BEFORE THE EXECUTIVE DIRECTOR
OF THE UTAH DEPARTMENT OF ENVIRONMENTAL QUALITY

In the Matter of:	**FINDINGS OF FACT, CONCLUSIONS OF LAW AND RECOMMENDED ORDER**
Red Leaf Southwest #1 Order Mine, Ground Water Discharge Permit No. UGW470002 and Construction Permit Associated with Ground Water Discharge Permit No. UGW47002	Carol Clawson, Administrative Law Judge January 19, 2016

This matter is before me pursuant to an appointment by the Executive Director of the Department of Environmental Quality (DEQ) dated August 20, 2014. The appointment charges me to conduct a permit review adjudicative proceeding in accordance with Utah Code §19-1-301.5 and Utah Administrative Code R305-7 and to submit to the Executive Director a proposed dispositive action pursuant to Utah Code Annotated Section 19-1-301.5(11) and (12).

This proceeding concerns the following two permits issued by the Division of Water Quality (DWQ) to Red Leaf Resources:

- UGW470002 Ground Water Discharge Permit for the operation of an oil shale mine and Early Production System capsule for extraction of hydrocarbons in Uintah County, Utah, signed and authorized by December 13, 2013 by Walter Baker, the Director of the Division of Water Quality. (WQ001252 *et seq.*)

- Construction Permit for Red Leaf Resources Early Production System Capsule Located in the SE1/4 of Section 30, T. 13 S., R. 23 E., Salt Lake Base Meridian, signed by Walter Baker on May 30, 2014. (WQ001573 *et. seq.*)

On November 24, 2015, the parties appeared before me for oral argument on the merits of Petitioner's Request for Agency Action ("RAA"). Joro Walker and Charles R. Dubuc appeared on behalf of the Petitioners, Denise Dragoo and Stephen Smithson appeared on behalf of Red Leaf Resources, and Sandra Allen and Paul McConkie appeared on behalf of the Director of the Division of Water Quality. Based on an extensive review of the record, the parties' briefs and argument, and controlling law, the following Proposed Findings of Fact and Conclusions of Law are submitted to the Executive Director as a proposed dispositive action pursuant to Utah Code §19-1-301.5(12)(c).

STANDARD OF REVIEW

Under section 19-1-301.5, the ALJ "conduct[s] a review of [DWQ's] determination" that is "based only on the administrative record and not as a trial de novo." Utah Code §§19-1-301.5(8) & 12(b). In the 2015 legislative session, the Legislature amended the statute, effective as of May 12, 2015. The amended statute instructs the Executive Director to "uphold all factual, technical, and scientific agency determinations that are not *clearly erroneous* based upon the petitioner's marshaling of the evidence."[1] Utah Code § 19-1-305.5(14)(b) (2015)(emphasis added). Factual

[1] The amendment to the statute requires the Petitioner to marshal the evidence, a requirement that was included in the June 15, 2015 Pre-Hearing Scheduling Order in this matter. Respondents assert that the Petitioners have failed to marshal all the evidence as required by the statute and the scheduling Order in this case. As the ALJ, I am exercising my discretion not to address the question of adequate marshaling of the evidence in this Recommended Order. The record in this case is massive. The parties agreed on nearly 2000 pages of relevant information, all of which I have read, some of it several times. The evidence on which the Director relied in issuing the permit is repeated in numerous places, so there is a great deal of redundancy. I find that the Petitioners made a good faith effort at citing to some, if not all, of the relevant facts. Given my

findings are clearly erroneous only if they conflict with the clear weight of the evidence or if they are without adequate evidentiary support. *R.B. v L.B.* 2014 UT App ¶ 26, 339 P.2d 137; *United States v. U.S. Gypsum Co*., 333 U.S. 364, 395 (1948), ("[a] finding is 'clearly erroneous' when, although there is evidence to support it, the reviewing court on the entire evidence is left with the definite and firm conviction that a mistake has been committed") (*cited in State ex rel. Z.D.* 147 P.3d 406, 206 UT 54 ¶ 38, Utah 2006).

In addition, section 19-1-301.5 affords the agency "substantial discretion to interpret its governing statutes and rules." Utah Code §19-1-301.5(15)(c)(i). Accordingly, the agency's legal interpretation of its operable statutes and regulations may only be overturned if the Petitioner shows that the agency's interpretation is a "clearly erroneous interpretation or application of the law." *Sierra Club v. Bd. of Oil, Gas & Mining, 2012 UT 73* ¶ 10, 289 P.3d 558.

In sum, unlike most other administrative proceedings involving an ALJ, a permit review adjudicative proceeding is an appellate like proceeding. There are no witnesses, no examination or cross-examination, no weighing of the evidence or determination of a witness' credibility. The ALJ's authority is limited to a review of issues raised in the public comment period, the record supporting DWQ's permit decision, and a determination of whether the Director's conclusions are clearly erroneous. Utah Code §19-1-305.1(4, 6).

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own review of the record, to now determine if *all* the facts were properly marshaled would not be an efficient use of my resources and would not alter the result.

PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW

A. Parties, Permit History and Procedural Background

1. The Petitioners are Living Rivers, the Southern Utah Wilderness Alliance (SUWA), Grand Canyon Trust, Great Old Broads for Wilderness and the Sierra Club, collectively referred to as "Living Rivers." The Respondents are Red Leaf Resources, Inc. ("Red Leaf"), and the Executive Director of the Division of Water Quality, referred to either as "the Director" or "DWQ."[2]

2. Red Leaf developed the Ecoshale In-Capsule™ Technology to extract petroleum from oil shale, and it seeks to prove this technology at the Southwest #1 Project Site (the "Project") – the mine site of concern in this matter. Ground Water Discharge Permit Application ("Permit Application" or "Ap."), WQ000111; WQ000113.

3. Since October 2008, when Red Leaf initiated construction of a test facility, the company has been in continuous operation at the Project to construct, test and scale-up the Ecoshale In-Capsule™ Technology test unit. The facility initially operated under the authority of a small mine operation permit issued by the Utah Division of Oil, Gas and Mining ("DOGM"). Small Mine Permit No. S/047/0102, Ap.,WQ000121; LR Cmt., WQ000507-508.

