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PETITION FOR REVIEW

I, Peter Bormuth, file this petition postmarked January 7, 2013, (sent overnight express mail to USEPA, Clerk of the Board, Environmental Appeals Board, Colorado Building, 1341 G Street NW, Suite 600, Washington DC 20005) for review of the Underground Injection Control Permit #MI-075-2D-0009 issued to West Bay Exploration Company for the West Bay #22 well in Jackson County Michigan for the purpose of disposal of oil and gas related brine.

According to 40 CFR § 124.19(a) *"Any person who filed comments on [the] draft permit or participated in the public hearing may petition the Environmental Appeals Board to review any condition of the permit decision."* I claim the right of petition since I participated in the May 23, 2012 public hearing held at Columbia Central High School in Brooklyn Michigan. I also filed comments with Anna Miller on May 29, 2012 by e-mail. Additionally under Section 124.13 *"the person filing the petition for review does not necessarily have to be the one who raised the issue"* during the comment period. See *In re Broward County, Florida*, NPDES Appeal No. 92-11, at 11 (EAB, June 7, 1993).

The petitioner challenges the permit decision since it is based on clearly erroneous findings of fact. Under the rules governing this proceeding, an erroneous finding of fact demands and warrants review. See 40 CFR § 124.19; FED. REG. 33, 412 (1980).

The burden of demonstrating that review is warranted rests with the petitioner. See *In re Avery Lake Property Owners Ass'n*, UIC Appeal No. 92-1, at 3 (EAB, Sept. 15, 1992).

The burden of demonstrating that the injection is safe and will not harm drinking water or the health of person's rests with West Bay Exploration and now since the permit has been issued, that burden rests with the EPA. See 40 CFR § 144.12(a). *"No owner or operator shall construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR part 142 or may otherwise adversely affect the health of persons. The applicant for a permit shall have the burden of showing that the requirements of this paragraph are met."*

The petitioner claims that the EPA clearly erred in finding that underground sources of drinking water would not be endangered by the injection of brine at this specific location. The geological formation at this site is clearly inappropriate for injection purposes since conversion of the Anhydrite cap to Gypsum will definitely take place upon exposure to the injected water. The combination of the pressure from the injected liquid, the pressure created by the contained swelling of the anhydrite cap, and the natural upward flow gradient in the Michigan

Basin would then force migration of the brine through the overlying rock layers into the USDW. The petitioner states that both laboratory and field data show that it is likely that the brine containing naturally occurring toxic chemicals will breach the cap through naturally occurring fault lines, pressure induced fractures, and areas where the converted anhydrite-to-gypsum dissolves in solution. The breaching of the anhydrite cap and the upward migration of the brine clearly would violate the Safe Drinking Water Act and endanger the health of persons.

The EPA lists these common components of oil field brines:

Benzene is a “conclusively” known human carcinogen and a notorious cause of bone marrow failure. Vast quantities of epidemiological, clinical, and laboratory data link benzene to aplastic anemia, acute leukemia, kidney cancer, and bone marrow abnormalities. Benzene exposure has been linked directly to neural birth defects, spina bifida, and anencephaly. **Ethylbenzene** exposure can irritate the eyes, nose, and throat. Very high levels can cause paralysis, trouble breathing, and death. High exposure may also damage the liver and chronic long term effects can last for months or years. **Toluene** exposure is associated with effects such as psychoorganic syndrome, visual evoked potential, toxic polyneuropathy, optic atrophy, brain lesions, and cerebellar, cognitive and pyramidal dysfunctions. Low to moderate levels can cause tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, and loss of appetite, hearing, and color vision. **Xylene** is an irritant of the eyes and mucous membranes at concentrations below 200 ppm. Ingestion of xylene causes gastrointestinal distress, disturbances of liver and kidney function and may cause toxic hepatitis. Chronic exposure may cause central nervous system depression, anemia, mucosal hemorrhage, bone marrow hyperplasia, liver enlargement, and liver necrosis. **Naphthalene** is classified as “possibly carcinogenic to humans” and may damage or destroy red blood cells. Exposure may cause confusion, nausea, vomiting, diarrhea, cataracts, blood in the urine, and jaundice. Under California’s Proposition 65, naphthalene is listed as “known to the State to cause cancer”. **Polycyclic aromatic hydrocarbons** are known for their carcinogenic, mutagenic, and teratogenic properties. Prenatal exposure is associated with lower IQ and childhood asthma. The Center for Children’s Environmental Health reports that exposure to PAH during pregnancy is related to adverse birth outcomes including low birth weight, premature delivery, and heart malformations.

