrating that the landfill will meet ground water siting criteria. The landfill is required to install monitoring wells to detect any impacts to the ground water from the facility. The landfill must control surface water run off and erosion from the landfill and monitor the water quality of discharges from the sediment ponds. The rules contain numerous provisions for construction, operation, monitoring, closure and post-closure care of the landfill. In addition, the landfill operator is required to provide financial assurance to ensure that the landfill will be properly closed and monitored for 30 years. (Certified Record ("CR") Item 3Y.)

[2] The Commission also DENIES Republic's renewed Motions to Dismiss for Lack of Standing as contained in its Proposed Findings of Fact and Conclusions of Law in both the Village's and the District's appeals. (ERAC Case No. 795323, Case File Item WWWW; ERAC Case No. 795334, Case File Item DDDDD.)

II. THE PARTIES

A. Appellants

2. Various individuals and entities timely filed three distinct appeals opposing the Director's approval of Republic's request to expand its existing landfill at the Countywide site. On June 24, 2003, Club 3000, the Lawrence Township Trustees, and several individuals collectively filed the first appeal, ERAC Case Nos. 795307-795320. The Village of Bolivar filed the second appeal, docketed as ERAC Case No 795323, on June 27, 2003. And, on July 1, 2003, the Stark-Tuscarawas-Wayne Joint Solid Waste Management District filed the third appeal, ERAC Case No. 795334. (Case Nos. 795307 – 795320, 795323, and 795334, File Items A.)

3. Club 3000 organized in the mid-1980s in response to Republic's initial permitting activities creating Countywide's original landfill site. Club 3000 is a not-for-profit Ohio corporation whose members reside in the vicinity of Countywide. Many of its members depend on private water wells for their water supply. (Testimony Harvey, O'Dell.)

4. Club 3000 first appealed to ERAC regarding Republic's activities at the Countywide site in 1989; the parties settled in 1990. Among other things, the settlement agreement "allowed authorized representatives of Club 3000 to access Countywide Landfill for the purposes of observing, inspecting and investigating the site and inspecting and copying" various documents. (Case No. 761978, File Item JJJ.)

5. Lawrence Township, whose trustees are appellants in the Club 3000 appeal, is located adjacent to Pike Township, the township in which the landfill is situated. (Testimony, Franks.)

6. The District is statutorily charged with "providing for . . . the safe and sanitary management of solid wastes within all of the incorporated and unincorporated territory of the . . . district." (Ohio Revised Code ("R.C.") 3734.52(A); Case No. 795534, File Item A.)

7. Bolivar, a small community of approximately one-thousand people, is located about one mile from the Countywide landfill facility, in Tuscarawas County, Ohio. Bolivar's public water system pumps approximately 120,000 to 150,000 gallons of water per day and serves about 425 residential and light-industrial customers, both inside and outside the Village limits. Water pumped to its customers comes exclusively from Bolivar's well field located approximately one and one-half miles southwest of the nearest edge of the Countywide site. (Testimony, Franks.)

B. Republic

8. Republic owns and operates, with the assistance of 30 full and part-time workers, the Countywide landfill site, located at 3619 Gracemont Avenue, SW, East Sparta, Ohio.[3] The

[3] In 1999, Waste Management, the largest solid waste company in the world, merged with U.S.A. Waste.

Countywide site encompasses approximately 818 acres; the southern third, a former coal mining area,is not used for landfill purposes. Republic reclaimed this lower portion, planted over 100,000 trees and developed recreational settings, such as a baseball diamond, a picnic pavilion, a fishing pond and a remote control airplane flying club field. The Countywide facility accepts waste from 26 counties in northeast Ohio and offers free disposal for debris from storm cleanup to the District and to Pike Township. Annually, Countywide pays $300,000 in fees to Pike Township and $1-2 million in fees to the District. It also bioremediates petroleum containing soil, which it recycles as landfill cover. (Testimony, Vandersall.)

9. Republic hired the EMCON/OWT Solid Waste Services division of the IT Group (later the Shaw Group) ("EMCON"), located in Livonia, Michigan, as consultants to assist in the facility design and application process to expand the Countywide facility. Mr. James Walker served as the registered engineer, or project manager, on the expansion development. The proposed expansion will increase the total limit of solid waste from 88.1 acres to 258.1 acres and the disposal volume from 14,311,273 cubic yards of waste to 84,649,924 cubic yards of waste. The proposed expansion will provide an additional disposal capacity of 54 years based on an average disposal rate of 3,500 tons/day or 27 years based on an Authorized Maximum Daily Waste Receipt of 7,000 tons/day. (CR Item 9.)

C. Ohio EPA'S Review

10. On February 14, 2001, Republic submitted an application for a permit to install ("PTI) a vertical and horizontal landfill expansion at the existing Countywide facility.[4] The PTI application consisted of five separately bound sections, which included "Engineering Plans," a "Hydrogeologic Investigation" and a "Ground Water Monitoring Plan." The narrative portions of the application describe the design, construction and operation of the proposed expansion. The engineering design plans provide overall site layouts and detailed designs for all pertinent aspects of the proposed expansion. As a reference tool, Republic also included a chart that listed and summarized Ohio Administrative Code ("OAC") rules applicable to solid waste landfills and identified where the corresponding information appeared within the application. (CR Item 9; Appellees' Exhibit ["Ex."] 3a; testimony, Bowman.)

11. During the more than two-year period between Republic's submittal of its application for expansion of the Countywide site and the Director's issuance of the Final PTI, representatives from OEPA and Republic engaged in numerous detailed discussions and correspondences relating to this PTI. Only those discussions and correspondences of particular relevance to the

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To satisfy the United States Department of Justice concerns about the merger, Waste Management sold the Countywide site and operations to Republic. (Testimony, Vandersall.)

[4] Ohio EPA issued the initial PTI for the existing facility on May 18, 1989. A new PTI was submitted and approved by the Agency on March 30, 1995. The site is currently operating under the PTI issued in 1995. (CR Items 7, 9.)

instant appeal are discussed herein.

i. Hydrogeology Review

12. Jeffery Rizzo, a hydrogeologist for OEPA's Division of Drinking and Ground Water ("DDAGW") in the Northeast District Office ("NEDO") reviewed the hydrogeology and geology portions of the application. Mr. Rizzo has dedicated over 1,000 hours considering matters relating to Countywide, 145 of those hours directly related to reviewing the instant permit. (Testimony, Rizzo.)

13. In reviewing Republic's permit application, Mr. Rizzo first read the hydrogeologic report and ground water monitoring plan. Next, he gathered the applicable rules in Ohio Administrative Code ("OAC") 3745-27-06(C)(2) and reviewed both the hydrogeologic report and the ground water monitoring plan, rule by rule, ensuring that each requirement had been "addressed adequately." Then, Mr. Rizzo similarly reviewed specific citing criteria found in OAC 3745-27-07(H)(2) and (3) ensuring that the ground water siting criteria had been met. Finally, Mr. Rizzo compared Republic's ground water monitoring plan to the requirements of 3745-27-10(A), (B), (C) and (D). Mr. Rizzo testified that during his comprehensive geologic and hydrogeologic review, he also consulted numerous other documents, including Ohio Department of Natural Resources ("ODNR") records, glacial geology documents, the DRASTIC report and map for Stark county, a ground water resource map of Stark county, applicable OEPA policy and guidance documents, and an underground mine map.[5] (Testimony, Rizzo.)

14. On May 22, 2001, Mr. Rizzo sent an inter-office communication ("IOC") containing his initial comments regarding Republic's application to Judith Bowman, Environmental Specialist, Division of Solid and Infectious Waste Management ("DSIWM"), also at NEDO. (Appellees' Ex. 173; testimony, Rizzo.)

15. Mr. Rizzo's IOC to Ms. Bowman contained four sections: Introduction, Compliance Issues, Comments and Conclusion. He found no Compliance Issues, but identified and included an analysis of two Compliance Deficiencies, both relating to the proposed ground water monitoring system. The first deficiency related to OAC 3745-27-10(B)(1)(b), in that the ground water monitoring system proposed by the applicant was "not capable of determining the quality of ground water migrating downgradient of the proposed unit." The second deficiency related to OAC 3745-27-10(B)(4)(a), in that the Applicant failed to propose a "sufficient number of ground water monitoring wells downgradient of the proposed expansion area." (Appellees' Ex. 173; testimony Rizzo.)

16. Mr. Rizzo recommended that to resolve both deficiencies, the "owner/operator should revise the proposed ground water monitoring plan to include a sufficient number of monitoring

[5] As will be discussed in greater detail later in the opinion, the purpose of a DRASTIC report is to identify and rank areas vulnerable to surface water pollution. (Appellants' Ex. D.)

wells located downgradient of the proposed expansion area, such that the ground water monitoring system is capable of representing the quality of the ground water passing directly downgradient of the limits of solid waste placement." (Appellees' Ex. 173; testimony, Rizzo.)

17. On May 25, 2001, Ms. Bowman sent a letter to Mr. Vandersall, General Manager at the Countywide site, citing the two hydrogeologic deficiencies identified by Mr. Rizzo. On July 18, 2001, on Republic's behalf, Mr. Walker, EMCON's project manager, proposed "[a]dditional monitoring wells . . . in the downgradient direction of the proposed limits of waste." Mr. Walker also stated that the "Investigation Report and the Ground-Water Monitoring Plan have been revised in such a way that the proposed ground water monitoring system will be capable of representing the quality of ground water passing directly downgradient of the proposed limits of solid waste placement." Further, he explained "the revisions have been copied on blue colored paper and have replaced or augmented the initial documents as noted in the attached table." (Appellees' Ex. 102, 174; testimony Bowman, Walker.)

18. Mr. Rizzo reviewed Mr. Walker's proposals and, on September 5, 2001, sent an IOC to Ms. Bowman summarizing his hydrogeologic review of Republic's July 18, 2001 revised Hydrogeology Investigation and Ground Water Monitoring Plan. Not satisfied that Republic's changes to the Hydrogeology Investigation and Ground Water Monitoring Plan adequately corrected the two hydrogeologic deficiencies, Mr. Rizzo recommended the inclusion of two additional conditions. Mr. Rizzo testified that, although he generally prefers that the applicant suggest and submit modifications to their application undergoing Agency review, in some circumstances, as was the case here, the Agency will draft conditions to a permit that are specifically tailored to address particular deficiencies noted by the Agency. (Testimony, Rizzo.)

19. Specifically, Mr. Rizzo proposed two additional conditions to Republic's PTI. Condition 19 required Republic to relocate ground water monitoring wells MW-115 and MW-115a and to install "additional ground water monitoring wells to be identified as MW-121 and MW-121a, to be located 500 feet south of relocated MW-115 and MW-115a." Condition 20 approved Republic's plan to phase in monitoring wells, but recommended that the Agency reserve the right to require Republic to "accelerate the phasing-in of ground water monitoring well or wells." Essentially, Condition 20 would allow Republic to phase in ground water monitoring wells as they become relevant and necessary to ascertain the quality of the ground water. (CR Item 3a3, testimony, Rizzo.)

20. In an IOC dated September 12, 2001, Mr. Rizzo advised Ms. Bowman that Republic's hydrogeologic investigation and ground water monitoring plan satisfied the siting criteria contained in OAC Rules 3745-27-07(H)(2)(a) through (e) and (H)(3)(a) through (c). As such, Republic's PTI met the siting criteria described in OAC 3745-27-07. (CR Item 3e3.)

ii. Engineering Review

21. Ms. Bowman's May 25, 2001 letter to Mr. Vandersall identifying hydrogeologic

deficiencies also identified four engineering deficiencies documented by Agency employees during the review process. In requesting that Republic address the four engineering "deficiencies and comments," the Agency:

> (1) (a) recommended that Republic include "operational height limitations and operating slopes for critical operational conditions" on the plan drawing for slope stability analysis under OAC 3745-27-16(C)(4)(l); and
>
> (b) presumed that the "geocomposite drain will be provided with adequate drainage outets [and] . . . requested that EMCON "revise the calculations in the HELP model or provide a justification for the assumption that water levels will not rise higher than the top of the geocomposite;"[6]
>
> (2) identified deficiencies in the Quality Assurance/Quality Control ("QA/QC") Plan. To comply with the QA/QC Plan requirements set forth in OAC 3745-27-08(C)(1)(b), the plan must: (a) specify the clod size to be used in the recompacted soil barrier, (b) specify the particle size to be used in the recompacted soil barrier; (c) state the thickness of the flexible membrane liner ("FML"); (d) adjust the peel and sheer test frequency performed on the FML so that it occurs every four hours; (e) include the construction of a test pad; and (f) specify the grain size and permeability testing methods for the added geologic material;
>
> (3) identified deficiencies in the Post-Closure Plan required under OAC 3745-27-06(C)(7)(g). Republic had failed to include costs relating to construction of test pads, material testing, personnel and management of sedimentation pond and cost delineation for "worst case" scenario for closure; and
>
> (4) noted that Republic failed to incorporate several requirements of OAC 3745-27-06(C)(7)(i) including a "description of personnel responsible for determining waste acceptance, procedure upon detection or suspected detection of PCB [Polychlorinated Biphenyls] or hazardous waste, procedures for training of sanitary landfill facility personnel for personnel safety and to recognize regulated hazardous wastes and PCB waste and notification procedures." (CR Item 3n2; Appellees' Ex. 102; testimony, Bowman, Rizzo.)

22. In the same eight-page correspondence to OEPA, in which Mr. Walker described changes made to satisfy the Agency's hydrogeologic concerns, Mr. Walker also addressed the four engineering deficiencies identified by the Agency. The first engineering deficiency contained two parts. Mr. Walker responded to the first part by stating "[t]o facilitate future alterations . . ."

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[6] Developed at the U.S. Army Engineer Waterways Experiment Station under a cooperative agreement with the U.S. Environmental Protection Agency to support RCRA (Resource Conservation and Recovery Act) and Superfund programs, the HELP model estimates water balances for municipal landfills, RCRA and CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) facilities, and other land disposal systems. (http://el.erdc.usace.army.mil/elmodels/helpinfo.html)

EMCON "felt it would be best to state the [operational height] recommendations within one location" of the PTI. Therefore, "only a note referencing the recommendations in the geotechnical report was included on the phase drawings." To address this concern, Republic altered the phase drawings as requested by OEPA. (Appellees' Ex. 174.)

23. Responding to the second part, Mr. Walker noted that an incorrect value was used in the HELP model. In the original calculation, the geocomposite was assigned a thickness value of 0.02. Republic reran the HELP model using the correct thickness value of 0.2. The corrected calculation "slightly lowered" the "leachate collection" and altered the HELP model outcome in such a way that no changes to the leachate generation rates were required. (Appellees' Ex. 174.)

24. To correct the second engineering deficiency, Republic made six revisions to its QA/QC Plan. The revised QA/QC Plan specified that: (1) the maximum clod size shall be 3 inches or ½ the lift thickness; (2) the specific particle size of the recompacted soil barrier; (3) if high density polyethylene is used, the thickness shall be 60 millimeters; (4) seams in the FML will be tested at the beginning of the seaming period and every four hours thereafter; (5) specifications for test pads and their construction are included; and (6) for added geologic material, the minimum frequency for testing grain size distribution is every 5000 feet and the minimum test frequency for permeability per material type is once every 5000 cubic yards. (Appellees' Ex. 174.)

25. The third engineering deficiency related to the Post-Closure Plan. To rectify these deficiencies, Mr. Walker advised that the construction costs for test pads, material testing and personnel could be found in the Closure Certificate and highlighted the phases contained in the plans demonstrating that a worst case scenario had been presented in the table. Additionally, he clarified that post-closure costs for cleaning the sedimentation basin assumed a clean-out frequency of every five years. (Appellees' Ex. 174.)

26. Finally, to correct the fourth engineering deficiency, Mr. Walker included an addendum offering details on PCB and hazardous waste prevention and detection programs not fully described in their original application. (CR Item 3u2; Appellees' Ex. 174.)

iii. Financial Assurance

27. On July 10, 2001, Fanny Haritos, of Ohio EPA's Compliance Monitoring and Enforcement Unit, Division of Solid and Infectious Waste Management ("DSIWM"), sent a letter to Mr. Vandersall advising him that the financial assurance figures for closure and post closure must be adjusted to anticipate inflation. Further, Ms. Haritos advised "the wording of the Certificate of Insurance doesn't meet the wording requirements of the financial assurance rules." (CR Item 3t2.)

28. Mr. Vandersall and Ms. Haritos exchanged several correspondences to resolve this matter. Ultimately, in a letter dated August 22, 2001, Ms. Haritos informed Mr. Vandersall that the cost adjustments for closure and post-closure care had been "updated correctly" and on

March 6, 2002, Ms. Haritos advised Mr. Vandersall that the Certificate of Insurance now meets the "requirements of the financial assurance rules." (CR Items 3x2, 3c3, 4r.)

iv. Public Comments and Final Agency Review

29. On February 20, 2001, Mr. Walker sent a letter to the Director, advising him that Republic intended to host a public information session on March 19, 2001 "to inform the public [of their recent application for expansion] and allow citizens to make comments on, or objections to the application." The sign-in sheet reflects that only one person not affiliated with Republic or OEPA attended the session. (CR Item 3q, Appellees' Ex. 101, 172.)

30. In a certified letter dated June 7, 2001, OEPA advised Republic that OEPA would host a public information session on August 2, 2001 at the Sandy Valley Jr.-Sr. High School beginning at 6:30 p.m. The agenda for the public information session listed several speakers scheduled to discuss various topics relating to the expansion, after which, the public was provided an opportunity to comment.[7] (CR Item 3j; Appellees' Ex. 175; testimony Bowman.)

31. On September 17, 2001, Judith Bowman circulated an IOC through Eric Adams, Environmental Supervisor, and Kurt Princic, Environmental Manager, to Dan Harris, Chief, DSIWM and Bill Skowronski, Chief, NEDO. The nineteen-page communication recommended the "issuance of a draft permit-to-install subject to conditions" and included a copy of the Draft PTI, a solid waste PTI worksheet and review summary, as well as two IOCs from Mr. Rizzo to Ms. Bowman. (Appellees' Ex. 176.)

32. On November 29, 2001, Kimberly L. Reese, of the Systems Management Unit in DSIWM, sent a certified letter to Republic Services stating that the Agency had approved their application and issued a Draft PTI containing twenty-one conditions. Ms. Reese's letter included a copy of a Public Notice scheduled to appear in several local papers of general circulation, *The Repository*, *Alliance Review*, *The Sun Journal*, *The Independent*, *The Hartville News*, *The Press News*, and *The Louisville Herald*. The Public Notice stated that a Public Hearing would be held on Thursday January 17, 2002 and that "written comments" would be accepted by the Director until January 31, 2002. (CR Items 4e and 4l; Appellees' Ex. 177; testimony Bowman.)

33. As scheduled, OEPA held the Public Hearing, for which one hundred-seven individuals signed OEPA's sign-in sheet. Ohio EPA considered all comments expressed during the Public Hearing, as well as the written comments received during the public comment period. Ohio EPA responded collectively to both sets of comments in a Responsiveness Summary included with

[7] The agenda identified the following four speakers and topics: OEPA employee Ms. Bowman would discuss the permit application process; Mr. Vandersall, of Countywide, would present an overview of the expansion; Mr. John Sugar, of Eagon and Associates, would discuss the "Hydrogreologic Investigation and Groundwater Monitoring System;" Mr. Walker, of EMCON, would discuss the "Landfill Expansion Design." The Commission is unaware as to whether the meeting was transcribed, as the CR did not include a transcript of the public information session. (CR Item 3j.)

issuance of the Final PTI. (Appellees' Ex. 177, testimony, Bowman.)

34. On February 21, 2002, Mr. Walker, of EMCON, sent a letter to OEPA reiterating Republic's position on Conditions 19 and 20 of the Draft PTI.[8] Condition 19 stated that the Draft PTI permit will not be issued as a final action of the Director until OEPA receives revisions to the QA/QC Plan which include "procedures for a permeability testing of the recompacted soil liner and recompacted soil barrier test pad including test method, frequency of testing, and pass/fail criteria." In his response, Mr. Walker clarified that this was discussed previously in a telephone conversation and "that the required information is provided in Appendix C of Attachment 7.6-1 . . . and that no further [action] is required for this item." (Appellees' Ex. 178.)

35. Condition 20 of the Draft PTI stated that the Draft PTI will not be issued as a final action until:

> OEPA receives a revised ground water monitoring program plan which proposes a sufficient number of ground water monitoring wells downgradient of the proposed expansion. . . . The plan shall include the following revisions:
>
> a. Ground water monitoring wells MW-115 and MW-115A shall be relocated . . . .; and
>
> b. Installation of additional ground water monitoring wells, to be identified as MW-121 and MW121A, which shall be located approximately 500 feet south of relocated monitoring wells MW-115 and MW-115A. (Appellees' Ex. 178.)

36. In his letter, Mr. Walker clarified for OEPA that the appropriate revisions to satisfy Condition 20 had already been made during an earlier revision to the ground water monitoring plan. He further stated that Republic had made corresponding changes to the hydrogeologic investigation and the engineering plan drawings, as well as fiscal adjustments to post-closure care cost estimates and concluded by stating, "[w]e believe that the information provided satisfactorily address all remaining outstanding issues for the Permit-To-Install." (Appellees' Ex. 178.)

37. On March 4, 2002, Mr. Rizzo, via IOC, advised Ms. Bowman that Republic "adequately responded to" Condition 20 of the Draft PTI. Mr. Rizzo did not address Condition 19 in this memo, as it had been resolved previously during a telephone conversation. (Appellees' Ex. 179; testimony Rizzo.)

38. In a memorandum dated May 21, 2002, Ms. Bowman recommended the issuance of a

[8] While reviewing Republic's application, the Agency revised and deleted several Conditions contained in the PTI, which altered the numbering of several conditions. Draft PTI Condition 19, discussed in this paragraph, relates to the permeability of recompacted soil, while the Condition 19 discussed in Finding of Fact ¶ 19 related to groundwater monitoring wells. Draft PTI Condition 20 is similar to Condition 19 discussed in Finding of Fact ¶ 19.

Final PTI to Republic. Accompanying her memorandum, Ms. Bowman included a copy of the Final PTI and a Responsiveness Summary. The Final PTI recommended by Ms. Bowman omitted Conditions 19 and 20, because Republic had adequately addressed those concerns in previous correspondences with the Agency and had made the necessary corrections and changes to their application. (Appellees' Ex. 180; testimony Bowman.)

39. The Final PTI recommended by Ms. Bowman differed from the Final PTI issued to Republic. Notably, the Final PTI, as issued, incorporated several new conditions in response to comments OEPA received during the public comment period. In a letter dated June 14, 2002, the Agency informed Republic that, during the public comment period, the Agency had received a letter from "SCS Engineers, noting several comments, questions, suggestions, and recommendations regarding the application."[9] The Agency further noted that some of the comments received resulted in minor revisions to the permit and the addition of a condition requiring Republic to revise its construction drawings and plans to reflect its inclusion of these minor revisions. The Agency also added Condition 17(b), which required Republic to submit, at least seven days prior to construction of a cell liner system, a narrative describing the potential for hydrostatic uplift and, if necessary, a discussion of any proposed water control structures. Finally, the Agency added Condition 23 to clarify surface water requirements for storm water discharge. (Appellees' Ex. 8, 180, 181; testimony Bowman.)

40. Over the next year, Republic and OEPA engaged in discussions and exchanged documents regarding Club 3000's activities relating to the operations at the Countywide site and the landfill expansion plans, miscellaneous topics relating to Republic's PTI application, and various operating matters not related to the proposed expansion. (See generally, CR Items 4e2 through 5u.)

41. On May 19, 2003, in its final communication about the proposed expansion, Mr. Walker of EMCON advised Ms. Bowman, that in accordance with a May 16, 2003 meeting, Republic was submitting two revised drawings and five supplemental drawings.[10] (Appellees' Ex. 182.)

42. On June 2, 2003, OEPA Director Christopher Jones issued a Final PTI to Republic Services of Ohio II, d/b/a Countywide Disposal and Recycling Facility. The Final PTI mandates compliance with all applicable laws and regulations, as well as twenty-four conditions contained in the permit. Moreover, the facility must be constructed with numerous systems designed to protect human health and the environment, including a composite liner system, a leachate collection system, a surface water management system, a ground water monitoring system and an explosive gas monitoring system. The permit approval also included financial assurance for closure and provided for 30 years of post-closure care. (Appellees' Ex. 8; testimony, Bowman.)

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[9] SCS Engineers, whose primary business is landfill engineering, concluded their written comments by stating "the application documents, for the most part, meet Municipal Solid Waste Regulations." and "the expansion can meet the regulatory requirements" for approval. (Appellees' Ex. 94; http://www.scsengineers.com/lfeng.html.)

[10] The record is unclear as to the specific nature of the meeting, only that a meeting was held on May 16, 2003, which necessitated revisions to certain drawings contained in the application.

III. ASSIGNMENTS OF ERROR

43. In total, Appellants alleged thirty-six assignments of error in this matter.

44. Club 3000 alleged fifteen Assignments of Error and withdrew four. The following eleven Assignments of Error remain:

> 1. The Director acted unlawfully and/or reasonably in issuing the permit without requiring Applicant to adequately characterize the geological and hydrogeological setting of the facility.
>
> 2. The Director acted unlawfully and/or unreasonably in issuing the permit based upon an erroneous and scientifically invalid conception of the geological and hydrogeological setting of the facility which substantially misinterprets and underestimates the potential of the landfill to cause water contamination.
>
> 3. The Director acted unlawfully and/or unreasonably in issuing the permit in violation of, and without a lawful waiver from, the citing requirement of Ohio Administrative Code Section 3475-27-07(H)(2)(e) prohibiting the landfill at a location where the isolation distance between the uppermost aquifer system and the bottom of the facility is not less than fifteen feet of suitable material.
>
> 4. The Director acted unlawfully and/or unreasonably in issuing the permit in violation of, and without a waiver from, the citing requirement of Ohio Administrative Code Section 3745-27-07(H)(3)(a) prohibiting the location of a landfill within a five-year time of travel to a public water supply well.
>
> 5. The Director acted unlawfully and/or unreasonably in issuing the permit based upon a scientifically invalid means of assessing the time of travel of contaminants from the landfill.
>
> 6. The Director acted unlawfully and/or unreasonably in issuing the permit in violation of, and without lawful waiver from, the citing requirements of Ohio Administrative Code Section 3745-27-07(H)(2)(d) prohibiting the landfill above an unconsolidated aquifer capable of sustaining a yield of one hundred gallons per minute.
>
> 7. The Director acted unlawfully and/or unreasonably in issuing the permit under circumstances where an obvious and significant likelihood will be created that the aquifer beneath the facility and the unconsolidated Sandy Valley aquifer close to the site will be rapidly contaminated.
>
> 8. The Director acted unlawfully and/or unreasonably in issuing the permit without providing scientifically valid consideration of the effects from the highly

fractured bedrock present beneath the landfill and its potential to provide a means of rapid egress of pollutants from the landfill into waters of the state.

9. The Director acted unlawfully and/or unreasonably in issuing the permit by authorizing the landfill to be built of soils and materials of dubious engineering qualities and with questionable methods of construction, which render the proposed landfill prone to failure, thus causing water pollution.

10. The Director acted unlawfully and/or unreasonably in issuing the permit under conditions which make failure of the landfill's liner system probable due to its placement in saturated areas with harmful hydraulic effects.

11. The Director acted unlawfully and/or unreasonably in issuing the permit with insufficient conditions to prevent pollution to waters of the state, including both ground and surface waters. (See, ERAC Case File Nos. 795307-795320.)

45. The District alleged ten Assignments of Error and withdrew four. The following six Assignments of Error remain:

1. The Director acted unlawfully or reasonably in issuing the permit despite evidence that the expansion will compromise the ambient water quality in violation of OAC 3745-31-05(A)(1).

2. The Director acted unlawfully or unreasonably in issuing the permit in violation of, and without lawful waiver from, the siting requirements of OAC 3745-27-07(H)(2), prohibiting a landfill above an unconsolidated aquifer capable of sustaining a yield of 100 gallons per minute.

3. The Director acted unlawfully or unreasonably in issuing the permit in violation of, and without a lawful waiver from, the siting requirement of Ohio Administrative Code Section 3475-27-07(H)(3) prohibiting the landfill at a location within a five-year time of travel to a public water supply well.

4. The Director acted unlawfully or unreasonably in issuing the permit without adequately considering the substantial risk of contamination to area aquifers, as a result of highly fractured bedrock present beneath the proposed landfill expansion.

5. The Director acted unlawfully or unreasonably in issuing the permit without adequately investigating and addressing the risk of contamination arising from highly fractured bedrock, preexisting mines, and oil and gas wells in the area of and under the proposed landfill expansion.

6. The Director acted unlawfully or unreasonably in issuing the permit where the

proposed liner system, materials for fill and sub-base, and ground water monitoring systems are inadequate and are not the best available technology. (See, ERAC Case No. 795334.)

46. The Village of Bolivar alleged ten Assignments of Error and withdrew four. The following six Assignments of Error remain:

1. The PTI in question herein fails to adequately and reasonably protect the ground water underlying the landfill in that the location, design, and proposed construction of the landfill does not comply with the siting requirements specified in Chapter 3745-27-07 of the Ohio Administrative Code and Ohio law.

2. Neither the application filed by Applicant with the Director nor any subsequent information submitted or developed regarding the facility has properly and adequately characterized the complex geology and hydrogeology underlying the site of this landfill. As a result, the application is invalid and incomplete and fails to provide adequate data and information that would be properly protective of ground water under the proposed facility.