4. Anticipating expansion of the Project, Red Leaf received a large mine operation permit from DOGM on March 9, 2012 for a permit area of 1,477 acres, and

[2] To avoid confusion, the Executive Director of the Department of Environmental Quality (DEQ) will be referred to as the "Executive Director," whereas "Director" refers to the Director of the Division of Water Quality (DWQ), a Division of the DEQ.

Red Leaf posted a reclamation bond with the State. DOGM conditioned the large mine permit upon filing with DOGM "either a ground water discharge permit (including a permit by rule) from Utah Division of Water Quality (DWQ), or a letter saying that a permit is not required." Ap., WQ000121.

5. DWQ requested Red Leaf to submit a ground water discharge permit application to determine whether the Project has "discharges or [has] activities [that] would probably result in a discharge of pollutants into the waters of the state." Utah Admin Code R317-6-6.1(A).

6. On December 21, 2011, Red Leaf submitted a Ground Water Discharge Permit Application for a commercial scale, 118-capsule project. On June 21, 2014, Red Leaf filed a revised permit application, seeking a ground water discharge permit for a single Early Production System ("EPS") capsule. Ap. WQ00108-410. The EPS capsule will be approximately 75% of the size of a full scale commercial capsule and will be constructed in the southeast portion of Section 30, T. 13 S., R. 23 E., Uintah County, Utah. Ap., WQ000116.

7. Red Leaf's June 21, 2013 application for the single EPS capsule is the basis for issuance of Ground Water Discharge Permit No. UGW470002 ("GWDP" or the "Permit") at issue here. The June 2013 application was submitted based on the Director's decisions that an individual permit, rather than a permit by rule, was required, and that the application would be limited to a single capsule.

8. The revised June 2013 application includes the capsule design, compliance monitoring data, a report detailing geology and hydrogeology of the area, water isotopic

analysis, SPLP leachate analysis, analytical results from drill hole operations including ground water data, aquifer testing information, and boring results. Ap., WQ000108-410. In addition, Red Leaf provided a Supplemental Seep and Spring Survey as part of the application. Ap. WQ000411-440.

9. The Director issued a Draft Ground Water Discharge Permit (GWDP) and accompanying Statement of Basis (SOB) on August 13, 2013. Draft GWDP, WQ000454-67; Draft SOB, WQ000441-53. The Director also provided public notice of the draft Permit. WQ000469.

10. On September 27, 2013, Living Rivers submitted timely comments on the Draft GWDP. LR Cmt., WQ000470. Living Rivers included in its comments expert testimony from Jim Kuipers and attached Mr. Kuipers' expert report, which analyzed the technology Red Leaf proposed to employ in constructing and operating the EPS capsule. Kuipers, WQ000481-98. Living Rivers also referenced and attached the expert report of Elliott Lips, which addressed the Director's claims about the hydrogeology at the mine site. Lips, WQ001211-31. The Director addressed the issues raised in his Comment Response and Supplemental Comment Response. Cmt. Resp.WZ001275-1352; Add. Cmt. Resp., WQ001776-93.

11. In response to Petitioners' comments, the Director modified two provisions of the draft Permit before issuing a final Permit. Specifically, the Director added the requirement of a Meteoric Water Mobility Procedure analysis as well as a Synthetic Precipitation Leaching Procedure analysis of the spent shale after the EPS capsule has cooled. Cmt. Resp., WQ001287. The Director further required Red Leaf to

remove all liquid hydrocarbons from the DPS capsule "for as long as the discharge occurs." Cmt. Resp., WQ001288.

12. The Director issued a final GWDP and a final SOB on December 20, 2013. At the same time, the Director released a written response to Living Rivers' comments. Permit, WQ001251-65; SOB, WQ001266-74; Cmt. Resp., WQ001275-1352.

13. On January 21, 2014, Living Rivers timely filed a Request for Agency Action (RAA), challenging the Director's decision to issue the final GWDP. As part of that RAA, Living Rivers attached a supplemental expert report from Mr. Lips in response to statements in the Director's response to comments. WQ001769-75. The Director subsequently issued a response to Mr. Lips' supplemental comments. Add. Cmt. Resp., WQ001776-93.

14. On February 18, 2014, this Tribunal issued a Notification of Further Proceedings and Prehearing Order. On February 20, 2014, this Tribunal issued an order staying the proceedings associated with the GWDP RAA pending the Director's issuance of the Construction Permit.

15. On April 1, 2014, the Director issued a draft Construction Permit for Red Leaf's Southwest #1 mine. On May 1, 2014, Living Rivers timely filed comments on that draft permit. WQ001562-66. Living Rivers referenced and attached to these comments an expert report from Mr. Kuipers, which provided a technical review of Red Leaf's proposed design and construction of the EPS capsule. WQ001568-72.

16. On May 30, 2014, the Director issued a final Construction Permit to Red Leaf. WQ001573-1666. The Director attached to the final construction permit to his response to Living Rivers' comments. WQ001667-82.

17. On June 30, 2014, Living Rivers timely filed an RAA challenging the Construction Permit.

18. On August 1, 2014, and pursuant to the stipulated joint motion of the parties, an order was entered dismissing both RAAs without prejudice. Living Rivers then filed a consolidated RAA in the matter of the Ground Water Discharge Permit (UGW470002) and the associated Construction Permit issued by DWQ to Red Leaf. On August 20, 2014, the Executive Director appointed the undersigned to continue to serve as the ALJ in the matter of the consolidated RAA based on the prior appointment to both matters and conflicts review.

19. On October 28, 2014, Living Rivers filed a motion to supplement the administrative record. That motion was granted in part and denied in part on February 5, 2015. A revised administrative record was subsequently submitted and included the Director's comments to the supplemental information that was allowed. WQ001769; WQ001776.