Obviously if these naturally occurring toxic chemicals reach our USDW a serious hazard to human health would result. The petitioner claims this outcome is likely because the Salina A-2 Evaporite will be breached and the injected brine will migrate upwards.

Under Response #1, **Geologic Siting** the EPA claims that “*the injection zone is topped by the Salina A-2 Evaporite, an approximately 28-foot thick layer of anhydrite which will act as a confining layer to prevent flow out of the injection zone.*”

The petitioner contends that this statement is an erroneous finding of fact which contradicts the known scientific data. Laboratory experiments show that anhydrite readily reverts to gypsum when brought into contact with water (See Hardie, *The American Mineralogist*, Vol. 52, January-February 1967 – THE GYPSUM-ANHYDRITE EQUILIBRIUM AT ONE ATMOSPHERE PRESSURE; see also Zen, *Journal of Petrology*, Vol. 6, Part 1, 1965 – SOLUBILITY MEASUREMENTS IN THE SYSTEM CaSO₄-NaCl-H₂O at 35, 50, & 70 degrees C and ONE ATMOSPHERE PRESSURE – publication approved by the Director, U.S. Geological Survey)

In response #34 the EPA rejects this laboratory evidence as “not relevant to gauging the behavior of the Salina A-2 Evaporite layer at approximately 2630 feet below the surface, where the pressure and temperature regime is much different and influences mineral reactions and rock behavior.” This is faulty logic.

First, temperature and pressure variables for the approximate depth of 2630 feet can easily be calculated and utilized in the same conversion formulas developed in the laboratories. There is no volcanic activity in lower Michigan and the temperature 100 feet below the surface is 55 degrees. There is 1 degree of temperature increase for each 100 feet you descend so I believe an estimate of the temperature at 2600 feet as 80 degrees is reasonable and usable in all calculations.

Second, while calculating the pressure is more difficult since it must take into account the 1,200 BWPD of water injected into the Anhydrite rock strata at a pressure of 682 psi, the pressure of the overbearing rock strata, and the potential pressure created by the swelling of the Salina A-2 Evaporite formation upon contact with the injected fluid, it is still possible to create a mathematical model. Anhydrite rock layers of similar size have been observed to swell and increase in volume up to 60% upon exposure to water and when such swelling is prevented due to confining conditions immense swelling pressures from 1.7 up to 4.7 MPa have been monitored and recorded. (see Steiner, *International Journal of Rock Mechanics and Mining Sciences & Geomechanics Abstracts*, 30, 4, (1993) – SWELLING ROCK IN TUNNELS; see also Sass & Burbaum, *ACTA Carsologica* 39/2 Postonjna (2010) – DAMAGE TO THE HISTORIC TOWN OF STAUFEN (GERMANY) CAUSED BY GEOTHERMAL FRILLINGS THROUGH ANHYDRITE-BEARING FORMATIONS). The model of Monnin allows the calculation of the solubility and saturation indices of both anhydrite and gypsum as a function of the solution composition, temperature (up to 200 degrees C) and pressure (up to 1kbar) in the Na-K-Ca-Mg-Sr-Ba-Cl-SO₄-H₂O system. (see Monnin, *Computers and Geosciences* 20, (1994) – DENSITY CALCULATION AND CONCENTRATION SCALE CONVERSIONS FOR NATURAL WATERS; also *Chemical Geology* 153 (1999) – A THERMODYNAMIC MODEL FOR THE SOLUBILITY OF BARITE AND CELESTINE IN ELECTROLYTE SOLUTIONS AND SEAWATER FROM 0 TO 200 DEGREES C AND TO 1KBAR; also *Geochimica et Cosmochimica Acta* 70 (2006) – THE SATURATION OF THE WORLD’S OCEANS WITH

RESPECT TO SO₄ SOLID SOLUTIONS; also *Marine Chemistry* 65 (1999) – THE MARINE BARITE SATURATION STATE OF THE WORLD'S OCEANS; also *Geochimica et Cosmochimica* 67 (2003) – A THERMODYNAMIC INVESTIGATION OF SULFATE AND CALCIUM SULFATE STABILITY IN SEDIMENTS; also *Marine Geology*, November (2011) – THE STABILITY OF GYPSUM IN MARINE SEDIMENTS USING THE ENTIRE ODP/IODP POREWATER COMPOSITION DATA BASE; see also Moller, *Geochimica et Cosmochimica Acta* 52, (1988) – THE PREDICTION OF MINERAL SOLUBILITIES IN NATURAL WATERS: A CHEMICAL EQUILIBRIUM MODEL).