3. The provisions of the application and the Permit relating to the installation, placement and use of an impermeable, geosynthetic liner system are unreasonable and inadequate under the circumstances and the conditions found at the site and in the operations of this facility. As a result of the geology and hydrogeology of this site, the liner system will be subject to hydrostatic forces thereby reducing or eliminating the effectiveness of the liner system. Neither the application nor the Permit itself adequately provides for an analysis of this problem nor for a method of resolution of this situation.

4. The ground water monitoring requirements, including both the number and monitoring well placement, are unreasonable and inadequate to detect any contamination to ground water resulting from the operations of the facility and, as a result, are not in compliance with Ohio law.

5. The fill materials and subbase, or subgrade, materials proposed to be utilized and which are authorized in the facility [*sic*] are unreasonable, inappropriate and insufficient to prevent permeation and contamination of the ground water underlying the facility and are not in compliance with the laws of the State of Ohio.

6. The application and materials submitted therewith by Appellee have mis-characterized the elevations and isolation distances between the uppermost aquifer system and the bottom of the landfill. As a result, the isolation distances are unreasonable, inadequate and the facility does not comply with the siting requirements specified in Chapter 3745-27-07 of the Ohio Administrative Code.

(See ERAC Case No. 795323.)

47. The issues before the Commission can be abridged and categorized into the following four groups:

Group 1: The Director unreasonably or unlawfully issued a permit where the applicant failed to adequately characterize the regional and site-specific geology and hydrogeology of the facility *(Assignments of Error: Club 3000 - 1, 2, 7, 10; District - 5, 9; Bolivar - 2)*;

Group 2: The permit fails to adequately and reasonably protect the ground water underlying the landfill, in that the location, design, and proposed construction of the landfill does not comply with the siting requirements found in OAC Chapter 3745-27-07. *(Assignment of Error: Bolivar – 1)*:

1. The landfill expansion is not to be located above an "unconsolidated aquifer capable of sustaining a yield of one hundred gallons per minute for a twenty-four hour period to an existing or future water supply well located within one thousand feet of the limits of solid waste placement . . .." (OAC 3745-27-07(H)(2)(d).) *(Assignments of Error: Club 3000 - 6; District - 2)*; and

2. "The isolation distance between the uppermost aquifer system and the bottom of the recompacted soil liner . . . must not be less than fifteen feet of in-situ or added geologic material deemed acceptable by the director." (OAC 3745-27-07(H)(2)(e).) *(Assignments of Error: Club 3000 -3; Bolivar - 9)*; and

3. The landfill expansion must not be "located within the surface and subsurface areas surrounding a public water supply well through which contaminants may move toward and may reach the public water supply well within a period of five years." (OAC 3745-27-07(H)(3)(a).) (*Assignments of Error: Club 3000 – 4, 5; District – 3)*.

Group 3: The Director failed to consider the expansion's effect on "water quality" and failed to protect the area's "ambient water quality" pursuant to OAC 3745-31-05(A)(1) *(Assignments of Error: Club 3000 - 15; District - 1).* The Director also failed to ensure the implementation of a ground water monitoring plan adequate to protect the environment. *(Assignment of Error: Bolivar - 7.*)

Group 4: The Director relied upon an erroneous and scientifically invalid conceptual model of the setting, which led to inaccurate slope stability calculations for the berm walls. Further, the Director issued the permit under conditions which make failure of the landfill liner probable due to its construction and placement in an area likely to experience hydrostatic forces. *(Assignments of Error: Club 3000 - 12, 13; District – 10; Bolivar – 6, 8)* (Case Nos. 795307-795320, 795323, 795334, File Items A.)

IV. IDENTIFICATION OF EXPERTS

48. To advance their positions in the instant matter, the parties presented numerous experts who testified before the Commission. Because of the complexity of the case and the number of experts, the Commission will delineate the experts by party and highlight qualifications which support the Commission's acceptance of their expert status in this case.

49. Dr. Julie P. Weatherington-Rice, Mr. Robert M. Galbraith, Dr. Darrell Leap, Mr. Daniel Fisher and Dr. Yun Zhou testified on behalf of the Appellants.

a. Dr. Rice received a Bachelor of Science in earth science education, a master's degree in geology and mineralogy and a Ph.D. in soil science, with a minor in geographic information systems ("GIS") from The Ohio State University.[11] Dr. Rice is employed by the consulting firm, Bennett & Williams, and is an adjunct professor at Ohio State University. Club 3000 offered Dr. Rice as an expert in geology, hydrogeology, geomorphology, geologic and hydrogeologic mapping and GIS, fracture flow analysis and economic geology. Appellees did not object to Dr. Rice being qualified as an expert in geology, hydrogeology, and geomorphology as it relates to GIS. Following significant discussion, the Commission admitted Dr. Rice to testify as an expert in geology, hydrogeology and geomorphology as it relates to GIS, but declined to admit Dr. Rice as an expert in geologic and hydrogeologic mapping, fracture flow analysis and economic geology. (Testimony, Rice.)

b. Mr. Galbraith holds bachelor's and master's degrees in geology from the University of Cincinnati and spent a year working on a Ph.D. at Virginia Polytechnical Institute. Registered with the American Institute of Professional Geologists, Mr. Galbraith began his geology studies in 1967 and has developed expertise in geological drilling processes and logging. Mr. Galbraith testified that he has reviewed ten to twelve thousand well logs, has been involved in three to four hundred well monitoring programs since 1982, and has spent eleven years focusing on "remedial investigations and cleanup of sites." Currently, Mr. Galbraith is engaged in selling real estate, but regularly reads professional journals and publications from the American Institute of Professional Geologists and the National Ground Water Association. The Commission accepted Mr. Galbraith as an expert in geology and hydrogeology. (Testimony, Galbraith.)

c. Dr. Leap, a hydrogeologist for approximately 38 years, holds a Bachelor of Science from Marshall University and a Master of Arts from Indiana University,

[11] Dr. Rice described GIS as a "computerized method of taking maps and data and within a computer, fitting them together to create other interpretations and other maps. It also helps us to take information that is data and display it visually." (Testimony, Rice.)

both in geology, and a Ph.D. from Pennsylvania State in geology with a hydrogeology minor. Dr. Leap is registered with the American Institute of Hydrogeology. His diverse career includes environmental assessment of nuclear waste placement, including fracture tracer experiments for the United States Geological Survey, fracture analysis in Indiana, South Dakota, and Nevada, as well as teaching and developing curriculum for hydrogeology courses at Purdue University.[12] The Commission accepted Dr. Leap as an expert in geology, hydrogeology, fracture tracers and the analysis of fracture terrain. (Testimony, Leap.)

d. Mr. Fisher received a bachelor's degree in geology from West Virginia University and a master's degree in geology from Kent State University. A licensed Professional Geologist in several states, Mr. Fisher is employed by Michael Baker, Jr., Inc., an engineering firm specializing in energy matters. A Technical Specialist 5 or Senior Hydrogeologist, he has acquired over 18 years experience planning and executing subsurface exploration via drilling, logging, sampling and analyzing drillings and borings, and has used this data to construct conceptual site models. The Commission accepted Mr. Fisher as an expert in geology, hydrogeology, geomorphology, hydrogeochemistry and ground water flow rate analysis. (Testimony, Fisher.)

e. Dr. Zhou received an undergraduate degree in mining engineering from Kunmin Engineering Institute in China. He holds three master's degrees and one Ph.D. Chronologically, Dr. Zhou's first graduate degree is a master's degree in mining engineering from Beijing University, the second is a master's degree in geotechnical engineering from the University of Pittsburgh, where he also received his Ph.D. in geotechnical engineering. Lastly, he obtained a master's degree in information technology from Carnegie Mellon University. Dr. Zhou, a licensed Professional Engineer in Pennsylvania, is employed by Michael Baker, Jr., Inc., where he provides technical support for company-wide projects and planning, as well as client development projects. Dr. Zhou has focused on slope stability analyses since 1983 and landfill design since 1989. The Commission accepted Dr. Zhou as an expert in civil engineering, landfill design as it relates to slope stability analysis, and strain compatibility as it relates to strain and stress analysis in landfill design. (Testimony, Zhou.)

50. Experts testifying on behalf of the Appellees were Mr. James G. Walker, Mr. Peter J. Carey, Mr. Allan C. Razem, Dr. Michael G. Sklash, Ms. Virginia Wilson, Ms. Judith Bowman and Mr. Jeff Rizzo.

a. Mr. Walker, a licensed Professional Engineer, holds a Bachelor of Science

[12] Dr. Leap conducted fracture tracer experiments to determine the dispersion characteristics and velocity of travel of contaminants through fractures. (Testimony, Leap.)

degree in civil engineering from the University of Michigan. A civil engineer for twenty-seven years, he spent the past seventeen in design and construction of solid waste landfills. During this time he designed twelve approved landfill expansions, five of which were located in Ohio. He has been involved in engineering activities at the Countywide site since 1992. The Commission accepted Mr. Walker as an expert in civil engineering, with a specialization in solid waste landfill design and geosynthetic materials and OEPA regulations relating to landfill design, provided he offer no legal conclusions regarding those regulations. (Testimony, Walker.)

b. Mr. Carey, a licensed Professional Engineer who is self-employed at P.J. Carey and Associates, P.C., obtained a Bachelor of Science from Rensselaer Polytechnic Institute in civil engineering, a master's degree from the University of Connecticut, also in civil engineering, and, while at the University of Connecticut, completed the course work for a doctorate degree. Mr. Carey's career includes extensive work in soil mechanics and the civil engineering subspecialty of geotechnical engineering, as they relate to landfill design.[13] The Commission accepted Mr. Carey as an expert in civil engineering, with a specialty in geotechnical engineering and the geotechnical aspects of landfill design. (Testimony, Carey.)

c. Mr. Razem, a hydrogeologist, received a Bachelor of Science in earth science from Edinboro State College and a Master of Science in geology from the University of South Florida. During his tenure at the United States Geological Survey, Mr. Razem worked in Ohio, Utah and Iowa and published numerous papers on topics relating to ground water modeling for water supply, ground water quality in coal mining areas and the effects of surface mining on ground water quality and ground water occurrence. He also developed finite ground water flow models.[14] While working for Battelle Memorial Institute, Mr. Razem acted as the section manager on a nuclear waste project where he evaluated the hydrogeology, including fracture flow and porosity analyses through a multi-state aquifer, in preparation for the construction of a repository for radioactive wastes.[15] Ultimately, Mr. Razem joined the geologic consulting firm of Eagon

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[13] Soil mechanics is the "study of the response of soils to the application of loads, how it behaves when you put stresses on it or build things or try to force water through it." Geotechnical engineering focuses on the ground level and everything below it; "[I]t's basically about how the ground responds to things that people want to do to it." (Testimony, Carey.)

[14] Hydrologists construct two basic types of ground water flow models, the finite difference model and the finite element model. The finite difference model is used in the vast majority of cases, because the grid is a rectangular grid and the equations are "a little easier to solve with a computer." The finite element model is "more flexible" than the finite difference model because the grid system is not rectangular, but it is used less frequently due to is complexity. (Testimony, Razem.)

[15] Fracture flow is water moving along a fracture within a rock, like a conduit. Porosity, or porous flow, is

and Associates ("Eagon"), where he spends eighty to eighty-five percent of his time working on landfills in Ohio, Kentucky, Indiana and Michigan. He has worked on 25 Ohio landfill projects. The Commission accepted Mr. Razem as an expert in geology, hydrogeology, geomorphology, ground water chemistry, the design of ground water monitoring well systems and OEPA regulations relating to landfill design, provided he offer no legal conclusions regarding those regulations. (Testimony, Razem.)

d. Dr. Sklash, a senior hydrogeologist and consultant for The Dragun Corporation, obtained a Bachelor of Science degree in geological engineering from the University of Windsor. Dr. Sklash obtained a Master of Science specializing in hydrogeology and a Ph.D. in earth science from the University of Waterloo. During his education, Dr. Sklash studied a wide spectrum of professionally-related topics, including geology, hydrogeology and their subspecialties, several types of mineralogy and engineering, as well as quaternary geology.[16] Dr. Sklash has worked on permitting and remedial investigations for landfills located in Michigan, Kansas, Indiana and South Carolina. Internationally, he worked on a water supply project in India and an acid mine drainage project in Zimbabwe. The Commission accepted Dr. Sklash as an expert in geology, hydrogeology and geomorphology. (Testimony, Sklash.)

e. Ms. Wilson, now employed at OEPA's NEDO in the Division of Surface Water, spent sixteen years as an Environmental Specialist 2 in OEPA's DSIWM.[17] She holds a Bachelor of Science in geologic engineering from the University of Akron. While in the DSIWM, she reviewed permits and applications for solid waste landfills and transfer stations, compost facilities, Rule 13 applications, closure plans and any alterations that may occur to a permit.[18] Ms. Wilson also worked on rules, guidance documents and policies for the Agency and served on a slope stability expert group that provided technical assistance to other agency divisions, known as the Geotechnical Resource Group or George team. The George team worked on a five to six year project which culminated in the publication of the Geotechnical and Stability Analyses for Ohio Waste Containment Facilities manual. The Commission accepted Ms. Wilson as an expert in Ohio's laws and regulation pertaining to solid waste facilities, landfill

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water moving between the grains or matrix of the formation. (Testimony, Razem.)

[16] Quaternary geology focuses on glacial deposits and "things related to glacial deposition." (Testimony, Sklash.)

[17] Ms. Wilson transferred to the Division of Surface Water one week prior to her testimony before the Commission, on February 23, 2005.

[18] Rule 13 applications refer to applications in which applicants request permission to engage in new activities at closed facilities. (Testimony, Wilson.)

design, landfill settlement and slope stability, excluding issues relating to hydrogeology, provided she offer no legal conclusions regarding these areas. (Testimony, Wilson.)

f. Ms. Bowman, an Environmental Specialist 3 in DSIWM at OEPA NEDO, holds a Bachelor of Science in biology and a Master of Science in civil engineering. In her current position, Ms. Bowman reviews all staff recommendations to the Central Office on health department approval status, enforcement actions and authorizing actions, as well as technical documents and permits. She also assists in developing policy and guidance documents and rules for DSIWM. The Commission accepted Ms. Bowman as an expert in Ohio's laws and regulations pertaining to solid waste landfill facilities, except for matters relating to hydrogeology, provided she offer no legal conclusions regarding solid waste regulations. (Testimony, Bowman.)

g. Mr. Rizzo holds a Bachelor of Science in geology and a Master of Science in environmental geology, both from the University of Akron. An employee of OEPA for approximately 12 years, Mr. Rizzo estimated that he has conducted over 500 data reviews at various facilities, reviewed 30 annual plans, 170 sampling and analysis plans, 50 assessment plans, and 20-25 assessment reports for various divisions at OEPA. The Commission accepted Mr. Rizzo as an expert in geology, hydrogeology, geomorphology and rule compliance as it relates to geologic and hydrogeologic issues. (Testimony, Rizzo.)

V. ASSIGNMENTS OF ERROR: GROUP 1 – Adequate Characterization

51. The Assignments of Error relating to Group One can be broken down into two categories: (1) adequate characterization of the regional geology and hydrogeology; and (2) adequate characterization of the site-specific geology and hydrogeology. Typically, an applicant collects regional and site-specific information and data and configures it in a hydrogeologic report and ground water monitoring plan. This collection of information and data must satisfy a voluminous list of engineering specifications and plans, as well as meet certain narrative requirements delineated in the OAC. (Testimony, Razem.)

52. Further, this material must be presented in a manner that allows the Director to determine whether the siting criteria set forth in 3745-27-07 [Additional criteria for approval of sanitary landfill facility permit to install applications.] and 3745-27-05 [Authorized, limited, and prohibited solid waste disposal methods.] are met. (OAC 3745-27-06; testimony, Razem, Bowman.)

53. More specifically, before the Director issues a final permit to install, he must review the applicant's geologic and hydrogeologic information to ensure that it contains enough information to (i) determine the suitability of the site for solid waste disposal, (ii) identify and characterize

the hydrogeology of the uppermost aquifer and all geological strata that exist above the uppermost aquifer system, and (iii) sufficiently characterize the site geology to allow for the evaluation of the proposed design of the sanitary landfill facility to ensure that it will be in compliance with the requirements of OAC regulations. (OAC 3745-27-06; testimony Razem, Bowman.)

54. To demonstrate that it had properly characterized the geologic and hydrogeologic setting of the landfill, Republic prepared the 2001 (revised in July 2001 and January 2002) "Hydrogeologic Investigation for Countywide Recycling and Disposal Facility Lateral and Vertical Expansion" ("2001 Hydrogeologic Report," "Hydrological Report"). The 2001 Hydrogeologic Report contains text, figures, tables, plates and appendices that present data collected and information obtained which was analyzed to characterize the hydrogeologic conditions in the region and at the facility. To demonstrate to the Director that it had satisfied the requirements of OAC 3745-27-06(C)(2), Eagon, the firm hired to assist Republic with the design and application process, prepared and submitted a hydrogeologic report containing the following:

> (i) information regarding the regional hydrogeology based on publicly available information, such as ODNR documents, water-well logs, and oil and gas well records;
>
> (ii) a detailed description of the hydrogeology under the proposed landfill expansion based on site-specific data collected from boreholes, piezometers, and test pits, including borehole logs and hydraulic test data collected by Eagon, Golder Associates ("Golder"), and Burgess and Niple, Limited ("Burgess and Niple");
>
> (iii) a detailed description of the ground water quality of the uppermost aquifer system and all significant zones of saturation above the uppermost aquifer;
>
> (iv) a detailed description of the methods and procedures used during the hydrogeologic investigation; and
>
> (v) a checklist to show the reviewer where the OEPA-required data, information and analyses are located in the report. (OAC 3745-27-06(C)(2)(b) through (e); Appellees' Ex. 5; testimony, Razem.)

A. Regional Geology and Hydrogeology

55. The 2001 Hydrogeologic Report submitted by Republic contains a regional geologic and hydrogeologic characterization of the Countywide site and includes the following data and information required by OAC 3745-27-06: regional geomorphology; regional stratigraphy; regional structural geology; regional aquifer; ground water flow directions; recharge and

discharge areas; location of ground water users within 2000 feet; location of public water supply wells within 10 miles; and location and status of oil and gas wells in the area. (OAC 3745-38-06; Appellees' Ex. 5.)

56. In characterizing the region's hydrogeology, Eagon employees assembled and reviewed numerous documents. Mr. Razem testified that a regional hydrogeologic investigation is conducted by reviewing publicly available literature. The rules do not require the applicant to go out into the field and physically characterize an entire region; rather, publicly available data is gathered and then described in the application. (Testimony, Razem.)

57. Appellants challenge only certain portions of Republic's characterization of the regional hydrogeology. Appellants agree that Republic located ground water users within 2000 feet, public water supply wells within 10 miles and oil and gas wells in the area. (Case Nos. 795307-795320, 795323, 795334, File Items A.)

58. Appellants do, however, challenge Republic's characterization of the regional geomorphology, regional stratigraphy, regional structural geology, regional aquifer, ground water flow directions, and recharge and discharge areas contained in the hydrogeologic investigation. The 293-page 2001 Hydrogeologic Report, submitted by Republic, contained the following relevant characterizations:

> (a) Regional Geomorphology:
>
> . . . almost entirely unglaciated except for a small northwest corner of Tuscarawas County. A northeast-southwest trending line in southern Stark County marks the southern limit of glaciation. . . . The region is characterized by a relatively high degree of stream dissection with moderate topographic relief . . .. In the unglaciated region, upland areas are mantled with thin residual and/or colluvial soils directly overlying bedrock. . . . The Site is located just east and south of the glacial boundary.
>
> In the Site vicinity, Sandy Creek and the Tuscawaras River are the principle streams. . . .
>
> The current configuration of the regional drainage system largely reflect glacial influences. Sandy Creek is underlain by deeply entrenched west to northwest trending ancestral buried-valley that was tributary to a north flowing river. . . . A tributary buried valley occupies the flood plain underlying Bear Creek, east of the site.
>
> The region surrounding the Site is also characterized by a high degree of surface alteration resulting from coal mining operations. . . . Typically, pre-1972 surface mining areas are not reclaimed, leaving very rugged topography with high walls and ponded areas. Post-1972 mining areas are reclaimed where the post-

mining land surface has been modified to approximate the original land surface.

(b) Regional Stratigraphy:

The region surrounding the Site is underlain by Pennsylvanian age bedrock overlain by a thin veneer of residual soils and/or colluvium. . . . Surface mining of coal deposits within the Pennsylvanian strata has created large areas that are underlain by mine spoils.

Bedrock stratigraphy of the region is described in detail in the 'Geology of Stark County, Bulletin 61' (Delong and White, 1963). The Conemaugh Group strata is described as shale and sandstone deposits that are limited to high elevation ridge top areas. Allegheny Group and upper Pottsville group strata form relatively thick, repetitive sequence (cyclothems) of sandstone, sandy shale, shale, limestone, coal and claystone deposits. This cyclothem stratigraphy represents alternating shallow marine to delta plain environments that formed as the sea level fluctuated. With sea level fluctuations, the depositional environments frequently shifted and/or disappeared creating laterally discontinuous and vertically varied deposits. *The variability of the cyclothem strata is problematic for regional stratigraphic correlations and assigning stratigraphic boundaries. . . . .Coal beds and limestone beds provide, by far, the best marker bed within the cyclothem sequences.*

(c) Regional Structural Geology:

The Appalachian Plateau strata in the region surrounding the Site dip gently to the southeast at about 30 feet per mile. . . . Locally, Pennsylvanian beds display an undulatory surface due to differential compaction during consolidation of the sediments prior to lithification. *The layered and compostionally varied structure of the Pennsylvanian strata is very important to the regional hydrogeology and results in a layered aquifer-aquitard system with dominant lateral flow.*

No faults that have had displacement in Holocene time are known in the area. The 'Geology of Stark County' identifies some slump structure associated with strata above the Middle Kittaning (No. 6) coal (Delong and White, 1963). . . . The location of the slump features is roughly 6 to 10 miles east of the site, Stark County, Sandy Township.

(d) Regional Aquifer:

Within southern Stark County and northern Tuscawaras County the ground-water resources reflect complicated bedrock stratigraphy and Pleistocene glaciation. There are two regional aquifers identified in the region. . . . The local

aquifers are associated with Pennsylvanian cyclothem stratigraphy, Upper Pottsville Group, Allegheny Group, and Conemaugh Group Strata. . . .

The Massillon and Sharon regional aquifer system comprise a relatively thick, areally [*sic*] *extensive water bearing unit.* . . . Primary porosity probably plays an important role in ground-water flow within the unit. The development of surficial weathering and fractures within the unit undoubtedly increase the permeability of the unit. *Areas near the outcrop or subcrop of the aquifer are probably more productive than areas where the unit is overlain by thick consolidated deposits.* Data on the aquifer system are dependant on deep water-well drilling records and surficial study in northwestern Stark County.

The Pennsylvanian cyclothem stratigraphy form a number of local aquifers. Even though some of the cyclothem units have regional extent, variations in lithology and formation permeability, the high degree of stream dissection, and the relatively thin horizontal lying units of the aquifer-aquitard system combine to produce local aquifer systems. The lateral continuity of most of the units vary considerably over short distances. Sandstones often grade into shales and many coal and limestone beds have very local occurrence and extent. Primary porosity of individual beds is limited to the degree of intergranular porosity and bedding plane development. *Most of the units within the Pennsylvanian cyclothem series exhibit low primary porosity.* Secondary porosity in the form of stress-relief fracturing and surficial weathering often increase the permeability of individual beds. Stress relief fracturing and weathering are often more highly developed within valley areas and along valley walls. *A unit may be a productive aquifer near its outcrop and not produce water where the unit is deeply buried and secondary permeably has not developed. . . . Sequencing of alternating relatively high permeability and low permeability unit further fragment the Pennsylvanian cyclothem stratigraphy into isolated aquifers.*

(e) Ground-water Flow Directions:

The Massillon and Sharon Sandstone/Conglomerate form an aquifer system that extends throughout the region. Ground-water flow within the unit is expected to follow the southeast structural dip of the strata, with minor divergence toward major buried valleys.

Ground-water flow within the local aquifers associated with the Pennsylvanian cyclothem strata is very complicated. The cyclothem strata form heterogeneous layered aquifer-aquitard sequences. *The hydraulic interconnection between aquifer units is typically low and horizontal ground-water flow is predominately horizontal.* The direction of ground-water flow commonly follows topographic gradients, showing radial flow from ridge areas to adjacent valleys and outcrop areas along valley walls. . . . *The local aquifer system is further*

complicated with variation in aquifer-aquitard composition and the reduction of secondary permeability with depth. A specific stratigraphic unit may not be considered an aquifer over its entire extent.

(f) Recharge and Discharge Areas:

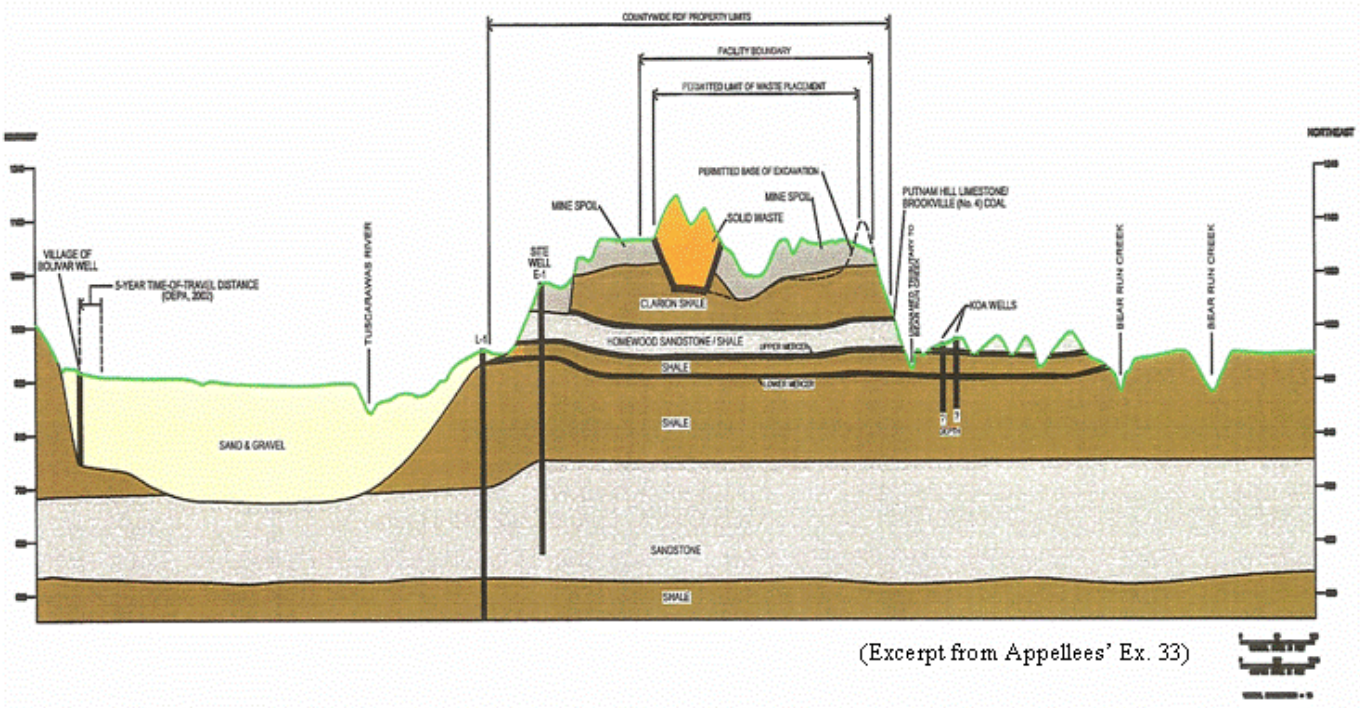
The Massillon and Sharon Sandstone/Conglomerate aquifer system primarily receives its recharge from the units outcrop in northwest Stark County. Infiltration of precipitation and slow leakage through overlying aquitard units is also believed to contribute locally to recharge. Ground-water . . . discharges primarily to the surrounding major buried valley aquifers.

Recharge to the buried valley aquifers occurs primarily due to direct infiltration of precipitation and inflow from the bedrock valley walls. The primary discharge area is the valley's associated stream. Several municipalities utilize these buried valleys for their water supply. . . .

Recharge to the local Pennsylvanian cyclothem aquifers is the result of infiltration of precipitation originating in upland-ridge areas. Precipitation infiltrates soil and weathered rock with slow leakage downward to the local uppermost aquifer. Ground-water flow within the local uppermost aquifer is primarily horizontal, but a small percentage of ground water flows downward through the underlying aquitards to the next aquifer where the same sequence is repeated. *Ground water discharges in the valley areas as seeps and springs where the local aquifer intersects land surface or discharge into other permeable surficial deposits. Coal aquifers with underlying claystones typically form obvious seep and/or spring lines*. . . . (Emphasis added.) (CR Item 7.)

59. At the *de novo* hearing, Mr. Razem commented on the importance of several sections in the Republic's Hydrogeological Report. He began by highlighting that the regional aquifer, the Massillon and Sharon sandstone formation, is deep, occurring approximately 250 feet below the site. (Testimony, Razem.)

60. He also advised that it is important to examine the geology of the region to better understand the regional hydrogeologic forces. In this instance, the Tuscawaras River, and the buried valley aquifer associated with it, occurs to the southeast of the facility, toward the Bolivar well. When preparing the Hydrological Report, he reviewed the regional settings, including the glacial, surface, and stratigraphic characteristics, to assure that the site "fits the whole picture" and no "anomalies" are present. For example, if this area were tectonically active, like eastern Pennsylvania where the beds are contorted or offset and not layered as they are at the Countywide site, additional investigation would have been required. (Testimony, Razem.)