20. After final briefing on the merits of the case, Living Rivers filed a Motion to Strike Red Leaf's Surreply, and Red Leaf filed a Motion to Strike Portions of Petitioners' Reply Brief. The motion to strike the surreply was denied on the grounds that the statute allows a surreply. Red Leaf moved to strike portions of Red Leaf's Reply on the grounds that certain issues were not preserved as required by section 19-1-301.1

(4) and (6). That motion was denied with the one exception as noted in the Order. *See* Nov. 14, 2015 Order. The proposed findings and conclusions set forth here address only issues previously found to have been properly preserved.

B. Project Description

21. Red Leaf 's patented technology consists of mining the oil shale and simultaneously creating the oil extraction capsule from the oil shale. Following oil extraction, the shale will be encapsulated in place for final disposition. Ap., WQ000111; WQ000113.

22. Once enough overburden has been removed from the pit area to create a capsule, a 3-foot bentonite-amended shale (BAS) liner will be placed at the bottom of the pit, underneath the capsule. A three-foot BAS layer will also surround the capsule – top, bottom and sides. The saturated hydraulic conductivity of the BAS layer will be 1.0 x 10^{-7} cm/sec or less. Inside the BAS liner, the company proposes placing a 13-foot gravel insulation layer. At the bottom of the capsule, above the insulation layer, the company plans to install a steel liquids-collection pan to direct liberated petroleum liquids to a collection system. The pans are sloped to direct liquids to collection troughs, which in turn direct liquids to sumps over grated vertical delivery pipes at an engineered bulkhead system. Ap., WQ000115.

23. Above the liquids-collection pan, the company intends to place ore in layers with corrugated steel heating pipes throughout the capsule. The heating pipes heat the ore to a maximum temperature of approximately 725 °F and, through pyrolysis, liberate liquid and gaseous components of the kerogen contained in the ore. *Id*.

24. The EPS capsule will be a stand-alone capsule approximately three-fourths the size of a full-scale commercial capsule. The EPS capsule will have BAS floor dimensions of 385 feet wide by 695 feet long by 100 feet high at the capsule edge and approximately 161 feet high at the top of the capsule crown. Ap. at 5, WQ000116; *see also* SOB, WQ001266. As a result of the intense heating and cooling of the capsule, the company expects the capsule to settle approximately 30 feet. Ap. WQ000151; *see also* SOB, WQ001267.

25. The mine operation is designed to be a zero-discharge operation. The Director considered the application and the record and determined that "Red Leaf's capsule technology does not use process water and does not involve containment of wastewater." Draft SOB, WQ000443; Ap., WQ000111-115, 124-125. There is no planned discharge water or other liquid for the operation. Due to capsule design, storm water will not contact waste materials and will be managed on site. The capsule is further designed to prevent both infiltration of precipitation-derived water into them and discharge of fluids from them. The cover material is engineered as an impermeable cap that will be covered with earthen borrow, graded, covered with salvage topsoil and revegetated. Ap., WQ000124.

C. Requirements for Issuance of a Discharge Permit

26. A "Discharge Permit" is issued to a person "who discharges or whose activities would probably result in a discharge of pollutants into the waters of the state." Utah Code §19-5-102(8)(a). Thus, a discharge permit is not a determination that no

discharge will occur but is is an authorization to discharge pollutants to the waters of the state if certain conditions are met.

27. The Director may issue a ground water discharge permit for a new facility if, after reviewing the information provided under R317-6-6.3, the Director determines that:

> 1. The applicant demonstrates that the applicable class TDS limits, ground water quality standards protection levels, and permit limits established under R317-6-6.4E will be met;
>
> 2. The monitoring plan, sampling and reporting requirements are adequate to determine compliance with applicable requirements;
>
> 3. The applicant is using best available technology to minimize the discharge of any pollutant; and
>
> 4. There is no impairment of present and future beneficial uses of the ground water.

R317-6-6.4.A.

28. The Ground Water Quality Protection Regulations (Regulations), which govern this proceeding, define "Ground Water" as "subsurface water in the zone of saturation including perched ground water." Utah Admin. Code R317-6-1.

29. "Waters of the State" are defined broadly as "**all** streams, lakes, ponds, marshes, water courses, waterways, wells, springs, irrigation systems, drainage systems and all other bodies or accumulations of water, surface or underground, natural or artificial, public or private, which are contained within, flow through, or border upon this state or any portion thereof[.]" Utah Code § 19-5-102(23)(a) (emphasis added); *see also* Utah Admin Code R317-6-1 (identical definition of "Waters of the State"). The Legislature further declared that: "All waters in this state, whether above or under the ground, are hereby declared to be property of the public." Utah Code Ann. § 73-1-1(1).

30. The Ground Water Rules consider both climatic and hydrogeologic conditions related to the potential for ground water contamination as well as the natural ground water quality. Cmt. Resp.,WQ001279.

31. The Ground Water Rules are based on an "anti-degradation strategy" for ground water protection, not non-degradation. Thus "discharge of contaminants to ground water may be allowed provided that current and beneficial uses of the ground water are not impaired" and the requirements of Rule 317-6-6.4 are met. Cmt Resp., WQ001277 (*citing* Preamble to the Ground Water Quality Protection Regulations of the State of Utah, sec. 2.1, August 1989).

D. Hydrogeology of the Mine site

32. The parties do not dispute that the ground water beneath the mine site is "water of the state" as defined in the Code and Administrative Rules. The dispute centers on the nature or quality of the water below the mine site and thus the level of protection required. Among other things, Living Rivers takes issue with the Director's conclusion that there is no shallow aquifer immediately beneath the mine and that the water "around and immediately beneath the mine site does not move either horizontally or vertically." Cmt. Resp. WQ001276-77. Living Rivers also disputes the Director's conclusion that the rocks immediately underlying the capsule construction are lower-grade oil shale with extremely low permeability, providing a protective barrier that would prevent discharges. *Id.* at 1280.

33. The Director reviewed both historical materials relating to the hydrogeology of the area as well as more current investigations and analyses performed by Red Leaf and others.

34. Referring to the Department of Natural Resources *Hydrologic Reconnaissance of the Unita Basin, Utah and Colorado*, the Director concluded that the area of the mine site is "a true desert." The evidence that indicates that the site is arid "with less than 10 inches of annual precipitation on average." Cmt. Resp., WQ001279 (*citing* Price and Miller, Dept. of Natural Res. Tech. Pub. No. 49 1975); Ap. WQ000131.

35. The project area is located in the Uinta Basin section of the Colorado Plateau physiographic province, described as follows:

> The southern Uinta Basin is underlain almost entirely by the Green River Formation, which is comprised of two members: the upper Parachute Creek Member and the underlying Douglas Creek Member. The Parachute Creek Member is characterized by the presence of oil shale throughout its thickness. The Mahogany Zone is a 100-foot-plus interval in the upper third of the unit that represents the horizon with the highest concentration of kerogen and is the zone to be mined by [Red Leaf] at Seep Ridge.

Ap., WQ000125.

36. The description, differences and separation between these two "members" – the Parachute Creek Member and the Douglas Creek Member – are important to keep in mind and are described in detail in the Application and the Director's Comment Response.

37. The character of the Douglas Creek Member is not disputed. It is Class II water located deep below the surface. Indeed, sources place it anywhere between 780 to

1100 feet below ground service. Ap., WQ00125, 127. Living Rivers does not dispute that it is adequately protected. Hearing Tr. T104:5-13.

38. While the parties agree that the Class II water of the Douglas Creek Member is protected, they disagree on the quantity and quality of the water more immediately below the mine site as well as the permeability of the rocks and potential degradation of nearby springs. Again, the Director relied on both historical and current reviews of the area geology and hydrology in reaching his conclusions.

39. Individuals from the Utah Geological Survey and the Department of Environmental Quality performed a field reconnaissance of the rocks underlying the site of the proposed mine. WQ000084-92. The summary of the rocks that stratigraphically underlie the site is also found in Red Leaf's June Permit Application and depicted in Figure 7 of the Application. Ap. WQ000130; SOB, WQ001269. These zones, from surface to depth are as follows:

Parachute Member

- Shale/Oil shale
- A Groove – Marlstone
- Mahogany Zone, divided into 3 segments: Upper Mahogany Zone, Mahogany Bed and Lower Mahogany Zone – shale/oil shale
- B Groove – Marlstone
- Shale/Oil shale

Douglas Creek Member

- Sandstone/Mudstone

See Ap., Fig. 7, WQ000140.

40. The Director describes general geology of the mine site in the Statement of Basis as follows:

> Bedrock at the mine site is the Eocene Green River Formation. These sedimentary rocks dip approximately 3 degrees in a generally northerly direction. Rocks exposed at the surface and in the strata to be mined are within the Parachute Creek Member, which consists mainly of oil shale, with minor interbedded amounts of siltstone, sandstone and altered volcanic tuff, and is approximately 1,100 feet thick. Oil shale is a dolomitic marlstone that contains solid hydrocarbon material known as kerogen. The Parachute Creek Member overlies the Douglas Creek Member, which consists of (in decreasing order of abundance) sandstone, mudstone, siltstone, algal limestones, chalky limestones and dolomitic limestones. The contact between the Parachute Creek and Douglas Creek Members is gradational and may be placed at different locations in the sedimentary column, depending on whether the interpreted contact was based on field mapping or drill hole data. A detailed stratigraphic column showing the main ore zone, named the Mahogany Zone, as well as rocks above and below it and key stratigraphic horizons is shown in Figure 5 of Red Leaf's June, 2013 ground water discharge permit application. Immediately on top and on the bottom of the Mahogany Zone are two horizons known as the A Groove and the B Groove, respectively, which get their names from their appearance in outcrop, as slope formers above and below the cliff-forming Mahogany Zone. At this location, these horizons are marlstone.

SOB, WQ001269.[3]

41. With respect to the water-bearing characteristics of the rocks in the subsurface, the Director concluded that "in general the Parachute Creek Member consists of fine-grained and low-permeability sedimentary rock that behaves as an aquiclude (an impermeable body of rock or stratum of sediment that acts as a barrier to the flow of groundwater); inhibiting infiltrating precipitation from recharging underlying rocks." SOB, WQ001270 (citing Holmes and Kimball, 1987, p.35); Ap. WQ000133-35.

42. The strata below the Mahogany Zone is a transitional sequence between the Parachute Creek Member, which is predominantly shales, oil shales and carbonates

[3] The final Statement of Basis (SOB), WQ001266-1274, does not significantly differ from the Draft Statement of Basis, WQ000441-449. Citations are therefore to the final SOB unless there was a substantial change from the Draft SOB or unless otherwise deemed necessary for context. All references to supporting materials included in the SOB are incorporated by reference.

with low permeability, and the Douglas Creek Member, which is predominantly sandstone and under artesian pressure. Ap.,WQ000127-28; SOB,WQ001272, 1281-82, 84-86, 90-92.

43. The Director found no support for the Petitioner's claim that there is an "aquifer as close as 20 feet below the proposed mining operation," describing the statement as a "misunderstanding of the nature of the geologic contact between the Parachute Creek Member and the underlying Douglas Creek Member. . ." SOB WQ001293. More specifically, the Director noted:

> Areas mapped as the Upper Douglas Creek Member in Figure 4 of the permit application are in the lower part of the Parachute Creek Member where the depositional environment is beginning to change to one that includes occasional sandstone interbeds, and do not represent the outcrop of the sandstones that from the Douglas Creek aquifer and are not exposed at the project side. The Douglas Creek aquifer is several hundred feet deeper in this section and isolated from these upper sandy beds by several zones of oil shale . . . There is no evidence that the sandy bed below the Mahogany Zone is an aquifer, and significant evidence that it is not.. . . It is overlain and underlain by oil shales with low permeability that prevents water from recharging into it. Examination of drill cores through this interval show that it is partly saturated with bitumen, further decreasing is porosity and permeability.

Cmt. Resp. SQ001293 (citations omitted).