61. As illustrated above, Mr. Razem provided a layer-by-layer, or stratigraphic, overview of the geology and ground water flow within the layers.[19] Beginning with the oldest strata, the Massillon sandstone and Sharon conglomerate is the lowest freshwater aquifer in the region; below this lies unusable brine saltwater. Above the Massillon sandstone and Sharon conglomerate is the upper and lower Pottsville groups, which are comprised of a shale sequence containing shale, sandstone and coal. Typically, coal layers are associated with a sequence of underclay and then shale with some limestones or thin limestones. Water will move horizontally in coal areas because coal is brittle, fractures easily and allows ground water to flow through its fractures. The underclay beneath the coal strata controls the water and moves the water horizontally. Generally, coal areas are considered a permeable formation and a productive water zone. The water production in the shale sequence of shale and sandstones is "spotty." If a well were placed in these shale units, some of them would produce water and some would not. (Appellees' Ex. 3; testimony, Razem.)

62. The next layer, the lower Mercer coal, is a horizontal pathway for water flow. Above the Mercer coal is the Homewood sandstone and then the Putnam Hill formation. The Putnam Hill formation consists of the Brookville No. 4 underclay, the Brookville No. 4 coal and the Putnam Hill limestone. The Brookville No. 4 coal and the Putnam Hill limestone ("Putnam Hill limestone/Brookville coal") are interconnected and, because of their similar water-bearing characteristics, are usually discussed together. The final formation, the Clarion shale, is a low permeability formation directly underneath the facility. (Appellees' Ex. 39; testimony, Razem.)

[19] Though Mr. Razem referenced this exhibit during his testimony, not every feature he discussed is contained in Appellees' Ex. 33. The Commission recognizes that the text in the exhibit is not easy to read, but chose to include it as it provides a general framework for Mr. Razem's testimony.

63. Mr. Razem also delineated the regional and localized ground water flow directions. Mr. Razem described the Tuscarawas River as meandering, but generally flowing north to south, and the Sandy Creek tributary as generally flowing east to west. The buried valley has its own ground water flow system because it is so much more permeable than the surrounding bedrock. The outcrop[20] from the Putnam Hill limestone/Brookville coal indicates that water moving in that layer flows generally from the north to southeast to east toward the outcrop. The regional ground water flow goes down toward an unnamed tributary, then to Bear Creek. Over all, the flow is toward the valley and toward the outcrop. (Appellants' Ex. 33, 39; testimony, Razem)

64. Appellants' characterization of the regional hydrogeology is significantly different than Republic's characterization. Though Appellants agree that a thorough understanding of the regional hydrogeology is "imperative" and the "site must fit in within the region," Dr. Rice described the region around Countywide as an unglaciated setting "strongly controlled by the underlying structural geology[21] of this area, notably the joint trellis[22] drainage pattern found in this region which is largely caused from fracturing." To reach her conclusion that a trellis pattern is present, Dr. Rice relied on the DRASTIC report, GIS maps, United States Geological Survey ("USGS") maps, Ohio Department of Natural Resource maps and aerial photos.[23] Dr. Rice also relied upon 3-D maps she prepared from data available through public sources, such as the Stark County Auditor's and Engineer's offices. (Appellant's Ex. D, E; testimony, Rice.)

65. Additionally, Dr. Rice, asserts that although the first portion of the 2001 Hydrogeologic Report, *i.e.* information contained in the boring logs and most of the cross sectional information, is accurate, Republic erred in failing to properly ascertain "how the water and leachate move through the rock and where they move to." (Testimony, Rice.)

i. DRASTIC Report

66. The parties agree that reviewing the DRASTIC report and map is an essential part of

[20] The outcrops present at the Countywide site are exposed areas of bedrock or other material on the side of the hill where the soil has eroded. The importance of outcrops will be discussed more fully later in the opinion. (Testimony, Razem.)

[21] Structural geology is the study of the three dimensional distribution of rock bodies and their planar or folded surfaces, and their internal fabrics. Structure controls the shape of what can be seen at the surface. (Testimony, Razem, Rice.)

[22] Dr. Rice refers to a trellis pattern as a joint trellis pattern. The Commission will follow the lead of the other experts who testified and the exhibits presented at the hearing, which label this drainage pattern as simply a "trellis pattern."

[23] DRASTIC is an acronym corresponding to the seven weighted characteristic incorporated into a DRASTIC map. Geographic Information Services is mapping software that allows the user to manipulate spatial data into different forms, which enhances the user's interpretation of the data. (Appellant's Ex. D; Testimony, Rice.)

adequately characterizing the regional hydrogeology. They disagree, however, as to the weight the DRASTIC report should be accorded when characterizing regional hydrogeology. The DRASTIC report relevant to this appeal, known as the Ground Water Pollution Potential of Stark County Ohio, Report No. 6, was published by ODNR in 1991. The purpose of the DRASTIC system is to identify and rank areas vulnerable to surface water pollution. The report's abstract describes a DRASTIC report as a "ground water pollution potential mapping program using the DRASTIC mapping process." The abstract delineates two major elements of the DRASTIC system, the hydrogeologic settings and a relative rating system for pollution potential. Additionally, the report cautions its readers by stating, "[t]he [DRASTIC] system was not designed or intended to replace site-specific investigations, but rather to be used as a planning and management tool." (Appellants' Ex. D.)

67. The DRASTIC report for Stark County classifies nine different hydrogeologic settings in Stark County. Each classification includes a block diagram. A corresponding narrative passage illustrates and describes the characteristics of the particular hydrogeologic setting depicted in the block diagram. The report also includes a color-coded map illustrating the relative pollution potential indexes throughout the county. (Appellants' Ex. D.)

68. Dr. Rice identified the region's hydrogeologic setting as DRASTIC setting "6Da Alternating Sandstone, Limestone, Shale, Coal and Clay - Thin Soil" and emphasized a fracture extending through the block diagram. On cross-examination, Dr. Rice agreed that the DRASTIC map demonstrated that the landfill site was located in areas color-coded to indicate a low pollution potential index and that the DRASTIC map should not be used to replace site-specific data. (Appellants' Ex. D; testimony, Rice.)

69. Mr. John Sugar, an Eagon employee who drafted DRASTIC maps prior to being employed by Eagon, testified that DRASTIC maps are "good planning tools," but are not intended to replace site-specific data. Further, after reviewing Stark County's DRASTIC map, Mr. Sugar concluded that the area sited for the Countywide expansion looks "perfectly acceptable to be investigated for a landfill." (Testimony, Sugar.)

ii. Drainage Patterns

70. The parties also disagree as to what type of drainage pattern controls water flow in the region. *The Physical Environment, an Introduction to Physical Geography*, a textbook introduced by Appellants, classifies drainage patterns into the following categories: dendritic, parallel, trellis, rectangular, radial, centripetal and deranged. Of particular interest are dendritic and trellis drainage patterns. A dendritic pattern is considered the "most common and looks like the branching pattern of tree roots [or a leaf]. It develops in regions underlain by homogeneous material. That is, the subsurface geology has a similar resistance to weathering so there is no apparent control over the direction the tributaries take. Tributaries join larger streams at acute angles (less than 90 degrees)." A trellis pattern "looks similar to . . . the common garden trellis. Trellis drainage develops in folded topography like that found in the Appalachian Mountains of

North America. Down-turned folds called synclines form valleys in which resides the main channel of the stream. Short tributary streams enter the main channel at sharp angles as they run down sides of parallel ridges called anticlines. Tributaries join the main stream at nearly right angles." (Appellants' Ex. F.)

71. Dr. Rice concluded that a trellis drainage pattern is present in the region surrounding the Countywide site. She based her opinion on information contained in the DRASTIC report, GIS, USGS and her own maps, as well as her review of the bore hole logs and testing results gathered at the Countywide site. She further posits that this area is highly fractured and regional water flow is controlled by a significant fracture system, consisting of large vertical fractures under and around the site. According to Dr. Rice, the aggressive fracture system will move contaminants more rapidly than expected and into areas unanticipated by Republic or the Director. (Testimony, Rice.)

72. On cross examination, however, Dr. Rice testified that a "more exact correlation" for the regional drainage pattern around the Countywide site might be a rectangular drainage pattern, rather than the trellis pattern she initially suggested. A rectangular drainage patter is typically found in regions that have undergone faulting and thus, the drainage enters the main stream at high angles, as opposed to the acute angles found in the Countywide region. (Appellants' Ex. D; testimony, Razem, Rice.)

73. Concurring with Dr. Rice's assumptions regarding the drainage pattern, another of Appellants' experts, Mr. Fisher, asserted that the geomorphology of the region supports the conclusion that a trellis drainage pattern is present. Mr. Fisher reviewed a 1982 USGS topographic map and concluded that Republic failed to identify a joint feature. To demonstrate his findings, Mr. Fisher overlaid the 1982 USGS map with his interpretations of joints, offering comments on their predictable orientation. Mr. Fisher testified that identifying a joint feature is important because the water can move very quickly along the joints, creating preferential pathways. To further illustrate his point, Mr. Fisher referenced a series of ground water figures contained in the Golder report that depicted a common downward ground water flow toward the southwest corner of the site.[24] (Appellants' Ex. D-EE, FF, GG, HH, and II; testimony, Fisher.)

74. Conversely, Republic asserted that the controlling drainage pattern is dendritic and significant faults or fractures are not present in the region. To illustrate this point, Mr. Razem relied on a map prepared by Eagon and Associates using GIS maps and county topographic data. The map covers approximately 15 square miles and encompasses portions of Stark, Carroll and Tuscawaras counties. The fundamental difference between the maps used by Mr. Razem and Mr. Fisher is the size of the area depicted on the map. Mr. Razem asserted that the size of the area interpreted is important because a smaller area, like the one selected by Mr. Fisher showing only the Bear Run tributary, could not, and did not, accurately portray the entire region. When the entire region is examined, the drainage pattern is revealed. And though the Bear Run

[24] The Golder report, prepared by Golder Associates for Republic, was based on hydrogeologic field investigations between 1992 and 1994. (CR Item 7.)

tributary is straight in certain sections, it branches off as it reaches its headwaters, thus revealing its dendritic nature. (Appellees' Ex. 37; testimony, Fisher, Razem.)

75. Mr. Razem also asserted that a dendritic drainage pattern is typical of flat lying rocks as are present in eastern Ohio. While working for the USGS, Mr. Razem studied the geology of eastern Ohio. He believes geology at the Countywide site is consistent with the geology of eastern Ohio and the data he collected in other parts of the eastern Ohio region. (Appellees' Ex. 146; testimony, Razem.)

76. Comparatively, regions where the structure is comprised of synclines and anticlines, or folds, are not controlled by dendritic patterns, but by trellis patterns.[25] Such trellis patterns can be found in the "folded Appalachians where alternating weak and strong strata have been truncated by stream erosion." A syncline and anticline pattern can continue for "10, 20 and 30 miles at a time, or farther." Mr. Razem does not believe that the region associated with the Countywide site is consistent with the drainage patterns found in the "folded Appalachians." Further, Dr. Sklash "ruled out" the presence of anticlines and synclines, finding the region to be monoclinal. Monoclines are evidenced at this site, because the topography simply "dips," similar to a "gentle S," sloping southeast. (Appellees' Ex. 33, 38, 146; testimony, Razem, Sklash.)

77. Concluding his assertion that a dendritic drainage pattern is present in the region, Mr. Razem referenced William D. Thornbury, a well-known expert in geomorphology. In a textbook Thornbury wrote, "The major streams frequently make nearly right-angled bends to cross or pass between aligned ridges, and the primary tributary streams are usually at right angles to the main stream and are themselves joined at right angles by secondary tributaries whose courses commonly parallel the master stream." Mr. Razem noted that the textbook offered by Appellants regarding geomorphology and drainage patterns is consistent with the textbook offered by Appellees. Mr. Razem concluded that a review of the entire region demonstrates that the streams and tributaries do not possess the requisite right angles to support the presence of a trellis pattern in the Countywide region. Indeed, many of the angles "coming off Bear Run" are approximately 30 degree angles, not right angles as would be expected in a region controlled by a trellis drainage pattern. (Appellants' Ex. F; Appellees' Ex. 146; testimony, Razem.)

78. The Commission finds that Republic adequately weighed, incorporated, and characterized the regional geology and hydrogeology at the Countywide site. The Commission also finds the evidence support that a dendritic drainage pattern is present in the region and that while a small area of the region may appear to reflect a trellis or rectangular design, the overall drainage pattern controlling water flow in the region is dendritic.

79. Correspondingly, the Commission finds that the Director had a valid factual foundation for determining that Republic adequately characterized the regional hydrogeology at the Countywide site in such a way so that he could ascertain whether Republic should be issued a

[25] Synclines are rocks folded to form a depression or valley. Anticlines are top forms or hilltops. (Testimony, Razem.)

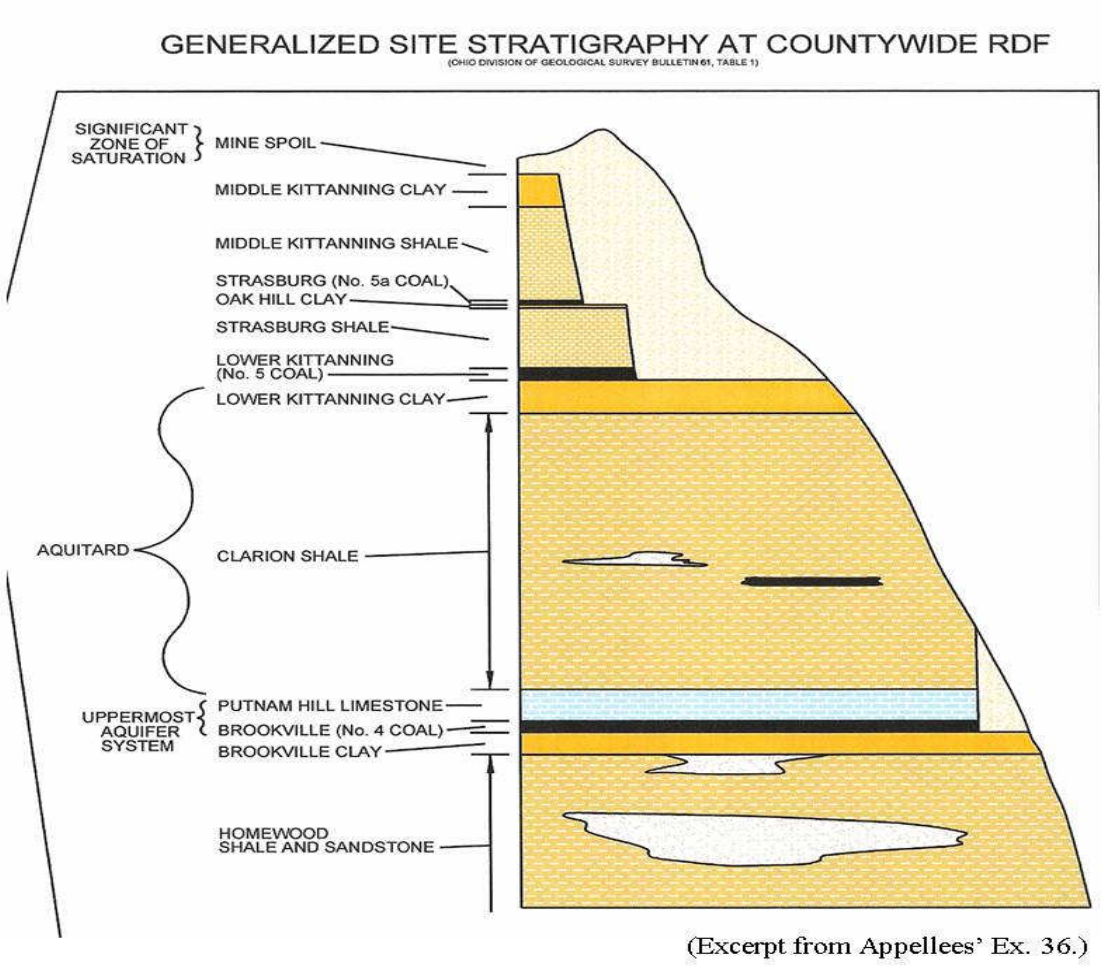
PTI to expand the Countywide landfill.

B. Site-Specific Geology and Hydrogeology

80. In addition to containing data supporting Republic's characterization of regional geology and hydrogeology, the 2001 Hydrogeologic Report contains the data used to characterize and describe the site-specific geology and hydrogeology at Countywide. The 2001 Hydrogeologic Report includes information collected over many years by Eagon, Golder, and Burgess and Niple.[26] Collectively, the three consultants gathered data from more than 200 borings and approximately 100 wells and piezometers. They also conducted approximately 100 hydraulic tests (pump, slug and packer tests), collected water-level data on over 40 separate dates from 1995 to 2000, identified seeps and springs, and gathered the analytical results of ground water quality samples collected from 11 wells. Republic asserts that the hydrogeologic and ground water quality data were collected and analyzed using industry standards, methods, equations and procedures that have been accepted by OEPA for investigations designed to characterize hydrogeologic conditions and are appropriate for the purpose of determining whether a solid waste landfill facility would be suitable in the Pennsylvanian-age rocks of eastern Ohio. (CR Item 7; testimony Razem, Walker, Carey, Sklash, Rizzo.)

81. The parties agree that Republic properly identified the generalized site stratigraphy at Countywide as a layer-cake arrangement, comprised of the Middle, and Lower and Middle Pennsylvanian-age stratigraphic series. A layer cake is flat-line geologic shape; the layers are not "folded or fallen or distressed." As with any geologic series, the Pennsylvanian series contains several groups and each group contains several strata, or layers. The Pennsylvanian series consists of four groups, the Pottsville, the Allegheny, the Conemaugh, and the Monongahela Groups. Though each group may contain several strata, not all strata are present at the Countywide site. Only the youngest layer of the Pottsville Group and the Allegheny Group are relevant to this appeal. (Appellees' Ex. 5, 36; testimony Razem, Rice.)

26 Burgess and Niple began hydrogeologic investigations at the site in the 1980s. Republic submitted Burgess and Niple's investigatory data with the application for the initial PTI approved in May of 1989. (CR Item 7.)



(Excerpt from Appellees' Ex. 36.)

82. The above illustration depicts the stratigraphic column at the Countywide site. The first unit illustrated is the Homewood shale and sandstone layer, the youngest layer of the Pottsville Group. Next, are the layers of the Allegheny Group present at the Countywide site: Brookville clay, Brookville (No. 4 coal), Putnam Hill limestone, Clarion shale, Lower Kittanning clay, Lower Kittaning (No. 5 coal), Strasburg shale, Oak Hill clay, Strasburg (No. 5a coal), Middle Kittanning shale, and Middle Kittanning clay. (Appellees' Ex. 5, 36; testimony Razem, Rice.)

83. Resting on top of the Middle Kittanning clay is mine spoil placed by mining activity that, according to ODNR records, ceased in 1937.[27] The Countywide facility rests on the Clarion shale layer. (Appellees' Ex. 5, 36; testimony Razem, Rice.)

84. Appellants dispute several site-specific hydrogeologic characterizations contained in the 2001 Hydrogeologic Report. Specifically, Appellants submit that Republic improperly identified

[27] Mine spoil is intermixed unconsolidated rock, rock fragments and soil that result from a surface mining operation. (www.ohiodnr.com.)

the uppermost aquifer system and significant zone of saturation, as well as the permeability of the Clarion shale and added geologic material. Appellants argue that mischaracterization of these features, as well as the overall hydraulic connection between the Clarion shale, Putnam Hill limestone/Brookville coal formation and the Homewood shale beneath it, create a flawed conceptual model of the expansion project. (Testimony, Fisher.)

i. The Conceptual Model

85. A conceptual model of a site is created so that the investigation team can develop a comprehensive plan for field investigative work. If the conceptual model is flawed, all tests and field work based on this model will be skewed improperly. (Testimony, Fisher.)

86. Republic's conceptual model of the site identified mine spoil as the significant zone of saturation, the Putnam Hill limestone/Brookville coal as the upper most aquifer system, and the Clarion shale as the confining unit lying between them. In approximately 5 of the 258 acres at the Countywide site, less than 2%, the Putnam Hill limestone and the Brookville coal and clay have eroded and the Homewood sandstone is the uppermost aquifer system. (Testimony, Razem.)

87. Republic based its conceptual model on findings contained in the Golder report. Republic contracted with Eagon and Associates, rather than Golder Associates, to perform the 2001 Hydrogeologic Investigation due to Eagon's familiarity with the Countywide site and the fact that Golder's Pittsburgh office, which had authored the Golder report, closed and its employees were no longer employed by Golder. (Testimony, Razem, Walker.)

ii. Identification of the Significant Zone of Saturation

88. Ohio EPA addressed the subject of "Significant Zone of Saturation [OAC rule 3745-27-01(RR)]" in document number GD0303.110, last revised in August 1991. This document provides "guidance and examples for interpreting the definition of significant zone of saturation. . . ." In the following passage, OEPA described a significant zone of saturation as:

> . . . a hydrogeologic unit in the zone of saturation that possesses certain hydraulic properties that allow it to transmit ground water and contaminates at a faster rate than surrounding geologic units. It must occur adjacent to or beneath a SLF's [sanitary landfill facility] area of solid waste placement and should possess a hydraulic gradient that transmits contaminates away from the limits of solid waste placement. These zones do not have to be capable of yielding a significant amount of water to a well or developed spring. (Appellees' Ex. 49.)

89. Republic identified the mine spoil as the significant zone of saturation noting the mine spoil's inconsistent saturation and potential ability to move water horizontally away from the

solid waste facility toward a seep or spring. Mr. Razem observed that some areas of the mine spoil were saturated while others were not and that water moving to the sides did not extend off-site, though water movement to the sides enables the mine spoil to be monitored. Further, water in the mine spoil will not be used as potable water because of its quality and location. (Testimony, Razem.)

90. Dr. Sklash testified that the mine spoil is discontinuous and transient in nature and even if its hydraulic conductivity were greater than the Putnam Hill limestone/Brookville coal, it still lacks the inherent qualities to be considered an aquifer. First, the mine spoil only occurs on the sides of the facility and will be removed in the small areas where it would be under the facility. Further, the mine spoil does not extend off-site and lacks lateral extent as demonstrated by dry wells located in the minespoil. Comparatively, an uppermost aquifer system would occur underneath the facility and would have lateral extent. Finally, the water in the mine spoil is not potable; an uppermost aquifer system must be able to yield a significant amount of potable water. (Testimony, Razem, Sklash.)

91. Conversely, Appellants assert that the mine spoil should be characterized not as a significant zone of saturation, but rather as part of the uppermost aquifer system. Appellants believe the mine spoil is part of the uppermost aquifer system because it is present along the sides of the landfill ridge where the Clarion shale is more fractured and the fractured Clarion shale will allow water to percolate down to the high-permeability Putnam Hill limestone/Brookville coal formation. (Testimony, Rice.)

iii. Identification & Permeability of the Uppermost Aquifer System & its Confining Unit

92. Ohio EPA addressed the subject of "Solid Waste Policy: Definition for Aquifer System: [OAC rule 3745-27-01(B)(4)]." in document number DDAGW-02-05-100, last revised in July 1997. This document provides "policy on the meaning of 'aquifer system' as defined in the solid waste regulations." When asked to describe how the Countywide site meets OEPA's guidance parameters for defining aquifer systems, Mr. Razem read the following passage:

> . . .
>
> For fractured bedrock, it is important to consider changes in the overall permeability of the formation when determining the boundaries of the water table aquifer system. Figure 4 represents the water table aquifer system within a fractured sandstone formation. Above the sandstone is fractured shale.
>
> Even though the two formations exist within the same fracture system, the differences in matrix properties cause the overall permeabilities of the two formations to be different. Boring logs and tests performed on the two formations indicate that the fractures in the shale are not as wide nor as extensive as those fractures in the sandstone. In addition, weathering along the fractures has

> deposited a significant amount of clay material into the fractures of the shale. Predictably, *hydraulic conductivity testing demonstrates that the permeability of the shale was several orders of magnitude less that [sic] the sandstone. In this case, the upper boundary of the aquifer system would be established at the top of the sandstone formation since it is probable that even if the shale became saturated it would not yield a significant amount of water and would constitute an aquiclude*. . . . (Emphasis added.) (Appellees' Ex. 55; testimony, Razem.)

93. Applying this passage to the Countywide site, Mr. Razem asked the Commission to replace the word "sandstone" with the phrase "Putnam Hill limestone/Brookville coal." He believes this substitution depicts the actual setting under the Countywide facility. (Appellees' Ex. 55; testimony, Razem.)

94. Republic identified the Putnam Hill limestone/Brookville coal as the uppermost aquifer system and the Clarion shale as the confining unit above it. A confining unit is a low-permeability strata overlying a more-permeable strata, thus, confining the lower unit. It is also known as an "aquitard," or by its older name an "aquiclude." (Testimony, Razem.)

95. Importantly, scientists do not rely on specific permeability ranges to classify strata as an aquitard or confining unit. It is the aquitard's relationship to other strata that makes it a confining unit. Typically, the permeability of an aquitard can be described as one order of magnitude lower than the confined underlying unit. (Testimony, Fisher, Razem.)

96. Mr. Razem described the function of an aquitard by explaining water movement in and through a confining unit. In an aquitard, water tends to move "more vertically." In zones more permeable than aquitards, water tends to move "more horizontally." And, because of the confining unit's "tightness," water in an aquitard would not be expected to move to the side of the hill. Mr. Razem also noted that, although the permeability of an aquitard is low, permeability is likely to vary throughout the unit. As such, water in a confining unit could move to the side of a hill and create a wet spot, but, because minimal water is moving through the unit, it would not create a seep. (Testimony, Razem.)

97. Mr. Razem also discussed the concept of a potentiometric surface versus water residing in a formation or unit. A potentiometric surface depicts the water surface under pressure. In a confined unit scenario, water resides below the aquitard and is under pressure. Therefore, once the driller hits the water bearing unit, the water level will immediately rise up in the borehole. Conversely, in a saturated zone or unconfined unit, water resides in the unit itself and a driller will encounter water in the borehole at the water table. Mr. Razem advised that water rising in a borehole is not indicative of water actually residing in that formation. For example, if one drilled into the Clarion shale, stopping two or three feet above the Putnam Hill limestone/Brookville coal (the confined unit), the "borehole would be dry for a number of days because it's [Clarion shale] so tight." (Appellees' Ex. 41; testimony, Razem.)

98. To quantitatively identify the uppermost aquifer system, Republic collected a range of

permeability data in the Clarion shale and hydraulic conductivity data in the Putnam Hill limestone/Brookville coal.[28] In the Clarion shale, Republic performed packer tests and calculated the geometric mean to be 1 x 10^{-6} centimeters per second (cm/sec).[29] To determine hydraulic conductivity in the Putnam Hill limestone/Brookville coal, Republic performed pump and slug tests. Republic plotted the collected permeability data and calculated the geometric mean for hydraulic conductivity in the Putnam Hill limestone/Brookville coal to be 1.7 x 10^{-4} cm/sec. Because the permeability of the Clarion shale is at least one order of magnitude less than the Putnam Hill limestone/Brookville coal, Republic concluded that the Clarion shale acts as an aquitard over the more permeable Putnam Hill limestone/Brookville coal formation. (Appellees' Ex. 30, 31; testimony Razem.)

99. Dr. Sklash's review of specific permeability data gathered during hydraulic conductivity testing of the Clarion shale confirms that the Clarion shale formation acts as a confining unit over the more permeable Putnam Hill limestone/Brookville coal. He noted that Boring No. 49, located in the middle-east of the expansion, runs through the Clarion shale. During hydraulic conductivity tests, Boring No. 49 exhibited a hydraulic conductivity range of approximately 1 x 10^{-5} cm/sec to approximately 1 x 10^{-8} cm/sec, with the lowest hydraulic conductivity level located closest to the Putnam Hill limestone/Brookville coal formation. Similarly, Boring No. 46, located in the near-middle of the expansion, also runs through the Clarion shale and possessed a hydraulic conductivity range from about 1 x 10^{-4} cm/sec to about 1 x 10^{-7} cm/sec. Predictably, Republic's illustrations depict the potentiometric surface of the uppermost aquifer rising into the Clarion shale in both borings. (Appellants' Ex. P; testimony, Sklash.)

100. Appellants assert Republic erred by using the geometric mean, rather than the higher permeability values collected, when determining permeability and hydraulic conductivity. Mr. Razem explained that identifying the uppermost aquifer system requires characterization of the entire confining formation, not just the highest or lowest levels of permeability, though using higher permeability values would be appropriate when analyzing the "worst case scenario" in time of travel calculations. (Testimony, Razem.)

101. Dr. Sklash analogized that using the geometric mean to determine hydraulic conductivity is similar to calculating your average speed on a drive from the highway into a suburban neighborhood. The first speed recorded is the highway speed, then the main street speed, then the subdivision speed, then your driveway speed. To determine the mean speed driven, you would not select the highway speed; you would calculate the mean of all the speed values driven. A log normal geometric mean ensures that the highest values do not overwhelm the lowest values. Dr. Sklash summarized by stating that to characterize how water moves through a

[28] Hydrogeology textbooks express permeability, or hydraulic conductivity, in ranges. If the data collected and plotted were all the same, the accuracy of the data would be suspect. Permeability and hydraulic conductivity are often used interchangeably, but were distinguished during this portion of the hearing. (Testimony, Razem.)

[29] In the instant matter, the geometric mean represents the "median or natural hydraulic conductivity distribution." (Testimony, Razem.)

formation, do not rely on the fastest permeability rate; all permeability rates must be included to accurately characterize the permeability of the entire formation. (Testimony, Razem, Sklash.)

iv. Fractures and Hydraulic Communication between the Formations

102. Appellants expressed further concern that significant hydraulic communication occurs through fractures connecting the Clarion shale and the Putnam Hill limestone/Brookville coal. They are concerned that this fracture network is prevalent and it's presence should preclude the Clarion shale from being classified as a confining unit and the Putnam Hill limestone/Brookville coal from being identified as the uppermost aquifer. (Testimony, Rice.)

103. Fractures are created by pressure. For example, a stick under enough pressure will break. A fracture can be defined as a break in continuity of material, though the presence of a fracture does not automatically suggest a physical separation or aperture. In other words, it can be broken, but not separated. Some fractures are incapable of transmitting water because they are either "infilled" with granular material or crystal growth, or no aperture is present. Generally, compressional tension (downward pressure), causes fractures to decrease in aperture and frequency deeper into the formations. Predictably, a greater number of fractures appear at the sides of the ridge because the formation is exposed to weathering. (Testimony, Rice, Sklash.)

104. Appellants argue that the fractures at the site are large, connected and numerous, enabling the fractures to move significant quantities of water through the Clarion shale. As evidence that a significant fracture system is present at the Countywide site, Appellants cited fractures noted in borehole logs, oxidation observed in core samples, and rapid water movement in borings and monitoring wells. (CR Item 7; Appellants' Ex. K, testimony, Rice.)

105. Mr. Rizzo, testifying on behalf of OEPA, characterized Appellants' concerns about fractures into two categories: near-surface fracturing and deep fracturing. All parties agree that, to some extent, near-surface fracturing, caused by weathering, is present at the site. Fundamentally, Appellants assert that deep fractures are present and form an extensive network of open spaces, which allow significant hydraulic communication between the various units. Mr. Rizzo disagrees with Appellants' characterization of fracturing at the site, stating that, while it is possible that such fracturing is present, he has seen no "indication" or "evidence" that such a network exists. (Testimony, Rice, Rizzo.)

106. Borehole logs reflect the presence of fractures throughout the site. Appellants contend that the fractures occur vertically, horizontally and at varying angles in between, like a pallet of bricks or stair steps, and are large and continuous enough to transmit significant quantities of water. Conversely, Republic argues that no evidence supports the existence of a fracture system resembling a pallet of bricks or stair steps. The fractures present at the site are small, discontinuous and unmappable. Republic contends that the fractures are unable to move significant quantities of water through the Clarion shale and do not control the ground water. Moreover, formations break and fracture during the violent drilling process and it is not

uncommon to find broken rock resembling fractures in borehole logs. (CR Item 7; Appellants' Ex. I; testimony Fisher, Rice, Sugar, Razem, Vandersall.)

107. Appellants also point to oxidation and precipitate on the fractures to suggest that water moves frequently through the fractures. Oxidization suggests that oxygen or water has been present, while precipitates suggest that water has been present. Republic explained that the presence of oxidation or precipitates does not establish the presence of a fracture system capable of transmitting significant quantities of water, only that water or oxygen has been present at some point and in some quantity. (Appellants' Ex. K, I; testimony Razem, Rice, Rizzo.)

108. Finally, Appellants assert that rapid water movement in Borings 57 and 99-10 and Monitoring Wells ("MW") 20 and 20A support the presence of a significant fracture system. The boring logs for Borings 57 and 99-10 indicate that Republic encountered fractures and weathering in the boreholes and water circulation was lost during the drilling process. Boring 57 lost water circulation at 27.0 feet and never regained it. The log for Boring 99-10 indicates that 1800 gallons of water were lost during the drilling process. (Testimony Rice.)

109. Republic contends that water loss encountered in these boreholes is consistent with its conceptual model, as Borings 57 and 99-10 are located on a fractured and weathered hillside. During the drilling process for both boreholes, water was used as a circulating medium to raise the drill cuttings to the surface. Because the boreholes performed as expected, Republic chose not to perform any additional tests to ascertain why water was lost in the drilling process. (Testimony, Rizzo).

110. Appellants believe that MWs 20 and 20A, spaced approximately twenty-five feet apart, are connected by a fracture system large enough to force water movement from MW 20 to MW 20A. MW 20, established in July 1989, was drilled to approximately 60 feet and is encased in the Clarion shale. MW 20A, established in May 1992, was drilled to about 129 feet and is encased in the Putnam Hill limestone/Brookville coal formation. Monitoring Well 20A's boring log states "[d]uring this run, we encountered water consistently flowing out the top of nearby well 20; it must have blown the cap off." (Appellants' Ex. KK, LL; testimony, Fisher.)

111. Republic's expert, Mr. Razem, did not find the behavior of the drilling fluid in MWs 20 and 20A unusual and cited two reasons why he believes that no fracture continues down through the Clarion Shale to connect the two monitoring wells. First, if a fracture had connected MW 20 with the Putnam Hill limestone/Brookville coal, MW 20 would have drained and not have had water in it when MW 20A was being drilled. Second, the slug test performed in MW 20 showed low permeability, as did the packer test. (Testimony, Razem.)

112. Further, Dr. Sklash believes that fractures at the Countywide site do not transmit water and listed three reasons for his conclusion: (1) he observed no water issuing out of fractures while visiting the site and the nearby Holmes mine; (2) monitoring wells in the Clarion shale recovered slowly after bailing them for sampling; and (3) he did not observe water in the coring or borehole work throughout the Clarion shale. (Testimony, Sklash.)

113. Dr. Sklash's several visits to the Countywide site and the surrounding area confirmed his opinion that fractures at the site do not transmit significant quantities of water. His visit to the nearby Holmes mine, west of the Countywide site across I-77, revealed that the Clarion shale was dry despite significant precipitation the week prior to his June 2004 visit, yet the Putnam Hill limestone/Brookville coal formation was discharging water. While at the Countywide site, Dr. Sklash observed the construction and the geology of a cell wall, core samples and springs. On another visit, he examined an area northeast of the facility, specifically, the KOA wells and its surrounding topography. Nothing during his visit suggested the presence of a fracture network as described by Appellants. (Testimony, Sklash.)

114. Moreover, Dr. Sklash prepared exhibits demonstrating a poor correlation between the presence of fractures and the presence of water in the Clarion shale. To compare the alignment of fracture zones and water occurrences throughout sections of the Clarion shale, Dr. Sklash compiled borehole log data from two of the twelve cross-sections depicting the hydrogeology at the Countywide site. Cross-section B-B' traverses from west to east across the northern third of the expansion and includes MW-29, and Borings 46, 49 and 51/51A. Dr. Sklash's chart, comparing the presence of fractures to the presence of water, demonstrated a poor correlation between where water is encountered and where fractures occur in the Clarion shale. Similarly, he examined data from cross section I-I', which contained MW-23A/23/11A, 99-10, MW-24/25, 46, and 47A/47. Cross section I-I' is perpendicular to B-B' and traverses from south to north through approximately the middle of the expansion and the eastern quarter of the existing landfill. Again, a poor correlation existed between fractures and water. (Appellees Ex. 25, 26; testimony, Sklash.)

115. After reviewing 200 plus borehole logs contained in Republic's application, Dr. Sklash concluded that the Clarion shale exhibits "no obvious relationship between where fractures are and where water is." Moreover, the lack of lateral continuity of the fractures found in the Clarion shale tends to refute Mr. Fisher's contention that the fracture zones continue for miles and miles. (Appellants' Ex. P; Appellees' Ex. 25, 26; testimony, Sklash.)

116. Importantly, Mr. Razem noted that while the block diagram (6)(D)(a) of the DRASTIC report shows what appears to be a generalized fracture, he has never seen one to that extent at this site or anywhere in eastern Ohio. Indeed, the Stark County Bulletin 61 by Delong and White is consistent with what Mr. Razem discovered at this site. If the Clarion shale at the Countywide site contained large fractures, they would have drained the formation. Further, no saturated zone would be present because it, too, would have drained to the "base level." (Testimony, Razem.)

117. Additionally, Appellants' expert, Mr. Fisher, expressed concern that the 2001 Hydrogeologic Report prepared by Eagon and Associates and the Golder report are in conflict because of Eagon's failure to anticipate the impact of fractures in the Clarion shale. Mr. Fisher concluded that the "major problem" with the conceptual model advanced by Eagon versus Golder was that the "Eagon report downplayed the role of water in the Clarion shale and . . . the role of communication between the Clarion shale, the uppermost aquifer and the underlying

Homewood." According to Mr. Fisher, the Golder report presented data demonstrating that the Homewood was "monitored" to reveal hydraulic communication between the formations. The Eagon report, conversely, either "omitted" or "downplayed" the Homewood data. (Appellants' Ex. BB, DD, FF; testimony, Fisher, Rice.)

118. Mr. Razem countered by explaining that Eagon drew their boring plan and field tests to confirm and verify consistency within the Golder model. Had Eagon discovered abnormalities during testing, they would have "investigated that more intensely." Mr. Razem did not recall finding abnormalities requiring further investigation. (Testimony, Razem.)

119. Mr. Fisher also believes that Eagon should have monitored the Clarion shale to better ascertain water movement at the site and asserts that the Golder report characterized the uppermost aquifer system as being an interconnected or a semi-confined aquifer. A semi-confined aquifer is sometimes referred to as a "leaky" aquifer. The less confined the aquifer, the more rapidly water moves through it. Fractures in a unit "short circuit" the confining effect of a unit. In other words, fractures accelerate the flow of water through a unit. (Testimony, Fisher.)

120. Mr. Fisher asserts that because Republic erred in classifying the Clarion shale as a confining unit, rather than a semi-confining unit, it improperly selected the straight-line Theis method to analyze the test data. The straight-line Theis method measures horizontal water movement in a confined aquifer. The problem with the Theis method, Mr. Fisher explained, is that it only accounts for horizontal movement of water and fails to acknowledge the vertical flow of water inherent in a semi-confined aquifer system. Thus, he believes Republic failed to select the proper tests and calculations designed to reveal hydraulic conductivity from one layer to another. (Testimony, Fisher.)

121. Mr. Razem contends that Republic planned and conducted proper testing to verify that the Clarion shale is an aquitard and was not a preferential pathway for water to reach the uppermost aquifer system. Assessing ground water flow in and between formations can be difficult and imprecise. Ground water flow is difficult to demonstrate because it is perpendicular to the potentiometric surface. Cross sections, the illustrations on which ground water flow is shown, do not depict a perpendicular feature, so water levels are approximated. (Appellants' Ex. D-PP-A; Appellees' Ex. 41, 43; testimony Razem.)

122. On the cross section diagrams, the ground water level, and ultimately its flow, is represented by a solid inverted triangle in the mine spoil, or significant zone of saturation. In the Putnam Hill limestone/Brookville coal the potentiometric surface, and ultimately the ground water flow, is represented by an open inverted triangle. Republic identified the direction of the ground water flow in the Putnam Hill limestone/Brookville coal by analyzing the potentiometric surface in various wells. (Appellees' Ex. 41, 43; testimony, Razem.)

123. To collect accurate data designed to assess ground water flow, Eagon employed a special screening method to ensure that water from the Putnam Hill limestone/Brookville coal formation was the only water measured during their testing. Mr. Razem described the process as follows:

(1) drill the boring; (2) install a PVC well casing that is slotted at the bottom, creating a well screen so that water can enter; (3) pack the interval with sand to allow water to move into the screen; and (4) fill the area above the sand-pack with grout to seal the screen so that water does not enter through the sides. This process ensures that the Putnam Hill limestone/Brookville coal formation is confined, so that when it is penetrated, water from the Putnam Hill limestone/Brookville coal will rise in the borehole until it is stable. Thus, the water level in the well represents the potentiometric surface in the Putnam Hill limestone/Brookville coal. (Testimony, Razem.)

124. Importantly, Mr. Razem believes it was unnecessary to monitor or perform additional tests in the Clarion shale because the Clarion shale did not create a preferential pathway for water. In support of this conclusion, he first referred to a September 1994 letter from Judith Bowman, OEPA, NEDO, to Anthony Stockman at Countywide. The letter from Ms. Bowman summarized Republic's prior communication, in which it sought a determination that the Clarion shale should not be considered a significant zone of saturation for the following reasons:

> (1) The hydraulic conductivity of the Clarion Shale is one to three orders of magnitude lower than the uppermost aquifer system and mine soil (*sic*) deposits. The uppermost aquifer system is directly beneath the Clarion Shale and is comprised of the Putnam Hill Limestone and the Brookville (No. 4) Coal.
>
> (2) The hydraulic gradient of the Clarion Shale is vertically downward. The calculated average vertical conductivity [corrected at *de novo* hearing to read "gradient" instead of "conductivity"] in the Clarion Shale is 0.9 feet/feet, compared to the calculated average horizontal gradient of 0.1 feet/feet.
>
> (3) '*The Clarion shale is a very poor sustainer of ground water flow as witnessed by monitoring wells installed in the Clarion Shale being purged dry during routine sampling and during past in-situ well testing.*' [A portion of OEPA's letter quoting text from a prior communication from Republic.] (Emphasis added.) (Appellees' Ex. 168; testimony, Razem.)

125. Ohio EPA concluded the letter by stating, "the *Clarion Shale is not a significant zone of saturation. It does not have any of the properties needed to act as a preferential pathway of migration away from the limits of solid waste placement*." (Emphasis added.) (Appellees' Ex. 168.)

126. Moreover, Mr. Razem stated that OEPA's determination regarding the low permeability of the Clarion shale was consistent with what Burgess and Niple, Golder and Eagon found. Indeed, both Burgess and Niple and Golder had attempted to monitor the Clarion shale, but the formation produced little water and, therefore, it was extremely difficult to obtain enough water to determine the water quality characteristics. (Testimony, Razem.)

127. Mr. Razem opined that based upon a reasonable degree of scientific certainty, Republic

characterized the uppermost aquifer in accordance with the solid waste rules and that the aquifer system consists of the Putnam Hill limestone/Brookville coal stratigraphic units. (Testimony, Razem.)

v. Seeps and Springs

128. Appellants expressed concern about the presence and number of seeps at the Countywide site.[30] Appellants assert that the water moving to the surface in the form of seeps or springs primarily comes from recharge filtering down through the formations. Over the years, Club 3000 members have observed and videotaped water issuing from seeps surrounding the landfill. Appellant Harvey testified he unscientifically calculated that approximately 20-30 gallons of water per minute was coming from the more prolific seeps and springs. (Testimony, Franks, Harvey.)

129. Conversely, Appellees contend that the water from the seeps originates from the ground water moving under the Countywide site and expressing itself at the sides of the hill. Mr. Razem testified that the seeps present at the Countywide site are where he would expect them. The potentiometric surface map demonstrates that water is following the topography. No disturbances or large discontinuities suggestive of fractures can be observed. It follows then, when considering the stratigraphic column, seeps will appear on the hillside on top of where the underclay outcrops in the hillside. (Appellees' Ex. 45; testimony Razem.)

130. Eagon generated a map entitled "Seeps at the Countywide RDF" to verify that the presence of seeps corresponded with the presence of an underclay or water bearing formation outcropping at the hillside. Eagon used color-coded circles to identify known seeps and springs at the site. The green seeps correlated to a green line that traced the approximate outcrop of the "Brookville (No. 4) Claystone." The mustard-colored seeps corresponded to a mustard-colored line that traced the approximate outcrop of the "Lower Kittanning (No.5) Claystone." Five seeps were colored magenta and associated with the "Homewood Sandstone/Shale." The remaining seeps, colored black, were in the mine spoil. (Appellees' Ex. 45; testimony, Razem.)

131. The presence of seeps and their known locations also supports Republic's contention that fractures in the Clarion shale do not control the ground water flow, but rather, that off-site ground water recharge, flowing from the north/northwest, flows horizontally along the fractured Putnam Hill limestone/Brookville coal. A portion of this ground water appears as seeps or springs along the hillside where the claystone layers intersect or outcrop the hill slope. Anecdotally, Mr. Razem shared that coal miners, in the "old days," would map the seeps knowing that the underclay lies just beneath the coal. (Testimony, Razem, Rizzo.)

30 Although definitionally, springs produce a greater quantity of water, at the hearing, the words "seeps" and "springs" were used interchangeably to represent both water features.

C. Tests & Analysis of Geologic & Hydrogeologic Information

i. Tests Republic Conducted

132. Mr. Sugar, a hydrogeologist employed by Eagon and Associates, oversaw the field investigation for the 2001 Hydrogeology Report and 2001 Ground Water Monitoring Plan. To prepare for the investigation, Mr. Sugar reviewed and assembled numerous documents including ODNR well logs, OEPA wellhead delineations, the DRASTIC report for Stark County, the Stark County Bulletin 61 and available public water supply documents. Mr. Sugar also reviewed "ground water resource maps, residential well logs and open file maps at USGS, such as bedrock-topography maps, and any other pertinent literature . . . in terms of stratigraphy and the ground water resources." To select test sites at the landfill, Eagon reviewed its own conceptual model, as well as the conceptual models and test data contained in the Burgess and Niple and Golder Reports. (Testimony, Sugar.)

133. Employed by Eagon and Associates since 1990, Mr. Sugar's work is comprised of approximately 80-90 percent "landfill-related issues," with his remaining time dedicated to water supply and surface-mining and tunneling issues. Mr. Sugar has been involved with Countywide since early in his tenure at Eagon and estimates he has spent "1,500 - 2,000" hours on-site conducting or overseeing drilling projects. In the instant case, Mr. Sugar supervised all of the borehole drilling and testing, except for the packer tests, which he conducted himself. Ultimately, he assembled and compiled the field work data and submitted it to Mr. Razem who created Republic's 2001 Hydrogeologic Report and the 2001 Ground Water Monitoring Plan. (Testimony, Sugar, Razem.)

134. Mr. Sugar offered an overview of the types of drilling equipment available for field investigations and explained the rationale behind why Eagon chose the selected drilling and testing methods. Mr. Sugar stated that he first considered the types of material to be drilled. Because a detailed site investigation already existed, this step was relatively simple. Eagon used a hollow-stem-auger for unconsolidated materials and a rotary drilling method for consolidated formations. (Testimony, Sugar.)

135. When using a hollow-stem-auger, the driller advances a steel casing with a steel coil wrapped around it. The coil rotates like a barber shop pole, lifting the cuttings from the hole. The casing and coil are in five foot sections and are bolted together as needed, depending upon the depth of the unconsolidated material. The bit, advanced inside the casing, has 2 ½ - 3 inch bullet-like teeth that "stick out to the side and actually" cut the rock. (Appellees' Ex. 29; testimony, Sugar.)

136. As the drilling proceeds, a split spoon sampling technique can be used to remove soils from inside the hollow stem of the auger. A split spoon sample is taken by driving a two-foot-long, two-inch-diameter barrel into the ground and pulling the contents to the surface for examination. The drilling and sampling cycle continues until the bit reaches consolidated material and can advance no further. This alternating cycle allows the driller to characterize the

"whole soil profile" as he moves through the material. (Testimony, Sugar.)

137. Once the auger reaches consolidated material, the driller will "seat the auger," *i.e.* he will embed the bits on the outside of the lead auger into the rock formations as far as he can, so that a tight seal is created. Creating a seal is important as, both the casing joint and the joint at the site of the auger, are areas susceptible to loss of circulation when drilling. (Testimony, Sugar.)

138. After seating the casing in the consolidated formation, the driller can convert certain auger drills into a rotary drilling method tool. A rotary method involves inserting a drill stem inside the auger to advance the borehole. Unlike the hollow stem auger bit used in unconsolidated materials, the rotary method bit requires a circulating medium - water, air or a combination of the two - to lift the cuttings out of the borehole. To sample rock in consolidated formations, the driller advances a hollow bit with an empty barrel on top of it, through the formation, taking representative, or core samples, from the rock. The sampling rod can be advance about five to 10 feet depending on the hollow barrel sitting on top of the rod. Once extracted from the hole, the driller can examine precisely what he has drilled through. Mr. Sugar testified that 40-42 of the 46 borings drilled to investigate the geology at Countywide were continuously sampled so that the entire borehole profile, in both unconsolidated and consolidated formations, was cored. (Appellees' Ex. 29; testimony, Sugar.)

139. Besides inspecting and identifying the formations in a bore hole, observers at the drilling site also measure the competency of the rock or "RQD." The RQD is a formula representing what percentage of the core is unbroken. A low RQD does not imply that the rock is fractured. It simply quantifies how the material cores, or the competency of the rock. Some rocks, like shale which is made up of thin layers that tend to break during the drilling process, will inherently have a lower RQD than more solid formations. Mr. Sugar testified that he thought the RQD was "fairly good" for the type of stratigraphy present at the site. (Testimony, Sugar.)

140. In addition to overseeing the drilling process, Mr. Sugar conducted, supervised, or "at least was present," during the various tests (*i.e.* the packer, the pump and the slug) designed to characterize the hydrogeology at the Countywide site. In general, packer tests are best suited for, and were performed in, low to very low permeability formations. Slug tests are best suited for, and were performed in, moderate to low permeability formations. And pumps tests are generally restricted to, and were performed in, higher permeability zones. At the Countywide site, Eagon employed these respective methods to test the entire length of a borehole. (Appellees' Ex. 36; testimony Sugar.)

141. Regarding selecting the proper hydraulic conductivity tests for the Countywide site, Mr. Sugar testified that the conceptual model developed by Eagon was similar to the models contained in the Burgess and Niple and Golder reports. Based on the conceptual model that portrayed the Clarion shale as a low permeability formation, Eagon, like Golder, relied on packer tests. Indeed, Burgess and Niple attempted to conduct pump tests in the Clarion shale, but found the boreholes failed to produce enough water to analyze. Mr. Sugar testified that Eagon reviewed the placement of the packer tests conducted by Golder to assure that the additional

packer tests were distributed "across the whole expansion." (Testimony, Sugar.)

142. Packer tests performed in the Clarion shale consisted of a pipe, with perforations at one end, and two inflatable packers. The lower packer has no outlet and, when inflated, creates a seal. The perforated pipe is inserted through the center of the upper packer, which, when inflated, creates the upper seal. Once the upper and lower packer seals are set, water is injected into the space or interval between the two packers via the perforation in the end of the pipe. The tester continues to inject water using constant pressure. The amount of water taken in by the formation is then used to calculate hydraulic conductivity in the formation. Packer intervals can be adjusted throughout the test length of a borehole to accommodate difficulty in creating a seal due to weathering differences in the rock. This flexibility assures the tester that the entire borehole has been tested, including any fractures that may be present in the different bedding planes. (Testimony, Sugar.)

143. Pump tests were conducted in all formations that produced enough water to create a valid pump test and included "some of the uppermost aquifer wells, the Putnam Hill Limestone, the Brookville coal wells, and most of the mine-spoil wells." (Testimony, Sugar.)

144. Appellants suggested that the pump tests should have been conducted for a longer period of time, even up to 24 hours. Eagon conducted pump tests for approximately one and one-half hours, enough time to obtain the "early-time analysis data," which is considered a conservative number. Mr. Sugar explained that a longer test period was unnecessary. The monitoring wells chosen for the pump tests were two inches in diameter and the water stored within the casing, the effective screen interval and the sand pack would have had a negligible impact on testing. He explained further, by describing that the tests are pumping greater than one gallon per minute, but, most likely, are two to four gallons per minute, or maybe up to five. He estimated it would only take 30 seconds to a couple of minutes to empty the water from the sand pack and borehole. During the balance of the ninety minutes, the pump would be drawing from the formation, which would be more than enough time to perform a valid pump test. (Testimony, Galbraith, Sugar.)

145. The final type of borehole test, a slug test, has been conducted in every well installed as part of this investigation since 1998. Relatively simple to conduct, slug tests were done at this site by dropping a transducer, a tool that measures water at a very quick rate, into a borehole. The transducer was dropped far enough below the water table that when the tester submerges the slug, the slug does not hit the transducer. Once the steel rod, or slug, was lowered into the well, the transducer recorded the change in the displacement of water. (Testimony, Sugar.)

146. Some wells were subjected to two different types of tests and, accordingly, had two sets of data which allowed Republic to compare the data and verify the accuracy of the outcomes. (Testimony, Sugar.)

147. As of the date of the *de novo* hearing, Republic had collected data in the various strata from 240 locations: twenty-nine data points (borings) terminated below the Brookville clay; thirty-three terminated in the Putnam Hill limestone/Brookville coal and clay; forty-nine

terminated in the Clarion shale; twenty-two terminated in the No. 5 coal/Lower Kittanning clay; one-hundred two terminated in the mine spoil; as well as five test pit locations. To prepare its application for expansion at the Countywide site, Republic relied on the 216 subsurface data locations collected from 1994 to the date they submitted their application. (Appellees' Ex. 188; Testimony Sklash.)

ii. Tests Republic Rejected

148. Appellants submit that Republic failed to conduct the proper field tests to ascertain the site-specific geology and hydrogeology. Mr. Fisher stated that Republic failed to do the correct tests in the field because its conceptual model failed to anticipate vertical hydraulic communication and, consequently, the field investigation only tested for horizontal communication. Appellants suggested that Republic should have conducted some of the additional tests and procedures listed in OEPA's February 1995 Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring, such as angled borings, tracer tests and geophysics tests. (Appellants' Ex. DDDD; testimony, Fisher.)

149. Unlike typical borings, which are done vertically through the formation, angle borings are a specialty type of boring that can detect vertical fractures. Republic chose not to use angle borings at this site because they are unnecessary in this setting and expensive. Neither Mr. Fisher in the over 50 sites where he has conducted ground water modeling, nor Mr. Sugar, who has worked on over 60 landfill sites, has been involved in an investigation that required angle borings. Moreover, OEPA regulations do not require angle borings if the site can be characterized using other methods. (Appellants' Ex. DDDD; testimony, Fisher, Rizzo, Sugar, Walker.)

150. In tracer tests, a solute is released into water or land surface and the tester will have monitoring stations downgradient of the release point so that the solute's travel can be observed. Tracer tests are often done in limestone and are helpful in finding the ultimate fate of ground or surface water. Republic believed tracer tests would not have produced any usable data. Mr. Razem elaborated by noting that if Eagon had performed a dye trace, it would have taken "decades to see the dye move," because Clarion shale is such a tight formation. By that time, the dye would have dissipated and could no longer be seen. (Testimony, Fisher, Leap, Razem.)

151. Geophysics testing may be used to augment direct field testing or to help guide its implementation. In a geophysics test, a pressure wave or nuclear radiation is induced. The material in the aquifer or subsurface absorbs or reflects the wave or radiation. The reflection or absorption reveals the nature of the substance – for example, water, sand, or clay. Mr. Razem believes these tests would not have been helpful because the mine spoil would have absorbed the energy trying to be sent down to the rock, so no data would have been available to interpret. Even if data had been produced, it is unlikely that it would have been of better quality than the bore hole data collected during the drilling process. (Testimony, Razem.)

152. Appellants also suggested that Republic failed to adequately characterize the site because it did not conduct laboratory tests for primary porosity, run ground water models, or test the travel time of a seep once it "daylights" or surfaces on the hillside. Mr. Razem asserted that the main reason Republic chose to exclude the other tests was because, as expected in this region of Ohio, none of the boreholes, tests, or maps indicated fracture flow that would necessitate additional testing beyond what was conducted. Moreover, OEPA regulations do not require an applicant to conduct these additional tests. (Appellees' Ex. 166 and 167; testimony, Fisher, Galbraith, Razem, Rizzo, Sugar.)

153. Further, Appellants assert that Republic inadequately characterized the geology and hydrogeology of the site because it selected improper formulas and calculations to predict ground water movement. Appellants alleged that Republic should have calculated "storativity," the amount of water in a formation, along with "transmissivity," the amount of water moving through a formation. Mr. Sugar noted that Ohio regulations do not require an applicant to calculate storativity or transmissivity and could envision no benefit to calculating these outcomes while attempting to characterize this site. (Testimony, Fisher, Sugar.)

154. Finally, Appellants allege that Republic improperly calculated ground water flow using an equivalent-porous-media flow, rather than using a fracture flow analysis. Mr. Razem testified that the Golder report and data collected by Eagon support that the correct model for assessing water movement in the Clarion shale is not a fracture flow analysis model, but rather an equivalent-porous-media flow model. In reaching his conclusion, Mr. Razem reviewed the potentiometric surface map, the discharge zones, the springs, the seeps, water level fluctuations, the permeability of the formations, as well as the borehole logs to determine the dominating flow criteria. (Testimony, Fisher, Razem.)

155. Mr. Razem testified that fracture flow analysis would be appropriate if fractures controlled water flow at the Countywide site. No evidence supports a finding that fractures control water flow at this site. Indeed, if such a situation were present, the potentiometric surface map would look different than it does. For example, the map would show inflections or disturbances indicating where fractures were present and the outcrop would be readily identified as a spring releasing hundreds or thousands of gallons of water per minute. If such a situation had been present at Countywide, the investigation would have been adjusted to include different testing parameters, such as dye-trace studies or geophysics so that water flow could be tracked through the fractures or solution channels. (Testimony, Fisher, Razem.)

156. In preparation for hearing, Republic asked Dr. Sklash to consider whether the Director possessed sufficient regional and site-specific hydrogeologic and geologic information of "good quality" to render an informed decision as to whether the Countywide site was appropriate for expansion and whether, in his expert opinion, the Director made the correct decision in issuing the permit to Republic. In reaching his conclusion, Dr. Sklash compared OAC rules relating to hydrogeology to Eagon's 2001 Hydrogeologic Report and 2001 Ground Water Monitoring Plan. These reports documented extensive information about the regional and site-specific hydrogeology, including boring logs from over 200 locations, hydraulic conductivity testing

(slug, pump and packer tests), the ground water monitoring system, ground water level and quality reports and information on the location of springs. Dr. Sklash also considered supporting documents such as the Golder Report, issued in 1995 for an earlier permit, the geology of Stark County, and the DRASTIC report for Stark County. Based upon a reasonable degree of scientific certainty, Dr. Sklash concluded that the Director possessed sufficient information upon which to make an informed decision. (Testimony, Sklash.)