44. To further understand the hydrogeologic conditions at the mine site, the Director reviewed the investigative work done by Red Leaf and its consultants, including the following results of Red Leaf's monitor wells:

> Red Leaf investigated ground water conditions in the shallow subsurface with a drilling program, aquifer testing and water quality sampling. Red Leaf drilled six rotary holes designed to be completed as monitor wells. Each boring was drilled to an unnamed sandstone unit that occurs beneath the B Groove. Five of these six monitor wells displayed evidence of water in the upper and lower parts of the bore holes. To evaluate possible ground water occurrences in the horizons penetrated in the upper parts of the bore holes, a shallower boring was drilled adjacent to

each of these five deeper monitor wells, resulting in a total of eleven monitor wells with five pairs of shallow and deep wells completed at the same sites. After drilling, water levels in the wells were allowed to stabilize and aquifer tests were conducted on those wells. A recovery test was also conducted in suitable wells. Hydraulic conductivities of the surrounding rocks were estimated from this data and in the six wells tested ranged from 143 x 10^{-7} to 9.52 x 10^{-7}. SOB, WQ001270. Ap., WQ000139-144 & Fig. 7 WQ000140.

45. The water encountered in these wells is highly saline and has a stable isotope composition different from precipitation at the site. Cmt. Resp., WQ001280.

46. Recovery in the monitoring wells took between 7 and 13 days. This indicates that the release of water from the water bearing zones in the subsurface to the wells was extremely slow at a rate between 0.6 and 4.7 gallons per day. Ap.,WQ000143, & App. D, WQ000205-241, 411-440; SOB,WQ001777.

47. The water quality data from the monitor wells yielded total dissolved solids (TDS) concentrations that ranged from 9,020mg/l to 58,600 mg/l. All but one of the eleven (9020mg/l) were in excess of the amount for a Class IV water classification (10,000 mg/l). Ap. WQ000144, 249-286. Samples were collected from the wells and sent for laboratory analysis. The conclusion reached by Norwest from the results is that the water in the wells are "much older and possibly belong to a time sequence that had a markedly different climate and elevation." Ap., WQ000144.

48. Based on an evaluation of all sample results and the characteristics of ground water in shales, the Director classified the uppermost ground water at the mine site as Class IV. He made this conclusion based on the eleven samples, all but one showing TDS levels ranging from 20,600 to 58,600 mg/l. WQ001253, 1271, 1783. The

Director's conclusion in this regard is reasonable and supported by the evidence. The classification of the water as Class IV dictates the level of protection required.

49. The Director also considered the water quality of nearby seeps and springs based on the data provided. Red Leaf investigated near-surface ground water by conducting a seep and spring inventory. The first one was done in the fall of 2012. WQ000206-247. Because this was done at the dry time of year (following a dry winter), Red Leaf reviewed the survey area again in May 2013. WQ000241-440. The purpose of the inventory was to "understand the occurrence of seeps and springs and to locate any previously unreported water sources in the inventory area." WQ00418.

50. The inventory looked at 8562 acres, including the mine lease area and surrounding land. Few seeps and springs were found in October 2012 and no distinctly new seeps and springs were found in May 2013. …." Ap., App. D, WQ00206 *et. seq.*; Supplemental Seep and Spring Inventory, WQ000412-440; Cmt. Resp., WQ001270, WQ001351.

51. The inventory found that the water from the seeps and springs has much lower dissolved solids content and lower pH than ground water from rocks in the shallow subsurface, indicating it has not been in contact with the rocks for as long a time …." Ap., App. D, WQ00206; Supplemental Seep and Spring Inventory, WQ000412-440; Based on the results of this survey, the Director determined that "the seeps and springs seen at the ground surface seem to represent very shallow, localized zones of saturation recharged by precipitation." Cmt. Resp., WQ001270, WQ001351.

52. The Director concluded that the source of the ground water feeding the springs is not the water found in the monitor wells beneath the proposed mining site. Further, there would be no exposure through the seeps and springs because there is no circulation between the uppermost ground water and the springs. If there were, the springs would reflect a similar water quality as was encountered in the wells. Instead the uppermost ground water is highly saline while the springs are not. WQ001779, 1783, 1292-97.

53. In summary, the Director concluded, "the geologic formation that includes Red Leaf's ore horizons and the rocks overlying and underlying them, . . . is described in the geologic literature as having low or minimal permeability. Thus the oil shale of the Parachute Creek member of the Green River formation act as a barrier to ground water flow and is confirmed from information collected by site investigations." Cmt. Resp., WQ001280.

E. The Applicable Class TDS Limits, Ground Water Protection Levels and Permit Limits

54. Water with TDS of 10,000 mg/l or more is classified as Class IV ground water. R317-6-3. Class IV protection limit for a potential discharge is "protection of human health and the environment." R317-6-4(4.7).

55. As previously noted, the samples from the eleven wells drilled near the site show TDS levels ranging from 20,600 to 58,600m300 mg/l. One well has TDS levels of 9020mg/l, slightly below the 10,000 mg/l threshold for Class IV designation. SOB, WQ001271, 1783; *see* also WQ000249-286. There is substantial evidence

supporting the Director's conclusion that the shallow ground water below the mine site is Class IV ground water with an average TDS concentration well in excess of 10,000 mg/l. SOB, WQ001271; Ap., WQ000143-144, 247-291, 446.

56. The evidence also supports the Director's conclusion that any discharges from the mine site would be of better quality than the shallow ground water. Supp. Cmt. Resp., WQ001787; Ap.,WQ000306-393, and that "the time frame for any liquid to discharge from the capsule is on the order of hundreds of years." Cmt. Resp., WQ001290; Cmt. Resp., WQ0001349 ("time necessary . . . to reach field capacity, . . 911 years").

57. The Director also reasonably determined that the Douglas Creek Aquifer originates from depths of 600-800 feet below ground surface and is Class II groundwater, with TDS greater than 500 but less than 3,000 mg/l. Red Leaf has tapped this aquifer for its water supply. Living Rivers has conceded that the aquifer underlying the mine site within the Douglas Creek Member is protected from activities related to the EPS capsule. WQ001278; Oral Arg. Trans., T104:5-13.

F. Monitoring Plan, Sampling and Reporting Requirements

58. Pursuant to Utah Admin Code R317-6-6.4(A)(2), to issue a ground water discharge permit, the Director must find that Red Leaf's monitoring plan, sampling and reporting requirements are "adequate" to determine compliance.