157. Based on the totality of the evidence presented at the *de novo* hearing, the Commission finds that the Director had a valid factual foundation to conclude that Republic had adequately characterized the regional and site-specific geology and hydrogeology, which allowed him to further evaluate whether the Countywide site was an appropriate site for the proposed expansion.

VI. ASSIGNMENTS OF ERROR: GROUP TWO – Siting Criteria

158. Appellant's second category of assignments of error relates to whether Republic satisfied the ground water related siting criteria found in OAC 3745-27-07(H). Republic asserts that the data and information contained in its hydrology and ground water monitoring reports fully satisfied OAC requirements relating to hydrogeologic siting criteria. (Testimony, Razem.)

159. In addition to the 2001 Hydrogeologic Report described earlier, Eagon prepared the 2001 (and subsequent revisions) "Ground-Water Monitoring Plan for Countywide Recycling and Disposal Facility Lateral and Vertical Expansion" containing text, figures, tables, plates and appendices that present the ground water monitoring system and procedures required in OAC 3745-27-07(C)(7) [Additional criteria for approval of sanitary landfill facility permit to install applications.], which, when taken together, demonstrate that Republic satisfied the requirements of OAC 3745-27-07. The siting criteria of OAC 3745-27-07 (H)(2) and (3) are summarized as follows:

> A sanitary landfill shall not be located:
>
> (i) in a sand and gravel pit;
>
> (ii) in a limestone or sandstone quarry;
>
> (iii) above a sole source aquifer as declared by the federal government;
>
> (iv) above an unconsolidated aquifer capable of sustaining a yield of one hundred gallons per minute for a twenty-four hour period or future water supply well located within 1000 feet of the limits of solid waste placement;
>
> (v) where the isolation distance between the uppermost aquifer system and the bottom of the recompacted soil liner is 15 feet or less;

(vi) within a five-year ground water time of travel ("TOT") to a public water supply well;

(vii) within an area of potential subsidence due to an underground mine; or

(viii) within one thousand feet from a water supply well. (OAC 3745-27-07(H)(2) and (3); Appellees' Ex. XXXX.)

160. Of the eight siting requirements contained in OAC 3745-27-07(H), Appellants argue that Republic failed to meet the following three: (1) the landfill must not be located above an unconsolidated aquifer capable of sustaining a yield of one hundred gallons per minute for a twenty-four hour period; (2) the landfill must have an isolation distance of at least 15 feet between the uppermost aquifer system and the bottom of the recompacted soil liner; and (3) the facility must not be located within a five year time-of-travel to a public water supply.

A. Unconsolidated Aquifer

161. Ohio Administrative Code section 3745-27-07(H)(2)(d) prohibits the placement of a landfill facility *above* an "unconsolidated aquifer capable of sustaining a yield of one hundred gallons per minute for a twenty-four-hour period to an existing water supply well . . . unless deemed acceptable by the director." (3745-27-07(H)(2)(d).)

162. Appellants assert that the word "above" should be interpreted as a topographical reference intended to describe a relationship, such as a hill and valley. In other words, Appellants assert that this regulation is triggered even if no direct, physical relationship exists between the landfill and the aquifer. (Emphasis added.) (Case File Items A; testimony, Rice.)

163. Republic contends the rule prohibiting location of the landfill above an unconsolidated aquifer is only invoked if the facility is located *physically*, not topographically, above an unconsolidated aquifer yielding greater than one hundred gallons per minute. Republic believes Appellants' concerns about potential topographical hydraulic connections are addressed adequately in other rules relating to protecting nearby water sources and that this rule relates solely to the physical relationship of an unconsolidated aquifer to a landfill. (Emphasis added.) (R.C. 3745-27-07(H)(2)(d); testimony Razem.)

164. Republic demonstrated why the expansion would not be located above an unconsolidated aquifer capable of yielding one hundred gallons per minute and, therefore, is not subject to this rule. A regional cross-section of the site illustrates that the stratigraphic column under the Countywide expansion is comprised of consolidated formations. In other words, unconsolidated material is not present under the facility boundary, thus, it is impossible for an unconsolidated aquifer yielding any amount of water to exist.[31] Further, Mr. Razem stated that, because no

[31] Unconsolidated means it is "loose like sand and gravel, something you can pick-up in your hand, like on a beach." A consolidated formation is like a rock or in this instance, the Clarion shale. (Testimony, Razem.)

unconsolidated material is under the expansion site, it is also impossible for an unconsolidated formation under the site to be *connected* to an unconsolidated aquifer located off site. To demonstrate the type of connection that would trigger application of this rule, Mr. Razem explained that if a one foot sand stringer, or lens, were present and connected to a high-yield aquifer within 1000 feet, the rule would be applicable. If however, the connection were 2000 feet away, the rule would not be applicable. (Emphasis added.) (Appellees' Ex. 33; testimony, Razem, Rice, Rizzo.)

165. Mr. Razem his testimony by stating that the borehole logs, maps, and cross sections provided information that allowed him to conclude to a reasonable degree of scientific certainty that Republic had satisfied the siting criteria of OAC 3745-27-7 (H)(2)(d). (Testimony, Razem.)

166. Further, the Agency addressed the subject of "Solid Waste Siting Criteria: 100 gpm [gallons per minute] Aquifer" in document number GD0202.102, last revised in July 1997. This document provides interpretation of the rule and guidance as to what documents and data the Agency will review when considering whether a facility can be sited above a high yield unconsolidated aquifer. Mr. Rizzo confirmed that, indeed, a physical geographic relationship must be present to trigger OEPA's rule prohibiting placement of a landfill above an unconsolidated aquifer. (Appellees' Ex. 50; testimony, Rizzo.)

167. Based on the totality of the evidence presented at the *de novo* hearing, the Commission finds that the Director had a valid factual foundation for concluding that the Countywide expansion is not located above an unconsolidated aquifer capable of sustaining a yield of 100 gallons per minute. (CR Item 7.)

B. Isolation Distance

168. The OAC rule regulating isolation distance states "the isolation distance between the uppermost aquifer system and the bottom of the recompacted soil liner" must not be "less than fifteen feet of in-situ or added geologic material deemed acceptable by the director." (OAC 3745-27-07(H)(2)(e).)

169. Appellants assert that Republic mischaracterized the elevations and isolation distance between the uppermost aquifer system and the bottom of the landfill at the Countywide site, such that the facility does not have a 15 foot barrier of *in situ* or added geologic material, between the uppermost aquifer and the bottom of the recompacted soil liner. (Ex. 8; Case File Items A.)

170. Mr. Razem testified that when assessing whether the isolation distance criterion is satisfied, he makes three distinct determinations: (1) characterization of the isolation distance; (2) identification of the uppermost aquifer system; and (3) identification of the significant zone of saturation. (Testimony, Razem.)

171. Mr. Razem first characterizes the isolation distance by examining whether the fifteen feet

of separation between the base of the soil liner and the top of the uppermost aquifer system is identified as *in situ* or added geologic material. In the 2001 Hydrogeologic Report, Republic stated that the Clarion shale satisfies the *in situ* requirement across the site, except in two areas, representing approximately five percent of the total site. In the 80-feet across the site where the Clarion shale is present, its thickness ranges from 15-100 feet, but it is typically about 50 feet in thickness. Geologic material approved by the director must be added to the east-central portion of the site and under existing Cell 5D in the southwest corner of the site where the Clarion shale is absent. (Appellants' Ex. 40; testimony Razem.)

172. The application states that Republic's construction procedures ensure that any added geologic material would have a permeability of 1×10^{-6}. This engineered permeability level is in compliance with the standards suggested in OEPA DSIWM guidance document number 0409, entitled "Construction Requirements for Added Geologic Material." This guidance document sets out the "procedures for the characterization and construction of added geologic material" pursuant to 3745-27-07(H)(2)(e). (Appellees' Ex. 53; testimony Fisher, Walker.)

173. The second determination Mr. Razem makes when deciding whether a 15' isolation distance exists relates to the identification of the uppermost aquifer system. As noted previously, identification of an aquifer is predicated on the permeability relationship between two formations, not on particular permeability values. Republic asserts that because the permeability of the Clarion shale is two orders of magnitude less than the permeability of the Putnam Hill limestone/Brookville coal, the Putnam Hill limestone/Brookville coal is properly identified as the uppermost aquifer system. (Appellees' Ex. 30, 31; testimony, Rizzo, Razem.)

174. Republic also relies on Dr. Sklash's work, which illustrates that the Clarion shale acts as an aquitard. As discussed previously, Dr. Sklash compiled data from cross sections B-B' and I-I' and prepared an exhibit showing "no obvious relationship between where fractures are and where water is." (Appellants' Ex. III and P; Appellees' Ex. 25, 26; testimony, Sklash.)

175. Further, Mr. Razem opined that based upon a reasonable degree of scientific certainty, Republic characterized the uppermost aquifer system at the site in accordance with the solid waste rules and that the aquifer system is comprised of the Putnam Hill limestone/Brookville coal stratigraphic units. (Testimony, Razem.)

176. The third determination Mr. Razem makes when deciding if Republic satisfied the isolation distance requirement set out in OAC 3745-38-07(H)(2)(e) is whether Republic properly identified the significant zone of saturation. A significant zone of saturation is "a monitored pathway. It doesn't have the yield or characteristics to be an aquifer, yet it could be a pathway for contaminates to migrate away from a landfill facility." (Testimony, Razem.)

177. Republic identified the mine spoil as a significant zone of saturation due to its inconsistent saturation and its potential to move water horizontally away from the solid waste facility. Further, Republic rebutted Appellants' assertion that the mine spoil is part of the uppermost aquifer system because no mine spoil will be present under the facility, the mine spoil

lacks lateral extent and the water in the mine spoil is not potable. Mr. Razem testified, that in his professional opinion, to a reasonable degree of scientific certainty, Eagon properly identified the mine spoil as the significant zone of saturation at the Countywide site. Mr. Rizzo confirmed that in his review of the Agency's guidance document and understanding of applicable OAC rules, Republic had properly identified the mine spoil as a significant zone of saturation. (Testimony, Razem, Rice, Rizzo.)

178. After making the three determinations helpful for assessing whether the isolation distance was at least 15 feet, Mr. Razem worked with the landfill facility design team to ensure that placement of the bottom of the soil liner was at least 15 feet from the top of the uppermost aquifer system. (Testimony, Razem.)

179. Based on characterization of the isolation distance and identification of the uppermost aquifer system and significant zone of saturation, the Commission finds the Director possessed a valid factual foundation for concluding that Republic had demonstrated that a 15-foot isolation distance is present between the bottom of the in-situ or added geologic material and the uppermost aquifer.

C. Time of Travel

180. Appellants allege that the Countywide expansion is located within a five year time of travel ("TOT") to a public water supply, specifically the KOA Campground wells and the Bolivar wellfield. (Case File Items A.)

181. Time of travel calculations are designed to allow enough time for corrective action before a release from a landfill would reach a public water supply well. Under the rules applicable to the Countywide expansion, Republic must demonstrate that the expansion is not within the five-year TOT along a ground water pathway to a public water supply well. (OAC 3745-27-07(H)(3)(a); testimony, Razem, Rizzo, Sklash.)

182. Republic and OEPA assert that TOT calculations were not necessary for the Countywide expansion because the nearest public water supply wells are not downgradient of the expansion. Despite this belief, Republic included TOT calculations, to provide OEPA with additional, general information on ground water behavior at Countywide. (Testimony, Razem, Rizzo.)

183. The closest public water supply well to the facility is the KOA Campground well system. The KOA well system consists of three wells located approximately 1500 feet northeast of the Countywide site. No well logs are available to provide precise details, but uncontroverted testimony supports that the wells are screened in formations lower than the uppermost aquifer system beneath the Countywide site. The wells are believed to be screened in the Massillon or Sharon formations and are about 90-100 feet below the elevation of an intermittent stream bed separating the landfill from the KOA wells. (CR Item 7; testimony Razem.).

184. The Bolivar well field contains three wells. Two of the wells are sixteen inch wells with a pumping capacity of 350 gallons per minute and the third well, which serves as a standby well, has a pumping capacity of 125 gallons per minute. The Village has discussed expanding its water servicing capabilities, though no plans or locations for expansion were identified at the *de novo* hearing. (Testimony, Franks.)

185. In demonstrating that it was not required to calculate TOT for either the KOA or the Bolivar wells, Republic relied upon exhibits and testimony to illustrate that water moving from the site would not reach either well system. Prepared in September 2004, an exhibit entitled "Ground-Water Flow in the Countywide RDF Vicinity" traces the "Approximate Limit of Putnam Hill Limestone (Uppermost Aquifer)" using a "brown or mustard-colored" line. (Appellees' Ex. 39; testimony Razem, Sklash.)

186. This exhibit depicts the KOA wells as a grouping of three solid circles located northeast of the facility. A mostly dry unnamed tributary to Bear Run is located between the Countywide site and the KOA wells. Sweeping blue ground water flow lines with arrows indicate the ground water flows off the Countywide site to the northeast, then into a topographically-inferred ground water flow pattern to the south. (Appellees' Ex. 39; testimony Razem, Sklash.)

187. The exhibit depicts the Bolivar well field as a solid circle to the southwest of the facility. The Bolivar wellhead protection area, established by OEPA in 2002, is indicated by a green curving S-shaped form extending slightly east and largely to the west of the Bolivar well. The Tuscawaras River flows between the site and the Bolivar well. Blue ground water flow lines in the southwest region of the site indicate that ground water is flowing off the Countywide site to the south and southwest. (Appellees' Ex. 39; testimony Razem, Sklash.)

188. Further, Republic asserts that flow net diagrams, commonly known as Hubbart cross-sections, also demonstrate why ground water from the Countywide site could not reach the KOA and Bolivar wells. Hubbart cross-sections depict the hydrogeologic principal that water flows from high areas, called "recharge areas" to low areas, called "discharge areas." Low areas, such as a dry valley or stream, can act as a hydraulic boundary preventing water discharged from one hill or slope (recharge area) from crossing into water discharged from another hill or slope (discharge area). The ground water flow pattern in a valley remains unchanged regardless of whether the valley feature is a stream, an intermittent stream, or a dry stream bed.[32] In other words, water discharging from one hill tends not to cross over into water discharging from another hill, regardless of whether the water is present in the stream. (Testimony, Sklash.)

189. Dr. Sklash, testifying on behalf of Republic, believes the unnamed tributary to Bear Run acts as a hydraulic obstacle, which inhibits ground water discharged from the Countywide site from reaching the KOA wells. The ground water flowing into the KOA wells flows toward the unnamed tributary of Bear Run. Significantly, Appellants presented no evidence demonstrating

32 When the evapotranspiration rate is lower than the discharge rate, a surface water body forms an intermittent stream. (Testimony, Sklash.)

that the pumping from the KOA wells would be sufficient to overcome the hydrogeologic obstacle provided by the unnamed tributary, nor could the cone of depression around the wells, even during emergency pumping, extend beyond the hydrogeologic obstacle created by the unnamed tributary.[33] Thus, the dominate capture zone for the KOA wells is from the opposite side of the intermittent stream, from water flowing toward, not from, the Countywide site. (Appellees' Ex. 90, 143a, 143b, and 143c; testimony, Fisher, Rice, Sklash.)

190. Republic asserts that another reason the ground water flowing from the Countywide site could not move into the KOA wells is because the wells are screened in a lower aquifer, unconnected to the Countywide site. A lower permeability formation (clay and shale and sandstone formation) rests below the uppermost aquifer system, which causes ground water under the Countywide site to outcrop as seeps and springs on the sides of the hill. The ground water actually discharges as surface water above the base of the unnamed tributary to Bear Run. Importantly, the elevation of the uppermost aquifer system reveals that this formation is not even present on the KOA side of the valley. (Testimony, Sklash.)

191. When evaluating the potential for contamination of the Boliver well, Republic concluded that it would be physically impossible for leachate from the Countywide site to reach the Bolivar wells. For leachate to reach the Bolivar well field, it must enter a buried valley and cross under the Tuscarawas River, then travel upgradient to the well field. Similarly, the NEFCO report found that water moving off the Countywide site would have no affect on the Bolivar well field.[34] (Appellees' Ex. 24; testimony Razem, Rice, Walker.)

192. An Ohio EPA guidance document regarding TOT supports Republic's contention that TOT calculations were not required in this instance. The Agency addressed "Solid Waste Siting Criteria: Minimum Distance From a Public Water Supply Well [OAC Rule 3745-2747(H)(3)(a) [*sic*]]" in document number GD0202.105, issued in 1996. The stated purpose of the document is to "provide interpretive guidance on OAC Rule 3745-27-07(H)(3)(a) and information required to assess the applicability of this rule." The guidance document states that the intent of the TOT rule is to protect public water supply ("PWS") wells from contamination. Importantly, the document advises "[i]f no PWS wells are intersected during the five year TOT demonstration *or if a surface water body is intersected with the contaminate discharging to the surface water body, prior to the five year TOT being reached then the demonstration ends.*" (Emphasis added.) (Appellees' Ex. 22; testimony Rizzo.)

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33 Pumping in a well lowers the water level near the well. This area is known as a cone of depression. Groundwater flows towards the well into the cone of depression. In some instances, pumping can change the natural direction of groundwater flow within the area around the well. (Testimony, Rice, Sklash.)

34 The NEFCO report, issued in December 2002, was a "summary of efforts completed by both the Northeast Ohio Four County Regional Planning and Development Organization (NEFCO) and Ohio EPA." The purpose of the assessment was to "provide information that the Village of Bolivar can use to help protect its source of drinking water from contamination." The Village of Bolivar Council voted in favor of rejecting the NEFCO report. Bolivar's Council found the report unsatisfactory and incomplete because it failed to include in its analysis a well recently acquired by Bolivar. (Appellees' Ex. 24; testimony, Franks.)

193. The Commission finds that he KOA wells are northeast of the facility on the opposite side of a hydraulic boundary and are screened in an aquifer much lower than the Putnam Hill aquifer, which is not even present at the KOA well site. Because there is no completed horizontal flow path to the public water supply, TOT calculations were not required relative to the KOA well field system. Similarly, the Commission finds that it would be contrary to the laws of hydrogeology for contaminants to enter a buried valley, cross under the Tuscarawas River, and then travel upgradient to reach the Bolivar well field. Because there is no completed horizontal flow path that would allow contaminates to reach the Bolivar well field, TOT calculations are not required relative to the Bolivar well field.[35]

194. Based on the totality of the evidence presented at the *de novo* hearing, the Commission finds that the Director had a valid factual foundation upon which to conclude that Republic's application provided adequate information for the Director to determine that Republic had satisfied the five year TOT assessment requirement.

VII. ASSIGNMENTS of ERROR: GROUP THREE – Ground and Surface Water

195. Appellants argue that the Director issued a permit where the applicant failed to create a ground water monitoring plan designed to adequately protect the surrounding ground and surface water should contamination occur. (Case File Items A.)

196. Understanding ground water flow is critical to designing an effective ground water monitoring plan. The ground water flow direction under the Countywide site is essentially northwest to southeast with a small radial component following the topographical down-slope of the aquifer. The topographical flow drives the water out to the sides of the hill to the outcrop areas. (Testimony, Sklash.)

197. The systematic organization of seeps surrounding the Countywide site supports Republic's characterization of the vertical and horizontal topographically-controlled ground water flow. At the Countywide site, seeps and springs are created because two of the three layers making up the Putnam Hill limestone unit are fairly permeable, while the claystone, at the base of this unit, is a low permeability material. The Clarion shale, directly above the Putnam Hill limestone/Brookville coal unit, has very low permeability and is not conducive to lateral flow of ground water. Essentially, ground water moving down through the Clarion shale and reaching the claystone moves to the sides of the hill and "expresses itself" as a seep or spring. Importantly, a significant portion of the water moving under the site is from the regional ground water flow, not from water moving down through the Clarion shale. (Appellees' Ex. 39, 45, and 189; testimony, Sklash.)

[35] To allow the Agency to more fully understand the hydrogeology at the site, Republic's application included permeability calculations related to their TOT assessments. Appellants allege that the calculations advanced by Republic in its application are flawed because Republic uses the wrong modeling equation and, therefore, does not predict the fastest rate of travel. Because the Commission finds TOT calculations unnecessary, it correspondingly finds a review of Republic's calculations would be superfluous.

198. Republic presented testimony and evidence to demonstrate that it took the following steps to monitor and protect ground water in the area:

a. The monitoring well network shows a greater density of monitoring wells in the downgradient direction and near areas of seeps and springs. This configuration follows the ground water flow and allows Republic to monitor water quality leaving the uppermost aquifer system.

b. Operation guidelines for the landfill demonstrate how Republic intends to prevent leachate breakouts at the Countywide site:

i. Leachate, created when water percolates down through the waste, eventually sits on the liner. The leachate is either pumped out and taken to the City of Alliance for treatment or recirculated. Recirculating leachate through the relatively dry waste coming in daily increases the moisture content of the new waste causing the new waste to stabilize quicker than it would without recirculation of the leachate.

ii. To prevent the bottom of the liner from filling with leachate, Republic will maintain a maximum head level of 12" of leachate on the liner. Pumps are set to keep the head level lower than 12" and, daily, an employee inspects the pumps to ensure that they are functioning properly.

iii. Each day, Republic covers the waste with soil or tarps which promotes runoff into the ponds.

c. The permit contains the following conditions designed to protect ground water:

i. Republic must provide at least a 45-day notice prior to abandonment of an existing underdrain.

ii. Republic's ground water sampling plan must include sampling of discharge from the existing southwest underdrain.

iii. Republic must alter the location of the ground water monitoring wells if annual testing results indicate the current monitoring well system is not adequate. Changes in ground water flow could trigger this condition. (CR Item 1, Conditions 20, 21, 22; testimony, Rizzo, Sklash, Walker.)

199. Appellant District also alleges that the permit failed to protect "ambient water quality." Ohio Water Quality Standards apply to surface water.[36] The District did not identify which

36 "Water quality standards are ambient standards as opposed to discharge-type standards. These ambient standards, through a process of back calculation procedures known as total maximum daily loads or wasteload allocations form the basis of water quality based permit limitations that regulate the discharge of pollutants into

surface water body would be impacted, nor did it identify which water quality standard was violated. (OAC 3745-1-01(A); Case Number 795334 File Item A.)

200. Republic has taken the following steps to protect surface water:

a. Republic collects all rainwater from the site

b. Republic operates pursuant to a National Pollutant Discharge Elimination System ("NPDES") permit for surface water discharges from its sediment ponds.

c. Republic reclaimed several strip mines which reduces acid mine drainage and improves overall water quality. (CR Item 9; testimony, Vandersall.)

201. The Commission finds that the Director had a valid factual foundation for concluding that Republic's ground water monitoring plan was designed to adequately protect the quality of ground and surface water surrounding the area.

VIII. ASSIGNMENTS of ERROR: GROUP FOUR – Construction Criteria

A. Construction Background

202. Appellants' final assignments of error allege that the Director issued a permit for which Republic failed to submit an accurate slope stability analysis and failed to demonstrate that it met the construction criteria set out in the OAC. Specifically, Appellants argue that the composition of the structural fill materials and inadequacy of the berm construction specifications will lead to slope, or berm, failure at the Countywide site. Appellants also assert that failure to satisfy the construction criteria, including proper construction of the bottom composite liner, the leachate collection system, surface water management systems and the final cap, will increase the potential for hydrostatic uplift of the liner material. Failure of berm walls and hydrostatic uplift could result in leachate contamination of the ground water under and around the Countywide site. (Case File Items A.)

203. To complete the construction criteria portion of Republic's application, Mr. James Walker of EMCON outsourced the geotechnical work to a specialty firm. Mr. Walker selected Mr. Peter Carey to prepare the geotechnical work included in Republic's application based on his specialization in geotechnical engineering, professional expertise and familiarity with the Countywide site.[37] (Testimony, Walker.)

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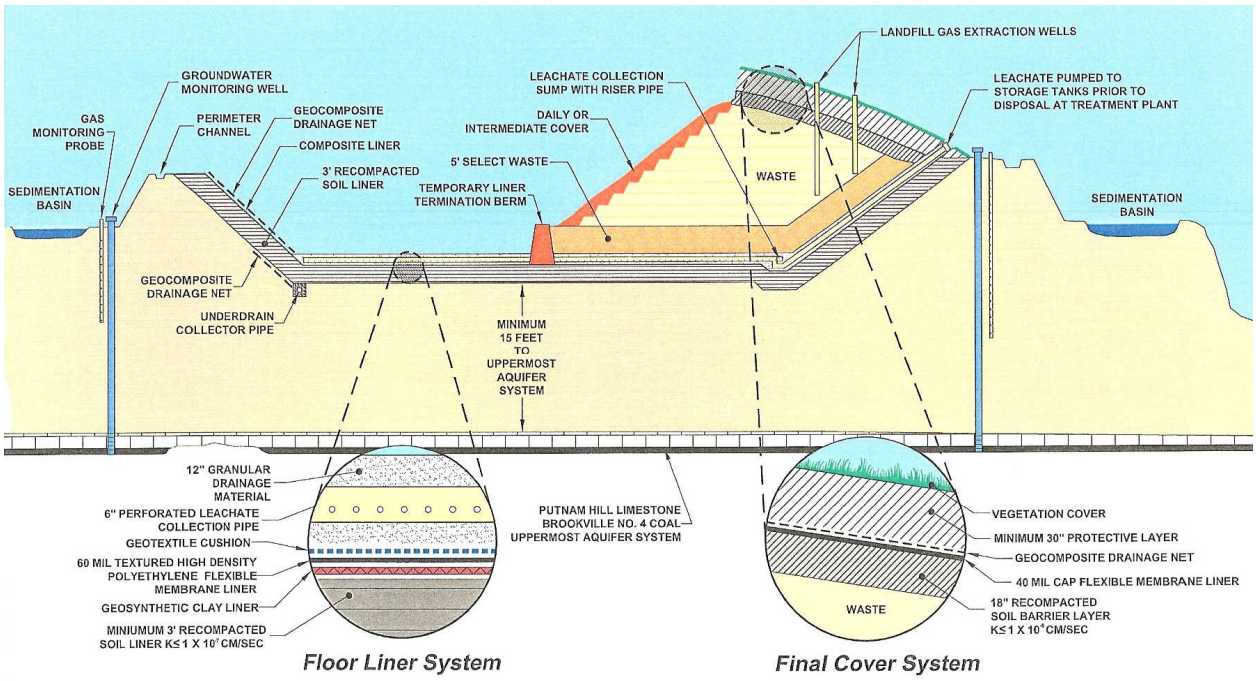
surface waters under the National Pollutant Discharge Elimination System (NPDES) permit program." Appellants (http://www.epa.state.oh.us/dsw/wqs/index.html.)

37 Geotechnical engineering, a branch of civil engineering, describes how "ground will respond to what people do to it." (Testimony, Carey.)

204. The Geotechnical Report, located in Appendix C of the Quality Assurance/Quality Control plan, Volume II of the application, contains the specifications and calculations for construction criteria. The geotechnical specifications contained in this report include requirements for the landfill subgrade, structural soil and rock fill, subbase isolation material, recompacted soil liner, geomembrane (flexible membrane liner), and the geotextile cushion layer above the liner. The report also includes specifications for the leachate collection components including: granular drainage layer, geocomposite, select aggregate, piping and pumps, initial select waste layer to be placed and final cap material. (Appellees' Ex. 10; testimony, Walker.)

205. One purpose of the geotechnical report is to demonstrate that the "slopes and landfill will remain stable through time and that the settlements that are expected to occur under the landfill will not result in poor drainage features on the bottom of the landfill." Specifically, OEPA required Republic to demonstrate berm stability in areas suspected to have "worst case" conditions, in the north and northwest sides of the expansion and in the valley on the southeast side of the expansion. (Testimony, Carey.)

206. The Geotechnical Report also contains a conceptual cross-section, illustrated below, which is a general layer-by-layer representation of the features to be constructed at the landfill. (Appellees' Ex. 108.)



(Excerpt from Appellees' Ex. 108.)

207. Beginning at the base of the area represented, the conceptual cross-section depicts and identifies:

a. The uppermost aquifer system, showing that it occurs predominately in the

Putnam Hill limestone/Brookville coal formation, except a small area where the Homewood shale and sandstone acts as the uppermost aquifer;

b. A minimum 15' isolation distance between the uppermost aquifer system and the liner, showing most areas at the site with substantially more than a 15' isolation distance;

c. An underdrain collector pipe and geocomposite drainage net in certain areas;

d. A floor liner system comprised of:

i. A minimum 3' thickness of recompacted soil liner with permeability of less than 1×10^{-7}. The soil liner is recompacted to detailed specifications and used to create test pads. Once tested, the soil liner is constructed to those specifications. It has an indefinite useful life;

ii. A geosynthetic clay liner. A geosynthetic clay liner is a manufactured product containing bentonite clay, which acts like kitty litter. Bentonite clay absorbs moisture, swells when wet to fill in liner inconsistencies and can seal small punctures. With a permeability of 5×10^{-9}cm/sec, the geosynthetic clay liner is 20 times less permeable than the compacted clay liner required by OEPA;

iii. A 60 millimeter ("mil") textured high density polyethylene flexible membrane liner ("FML"). The 60 mil FML has a useful life of 200 years and is used extensively throughout the United States;

iv. A geotextile cushion. The geotextile cushion is designed to provide protection to the liner from deposited waste;

v. A network of 6" diameter perforated pipes that drain the leachate to one of five fully-lined depressions called a sump. The five sumps automatically pump the leachate to storage tanks, where it is stored prior being transported to and disposed of at a water treatment plant; and

vi. A layer of twelve-inch granular drainage material designed to collect leachate;

e. A five-foot layer of select waste. The select waste layer is comprised of waste chosen for its absence of sharp or potentially damaging features. Select waste adds a layer of protection to help ensure that waste does not puncture the liner;

f. A permanent channel surrounding the landfill to collect surface and storm water runoff from the landfill. The collected runoff is routed to one of five monitored sediment ponds or basins for which Republic has obtained separate OEPA NPDES permits; and

g. A final cover system comprised of:

i. A barrier layer of recompacted soil at least 18" thick satisfying permeability requirements of 1 x 10^{-6} cm/sec or less;

ii. A 40 mil flexible membrane liner;

iii. A geocomposite drainage net to drain any moisture that has moved down through the soil;

iv. A 30" protective soil layer; and

v. Vegetative cover. (Appellees' Ex. 108, testimony Walker.)

208. The Geotechnical Report states that the berms at Countywide will be constructed from structural fill obtained primarily from the site. The perimeter of the berm wall will be approximately 9000 linear feet, up to 100 feet high and 100 feet wide at the top of the berm. Sixty percent of the berm will be constructed on existing rock, with forty percent constructed on mine spoil. Republic will proof roll the ground where the berm will be constructed to locate and remove soft spots, which will enhance the perimeter berm's stability. Exterior berms will have a vertical slope of 2.5 to 1.0 and the interior berms will have a slope of 3.0 to 1.0. (CR Items 9, 10; Appellees' Ex. 61; testimony, Carey, Walker.)

209. During construction of the berm, Republic will assign a quality control officer to verify that only pre-qualified soils are used in the 3' clay liner, to inspect for and remove rocks over 2", and to conduct a full scale test of the clay liner in the field to verify permeabilities of the material before the liner is constructed. (CR Item 10; testimony Hale, Walker.)

210. Republic employed the design techniques of "bonding bench" and a "key-in" trench to enhance the stability of the berm. The perimeter berm is designed in a "bonding bench" fashion on all slopes over a 15% grade. Bonding bench design creates a stair step set of cuts into the hillside to ensure that the added structural fill will nest in, or adhere to the native ground. Significantly, each stair step is sloped away from the hillside at a 10% grade to reduce or eliminate a potential slip plane that may develop between the natural soil and structural fill added to create the berm. Each bonding bench is proof rolled to assure that it will support the berm. Additionally, Republic designed a key-in trench to be built at the toe, or base, of each perimeter berm. The key-in trench construction method provides resistance at the base of the slope, so a failure plane will not develop at the toe of the slope. (CR Items 9, 10; testimony, Hannahs, Walker.)

211. Prior to beginning work on the Geotechnical Report for the expansion project, Mr. Carey reviewed previous geotechnical work done by Republic in existing Cell 5D. The work in Cell 5D involved the construction of a large berm, which included partial replacement or recompaction of

mine spoil. Republic performed a series of analyses for berm stability and looked at "settlement or compression of various amounts of mine spoil and compacted-fill scenarios filling up against a highwall . . . ."[38] (Testimony, Carey.)

212. Based on the results of the Cell 5D assessment, Mr. Carey concluded that the "mine spoil was capable of supporting the loads, and that with a minor amount of overexcavation and compaction of the surface directly adjacent to the liner, . . . we could achieve a condition where very little strain occurred." He concluded that the "berm to the outside would be quite stable and had minor requirements for subgrade preparation down near the . . . toe slope." (Testimony, Carey.)

213. Mr. Carey next reviewed regional and site-specific data that could impact construction at the Countywide site. To assess the regional data, Mr. Carey reviewed "Geofacts Number 8 Fact Sheet." Published by ODNR, this document highlights portions of Ohio prone to "significant landslide." Mr. Carey's review confirmed that Countywide is located outside areas identified as areas prone to "significant landslide." (Appellees' Ex. 65; testimony, Carey.)

214. To analyze the site-specific data, Mr. Carey used three sources: a "site reconnaissance," boring data, and test pit data. As part of the site reconnaissance process, Mr. Carey reviewed existing information and topographical maps to create a preliminary conceptual design of the site. After completing the conceptual design, he visited the site, walked the area observing where berm walls will be built and looked for signs of soil instability or preexisting failure masses or planes. "[I]n order to do a successful design," signs of instability or preexisting failure would require full exploration. During his site visit, Mr. Carey saw no signs of instability in the mine spoil or preexisting failure planes in the soils. (Testimony, Carey.)

215. Next, he utilized geotechnical borings to "define the geometry and obtain samples at specific locations . . . ." Geotechnical borings are used to define stratigraphy and perform penetration tests, in which a hammer is banged on a spoon and disturbed samples are retrieved for laboratory testing. Mr. Carey also collected undisturbed samples using a Shelby tube. A Shelby tube is a steel tube slightly larger in diameter than an exhaust pipe, with a fairly sharp cutting edge that can be drilled into the soil. (Testimony, Carey.)

216. Republic sent these samples, including samples of mine spoil that Republic intended to use as compacted fill to construct the berm, to a laboratory where a suite of tests were run on them. The laboratory tests included index property tests to test the plasticity of the clay, commonly known as Atterberg limit tests, grain size tests, moisture content tests and tests to measure the shear, or strength, properties of samples collected in the Shelby tubes. (Appellees' Ex. 61; testimony, Carey.)

217. Shear properties are "a way of describing how soils would respond to forces that would tend to make it slide - make individual particles slide over one another." To demonstrate shear

38 A highwall is "near vertical or very steep face in the rock" or "cliff" left behind by a coal mining company after it determines that it is no longer economical to continue mining the coal seam. (Testimony, Carey.)

properties, Mr. Carey said to first visualize an imaginary cube. Then, hold on to the bottom of that cube and push the top of the cube, trying to reshape the cube into a rhombus. In other words, shear properties represent the way that soils distort and "how much force they will support while being distorted, with all the different forces and activities that are presented around them." (Testimony, Carey.)

218. Shear tests measure types of shear strength - peak and residual.[39] Direct shear strength or just "shear strength" is the "resistance to sliding." Peak shear strength is the "highest strength measured" in a test or series of tests. Residual shear strength is the "lowest strength that a soil would obtain . . . regardless of how much displacement or shear strain or relative motion occurred within the sample." All materials have a peak and a residual shear strength. In some materials, the peak and residual shear strengths are the same. In others, the difference is the amount of shear distortion or strain that occurred at the time the measurement was taken. Strain softening is a property where a material, like soil, loses its strength as the strain on it increases, holding all other conditions constant. The soil is said to be so stressed as to be at its "fully softened strength." (Testimony, Carey.)

219. Ms. Wilson, an OEPA employee, offered sled riding as a simplified illustration of peak and residual shear strength. She explained that, if you are sitting on a sled at the top of a hill, it takes a lot of strength or effort to move down from the top of the hill. The strength or effort necessary to move the sled can be thought of as peak strength; the most you need to get yourself moving. Then, as you come down the hill, not much effort is needed to keep moving -- that is residual strength. Ms. Wilson also used sledding to illustrate the concept of slickenside. Slickenside is an observable characteristic of soils where movement has occurred. In this example, the path in the snow made by the sled is evidence of slickenside having occurred. (Testimony, Wilson.)

220. Republic collected thirty-two samples from nine different locations at the Countwide site and ordered a variety of tests to ascertain the strength of the soil material that would be used in berm construction. The shear tests demonstrated that the mine spoil possesses a "decent shear strength." This finding was consistent with other investigations at this site and with published data that studied the appropriateness of mine spoil as structural fill. (Testimony, Carey.)

221. In addition to performing shear tests, the laboratory assigned soil classifications to the mine spoil and the natural soils found at the site. The laboratory classified the mine spoil as "either silty clay or clay silt with varying amount of rock fragments." The natural soils present at the site consist of less than five percent claystone-derived soil. Claystone is considered a highly plastic material with low shear strength. Shear strength test values for the claystone were similar to those published in scientific literature for these types of soils, yet Republic chose a lower,

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39 Most of the shear tests were "consolidated, undrained, triaxial shear tests," though the laboratory also conducted "direct shear tests" on a variety of samples so that they had measured and described shear strengths over a "wide range of stresses." Direct shear tests are similar to triaxial shear tests, except that the soil sample is drained before testing. (Appellees' Ex. 61; testimony, Carey.)

more conservative, shear strength value for its calculations. Tests of the colluvial and residual soils revealed that they have similar stability properties to each other and showed "shear strength versus normal stress relationship . . . that was a good fit for the data."[40] (Testimony, Carey.)

222. For a more "rigorous," "direct" observation of the soils than was available through a "site reconnaissance" or reviewing the boring data, Mr. Carey inspected test pits. While examining test pits, he looked for materials exhibiting instability and preexisting failure conditions, such as soils with high plasticity or "clay materials on thin planes" that may not be readily observable in borings. (Testimony, Carey.)

223. Because OEPA rules require the applicant to perform "worst-case scenario" analyses, Republic gathered data from areas presenting the greatest potential for failure. Areas requiring additional inspection were predominately located on the north slope and the northwest side of the site and the southeast corner of the expansion. In the numerous borings and six test pits, Mr. Carey found "no signs of preexisting failure planes or any indication of an unstable zone within the soil sliding over a more-stable zone as we approached the top rock or anything of that type." (Testimony, Carey.)

224. Appellants' construction concerns fall into two basic categories. Appellants allege that poor berm construction engineering will lead to berm failure and poor liner construction engineering may result in hydrostatic uplift. Each of these problems could result in a release of leachate into the surrounding soils and water. (Case File Items A.)

B. Berm Construction

225. Regarding berm construction, Appellants believe that Republic's slope stability calculations, testing methods and sampling selections were inadequate and failed to demonstrate that the berm design and construction would contain the solid waste. (Case File Items A.)

226. Regarding strength values used to calculate slope stability, Dr. Zhou, Appellants' expert, asserted that Republic erred in using a peak strength value to calculate the stability of colluvial and residual soils beneath the berms. Rather, Dr. Zhou argued that Republic should have used a residual value to calculate the berm's stability based on his observation of slickenside, or movement in the soils, and the presence of colluvium, which by definition has moved downhill to its current location. (Testimony, Zhou.)

227. Ms. Wilson stated that OEPA considers the use of residual strength value would have been inappropriate because one does not see movement in the materials. None of the test pits,

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40 "Colluvial soils" or "colluvium" is soil that has moved, under force of gravity, some amount after its formation. The colluvial soils at this site would "probably" have "started out as" residual soils further uphill from were they were found and over "thousands of years since they were formed, have crept down a little bit." Residual soil is formed from the "parent" of a bedrock and is found in "relatively the same place it originally existed." (Testimony, Carey.)

borings, regional data, or on-site visitations revealed any evidence of slickenside. Ms. Wilson stated that the colluvium at the site is more akin to a natural deposit than a material that has moved, despite the fact that colluvium, by definition, is a moved material. The OAC rules do not specify which strength value must be used, only that the applicant must demonstrate slope stability. Employing a residual strength value, Ms. Wilson asserted, would have been too conservative for this project. (Testimony, Wilson, Zhou.)

228. Publications by the United States Army Corps of Engineers, a federal agency involved in construction of large earthen dams and embankments in a wide range of geologic conditions throughout the world, support Republic's contention that using the residual strength value would be inappropriate at the Countywide site. The U.S. Army Corps' guidance document, "Engineering and Design Bulletin EM 1110-0-1902," revised in 2003, states "[f]or slopes without previous slides, the 'fully softened' strength should be used. This is the same as the drained strength of remolded, normally consolidated test specimens. For slopes with previous slides, the 'residual' strength should be used. This is the strength reached at very large shear displacements, when clay particles along the shear plane have become alligned in a 'slickensided' parallel orientation." (Appellees' Ex. 69; testimony, Carey.)

229. Dr. Zhou testified that the residual strength value for soils at Countywide would be a calculated value of approximately 26 or 27. Ms. Wilson testified that the actual peak strength value would be 34 or 35. Republic used a strength value of 30, a value between peak and residual strength. So, in her estimation, Mr. Carey actually used an average of the peak and residual strength, something referred to as a post-peak value or fully-soften shear strength, a value more conservative than perhaps was dictated by the project. (Testimony, Carey, Wilson, Zhou.)

230. Appellants also expressed concern about the laboratory tests arguing that most of the tests Republic selected to qualify the soils at the site were inappropriate because they are unable to calculate residual strength. During cross-examination, Dr. Zhou admitted that one reason he recommended the use of a residual value to calculate stability was because of his personal observation of soil movement near the site. He agreed, however, that on-site observation of the soils is only one step in assessing the strength of the soil and admitted that he had only viewed soils surrounding the Countywide site, not the soils on the site itself. He also agreed test pits and laboratory tests, such as the ones ordered by Republic, would provide more accurate information about the condition and strength of the soils. Significantly, Dr. Zhou agreed that residual strength values would be overly conservative if the berm toe, the weakest point of the berm, were constructed in a stair step fashion. Finally, he conceded that he was unaware that Republic had designed the berm toe to be built into the slope using "bonding benches" or a stair step method of construction. (Testimony, Zhou.)

231. At the close of testimony on slope stability, Mr. Carey stated that he believed the berm is a "safe, stable slope" and that Republic has satisfied OAC regulatory requirements regarding berm construction and stability. He based his belief on numerous things, including his education and experience, the generally-accepted literature in this field, and several on-site inspections. In

reaching this conclusion, he also reviewed data on the regional and site-specific soil properties, the hydrogeological and geotechnical borings and laboratory tests and reports assembled for the application, as well as the overall berm design. (Testimony, Carey.)

232. Dr. Zhou also asserted that Republic's berm stability calculations regarding strain compatibility were incorrect. Analysis of strain compatibility requires the geotechnical engineer to design for the effect of two materials stressing together, *i.e.* the geotechnical engineer must anticipate what occurs when one material reaches full strength at a particular rate and the other material reaches full strength at, perhaps, a different rate. In this instance, the geotechnical engineer must design to account for strain compatibility between the strength of the liner and the strength of the waste. (Testimony, Carey, Zhou.)

233. To demonstrate strain compatibility, Republic chose a waste cohesion value, or strength value, of 300. A cohesion value represents the strength of the waste; the higher the number, the stronger or more cohesive the waste. Dr. Zhou selected 224. Ohio EPA recommended a waste cohesion value of 535. (Testimony, Carey, Wilson, Zhou.)

234. Dr. Zhou asserted that the waste cohesion value selected by Republic was too large, and not compatible with the strength of the liner system. Dr. Zhou was concerned that the landfill liner will gain strength at a faster rate than the waste, and therefore, the liner will reach peak strength quicker than the solid waste will reach its peak strength. (Testimony, Zhou.)

235. Republic contends that Dr. Zhou's assumption is overly-conservative and would result in overengineering of the berm. The act of piling waste on the liner activates and increases the shear strength of the waste. Mr. Carey designed for a worst-case situation by assuming the liner reached post-peak strength, thus eliminating the issue of strain compatibility and movement of the liner or waste. (Testimony, Carey, Wilson.)

236. OEPA recommended a waste cohesion value of 535. Ms. Wilson testified that OEPA has worked with Dr. Tim Stark, who has done back calculations to ascertain the causes of landfill failures. Dr. Stark's calculations demonstrate that solid waste can be "really strong" with a cohesion value of 1000. She also noted that when reviewing the causes of failure in another landfill, inspectors observed vertical scarps, or steep slopes, of waste resting at 90 degree angles within the landfill perimeter. Dr. Stark suggested a waste cohesion value of approximately 500, with a friction angle of 35, would "bring the waste down to a level" so that it would be more compatible with the materials it may be overlying. (Testimony, Carey, Wilson and Zhou.)

237. In Ms. Wilson's opinion, Dr. Zhou's recommendations for both sheer strength and strain compatibility were overly conservative and unreasonable. In other words, building the landfill as specified by Dr. Zhou, would result in overengineering and this concept, taken to extreme, could lead to designing a project that could not be built. (Testimony, Wilson.)

238. Mr. Carey concluded his testimony about strain compatibility by stating that to a reasonable degree of scientific certainty, he believes that no strain incompatibility exists between

the solid waste and the landfill liner at the Countywide site. (Testimony, Carey.)

C. Liner Construction

239. Regarding Appellants concerns about the integrity of the liner and potential hydrostatic uplift, Appellents alleged that poorly engineered pipe penetration and failure to account for seepage in berm walls could result in hydrostatic uplift. (Case File Items A.)

240. Specifically, Dr. Zhou was concerned that leachate collection pipes penetrating the base of the liner would jeopardize the liner's integrity. The style of pipe penetration of concern to Dr. Zhou has not been used in general engineering landfill design since 1990 and Mr. Walker has not designed a liner with this type of pipe penetration since 1987. During cross-examination, Dr. Zhou admitted he had not fully reviewed Republic's application and testified that his concerns regarding pipe penetration were founded on his erroneous presumption that the landfill liner had 10 different points of pipe penetration, one for each of the cells in the expansion. Dr. Zhou was unaware that the liner design for the expansion included only one pipe penetration site, and that this one site was designed differently than he had assumed while forming his expert opinion. (Testimony, Walker, Zhou.)

241. The sole pipe penetration site in the expansion is located in Cell 9. The leachate collection pipe runs between Cells 1 and 9. It is constructed with two pipes - an internal pipe, which is the main pipe transporting leachate from Cell 1 to Cell 9, and an exterior pipe, which acts as a double containment system as the leachate pipe goes through the berm. A boot encases the exterior pipe. The boot is sealed with welds and tested in the field as it is being constructed. The complex dual-pipe design is assembled with the plastic boot going around the pipe at the point where the pipe, which is of the same grade as those used in natural gas pipelines, goes through the liner. The leachate collection pipe systen is designed so that it can move without tearing or damaging the liner around it. Mr. Walker opined that the single leachate collection pipe site, installed as designed, will not compromise the integrity of the liner at the Countywide site. (Testimony, Cary, Wilson.)

242. Ohio EPA performed an independent settlement analysis to ascertain whether the sole leachate collection pipe penetrating the liner would jeopardize the integrity of the liner and concluded that the liner will experience minimal settling and the boot and pipe design will produce no movement that may tear or damage the liner. (Testimony, Wilson.)

243. A key element in conducting a settlement analysis of a particular area is the assessment of the thickness of the materials that could potentially settle in that area. Ms. Wilson testified that, in this location, the bedrock is at an elevation of approximately 1085 feet and the berm is at an elevation of approximately 1096 feet, so "there is about 10-11 feet of material that could settle right where this berm is located." The majority of the berm is comprised of structural fill, which is very compact. Additionally, the berm construction process will further compact the material. The more compaction, the less settlement a material will experience. In this area, Ms. Wilson

estimated less than one inch of settlement would occur. One inch of settlement, Ms. Wilson testified, would have no impact on the pipe penetration site. The one inch settlement, with the aid of the flexible boot, would only affect the exterior pipe and "maybe deflect at the ends from waste settlement." It would not, however, affect the interior pipe in any way. (Testimony, Wilson and Zhou.)

244. Appellants also expressed concern about the placement of the liner and hydrostatic uplift. Hydrostatic uplift is a condition where ground water underneath the clay liner exerts pressure on the clay and could push up the FML before enough waste is deposited to counteract the uplift pressure. (Case File Items A; testimony, Bowman.)

245. The bottom of the expansion liner is located above the potentiomentric surface. Therefore, Republic believed hydrostatic uplift calculations were unnecessary, as the liner will not experience any upward pressure from water beneath the liner. (Testimony, Walker.)

246. Additionally, Appellants were concerned about excessive pressure from recharge or leachate in the mine spoil creating hydrostatic uplift. Most of the mine spoil will be removed or reworked, if used as structural fill, so mine spoil will not act as a conduit to drain water that could cause hydrostatic pressure against the liner. (Testimony, Galbraith, Walker.)

247. Additionally, any seeps present during construction of cells will be evaluated by Republic and OEPA. If warranted or required by OEPA, Republic will install underdrains to relieve pressure that may cause hydrostatic uplift. (Testimony, Vandersall.)

248. Moreover, Republic asserts that the engineered liner system and materials are more protective of ground water than what is required under OAC rules. The FML's permeability is 1 x 10^{-12} or $^{-13}$. The bentonite powder in the geosynthetic clay liner is twenty times less permeable than the OAC-approved compacted natural clay liner. Further, the bentonite powder provides additional protection; when it becomes wet it swells to fills in minor flaws in the liner and can seal around a puncture. (Testimony, Walker.)

249. The geocomposite drainage net and underdrain collection pipe are part of the ground water collection system. If a slope exhibits seepage, as is expected on the north side of the landfill, Republic will install a drainage net to intercept and route the drainage to a collection pipe that transports the drainage away from the liner, thus further protecting the liner and berm from excessive moisture, which can lead to hydrostatic uplift. (Testimony, Walker.)

250. Finally, Republic asserts that the Countywide landfill surpasses OAC design rules regarding erosion rates and leachate collection systems. The surface drainage channels on the landfill are designed to control the amount of erosion caused by runoff. Though only required to reduce the erosion rate to below 5 tons/acre/year, the Countywide landfill is designed to limit erosion to 2.2 tons/acre/year. Further, the permeability of the leachate collection pipes are designed to be up to 100 times more permeable than what was required by the OAC at the time Republic submitted its application. Using pipes with greater permeability allows Republic to

collect leachate more aggressively than was required under the OAC. (Testimony, Walker.)

251. Based upon the facts presented at the *de novo* hearing, the Commission finds that the Director had a valid factual foundation for concluding that Republic satisfied the OAC construction criteria relating to berm and liner construction

D. Post-Hearing Matters Relating to Group Four Assignments of Error

i. The Village's Motion

252. On November 20, 2006, the Village filed a Motion to Suspend Proceedings and to Remand Proceedings arguing "circumstances on the ground at the Countywide landfill [at the existing site] have so fundamentally physically altered and changed, that it is clear that the facts upon which the application to construct had been filed must now be reevaluated by the Director." The Village further argued that the "essential facts necessary to understand and possibly resolve this issue are not known by Bolivar, the Director, or Countywide." (Case No. 795332, Case File Item JJJJJ.)

253. The Village argues that "dramatic horizontal shifting and vertical displacement" occurred at Countywide "sometime after the Application for PTI was filed." And, this occurrence has "rendered the Application insufficient in its facts," which means that the PTI issued by the Director for the Countywide expansion was based upon an invalid factual foundation. (Case No. 795332, Case File Item JJJJJ.)

254. In support of its motion, the Village attached Director's Final Findings and Orders ("DFFOs) issued to Countywide on September 6, 2006. The Director's Final Findings and Orders served as the "resolution of verified complaints submitted by Mr. [William] Huth, the Tuscarawas County Commissioners, Village Council of the Village of Bolivar, Ohio and the Lawrence Township Trustees, under Ohio Revised Code ("R.C.") Section 3745.08." Rather than include the entire sixteen-page document in which OEPA addressed Republic's operations of the existing landfill site, the Commission has excerpted and summarized the following relevant portions of the DFFOs:

<u>FINDINGS</u>

- Mr. Huth alleged "he had witnessed the emission or escape of odors from Respondent's facility in such a manner and in such amount that constituted an air pollution nuisance as specified in OAC [Ohio Administrative Code] Rule 3745-15-07." In 2004, the City of Canton ("Canton") had received approximately 30 odor complaints by citizens and several complaints from its own employees who had smelled "offensive garbage odors" while driving by Countywide on I-77.

- In December 2004, the Stark County Health Department issued a 2005 solid waste disposal facility operating license to Countywide, in which it stipulated that Countywide must "identify and install" an odor suppression system by May 1, 2005 and develop an odor control contingency plan by March 15, 2005. Due to weather delays, the odor suppression system was not fully operational until June 1, 2005. From June through December 2005, Canton received four odor complaints.

- From January 2005 through August 2006, Canton received over 660 odor complaints; on some days, Canton received as many as 25 odor complaints.

- From January 2006 to the date of the DFFOs, September 6, 2006, Countywide voluntarily engaged in 23 listed activities to reduce odors at the site, including "*discontinuation of leachate recirculation to reduce moisture within the landfill*" and "*conducted laboratory testing of aluminum dross waste to determine what impact it has on the decomposition and odor generation*."

- In June 2006, Countywide requested a "[d]irector's discretionary exemption to install additional gas collection and control systems to reduce the odors generated by the facility." The Director granted the discretionary exemption under OAC 3745-31-01(PPP)(1)(a)(vi) because the "minor increase [of emissions] was determined to be environmentally beneficial and was not prohibited under any Ohio EPA rules or the federal Clean Air Act." Ultimately, OEPA determined that the requested "increase in flare capacity was not sufficient to control the gas generated by the landfill and to reduce the odors to an acceptable and tolerable level."

- *"The 'affected area' of the landfill has settled a minimum of twenty feet and has moved horizontally a minimum of six feet. Current data indicates that the affected area is continuing to show vertical and horizontal movement."*

- Based on his findings, the Director determined that Countywide "had and is violating OAC Rule 3745-15-07, the terms and conditions of [its current] PTI and its Title V Permit, and ORC § 3704.05(C) and (G) by causing an air pollution nuisance as alleged in the verified complaints."

ORDERS

- Countywide was required to bring its facility into compliance with the "air pollution nuisance prohibition in OAC Rule 3745-15-07 by no later than December 15, 2006 . . . ."

- Within twenty-one days after the effective date of these orders, Countywide must prepare and submit an "approvable Odor Sampling and Analysis Workplan (the 'Workplan')," which is:

- "fully capable of characterizing the individual constituents and the complete chemical composition and concentration of the odor and its source of the generation;

- fully capable of determining the impact to releases beyond the facility boundary and the risk it presents to public health, safety and the environment; and

- fully capable of characterizing the individual constituents and the complete chemical composition and concentration of the leachate at the landfill."

- The Workplan must include a leachate sampling plan, which must be conducted at a minimum of monthly and odor-related sampling, which must be done at a minimum of weekly, unless otherwise agree to by the Director.

- Countywide must "install, implement, operate and maintain" odor control measures pursuant to eleven listed criteria.

- Countywide must begin monitoring and keeping record of the "strength, location and time of any odor identified by plant personnel at the facility's boundary." Detected odors must be investigation for possible causes.

- Pursuant to R.C. § 3704.03(R), Countywide must expand its gas collection and control beyond what is specified in its current PTI and Title V permits. The Orders enumerate design and operation specifications for the gas collection and control expansion. Further, Countywide must install additional gas extraction wells and connect them to the gas collection and control system.

- Within 30 days after the effective date of the DFFOs, *Countywide must submit an "acceptable Slope Stability Analysis and Monitoring Plan (the 'Plan').*[41] *The Plan shall include, but not be limited to the following:*

  a. *an evaluation of current slope stability conditions within the affected areas;*

  b. *a narrative describing [Countywide's] continued slope stability monitoring of the affected areas; and*

  c. *a narrative describing [Countywide's] action to achieve slope stability as required by OAC Rule 3745-27-08.*" (Emphasis added.) (ERAC Case No. 795323, Case File Item JJJJJ.)

[41] On October 6, 2006, Republic timely submitted to Ohio EPA the "South Slope – Countywide RFD, Stability Analysis and Monitoring Plan" designed to satisfy the portion of the DFFO relating to slope stability analyses. (ERAC Case No. 795334, Case File Item, IIIIII, Attachment B.)

255. On December 1, 2006, Republic responded to the Village's Motion to Suspend Proceedings and to Remand Proceedings contending that the Village's concerns are exclusively "operational issues" relating to the existing site and not relevant or linked to the issues raised in the Village's notice of appeal regarding the PTI for expansion at Countywide. (ERAC Case No. 795323, Case File Item VVVVV.)

256. On January 4, 2007, the Director responded to the Village's motion by stating the Village "raises operational and compliance issues related to the original 88-acres . . . ." Moreover, the Director argued that the Village failed to establish a connection "between the original area that is not the subject of this appeal and the expansion area," which is the subject of the present appeal. (Case No. 795323, Case File Item RRRRR.)

ii. The District's Motion

257. The District, incorporating the supporting brief filed by the Village in its November 20th motion, filed a similar Motion to Suspend Proceedings and to Remand Proceedings in its own case on December 26, 2006. Specifically, the District argues that the September 6th DFFOs were issued to reduce odors emanating from Countywide as a result of aluminum dross in the landfill reacting with leachate being recirculated at the site. The District also expresses concern about "significant movement of the landfill mass, excessive heat in the range of 230° to 250° Fahrenheit, and an extraordinary increase in leachate, from 400,000 to 600,000 gallons a month to 3,000,000 to 6,000,000 gallons a month." (ERAC Case No. 795334, Case File Item YYYYY.)

258. In support of its Motion, the District included two affidavits with attachments, a copy of the September 6th DFFOs issued to Countywide, and a copy of the Slope Stability Analysis and Monitoring Plan ("Slope Stability Analysis") prepared by Republic, as required by the September 6th DFFOs. (ERAC Case No. 795334, Case File Item YYYYY.)

259. The District's first affidavit is of Mr. Joseph Amabeli, who is "in charge of the waste water treatment plant for the City of Alliance, Ohio." Referenced in his affidavit, and attached to the District's motion, is a document from the City of Alliance's waste water treatment plant detailing the number of gallons of leachate received from Countywide from the first quarter of 2000 through the third quarter of 2006. (ERAC Case No. 795334, Case File Item YYYYY, Exhibit A.)