59. The purpose of a Sampling and Analysis Plan (SAP) is to "insure that data collected during the time that monitoring is required is consistent over time." Cmt. Resp., WQ001284, 1272-74; Cmt. Resp., 1284-1292.

60. The monitoring plan, sampling and reporting requirements and compliance schedule requirements are described in the Permit and the Statement of Basis. Permit, WQ001256-59.

61. Among other things, the permit requires Red Leaf to monitor drainage from the metal collection pan, the top of the lower BAS line, and the six channels that lead to the liner penetration bulkheads semi-annually for water or liquid hydrocarbons discharging from the capsule. This monitoring will begin six months after shutdown of retorting operations in the EPS capsule, and Red Leaf is required to report any quantities of water draining identified points. If water drains from these points in a quantity large enough to obtain a sample for analysis, Red Leaf is required to analyze the samples for the constituents identified in the Permit. Permit, WQ001256.

62. The permit requires Red Leaf to report and remove all liquid hydrocarbons from the site for as long as the flow from the capsule drains. If water discharges from the pan, it must be contained until DWQ approves a disposal method. The permit "does not authorize discharge of waters impacted by surface or subsurface operations to surface water or place any materials where there is probable cause to believe it will cause pollution." Permit, WQ001256.

63. The permit further requires Red Leaf to submit a Sampling and Analysis Plan within 90 days of completion of construction of the EPS capsule. The Permit specifically addresses the parameters for the analysis of spent shale and waste rock and for the evaluation of the upper BAS liner performance and hydrologic properties of the spent shale. Permit, WQ001257-58.

64. The Director reasonably concluded that source monitoring, as opposed to ground water monitoring, is more appropriate in this case. WQ001272-74, 1300. He found that it is not necessary for a SAP to be entirely complete prior to issuance of the permit for the following reasons: (a) the sample ports that will be used to collect any potential leachate from the EPS capsule's metal collection pan and top of the lower BAS line have not yet been designed; (b) the SAP must include detailed instructions on how to obtain scientifically valid samples from these ports that have not yet been designed; and (3) the full suite of analytical parameters will not be known until Red Leaf completes the spent shale analyses required by the permit. Cmt. Resp., WQ001285.

65. In further support of requiring only source monitoring, the Director concluded:

> Discharge is controlled by site conditions that include the presence of rocks with very low permeability below the capsule and no aquifers for hundreds of feet below the land surface, by the fact that capsule contents are under unsaturated conditions and will not impose significant hydraulic head on the lower liner and bedrock, and by the upper capsule cap that must be the functional equivalent of three feet of material with hydraulic conductivity of 1×10^{-7} cm/sec under permit conditions and which will minimize infiltration of precipitation into the capsule.
>
> Monitoring beneath the capsule is not critical to insure control of discharge, . . . In the very unlikely event that leachate builds up within the closed capsule, the permit requires monitoring of drainage from the metal pan and the top of the lower BAS liner." Cmt. Resp, WQ001289, Permit, WQ001256.
>
> The permit requires source monitoring of any leachate that may collect on the metal pan within the capsule and the upper surface of the lower BAS liner. This would detect any problems with leachate discharge long before there would be a discharge to the subsurface. The rocks underlying the capsule are of very low permeability. The highly saline nature and distinct isotopic composition of ground water observed in these rocks, as well as the very low permeability measured directly in these rocks by recovery testing at Red Leaf's monitor wells is evidence that it does not circulate, and potential discharge from the capsule would not necessarily report to a monitor well, even if the well was located

> directly down-gradient from the EPS capsule. In addition, it would be very difficult or impossible to detect the influence of leachate in highly saline ground water containing naturally occurring dissolved hydrocarbons such as that observed in Red Leaf's monitor wells.

Cmt. Resp., WQ001300. The evidence in this regard supports the Director's conclusion.

G. Best Available Technology

66. Pursuant to Utah Admin Code R317-6-6.4(A)(3), to issue a ground water discharge permit, the Director must find that Red Leaf is using the best available technology.

67. Best available technology, or BAT, is defined as "the application of design, equipment, work practice, operation standard or combination thereof at a facility to effect the maximum reduction of a pollutant achievable by available processes and methods taking into account energy, public health, environmental, economic impacts and other costs." Utah Admin Code R317-6-1.

68. The capsule design includes the following components:

a. *A lower liner*: "A layer of bentonite-amended shale (BAS) will be placed on the bedrock surface and compacted to construct a liner with saturated hydraulic conductivity of 1 x 10^{-7} cm/sec or less, with a thickness of three feet. (All other BAS liners in the capsule will be constructed to this standard.)" Permit, WQ001252-55.

b. *Lower liner penetrations*: In order to protect against the possibility of leaks where the heating and extraction piping perforates the BAS liner, the Permit requires the BAS liner to "overlap the bulkhead creating a seal." *Id.*

c. *Liquids collection pan*: While liquids are not anticipated to accumulate in the EPS capsule, the Permit requires the installation of a liquids-collection pan "on top of engineered, insulating fill overlying the BAS. The steel pan will direct the liberated petroleum liquids to a collection system and prevent loss of oil to the underlying liner or the environment. The pan is sloped northward to direct liquids to a collection trough and from there to

vertical pipes that penetrate the lower liner through the bulkhead on the north side of the capsule." *Id.*

d. *Insulating "rind:"* "An additional layer … will be placed on top of the metal pan to insulate the BAS liner from heat used to retort the shale. As the capsule is constructed, this layer and the BAS liner will be placed vertically to enclose the ore on the sides, and the insulating layer and BAS liner will also be placed on top of the ore to completely enclose it." Permit, WQ001255.

e. *Mine capsule construction*: "All sides of the EPS capsule will be buttressed by engineered fill, placed at a slope of 1.5H:1V." *Id.*

f. *Capsule top layers*: "Significant compaction of the oil shale ore is anticipated both during placement and retorting. To accommodate this compaction and maintain integrity of the upper BAS liner, the upper portion of the capsule will be designed to have a pitched cover surface. An insulating layer will be placed over the upper surface of the ore, connected to the side insulating layers to complete the "rind" surrounding the stacked ore. A top BAS liner will be constructed over the insulating layer and will be joined to the vertical side BAS liners with a sloped 'knuckle' structure. The top BAS liner will be covered with 4 to 15 feet of overburden/ interburden material to maintain compressive stress on the liner. This surface will be covered with 6 to 12 inches of topsoil or a topsoil substitute to begin reclamation." *Id.*

69. BAT is satisfied because, after heat extraction of kerogen, the spent shale will be dry and not have any significant water content, and it will also be completely enclosed in a three-foot thick liner of BAS or its functional equivalent. This is in addition to the inherent protectiveness of the site. SOB, WQ001272.

70. The Director was satisfied that there was an "unlikely possibility that the capsule would cause a discharge of contaminants to the subsurface, in combination with low permeability of the rocks underneath the capsule and the poor quality of ground water contained in them." WQ001272, *see also* Ap., WQ000108-410, Const. Ap., WQ001456-1544; Norwest Stacked Capsule Backing Wall Stability Analysis, WQ000038-83; Bayer Tech. Mem., WQ000096-98.

71. Petitioners argue that the capsule cannot represent BAT in the absence of a secondary containment. The Director rejected this argument based primarily on site conditions:

> Red Leaf's ground water discharge application represented the capsule as a "zero discharge" facility, but from DWQ's perspective, a zero discharge is not necessary for permit issuance because of the site conditions described. . . . Liners that are mainly intended for product containment provide added protection, but the permit is not based on a zero-discharge design for the EPS capsule, which would be an excessive standard in this case. Site conditions and what is known about the nature of the potential discharge justify accepting the proposed design for the EPS capsule to be Best Available Technology.

Cmt. Resp.,WQ001290.

72. Living Rivers' assertion that there is a "high likelihood of failure of the BAS liner and the release of hydrocarbons into the environment" is also not supported by the record. As noted in the Director's Response to Comments:

> Stability of the capsule is important from a safety and operational perspective but not from a groundwater quality permitting perspective. . . . As described [], the time frame for any liquid to discharge from the capsule is on the order of hundreds of years. Natural site conditions are already highly protective of the Douglas Creek Aquifer hundreds of feet beneath the mine site. DWQ is generally interested in how the BAS liner performs relative to the conditions noted in the comment but these issues are not relevant to protection of the aquifer at the site or the permitting conditions required under R317-6-6.4A.

Cmt. Resp., WQ001290.

73. The EPS capsule is using a preliminary Eco-Shale capsule design. It is designed to be environmentally protective and the evidence supports the Director's conclusion that it is the best available technology.

H. Impairment of Present and Future Beneficial Uses of Ground Water.

74. Pursuant to Utah Admin Code R317-6-6.4(A)(4), to issue a ground water discharge permit, the Director must find that there will be no impairment to present and future beneficial use of ground water. The assessment of impairment of present and future beneficial uses of ground water is perhaps the most important factor in the analysis required of the DWQ in granting a permit.

75. Initially, and based on the evidence, the Director rejected the Petitioner's claim that the permit application fails to accurately characterize the geology and hydrology in the area of the mine. *See* Cmt. Resp., WQ001292-94. As previously noted, the Director found "no support for Lips' statement that there is or may be an aquifer as close as 20 feet below the base of the mine operations." *Id.* *See also*, Ap., WQ000138-143.

76. The Director found that the EPS capsule would not impair present and future beneficial use of ground water at the mine site. In support of this finding, the Director found:

a. The shallow ground water is of poor quality. It contains BTEX (benzene, toluene, ethylbenzene and xylenes) in reportable concentrations. Ap., WQ000247-91. It is also highly saline with total dissolved solids ("TDS") ranging from 9,020 mg/l to 56,800 mg/l. *Id.*, SOB, WQ001271. The shallow ground water is therefore classified as Class IV (TDS greater than 10,000 mg/l). *Id.*; Permit, WQ001253.

b. "[E]ven if the capsule were to fail …, the water quality would be better than the existing water quality in the water bearing zones underlying the mine site. No Class III water quality standards were exceeded. … Thus, even if there were a leak, there would be no pollution. . . . The water quality of the leachate is of better quality than the water in the natural water bearing zones and the potential reintroduction of some very minor hydrocarbons to the environment that already carries much higher

concentrations (and from whence it came originally) is hardly a significant source. Even if the entire floor of the EPS ruptured, there is no likelihood . . . of impact to any other current or future beneficial use of ground water in the mine area." Supp. Cmt. Resp., WQ001787; Ap., WQ000159-163, 306-393.

c. There is a general absence of recharge from precipitation at the mine site. The actual infiltration rate at the mine site is likely lower than 0.3 inches per year. Cmt. Resp., WQ001280; Ap., WQ000405-406.

d. The oil shale underlying the mine site is effectively impermeable with a hydraulic conductivity on the order of 10^{-7} cm/sec. SOB, WQ001270-1271; Ap., WQ000139-143; Cmt. Resp., WQ001277; Supp. Exp. Resp., WQ001778, 1780.

77. The evidence also supports the Director's conclusion that the Permit is adequately protective of seeps and springs. The Director concluded that the springs found near the mine site are not hydraulically connected to the mine site. *Id.* Among other things and in support of this conclusion, the Director noted that the evidence demonstrates the following: (a) there is a substantial difference in water quality and characteristics between the springs and the monitor wells; (b) the ground water underlying the mine site has a significantly higher content of dissolved solids that the springs; (c) its stable isotope composition indicates that it was recharged at a time when climate in the area was different than the current climate; and (d) the seasonal variation in the flow of the seeps and springs indicates short, seasonal residence in the aquifers that are their sources. SOB, WQ001271. Red Leaf also demonstrated through its monitoring wells that the ground water that exists in the shallow subsurface immediately beneath the site is contained in rocks with very low hydraulic conductivity. Ap., WQ000139-43.

78. The evidence further supports the conclusion that these springs represent discharge from a shallow system contained in unconsolidated surficial deposits and weathered bedrock isolated to the alluvial changes of the drainage. SOB, WQ001270.

79. The EPS capsule will be constructed on bedrock at the base of the Mahogany Zone in the mine pit. Any discharge from the capsules would be to bedrock of very low permeability and at an elevation below the land service and would not affect water in the saturated surficial deposits. WQ001295, 1317, 1318.