260. The second affidavit is of Mr. Donald R. Green, P.E., currently employed by Michael Baker Jr., Inc. Referenced in Mr. Green's affidavit, and attached to the District's motion, is an Annual Climatological Summary. In his affidavit, Mr. Green states that he believes the dramatic increase in leachate "cannot reasonably be explained by an increase in precipitation or decomposition of the landfill mass." He believes, the "most likely explanation is that water is migrating into the landfill from another source, such as the water table adjacent to the landfill liner." Specifically, Mr. Green asserts that the records he "reviewed demonstrated that a water

table exists to a height of 66 feet above the bottom of the liner for Cells 5A and 5D at the Countywide facility. This water table is immediately adjacent to the Countywide landfill." (ERAC Case No. 795334, Case File Item YYYYY, Exhibit B.)

261. Mr. Green is also concerned that excessive heat created by the aluminum dross reacting with recirculated leachate in waste mass will degrade and shorten the life span of the landfill liner. He states that he was advised by an Ohio EPA representative that temperatures in the landfill have reached 230°F to 250°F. Such high temperatures can deplete anti-oxidants and accelerate the degradation of the landfill liner. Further, he stated "[l]andfill liners are not designed to be stretched to a significant extent. The amount of movement in the landfill mass, which is reflected in the stability analysis report, would significantly exceed what the liner could withstand if it was exposed to such movement." (ERAC Case No. 795334, Case File Item YYYYY, Exhibit B.)

262. On January 5, 2007, Republic responded by stating "the District fails to point to any legitimate basis" for its requested relief and "confuses issues of compliance and permitting in an effort to find support for its request." Further, Republic argued that the District asserted "vague generalizations" related to operational issues, which "do not invalidate or otherwise change the underlying design and plans submitted in the landfill expansion permit." Moreover, Republic identified numerous deficiencies with Mr. Green's affidavit, including that the document contains hearsay and fails to cite specific "'diagrams,' 'records' or other 'information' [he] relied upon to support his conclusions."[42] (ERAC Case No. 795334, Case File Item BBBBBB.)

263. In direct rebuttal to the District's allegations, Republic contends that the District's assertions of increased leachate generation, higher temperatures in the waste and potential liner damage are "used out of context or in the abstract," "completely misinterpret[s] the data," or are "flatly wrong." To support its position, Republic relied on the following exhibits: 1) two affidavits, one dated August 25, 2006 and one date January 4, 2007, of Mr. Peter J. Carey, who was admitted as an expert at the *de novo* hearing in the underlying matter; 2) an excerpt from the transcript of the *de novo* hearing testimony from February 2, 2005; and 3) an article from the June 2005 publication of the *Journal of Environmental Engineering* entitled "Estimating the Hydraulic Conductivity of Landfill Municipal Solid Waste Using the Borehole Permeameter Test." (ERAC Case No. 795334, Case File Item BBBBBB.)

264. Regarding leachate generation, Republic submits that the increase in leachate noted by the District is predominately due to an increase in leachate processing, not leachate generation. As documented in the September 6th DFFOs, Republic reduced and eventually discontinued recirculation of the leachate during the relevant timeframe, which predictably increased the

[42] On January 9, 2007, the Director filed his response to the District's motion asserting the same argument it asserted in its response to the Village's November 20, 2006 motion. *i.e.* "[t]he District raises operational and compliance issues related to the original 88-acres of the landfill . . ." and that the District failed to establish a connection "between the original area that is not the subject of this appeal and the expansion area," which is the subject of the instant appeal. (ERAC Case No. 795334, Case File Item DDDDDD.)

amount of leachate Republic sent off-site to the City of Alliance for processing. Further, settlement of the waste in the existing cells at the Countywide site has affected the site's grading, causing increased opportunity for "rainwater infiltration" into the waste mass; thus, increasing leachate production at the Countywide site. Finally, Republic notes that Mr. Green failed to identify any record supporting his assertion that a water table is present sixty-six feet above the liner floor in Cell 5A and 5D. (ERAC Case No. 795334, Case File Item BBBBBB, Exhibits A, C.)

265. Regarding increased temperatures in the waste and their potential effect on the permeability of the waste and stability of the liner, Republic argues that the District's data and Mr. Green's assumptions are unrelated to the expansion and are not supported by generally-accepted landfill engineering principals. (ERAC Case No. 795334, Case File Item BBBBBB, Exhibits A, C.)

266. Finally, Republic submits that the liner remains unaffected by any activity, settlement, or otherwise, occurring "at elevations significantly above the liner." More importantly, Republic asserts that the Slope Stability Analysis confirms that movement occurring in the waste is localized "well above the landfill liner system" and that there is "no indication of any movement in any area that could affect the integrity of or breach the liner." (ERAC Case No. 795334, Case File Item BBBBBB, Exhibit A, D.)

267. Republic concluded its opposition to the District's motion by stating that the Director's September 6th DFFOs have "absolutely nothing to do with the stability of the external berms challenged by the District during its case in chief." (ERAC Case No. 795334, Case File Item BBBBBB, Exhibit D.)

268. On January 16, 2007, the District replied to Republic's opposition, noting that while these events may indeed be operational, "damage to the liner underneath the landfill, being vertically expanded, is also a permit issue." (ERAC Case No. 795334, Case File Item EEEEEE.)

269. The District noted that a number of facts had "recently emerged" demonstrating the necessity of a formal assessment by Ohio EPA of the conditions at the Countywide site. The District pointed to reports of increased temperature in the waste mass and near the liner system and reiterated its position that leachate generation has increased at the site. In support, the District offered several attachments: 1) the affidavit of Mr. David Held, who serves as the Director of the District; 2) a map presented by Mr. Princic at a public meeting held January 5, 2006; 3) an affidavit of Daniel S. Fisher, an employee of Michael Baker Jr., Inc., who testified as an expert during the *de novo* hearing in the underlying matter; 4) a second affidavit of Mr. Green; and 5) a white paper published by the Geosynthetic Institute dated June 7, 2005 entitled "Geomembrane Lifetime Predictions: Unexposed and Exposed Conditions." (ERAC Case No. 795334, Case File Item EEEEEE.)

270. Mr. Held averred that during a public meeting conducted on November 16, 2006, Mr. Kurt Princic, from Ohio EPA, "reported that the Countywide landfill had experienced

temperatures of between 230ºF and 250ºF." Further, during a public meeting conducted on January 5, 2006, Mr. Princic reported "aluminum dross had been disposed of at the Countywide facility throughout the 88-acre area of the original landfill, but was concentrated in Cells 4A, 4B, 6A, 1, and 3. [Mr. Princic] indicated his belief that the aluminum dross was the source of an intense reaction at the landfill resulting in high heat and odors. . . . [Mr. Princic] also stated that [portions of] Cell 6A contained a reinforced berm which was installed to address substantial movement in the landfill mass." Finally, Mr. Held stated that Mr. Princic told the group that "the temperature of the leachate exposed to the liner was around 120ºF." Significantly, the District failed to provide a transcript of or affidavit from Mr. Princic testifying to his own statements regarding his purported comments. (ERAC Case No. 795334, Case File Item EEEEEE, Exhibits A, B.)

271. Mr. Fisher offered statements based on his review of documents in the underlying matter and Mr. Carey's January 4, 2007 affidavit. Essentially, Mr. Fisher disputes and reanalyzes the testimony and data discussed during the *de novo* hearing and concludes that the water table is high enough to exert pressure on the liner. (ERAC Case No. 795334, Case File Item EEEEEE, Exhibit C.)

272. Mr. Green bases the statements contained in his affidavit on Mr. Carey's affidavit of January 4, 2007, on Mr. Held's affidavit regarding Mr. Princic's comments, and on his review of a "white paper published by the Geosynthetic Insitute on June 7, 2005." Mr. Green stated that the studies "summarized in the white paper were conducted under simulated landfill conditions. . . . The white paper studies show, that at certain temperatures, heat damages landfill liners by depleting antioxidants, which then can subject the landfill liner to relatively rapid degradation. . . . The information provided by Ohio EPA's representative indicates" that liners at the Countywide site were exposed to temperatures that would "cause a substantial decrease" in the life expectancy of the Countywide landfill liner. Mr. Green has never visited the Countywide site. (ERAC Case No. 795334, Case File Item EEEEEE, Exhibits D, E.)

273. Mr. Green also stated, that based on his review of Republic's Slope Stability Analysis, the "area of movement" of the liner is greater than described by Republic. He concluded that "[f]urther data and analysis would be necessary to identify the extent of the area affected by movement." (ERAC Case No. 795334, Case File Item EEEEEE, Exhibits D, E.)

274. On January 30, 2007, Republic filed its sur-reply to the District's reply brief arguing that the District's arguments "are not based on objective data or facts . . . . " In support of its position, Republic attached the following documents: 1) an affidavit of Mr. Tim Vandersall, General Manager of Countywide, who testified in the underlying matter; 2) a copy of Republic's Slope Stability Analysis; 3) a 1994 letter from Ohio EPA reviewing the hydraulic conductivity of the Clarion shale, which was admitted into evidence during the *de novo* hearing; and 4) an article published in June 1998 in the *Journal of Geotechnical and Geoenvironmental Engineering* entitled "Antioxidant Depletion Lifetime in High Density Polyethylene Geomembranes." (ERAC Case No. 795334, Case File Item IIIIII.)

275. In his affidavit, Mr. Vandersall stated that he has had "several communications with Kurt Princic of Ohio EPA regarding leachate temperatures at the landfill. . . . The highest leachate temperature reading that I have provided Mr. Princic was 116°F. This temperature reading is the highest leachate temperature reading experienced at the facility to date." He also stated that to his knowledge, OEPA has not "obtained any temperature readings. If temperature readings were requested by the Agency, that would be something that I would be aware of and been involved in." (ERAC Case No. 795334, Case File Item IIIIII, Exhibit A.)

276. Regarding the water table and permeability of the Clarion shale, in a 1994 letter, Ohio EPA agreed with Republic's assessment that the Clarion shale acts as an aquitard and is not a significant zone of saturation. (A more detailed discussion of the 1994 OEPA letter addressing the hydraulic properties of the Clarion shale can be found earlier in this opinion at Findings of Fact 124 – 126.) (ERAC Case No. 795334, Case File Item IIIIII, Exhibit C.)

277. On February 8, 2007, the District filed a supplemental brief addressing the issue of reported temperatures in the landfill waste and at the landfill liner. In support the District attached: 1) an article published in the *Akron Beacon Journal*; 2) "Appendix B Antioxidant Depletion Time in High Density Polyethylene Geomembranes;" 3) another article published in the *Akron Beacon Journal*; and 4) transcript pages 927 - 944. (ERAC Case No. 795334, Case File Item MMMMMM.)

278. Specifically, the District asserts that Mr. Vandersall informed a reporter from the *Akron Beacon Journal* "[t]he leachate at the bottom of the landfill closest to the synthetic liner has a temperature of 120 degrees . . . and that's not hot enough to threaten the liner." The District also relies on the journal article cited by Republic to substantiate their assessment that damage to the liner will occur at the temperatures reported by Republic and Ohio EPA. Additionally, the District notes that the *Akron Beacon Journal* reported on alleged dissention between Ohio EPA's district and central office regarding the data collected from the Countywide site. (ERAC Case No. 795334, Case File Item MMMMMM.)

279. Further, the transcript pages provided by Appellants are not readily identifiable on their face, but were described by counsel as testimony by Mr. Dan Fisher. Mr. Fisher, admitted as an expert during the de *novo hearing* in, among other things, geology and hydrogeology, testified about the presence of fractures in the Clarion shale. Mr. Fisher testified that he believed a systematic fracture network connects the Clarion shale to the mine spoil and uppermost aquifer. He believes that the drilling activity logged in the MW20 and MW20A boring logs support the presence of an aggressive fracture network that will be able to rapidly move leachate from the landfill to the uppermost aquifer. (A full discussion of the effects of fractures at the Countywide site and the activities noted in the drilling logs of MW20 and MW20A is provided earlier in this opinion.) (ERAC Case No. 795334, Case File Item MMMMMM.)

CONCLUSIONS OF LAW

General Law

1. At the close of a *de novo* hearing, the Commission is statutorily-required to determine whether the Director's actions were unlawful or unreasonable. R.C. § 3745.05.

2. "Unlawful" means that the action taken by the Director was not in accord with the relevant, applicable law. "Unreasonable" means that the action was not in accord with reason, or that it had no valid factual foundation. The Commission will find the action under appeal unlawful or unreasonable only in those cases where the evidence establishes that the Director's action was not in accord with the relevant law, or where there was no valid factual foundation for his action. *Citizens Committee to Preserve Lake Logan v. Williams* (1977), 56 Ohio App.2d 61; *Northeast Ohio Regional Sewer Dist. v. Shank* (1991), 58 Ohio St.3d 16.

3. The Tenth District Court of Appeals, in emphasizing its holding in *Citizen's Committee*, further clarified:

> . . . We also stated in *Citizens Committee* that 'the ultimate factual issue to be determined by the board upon the *de novo* hearing is *whether there is a valid factual foundation* for the Director's action and not whether the Director's action is the best or most appropriate action, nor whether the board would have taken the same action.' (Emphasis by court.) *Swan Super Cleaners, Inc., v. Tyler* (1988), 48 Ohio App.3d 215, citing *Citizens Committee*, s*upra*.

4. Further, the court of appeals upheld the Commission's ruling in *Swan Super Cleaners*, wherein the Commission found an OEPA regulation to be unreasonable because the regulation lacked 'factual support.' The Tenth District noted, "[w]ithout a factual foundation [the regulation under review] becomes 'unreasonable' based on our definition in *Citizens Committee*." *Id.* at 220, 221.

5. Conversely, where the evidence before the Commission demonstrates that the Director's action was lawful and reasonable, the Commission must affirm the action of the Director. In such instances, the Commission may not substitute its judgment for that of the Director. Further, in the event that qualified expert witnesses disagree on a matter within their area of expertise, the Commission will generally defer to the opinion offered by the Director's expert witness. See *CF/Water v. Schregardus* (October 27, 1994), Case No. 112570, 1994 Ohio EVN LEXIS 15*18; *American Legion Post 526 v. Ioannides* (December 31, 1991), Case No. 292410, 1991 Ohio ENV LEXIS 8. Further, the Commission is cognizant of the well-accepted principal that deference should be granted to the Director's "'reasonable interpretation of the legislative scheme' governing his Agency." *Sandusky Dock Corp. v. Jones* (2005), 106 Ohio St.3d 274, citing *Northwestern Ohio Bldg. & Constr. Trades Council v. Conrad* (2001), 92 Ohio St.3d 282; *State ex rel. Celebrezze v. National Lime & Stone Co.* (1994), 68 Ohio St.3d 377; *North Sanitary Landfill, Inc. v. Nichols* (1984), 14 Ohio App.3d 331.

Assignments of Error

Assignments of Error: Group One

6. Appellants allege that the Director unlawfully or unreasonably issued a permit in which Republic failed to adequately characterize the regional and site-specific geology and hydrogeology of the Countywide site. More specifically, Club 3000 alleged that the Director approved Republic's application even though it contained an invalid concept of the geology and hydrogeology and an inadequate characterization of the geology and hydrodrogeology in the region and at the site. Club 3000 believes these errors could lead to contamination of a large buried valley aquifer near the site. The District alleged that the Director failed to consider the risk of contamination that fractured bedrock under the landfill may cause. And, the Village of Bolivar alleged that neither Republic nor the Director properly or adequately characterized the complex geology and hydrogeology under the facility, thus, area ground water is not properly protected from contaminates that could potentially be released from the Countywide facility.

7. Ohio Administrative Code Section 3745-27-06 [Sanitary landfill facility permit to install application.] requires every applicant for a permit to install a sanitary landfill to submit an application which adequately characterizes the geological and hydrogeological nature of the site. The section also outlines what a PTI application for a sanitary landfill must include. In pertinent part, Subsection (A) states:

> (A)(1) A permit to install application as required by section 3734.05 of the Revised Code [Licensing requirements; application for installation and operation permit; public information sessions and hearings.] shall be submitted, and approved by the director, before the establishment or modification of the sanitary landfill facility is begun. The permit to install application shall:
>
> > (a) Contain all the information required in paragraphs (B) and (C) of this rule so that the director can determine if the criteria set forth in rules 3745-27-07 [Additional criteria for approval of sanitary landfill facility permit to install applications.] and 3745-31-05 [Criteria for decision by the director.] of the Administrative Code are satisfied; and
> >
> > (b) Contain detail engineering plans, specification and information that shall be presented in a manner acceptable to the director or his authorized representative. Detail shall be sufficient to allow clear understanding for technical review of the application, to give assurance that the facility is designed and will be operated in accordance with Chapters 3745-27 and 3745-37 of the Administrative Code, and be readily understandable by operating personnel at the facility. . . .

8. Subsection (B) of OAC 3745-27-06 enumerates an extensive list of "detail engineering

plans" and "specifications information" that an applicant must include in its application and states that this information "shall be shown by means of drawing and narrative descriptions where appropriate."

9. Subsection (C) of OAC 3745-27-06 requires the applicant to address the following topics in a narrative format:

> (1) Summary of the site environs and demonstration that the sanitary landfill facility will meet the criteria . . . specified in 3745-27-07 and 3745-31-05 . . . .
>
> *(2) A hydrogeologic site investigation report, which shall at a minimum include:*
>
> *(a) Sufficient hydrogeologic information to allow the director to:*
>
> *(i) Determine the suitability of the site for solid waste disposal, and*
>
> *(ii) Identify and characterize the hydrogeology of the uppermost aquifer system and all geologic strata that exist above the uppermost aquifer system; and*
>
> *(iii) Sufficiently characterize the site geology to allow for the evaluation of the proposed design of the sanitary landfill facility and to ensure that it will be in compliance with the requirements of this chapter; and*
>
> (b) *A description, based on publicly available information, of the regional hydrogeology of the proposed sanitary landfill facility*. This shall include, but may not be limited to:
>
> (i) The *identification of regional aquifers*; and
>
> (ii) The *well logs of public and private water supply wells within one mile . . .*; and
>
> (iii) The average yield of water supplies within one mile . . .; and
>
> (iv) The *direction of ground water flow in the regional aquifer(s)*; and
>
> (v) The *identification of recharge and discharge areas of the regional aquifer(s)*; and
>
> (vi) The *identification of any public water supply wells within ten*

miles . . .; and

(vii) Regional stratigraphy; and

(viii) The structural geology, including a description of local and regional structural features; and

(ix) A description of the *regional geomorphology*, including the location of surface water bodies, flood plains, etc. The description shall include an analysis of any topographic features that may influence the ground water flow system; and

(c) A detailed description of the *hydrogeology under the proposed sanitary landfill facility*. This description shall be based on data collected from boreholes, peizometers, and test pits. The description shall include but may not be limited to:

(i) A *description of the consolidated and unconsolidated stratigraphic units from the ground surface down to the base of the uppermost aquifer system*

. . .

(d) A *description and quantification of the ground water quality of the uppermost aquifer system and all the significant zones of saturation above the uppermost aquifer system*. . . .

(e) A detailed description of:

(i) The *drilling and soil sampling methods used in characterizing the soil and hydrogeologic properties of the proposed sanitary landfill facility*; and

(ii) The *analytical procedures and methodology used to characterize the soil and rock materials obtained from test pits and borings*; and

(iii) The *methodology, equipment, and procedures used to define the uppermost aquifer system and all significant zones of saturation above the uppermost aquifer system* . . . .

(iv) The *methodology, equipment, and procedures used to determine the ground water quality in the uppermost aquifer system and any significant zones of saturation above the uppermost aquifer system* . . . .

(3) Detail the measures and operations to control and manage the following:

(a) Leachate production and migration; and

(b) Ground water infiltration; and

(c) Explosive gas migration; and

(d) Fires, dust, scavenging, vectors, erosion, blowing litter, and birds; and

(e) Surface water run-on and runoff and sediment discharge.

(4) . . . [Numerous calculation requirements.];

(5) [Required discussions relating to illustrations in the detail engineering plans.];

(6) [Required discussions relating to operational information.]

(7) The following plans:

(a) *Ground water detection monitoring plan* . . ., and if applicable the ground water quality assessment plan and/or corrective measures plan . . .; and

(b) Surface water monitoring plan, if required by the Director. . . .; and

(c) Leachate monitoring plan . . .; and

(d) Leachate contingency plan . . . ; and

(e) Explosive gas monitoring plan . . .; and

(f) *The quality assurance/quality control plan* . . .; and

(g) *The 'final closure/post closure plan'* . . . .; and . . . .

(8) [Various contingency plans.]

(9) [Identification of various geological features and governmental entities and assurances and demonstrations relating to certain portions of the federal Clean Water Act.] (Emphasis added.) *Id.*

10. Significantly, Appellants do not allege that Republic submitted an incomplete application or that it neglected to submit relevant information. Rather, Appellants believe the Director issued a permit for which Republic failed to adequately characterize regional and site-specific geology and hydrogeology at the Countywide site.

11. At the *de novo* hearing, Appellants presented evidence and testimony to support their contention that Republic failed to adequately characterize the site based on Republic's inaccurate interpretation of the DRASTIC report and misidentification of drainage patterns, the uppermost aquifer, the significant zone of saturation, the permeability of the Clarion shale, the presence of fractures in the Clarion shale and the presence of seeps and springs surrounding the site. Further, Appellants asserted Republic failed to select investigative tools that could properly characterize the geology and hydrogeology at the Countywide site. The Commission disagrees.

12. Evidence presented at the *de novo* hearing supports a finding that Republic submitted an application that complied with the requirements of OAC 3745-27-06(C)(2)(a), set out above.

13. On February 14, 2001, Republic submitted its application for expansion of the Countywide site. The application contained five separately bound volumes, which OEPA employees reviewed extensively over a more than two year period. The first two volumes contained the application itself. The other three volumes contained engineering plans, a hydrogeologic investigation and a ground water monitoring plan. As a reference tool, Republic also included a chart listing and summarizing OEPA rules applicable to municipal solid waste landfills and identified where the corresponding information could be located in the application.

14. The 2001 Hydrogeologic Report contained information relating to the regional geology and hydrogeology based on publicly available information, as well as a detailed description of the geology and hydrogeology in the region. The report also included site-specific information based on data collected from over 200 borings, approximately 100 wells and piezometers and approximately 100 hydraulic tests. Further, the report included water level data collected on over 40 separate dates between 1995 and 2000, spring identifications and analytical results of ground water quality samples collected from 11 wells.

15. In arguing that Republic failed to adequately characterize the site, Appellants allege that Republic should have placed greater reliance on the DRASTIC report, particularly the verbage describing the region and the illustration depicting a fracture running through the generalized stratigraphy. The Commission disagrees.

16. The DRASTIC report itself advises the reader that the report is a planning tool, and is not designed to replace site-specific investigations. Further, testimony by Mr. Sugar, who at one point in his career, drafted DRASTIC maps, confirmed that DRASTIC maps are good planning tools, but should not replace on-site investigations. He further noted that, based on the DRASTIC report, the location sited for expansion is in an area with a low pollution index and looks "perfectly acceptable to be investigated for a landfill."

17. Appellants also argued that Republic failed to properly characterize the regional drainage pattern controlling water in the area of the Countywide site. Appellants believe the area drainage is controlled by a trellis pattern, which could potentially allow a highly-connected fracture network to control the drainage and ground water flow in this regional setting. The Commission disagrees.

18. Evidence presented at the *de novo* hearing supports that a dendritic drainage pattern is present at the site. Mr. Fisher, an expert for the Appellants, prepared an exhibit that he believed demonstrated the presence of trellis patterns. An expert for Republic, Mr. Razem, noted that Appellents' map was inaccurate because the area depicted was too small to accurately portray the drainage patterns in the region. Further, Mr. Razem confirmed his belief that dendritic patterns control drainage in the region through personal observations, a review of two textbooks defining drainage patterns and an understanding of the stratigraphy at the Countywide site.

19. Appellants also argued that Republic failed to adequately characterize the site because it misidentified the significant zone of saturation, the uppermost aquifer, and the permeability of the Clarion shale. Appellants believe that the mine spoil should be characterized as part of the uppermost aquifer system and the Clarion shale acts as a leaky aquifer between the mine spoil and the Putnam Hill limestone/Brookville coal. The Commission disagrees.

20. Evidence presented at the *de novo* hearing supports that Republic accurately identified the significant zone of saturation as the mine spoil. Republic's experts concluded that the mine spoil exhibits the characteristics of a significant zone of saturation because the mine spoil has inconsistent saturation, is discontinuous and transient in nature, and contains non-potable water, which can be monitored because of its potential to move horizontally away from the solid waste facility. Republic also listed several reasons the mine spoil could not be classified as part of the uppermost aquifer system: it occurs only on the sides of the facility and will be removed in the small areas where it would be under the facility, it does not extend off-site, it lacks lateral extent, and its water is non-potable.

21. Regarding Republic's identification of the uppermost aquifer and the permeability of its confining unit, Appellants contend that Republic erred in identifying the Putnam Hill limestone/Brookville coal as the sole uppermost aquifer system and the Clarion shale as its confining unit. Rather, Appellants believe the Putnam Hill limestone/Brookville coal is a "semi-confined aquifer" and is connected, via a significant fracture network, to the Clarion shale, which acts as a "leaky" aquifer, not a confining unit. The Commission disagrees.

22. Evidence presented at the *de novo* hearing supports that Republic accurately identified the Putnam Hill limestone/Brookville coal as the uppermost aquifer and the Clarion shale as the confining unit, or aquitard, resting above it. Neither scientists nor OEPA have guidelines or regulations requiring a specific permeability range to classify a unit as an aquitard. Rather, it is the aquitard's relationship to other units that makes it a confining unit. Generally, the permeability of an aquitard is one order of magnitude lower than the unit beneath it. In this instance, the permeability range of the Clarion shale is two orders of magnitude lower than the

Putnam Hill limestone/Brookville coal.

23. Regarding the presence of fractures at the Countywide site, Appellants argue that Republic failed to adequately characterize the site because it did not acknowledge a significant network of fractures. Appellants allege this unaccounted-for network of fractures could result in a significant amount of hydraulic communication between the strata at the site. The Commission disagrees.

24. Evidence presented at the *de novo* hearing supports the Director's decision to accept Republic's characterization, *i.e.* although some fractures are present, no fracture network exists that will transmit water differently than characterized in their hydrogeologic report. To substantiate the presence of a fracture system, Appellants cite to fractures and water loss noted on borehole logs during the drilling process. Experts who inspected Republic's borehole logs determined that the fractures are small, discontinuous and unmappable. The fractures noted in the borehole logs could not create the brick-layer like structure as asserted by Appellants. Further, water loss during the drilling process is not uncommon. The noted behavior of MWs 20 and 20a during the drilling process does not prove the Putnam Hill limestone/Brookville coal is connected by fractures to the Clarion shale. If a fracture had connected MW20 with the Putnam Hill limestone/Brookville coal, MW20 would have drained to that formation and would not have had water in it when MW20A was drilled. Further, MW 20 slug test results showed low permeability in the Clarion shale.

25. Additionally, personal observations made and exhibits presented by Appellees' experts revealed no evidence of a fracture system like the one advanced by Appellants. Indeed, Appellees exhibits demonstrated a poor correlation between the presence of fractures and the presence of water in the Clarion shale.

26. Importantly, if an aggressive fracture system, capable of producing the hydraulic communication posited by Appellants, were present at the Countywide site, the fractures would have drained the formation and no saturated zone would exist. Further, in a 1994 letter from OEPA responding to Republic's inquiry as to whether the Clarion shale is a significant zone of saturation, OEPA concluded "[t]he Clarion shale is a very poor sustainer of ground water flow as witnessed by monitoring wells installed . . . being purged dry during routine sampling and during past in-situ well testing." Ohio EPA concluded by stating the Clarion shale lacks "any of the properties needed to act as a preferential pathway of migration away from the limits of solid waste placement."

27. Regarding seeps and springs present around the Countywide site, Appellants allege that Republic failed to adequately characterize the site because it failed to recognize that the numerous seeps and springs surrounding the site are formed primarily from recharge filtering down through the formation. The Commission disagrees.

28. Evidence presented at the *de novo* hearing supports Republic's assertion that seeps and springs are formed by regional ground water outcropping at the hillside, not by recharge filtering

down through the formations. The presence of seeps and springs in their known locations is consistent with the premise that the ground water flows horizontally along the fractured Putnam Hill/Brookville coal from off-site recharge flowing from the north/northwest and expresses itself as a seep or spring on the hillside where the claystone layers intersect the slope.

29. Regarding whether Republic selected the correct field tests to characterize the site, Appellants argue that Republic was precluded from adequately characterizing the site because its conceptual model failed to anticipate vertical hydraulic communication occurring at the site. Appellants assert Republic should have conducted additional tests such as angled borings, dye-tracer and geophysics testing. The Commission disagrees.

30. Evidence presented at the *de novo* hearing supports that the field tests selected by Republic were tests that could, and did, adequately characterize the Countywide site. None of the tests recommended by Appellants were warranted at this site. Angle borings are expensive and rarely used. Running dye-tracer tests in the Clarion shale would have been useless because it would have taken decades to see the dye move, assuming it had not dissipated by that time. And, geophysics tests would not have produced any additional useful information.

31. In summary, the Commission rejects Appellants' assertions relating to whether Republic adequately characterized the geology and hydrogeology at the Countywide site. Having found that the Director possessed a valid factual foundation to determine that Republic adequately characterized the geology and hydrogeology at the site, the Commission, correspondingly, finds the Director's action reasonable in this regard.

32. In reaching his conclusion that Republic satisfied the regulations regarding characterization of geology and hydrogeology (OAC 3745-27-06, generally, and OAC 3745-27-06(C)(2)(a), more specifically), the director extensively reviewed, examined and considered numerous documents and sources, including the 2001 Hydrogeologic Report and the 2001 Ground Water Monitoring Plan.

33. The Commission finds that Republic's application contained sufficient hydrogeologic information to allow the Director to determine the suitability of the site for solid waste disposal, identify and characterize the hydrogeology of the uppermost aquifer and all geologic strata that exist above the uppermost aquifer system and to sufficiently characterize the site geology in such a way that allows the Director to evaluate the proposed design of the sanitary landfill facility to ensure compliance with OAC regulations.