80. The Director's conclusion that the permit order was "properly protective, based on the negligible risk to ground water and its present and future beneficial uses" is based on a thorough review of the evidence included in the Permit Application and the public comments.

CONCLUSIONS OF LAW

1. As a matter of law, the Director's factual and technical determinations regarding the issuance of the Ground Water Discharge Permit and the Construction Permit are entitled to deference and must be upheld so long as they are not clearly erroneous. Utah Code 19-1-301.5(14)(b).

2. The Director's conclusion that the area of the mine site consists of low permeability rocks is supported by the evidence and is not clearly erroneous. Indeed, the Director found that the rock beneath the mine site is almost as impermeable as an engineered clay liner, and these low-permeability conditions extend 600 feet below the mine site, as shown by the fact that the first occurrence of ground water associated with

the Douglas Creek aquifer is under confined conditions and artesian pressure. WQ000034, 1271, 1272.

3. The low permeability of rocks below the project site is central to understanding the Director's findings that the Permit is protective of ground water, that the beneficial use of ground water will not be impaired, that source monitoring is appropriate, and that the best available technology criteria is met.

4. The Director concluded that Red Leaf demonstrated that water beneath the mine is Class IV and does not circulate. This finding is not clearly erroneous. Thus the standard for protection under R317-6-4(4.7) is met since there will be "no effect on human health or the environment." There is no dispute that the class II Douglas Creek aquifer is several hundred feet beneath the mine and adequately protected. Cmt. Resp. WQ001278; Trans. T104:5-13.

5. Having reviewed the evidence, this Tribunal has determined as a matter of law that the Director's factual and technical determinations regarding the applicable TDS limits, ground water quality standards protection levels, and permit limits are not clearly erroneous. The Director has satisfied Utah Admin Code R317-6-6.4(A)(1).

6. The Director concluded that the monitoring plan, sampling and reporting requirements set forth in the Permit Order are adequate to determine compliance with the permit requirements. Specifically, :

> [T]he monitoring, sampling and reporting requirements are satisfied because Red Leaf has evaluated which contaminants may be leached from spent shale that comes into contact with rainwater or snowmelt. The analysis showed "some metals and organic compounds may leach from spent shale, and the leachate will likely have a high pH. These tests further showed low levels of TDS and non-detectable results for most metals and organic compounds. To fully evaluate

> which contaminants may be present in leachate, additional analyses are required in the permit as described in the SOB Part VI. The permit requires representative sampling of capsule contents for a specific suite of organic and inorganic parameters. The sampling method will be determined following Red Leaf's assessment of capsule conditions following cooling.

Cmt. Resp., WQ001278.

7. Having reviewed the evidence, this Tribunal has determined as a matter of law that the Director's factual and technical determinations regarding the monitoring plan, sampling and reporting requirements are not clearly erroneous. The Director has satisfied Utah Admin Code R317-6-6.4(A)(2).

8. The Director concluded that Red Leaf is "using the best available technology to minimize the discharge of any pollutant based on the design of three feet of BAS in the test capsule." The Director further concluded:

> Site conditions and what is known about the nature of the potential discharge justify accepting the proposed design for the EPS capsule to be Best Available Technology. DWQ's approval of Red Leaf's design is conservative for these conditions. The permeability of the underlying bedrock is so low that discharge from an unlined, uncapped pile of spent shale would not seep through and impair underlying aquifers of higher quality than the leachate, even if some seepage occurred. Nor does available information suggest that the leachate would threaten beneficial uses, if there were any, of the limited quantities of class IV ground water.

Cmt. Resp., WQ001278.

9. Having reviewed the evidence, this Tribunal has determined as a matter of law that the Director's factual and technical determination that the EPS capsule design is the Best Available Technology for the conditions of this site is not clearly erroneous. Therefore, the Director has satisfied Utah Admin Code R317-6-6.4(A)(3).

10. The Director concluded that there is "no impairment of present or future beneficial uses based on the complete unlikelihood of a discharge ever reaching the Douglas Creek Aquifer and on the lack of any present or future beneficial use of the limited quantity of Class IV shallow ground water at the mine site." Cmt. Resp., WQ001278. He further concluded that the Permit is adequately protective of seeps and springs. Cmt. Resp. WQ001270, 1351.

11. Having reviewed the evidence, this Tribunal has determined as a matter of law that the Director's factual and technical determinations regarding present and future beneficial use of ground water at the mine site are not clearly erroneous. The Director has satisfied Utah Admin Code R317-6-6.4(A)(4).

12. As a matter of law, the Director made all four findings required under Utah Admin Code R317-6-6.4(A)(1)-(4) for the issuance of the Permit and his factual and technical findings are supported by the evidence and are not clearly erroneous.

MOTION TO STAY

On April 13, 2015, Living Rivers filed a Motion to Stay the ground water and construction permits issued to Red Leaf. The parties agreed that the Motion to Stay would be heard with the hearing on the merits. The Motion to Stay was not addressed at oral argument but remains pending. In light of the Findings, Conclusions and Recommended Order on the merits, this Tribunal also finds that the Petitioners cannot satisfy the four elements required for a stay. Specifically, they have failed on the merits of the matter. The Motion to Stay is therefore DENIED.

CONCLUSION AS TO THE ALJ'S RECOMMENDED ORDER

For the reasons stated above, the ALJ recommends that the Director's decision to issue the Ground Water Discharge Permit and Construction Permit be affirmed.

NOTICE AND OPPORTUNITY FOR COMMENT

The parties may file comments to this Recommended Decision with the Executive Director of the Department of Environmental Quality within ten business days of the service of this recommended decision in accordance with the provisions of R305-7-213.

DATED this 19th day January 2016.

Carol Clawson
Administrative Law Judge
clawsonlaw@centurylink.net

CERTIFICATE OF SERVICE

I hereby certify that on this 19h day of January 2016, a true and correct copy of the foregoing **FINDINGS OF FACT, CONCLUSIONS OF LAW AND RECOMMENDED ORDER** was served by e-mail upon the following:

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