34. Accordingly, the Commission finds that the Director's action in determining that Republic had satisfied OAC 3745-27-06 was lawful. As such, the Commission denies Appellants' assignments of error relating to adequate characterization of the geology and hydrogeology.

Assignments of Error: Group Two

35. In the second group of assignments of error, Appellants alleged that the Director unlawfully or unreasonably issued a permit in which the location of the landfill expansion failed to comply with certain siting criteria of OAC Section 3745-27-07 [Additional criteria for approval of sanitary landfill facility permit to install applications.]. Collectively, Appellants challenge three specific siting criteria relating to the following: (1) the unconsolidated aquifer; (2) the isolation distance between the uppermost aquifer system and the bottom of the recompacted soil liner; and (3) time of travel to a public water supply.

36. First, Appellants allege that the facility's location violated OAC 3745-27-07(H)(2)(d), commonly referred to at the *de novo* hearing as the "unconsolidated aquifer" criterion. The unconsolidated aquifer criterion prohibits placement of a landfill "*above* an unconsolidated aquifer capable of sustaining a yield of one hundred gallons per minute for a twenty-four hour period or future water supply well located within one thousand feet of the limits of solid waste placement." (Emphasis added.)

37. Appellants argue that Republic and the Director misinterpreted and misapplied the unconsolidated aquifer rule. They believe the phrase "above an unconsolidated aquifer" should be interpreted to mean topographically, not physically, above an unconsolidated aquifer. The Commission disagrees.

38. Evidence presented at the *de novo* hearing supports that the proper interpretation of OAC 3745-27-07(H)(2)(d) is that the facility must be physically located above an unconsolidated aquifer. In a 1997 guidance document, the Agency explained its interpretation of this rule by citing examples and showing that either a physical relationship over an unconsolidated aquifer or a connection to an unconsolidated aquifer via unconsolidated material under the site was necessary to trigger this rule. Testimony by Mr. Rizzo, an OEPA employee and expert witness in hydrogeology, confirmed the Agency's position. Moreover, exhibits presented by Republic demonstrated that no unconsolidated material will be present under the facility. Therefore, it is impossible for the expansion to be located above, or be connected to, an unconsolidated aquifer of any size.

39. The Commission believes that the Director, possessing a valid factual foundation for concluding that the Countywide expansion will not be located above an unconsolidated aquifer, lawfully applied OAC 3745-27-07(H)(2)(d).

40. Based on the foregoing, the Commission finds that it was reasonable and lawful for the Director to have determined that Republic satisfied the unconsolidated aquifer siting criteria found in OAC 3745-27-07(H)(2)(d). Accordingly, the Commission finds Appellants assignments of error relating to OAC 3745-27-07(H)(2)(d) not well taken.

41. Second, Appellants allege that the Director issued a permit to Republic despite Republic's failure to satisfy the siting criterion contained in OAC 3745-27-07(H)(2)(e), referred

to at the hearing as the "isolation distance" criterion. The isolation distance criterion requires an applicant to demonstrate the "isolation distance between the uppermost aquifer system and the bottom of the recompacted soil liner is not less than fifteen feet of in-situ or added geologic material."

42. Appellants argue that Republic can not satisfy OAC 3745-27-07(H)(2)(e) because the mine spoil is part of the uppermost aquifer system and, therefore, there is no barrier between the recompacted soil liner and the uppermost aquifer system. We disagree.

43. Evidence presented at the *de novo* hearing supports Republic's assertion that the isolation distance between the bottom of the recompacted soil liner and the uppermost aquifer system ranges from fifteen to one hundred feet, but is typically about fifty feet in thickness. On over 95% of the site, the Clarion shale will act as the barrier. In the remaining area, Republic will add geologic material possessing a permeability of 1×10^{-6}, which is in compliance with OEPA permeability standards. As previously discussed, Republic properly identified the uppermost aquifer as the Putnam Hill limestone/Brookville coal and the mine spoil as the significant zone of saturation, thus excluding the mine spoil as part of the uppermost aquifer system. Therefore, Republic need not consider the mine spoil when calculating the isolation distance.

44. The Commission believes that the Director, possessing a valid factual foundation for determining the area of the Countywide expansion will have at least a fifteen foot isolation distance of in-situ or added geologic material between the liner and the uppermost aquifer system, lawfully applied OAC 3745-27-07(H)(2)(e).

45. Based on the foregoing, the Commission finds it was reasonable and lawful for the Director to have determined that Republic satisfied the siting mandate in OAC 3745-27-07(H)(2)(e). Accordingly, the Commission finds Appellants' assignments of error relating to OAC 3745-27-07(H)(2)(e) not well taken.

46. Thirdly and finally**,** Appellants allege that the Director issued a permit to Republic that failed to satisfy the requirement in OAC 3745-27-07(H)(3)(a), which provides that a landfill "must not be located within the surface and subsurface areas surrounding a public water supply well through which contaminates may move toward and may reach the public water supply well within a period of five years."

47. Appellants argue that the Countywide expansion is located within a five year time of travel to a public water supply, specifically, the KOA campground wells and the Bolivar well. We disagree.

48. Evidence presented at the *de novo* hearing supports Republic's assertion that time of travel calculations were unnecessary, because neither the KAO campground wells nor the Bolivar well is downgradient of the expansion. *i.e.* water moving from the expansion would not reach either well.

49. The closest water supply well, the KAO campground well system, is screened in formations lower than the Putnam Hill limestone/Brookville coal and is separated from the Countywide site by a hydraulic obstacle, the unnamed tributary to Bear Run, which inhibits ground water at the Countywide site from reaching the KOA wells. Appellants presented no evidence to demonstrate that pumping in the KOA wells would overcome the hydrogeologic obstacle provided by the unnamed tributary. Additionally, the Bolivar well is separated from Countywide by the TuscarawasRiver, which acts as a hydrogeologic barrier between it and the Countywide site. For water from the Countywide site to reach the Bolivar well field, it must move contrary to hydraulic principles by entering a buried valley, crossing under the Tuscarawas River, then traveling upgradient to Bolivar's well field.

50. Moreover, an OEPA guidance document advises that time of travel calculations may be discontinued if no public water supply wells are "intersected during the five year TOT demonstration or if a surface water body is intersected with the contaminate discharging to the surface water body, prior to the five year TOT being reached . . . ." Significantly, the Putnam Hill limestone/Brookville coal, the uppermost aquifer under Countywide, outcrops or daylights on the hill slope. Outcropping or daylighting represents the ground water expressing itself as surface water above the base of the unnamed tributary, thus ending any time of travel demonstration.

51. The Commission believes that the Director, possessing a valid factual foundation for determining that Countywide will not be located where contaminates may reach a public water supply well within five years, lawfully applied OAC 3745-27-07(H)(3)(a).

52. Based on the foregoing, the Commission finds it was reasonable and lawful for the Director to have determined that Republic satisfied the siting mandate of OAC 3745-27-07(H)(3)(a). Accordingly, the Commission finds Appellants' assignments of error relating to the OAC 3745-27-07(H)(3)(a) not well taken.

Assignments of Error: Group Three

53. Appellants, in the third group of assignments of error, allege that the Director unlawfully or unreasonably issued a permit that failed to protect ambient water quality pursuant to OAC 3745-31-05(A)(1) [Criteria for decision by the director.] and ground water, in general.

54. Ohio Administrative Code Section 3745-31-05 [Criteria for decision by the director.] states, in relevant part:

> (A) *The director shall issue a permit to install* or plan approval, on the basis of the information appearing in the application, or information gathered by or furnished to the Ohio environmental protection agency, or both, if he determines that the *installation or modification and operation of the . . . solid waste disposal facility, . . . will:*

> (1) *Not prevent or interfere with the attainment or maintenance of applicable ambient water quality standards* or ambient air quality standards; . . . . (Emphasis added.)

55. Ambient water quality standards apply to surface water. Significantly, the District never identified what surface water body would be impacted or which water quality standard(s) Republic would violate if the proposed expansion were constructed, but argue, in general, that Republic's ground water monitoring plan fails to protect surrounding ambient water.

56. Similarly, Appellants point to no specific deficiency in the application or permit regarding protection of ground water only that, in its entirety, the permit fails to protect the ground water surrounding Countywide. The Commission disagrees.

57. Evidence presented at the *de novo* hearing supports Republic's assertion that it designed a ground water monitoring program that is protective of ambient and surface water in the area. Republic designed the 2001 Ground Water Monitoring Plan based upon data it collected during its comprehensive hydrogeologic investigation. Further, Republic systematically situated monitoring wells in the downgradient direction and near areas of seeps and springs, which allows Republic to monitor ground water moving off-site. Moreover, the permit requires numerous operating conditions designed to protect ambient and ground water quality at and near Countywide – such as: (1) leachate will be recirculated or taken to the City of Alliance for treatment; (2) pumps that keep the leachate below a 12" head, are inspected daily; waste is covered by tarps or soil daily; (3) Republic must provide a 45 day notice to OEPA before abandoning an underdrain; (4) the ground water sampling plan includes a two-point monitoring plan for the southwest underdrain; and (5) OEPA retains the right to alter the location of the ground water monitoring wells, if annual testing results indicate that the current system is inadequate. Further, Republic collects all rainwater from the site and has National Pollutant Discharge Elimination System permits for its surface discharges from its sediment ponds.

58. The Commission believes that the Director, possessing a valid factual foundation for finding that Republic had adequately protected ambient and ground water at and surrounding the site, lawfully applied OAC 3745-31-05(A)(1) to the extent it relates to ambient water quality protection , as well as other various rules relating to ground water monitoring.

59. Based on the foregoing, the Commission finds it was reasonable and lawful for the Director to have determined that Republic adequately protected the ambient and ground water by meeting or exceeding the requirements set forth in OAC 3745-31-05(A)(1), as well as other various rules relating to water monitoring. Accordingly, the Commission finds Appellants' assignments of error relating to the protection of ambient water quality under OAC 3745-31-05(A)(1) and ground water protection, in general, not well taken.

Assignments of Error: Group 4

60. In the fourth group of assignments of error, Appellants allege that the Director unlawfully or unreasonably issued a PTI where the applicant failed to submit accurate slope stability analyses and failed to demonstrate that it met various construction criteria set forth in OAC 3745-27-07.[43]

61. Section 3745-27-07 of the OAC [Additional criteria for approval of sanitary landfill facility permit to install.] identifies miscellaneous additional criteria - some mandatory, some discretionary - that the Director will consider before issuing a permit. Except for the three siting criteria identified in Appellants' Assignments of Error Group Two, discussed above, (unconsolidated aquifer, isolation distance, time of travel calculations), Appellants do not allege that Republic failed to satisfy any particular rule, only that Republic's construction of the berm and liner would be inadequate to protect ground water and, generally, did not meet OAC requirements regarding landfill construction.

62. Appellants argue that the proposed landfill berms and liner are poorly engineered, which will ultimately lead to slope instability and liner failure. Specifically, Appellants argue that the slope stability calculations, testing methods and sampling selections for the berms at Countywide failed to demonstrate slope stability. Appellants also argue that the liner construction, particularly the pipe penetration design, is subject to failure and will not prevent or resist hydrostatic uplift under the recompacted soil liner. The Commission disagrees.

A. Berm Construction

63. Evidence presented at the *de novo* hearing demonstrates that Republic designed a landfill with stable slopes. Republic chose materials and construction processes that meet or exceed OEPA regulations. The berms, constructed from structural fill primarily from the site, will be built on ground that has been proof rolled to remove soft spots. To create an adhesion between the berm and its base, Republic will construct a key-in trench at the toe of each berm and use a bonding bench method at the base of berms constructed on slopes over 15%.

64. Republic gathered on-site information, boring data, and test pit data and compiled it into the Geotechical Report. An on-site reconnaissance revealed no signs of instability or preexisting failure planes in the soils. Republic collected samples of disturbed and undisturbed soils from

[43] In its Notice of Appeal, the District also alleged that the Director failed to require Republic to employ a "best available technology" analysis for the "proposed liner system, materials for fill and sub-base, and ground water monitoring." Significantly, the OAC contains no provisions explicitly requiring an applicant to use a "best available technology" analysis for a "proposed liner system, materials for fill and sub-base, and ground water monitoring." Though applicants must satisfy the various engineering requirements and specifications located throughout OAC 3745-27-01 *et seq*., and contained in OEPA guidance documents relating to these items, applicants are not required to conduct a "best available technology" analysis for the "proposed liner system, materials for fill and sub-base, and ground water monitoring."

borings done during the hydrogeologic investigation and from the geotechnical borings ordered by Mr. Carey. Republic sent thirty-two samples, from nine different "worst-case scenario" locations, to a laboratory for classification of the soils and shear strength testing. Based on laboratory results, Republic used a mid-strength value, known as the fully-softened strength value, to calculate slope stability.

65. Appellants argued that Republic's tests were inadequate because they failed to calculate residual shear strength of the soils. Appellants asserted that Republic should have used the residual value, not the fully-softened strength value to calculate slope stability because of movement Appellants' expert observed in the colluvial soils. The Commission disagrees.

66. Evidence presented at the *de novo* hearing demonstrates that Republic chose the correct shear strength value to calculate slope stability. On cross-examination, Appellants' expert conceded that he had only inspected areas near Countywide, not the site itself. Further, he agreed that use of the residual strength value would not be necessary if boring data and test data supported the use of a fully-softened strength value. He also agreed that residual strength values would be overly-conservative if the berm toe, the weakest point, were constructed in a stair step, or bonding bench fashion.

67. Additionally, Appellants asserted that the liner is subject to failure because Republic's strain compatibility calculations were incorrect. Appellants argued that Republic selected a solid waste cohesion value that was too large. The Commission disagrees.

68. Evidence presented at the *de novo* hearing demonstrates that Republic selected conservative factors to calculate strain compatibility. Appellants' recommended cohesion value is overly-conservative because it fails to account for the fact that waste gains strength and begins to exert pressure as it is placed on the liner. Even though waste gains strength during the fill process, Republic designed for a worst-case scenario by assuming the liner reached post-peak strength and eliminated the issue of strain compatibility.

B. Liner Construction

69. Regarding liner construction, Appellants argued that Republic designed a pipe penetration system which will likely lead to liner failure and failed to account for hydrostatic forces under the recompacted soil liner. The Commission disagrees.

70. Evidence presented at the *de novo* hearing demonstrates that Republic designed a landfill liner with a well-engineered pipe penetration system. Appellants' expert based his opinion that pipe penetrations could damage the liner on an erroneous assumption that Republic designed 10 pipe penetration sites using an obsolete design. The sole pipe penetration site in Cell 9 of the expansion is designed so that the leachate collection pipe penetrating the wall of Cell 9 can experience movement without damaging the integrity of the liner.

71. Furthermore, evidence presented at the *de novo* hearing demonstrates that Republic designed a liner system that prevents hydrostatic uplift from damaging the liner and that seepage into the berm will not create hydrostatic uplift or jeopardize the integrity of the liner. Republic designed a liner system using materials and construction techniques that are more protective of the environment than mandated in OAC rules. The geosynthetic clay liner containing bentonite is twenty-times less permeable than the natural compacted clay liner permitted by OAC rules. Its bentonite properties cause the liner to swell when wet to fill minor flaws and seal small punctures. Additionally, the geocomposite drainage net and underdrain collection pipe, which are part of the ground water collection system likely to be used on the north slope, will intercept and route drainage to a collection pipe that drains away from the liner. Further, the surface drainage channels proposed by Republic are over two times more protective than what is prescribed in the OAC. Finally, the collection pipes used at the site are 100 times more permeable than required by OAC rules.

C. Post-Hearing Matters Relating to Group Four Assignments of Error

72. The Commission will now consider the Motions to Suspend Proceedings and to Remand Proceedings filed by the Village and the District. First, the Commission notes that it is "not confined to the record certified by the Director, but may consider additional evidence properly presented to it." *Southwest Montgomery County Environmental League v. Schregardus*, ERAC Case Nos. 573583, et seq. (March 17, 1998), citing *Northeast Ohio Regional Sewer Dist. v. Shank* (1991), 58 Ohio St.3d 16, (at a *de novo* hearing the commission is not limited to evidence available to the Director at the time of his decision.)

73. The Commission also notes that neither the District nor the Village cites specific legal authority permitting ERAC to suspend a proceeding and remand the matter to the Director for evaluation of newly presented or newly available information. The Commission need not address whether it possesses such authority because the Commission is prepared to issue its decision solely on the merits, as presented by the parties at the *de novo* hearing and in their briefs, affidavits and oral arguments.

i. The Motions

74. In its Motion to Suspend Proceedings and to Remand Proceedings filed on November 20, 2006 expressing concern about the stability of the berms and competency of the liner, the Village argues that the factual foundation upon which the Director relied to issue the expansion PTI is "fatally flawed and incomplete, if not moot on its face." The Village directs the Commission to Paragraph 24 of the Director's September 6, 2006 DFFOs, which states "[t]the 'affected area' of the landfill has settled a minimum of twenty feet and has moved horizontally a minimum of six feet. Current data indicates that the affected area is continuing to show vertical and horizontal movement." The Village argues, ". . . essential facts necessary to understand and possibly resolve this issue are not known by Bolivar, the Director, or Countywide. What is certain,

however, is that the Application and the PTI issued pursuant to it are no longer relevant to the physical conditions found at the landfill. . . ."

75. The District, too, in its Motion to Suspend Proceedings and to Remand Proceedings filed on December 26, 2006, argues that the circumstances under which the Director issued the expansion PTI have so substantially changed that the Director can no longer possess a valid factual foundation for his decision. In support, the District offers affidavits and journal articles describing the alleged conditions currently existing at the Countywide site and predicting what affects these conditions will have on the existing site. The District argues that because such conditions are present in the existing site, the expansion should not be authorized as the affects of these conditions upon the expansion are unknown.

76. Republic and the Director maintain that the issues presented by Appellants are operational in nature, relating to the existing facility, and that Appellants failed to establish any valid scientific link between their concerns and the expansion permit. Republic also noted that the berm stability issues raised in the District's Notice of Appeal related solely to the external berms to be constructed as part of the expansion, not to the internal berms situated between cells, and that the Director's DFFO addressed waste settlement inside cells of the existing facility, not the stability of external berm walls.

77. Essentially, Appellants argue that the facts and circumstances at Countywide have so fundamentally and drastically changed, that any valid factual foundation the Director may have possessed at the time of the issuance of the expansion PTI has vanished. Appellants place heavy reliance on the Tenth District Court of Appeal's holding in *C.F./Water v. Schregardus*, 1999 Ohio App. LEXIS 5028 (Ohio Ct. App. 1999).

78. In *C.F./Water*, a citizens group known as C.F./Water, appealed the Director's issuance of a PTI to Danis Clarkco Landfill Company ("Danis") for the construction of a new solid waste disposal facility, or landfill. *Id.* at 2. The proposed landfill was to be approximately ninety acres, designed with a "double composite liner leachate collection system." *Id.* The area upon which the landfill was to be constructed consisted of eighty to one hundred thirty feet of till, with sand zones interspersed throughout the till creating "significant lateral extent of continuity or greater potential for movement." *Id.* Below the till is a layer of "stratified drift," comprised of varied material less cohesive than the till layers. *Id.* Bedrock rests underneath the stratified drift. *Id.*

79. Two aquifers were present below the proposed Danis facility. The one in the stratified drift was defined as the uppermost aquifer and lay directly beneath the till. *Id.* at 3. The other aquifer was in the bedrock. *Id.* If constructed, a thirty foot layer of till, acting as a barrier to vertical movement of leachate and groundwater to the aquifer, would separate the landfill and the uppermost aquifer. *Id. "The ability of the till to adequately protect the aquifers was an issue throughout the permit review process*." (Emphasis added.) *Id.* at 3, 4.

80. Significantly, "[t]hroughout the application process, the OEPA considered the site to be

'marginal' for use as a landfill because of the one hundred gpm aquifer below the site, and the presence of sand zones above the aquifer." *Id.* at 4. Danis revised and supplemented its application several times responding to numerous questions and concerns from Ohio EPA, the local township and the City of Springfield, which is located nearby. *Id.* Ultimately, Danis included extensive data and tests relating to "soil borings, pump tests, hydraulic conductivity (or 'slug') tests and isotopic age-dating." *Id.* at 4, 5.

81. "The Director's decision to issue the permit was based on the factual determination that there were no 'effective,' (*i.e.*, hydraulically active), fractures present that would provide a direct pathway to the one hundred gpm aquifer. *If hydraulically active fractures were present in the till, the permit would not have been granted.*" (Emphasis added.) *Id.* at 5.

82. At the *de novo* hearing conducted in *C.F./Water*, the Commission properly considered facts that came to light after the issuance of the permit. *Id.* at 5, 6. See also *Northeast Ohio Regional Sewer Dist. v. Shank, supra.* Specifically, the Commission found that when Ohio EPA's lead reviewer recommended that the permit be issued to Danis, he was unaware that boring logs, which had been submitted and were available for his review prior to the Director's issuance of the PTI, documented the presence of fractures in the till. *C.F./Water* at 6. Moreover, a number of other documents available for review by OEPA staff depicted "geologically descriptive terms suggestive of fractures." *Id.* At the *de novo* hearing, the lead reviewer testified that he had not examined the "boring logs as part of his review or prior to making his recommendation, but that he assumed . . ., his predecessor at OEPA, had reviewed the logs." *Id.*

83. In our ruling in *C.F./Water*, the Commission found the Director's action in issuing the PTI to Danis "unreasonable[,] and remanded the cases to the Director to 'conduct an appropriate investigation into the application in light of the undisputed presence of fractures in the till overlying the aquifers.'" *Id.* at 6. The court of appeals upheld the Commission's decision noting that testimony from Ohio EPA demonstrated that several of the assumptions, or bases, upon which the Director relied to make the "'no effective fractures'" determination, were not based on a valid factual determination. *Id.* at 11.

84. In affirming the Commission's ruling finding the Director's action unreasonable, the court referenced a previous decision, *Citizens Committee*, 56 Ohio App.2d at 69, in which it stated, "the factual issue before ERAC was not whether the permit should have been granted; rather, the factual issue was whether the action of the Director in granting the permit was unreasonable or unlawful. *Id.* at 8-9. The *C.F./Water* court continued by stating, "[i]f the factual basis for a particular decision is found to be invalid or no longer exists, then the action of the Director of the Ohio Environmental Protection Agency stemming from that invalid basis may be invalid." *Id.* at 9, citing *Swan Super Cleaners, Inc. v. Tyler* (1988), 48 Ohio App.3d 215, 220.

85. Upon a careful review, the Commission finds the facts presented in *C.F./Water* to be superficially similar to the facts presented herein, but distinguishable in several critical areas. First, in *C.F./Water*, the Director considered the Danis project "'marginally' acceptable," because it would have been located over a one hundred gpm aquifer and the issue of whether the

till could "adequately protect the aquifers" was examined throughout the permit review process. In the instant matter, the expansion was never considered "'marginally' acceptable" and it is not sited above or over a one hundred gpm aquifer. Further, unlike *C.F./Water*, the Certified Record in this matter did not contain the types of communications between Republic and OEPA that might suggest the Agency's heightened scrutiny of hydraulic communication between the barrier strata (the Clarion shale) and the uppermost aquifer, which would be the ultimate concern if the liner system failed. Indeed, the only hydrogeologic deficiencies noted by the Agency were related to the ground water monitoring system, not the acceptability of the geologic or hydrogeologic setting for siting a landfill.

86. Second, Danis's proposed landfill would have rested over eighty to one hundred thirty feet of till. During the application's review, the Director expressed repeated concern about hydraulic communication through a fracture system and sand zones that may potentially provide a rapid conduit through which leachate could move to the uppermost aquifer. Conversely, Republic's proposed expansion rests on Clarion shale, an aquitard that acts, not as a conduit to the uppermost aquifer, but as an effective barrier between the landfill and the uppermost aquifer.

87. Third, the Danis project was an application for a new landfill, thus the only data available to the Director was the data contained in Danis's application for the landfill PTI and any additional data the Director may have gathered independently. In the case at hand, however, Republic provided the Director with decades of data collected by several different sources against which the Director could review, compare and verify his understanding of the Countywide project.

88. Fourth, in *C.F./Water,* the Director's decision to issue the permit was based on the factual determination that no hydraulically active fractures were present at the Danis site; and, if such fractures had been present, testimony established that the permit would not have been issued. Though the parties did not present affidavits addressing this particular issue, during the oral argument held on whether the Commission should grant Appellants' Motions to Suspend Proceedings and to Remand Proceedings, the Commission specifically asked whether the Director would have issued the PTI for the Countywide expansion, if the events documented by OEPA in the September 6th DFFOs had been occurring at the time OEPA issued the expansion PTI to Republic. The Director's counsel stated that he can not speculate as to whether a permit issued under the current circumstances would be identical to the PTI at issue herein, but that only a very small portion of the expansion, the vertical portion, is located directly over the existing landfill. The Director asserted that the allegations contained in Appellants' Motions to Suspend Proceedings and to Remand Proceedings are operational in nature, relating exclusively to the current facility, and, therefore, affect only the vertical expansion at issue in the PTI. Further, counsel for Republic stated that, though her client was not conceding any safety complications, it does recognize that placement of waste in the vertical expansion area is an operational concern. And, as such, Republic had already voluntarily ceased placing waste in the vertical space over the existing facility.

89. And, fifth, in *C.F./Water* the Director and Agency staff failed to review all the data and

tests available to him, which precluded him from discovering existing fractures in the till and evaluating their impact on the proposed landfill. Due to this internal oversight, the Director was unaware of the presence of the fractures until after the permit had been issued. In the underlying matter, however, none of the parties knew of the problems that would ultimately occur in the existing portion of Countywide, nor were these problems documented at the time the expansion PTI was applied for or issued. Indeed, the issues of concern to Appellants would not even occur until several years after the Director's review and issuance of the expansion PTI. Thus, the five volumes of Republic's application available to and reviewed by the Director at the time he issued Republic's PTI provided all relevant data in existence at the time he made his decision.

90. In concluding that *C.F./Water's* facts are dissimilar to the instant matter, the Commission finds the holding in *C.F./Water* unpersuasive in the matter before us.

91. Moreover, the Commission finds that neither the Village nor the District scientifically quantified or substantiated the entirety of their claims. Appellants believe that, on their face, the changes at the landfill are substantial enough to alter the basis upon which the Director issued the expansion PTI to Republic. Even if we were to find that the Director should have known or anticipated these future events at Republic's existing facility, the Commission notes that Appellants' allegations in the post-hearing matters fail to demonstrate a scientifically valid link tying the conditions at the existing portion of the facility to the expansion PTI.

92. Indeed, even Appellants note the inherent difficulty in scientifically quantifying their concerns and identifying how these concerns would impact Republic's proposed expansion. The Village argued that the "circumstances . . . have so fundamentally physically altered and changed, that it is clear that the facts upon which the application to construct had been filed must now be reevaluated by the Director" and that the "essential facts necessary to understand and possibly resolve this issue are not known by Bolivar, the Director, or Countywide." Though it offered significantly more data and affidavits to support its contention that the Director's action was based on an invalid factual foundation, the District too, ultimately, noted that the expansion should not be authorized because the affects of the current conditions upon the horizontal expansion are unknown. Absent such a link between the current conditions at the existing landfill and the proposed expansion, Appellants' concerns remain operational in nature and relate exclusively to the on-going regulation of an existing facility for which an operational license is reviewed annually.[44]

93. Having found that the Director possessed a valid factual foundation, at the time he issued the expansion PTI, for determining that Republic had designed stable berm slopes, an effective and protective pipe penetration site and protected against hydrostatic uplift, the Commission now

[44] In its review of the filings and oral arguments presented by the parties in this matter and the subsequent Notices of Appeal filed with the Commission containing DFFO's issued in March 2007 relating to the Countywide site, the Commission observes that the Director and the local board of health appear acutely aware of the many enforcement options available to ensure protection of the environment by requiring compliance with the numerous applicable laws and regulations relating to the operation of a landfill facility.

finds that the Director lawfully applied OAC Section 3745-27-07.

94. Based on the foregoing, the Commission finds it reasonable and lawful for the Director to have determined that Republic satisfied various construction requirements relating to berm construction and landfill liner design and construction. Accordingly, the Commission finds Appellants assignments of error relating to berm and liner design and construction not well taken. Further, for the reasons discussed above, the Commission finds Appellants' Motions to Suspend Proceedings and to Remand Proceedings not well taken and rules to DENY said motions.

MULRANE and LYNN, COMMISSIONERS, concur.

FINAL ORDER

As more fully explained above, the Commission hereby AFFIRMS the Director's issuance of PTI Number 02-14796 to Republic.

The Commission, in accordance with Ohio Administrative Code Section 3746-13-01, informs the parties that:

> Any party adversely affected by an order of the commission may appeal to the court of appeals of Franklin County, or, if the appeal arises from an alleged violation of a law or regulation, to the court of appeals of the district in which the violation was alleged to have occurred. The party so appealing shall file with the commission a notice of appeal designating the order from which an appeal is being taken. A copy of such notice shall also be filed by the appellant with the court, and a copy shall be sent by certified mail to the director or other statutory agency. Such notices shall be filed and mailed within thirty days after the date upon which appellant received notice from the commission of the issuance of the order. No appeal bond shall be required to make an appeal effective.

THE ENVIRONMENTAL REVIEW APPEALS COMMISSION

_____
Melissa M. Shilling, Chair

Entered into the Journal of the Commission this _____ day of June, 2007.

_____
Toni E. Mulrane, Vice-Chair

_____
Sarah E. Lynn, Member

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