The EPA in Response #34 stated that the evidence described in these papers “is not relevant to the permit decision, because the geologic setting of the German town is very different from the geologic regime at the West Bay #22 site and geothermal heat exchange technology is different than Class II injection well technology.” The purpose of the petitioner quoting these studies is to show that anhydrite transforms to gypsum upon exposure to water in actual locations. The surrounding formations in a geologic setting will not alter this basic chemical reaction. It is an accepted fact of science that anhydrite will convert to gypsum upon exposure to water. Many researchers have reported evidence of this conversion at shallower depths with Murray reporting it at a depth of 3500 feet below the surface. (see Murray, *Journal of Sedimentary Petrology*, Vol. 34, No. 3 September 1964 – ORIGIN AND DIAGENESIS OF GYPSUM AND ANHYDRITE). The EPA is demanding an exactly similar situation before it accepts the scientific evidence that is available showing what happens when water is introduced into anhydrite formations. But the burden of proof rests on the EPA to show that this commonly accepted reaction studied both in laboratories and in situ locations will not occur at the West Bay site. What makes this anhydrite formation so unique? Give me specific reasons why this anhydrite will not hydrate and convert to gypsum. Vague generalities about temperature and pressure are not sufficient.

The EPA can argue that the geothermal and tunneling technologies described in the respective Steiner and Sass & Burbaum papers introduced fresh water and not brine into the anhydrite formations (which then reported swelling which is the first stage of the conversion of anhydrite to gypsum). But the scientific literature shows that certain salts activate rather than inhibit the hydration of anhydrite and thus promote the conversion of anhydrite to gypsum. In laboratory studies the best activators were found to be sodium, potassium sulfate and sulfuric acid. Anhydrite reacts very rapidly with concentrated Na₂SO₄ solutions to form Ca-Na double sulfates. These double-salts are unstable in dilute solutions and decompose to gypsum and/or glauberite. Need I mention that West Bay is planning on injecting 1,200 BWPD of water with a sodium content of 37,600 mg/l into the anhydrite strata? (see Conley and Bundy, *Geochimica et Cosmochimica Acta*, v. 15 (1958) – MECHANISM OF GYPSIFICATION; see also Hardie, *The American Mineralogist*, Vol. 52, January-February 1967 – THE GYPSUM-ANHYDRITE EQUILIBRIUM AT ONE ATMOSPHERE PRESSURE); see also Singh, *Amer. Ceram. Soc.* Vol. 88

(January 2005) - EFFECT OF ACTIVATOR K₂SO₄ ON THE HYDRATION OF ANHYDRITE OF GYPSUM (CASO₄.II).

In the laboratory Singh proposes the following mechanism for the conversion of anhydrite to gypsum: as soon as anhydrite comes into contact with water, a part of it is dissolved, making a solution saturated with respect to Ca²⁺ and SO₄²⁻ ions. These ions, which are hydrated in the solution, rapidly get absorbed at the surface of anhydrite, giving a higher surface area. The thickness of the absorbed layer increases over time. When the thickness of the absorbed layer increases beyond a certain limit, cracks are formed. Water molecules enter through the cracks and come in contact with a fresh surface of anhydrite. When there are sufficient numbers of Ca²⁺ and SO₄²⁻ ions and water molecules at the surface, nuclei of gypsum are formed (Singh, *Amer. Ceram. Soc.* Vol. 88 (January 2005) - EFFECT OF ACTIVATOR K₂SO₄ ON THE HYDRATION OF ANHYDRITE OF GYPSUM (CASO₄.II). The natural cracking is significant since under pressure the Anhydrite can be expected to fracture along naturally occurring fault lines. In a private communication with the petitioner, Dr. Timothy Bechtel PhD. P.G. stated: "the biggest problem with anhydrite is the 60% volumetric expansion it suffers when hydrating to gypsum. I have been involved with an anhydrite case in Germany (Google Staufen im Breisgau) in which introduction of water into an anhydrite bed has produced swelling and cracking of the earth. Oilfield brine could produce similar results...swelling and cracking to produce conduits for fluid migration." (e-mail – Bechtel to wardance@live.com – 7-18-12). And Suthersan in his study of hydraulic and pneumatic fracturing notes that "The injection pressure required to create hydraulic fractures is remarkably modest (less than 100 psi)." (See Suthersan, Boca Raton: CRC Press LLC, (1999) – HYRDAULIC AND PNEUMATIC FRACTURING). Other researchers have found that gypsum fractures at pressures as low as 300 psi. West Bay will be injecting fluid at 682psi.

As a last resort the EPA argues in Response #34 that even if the anhydrite was breached "***the fluid would migrate up into the next rock unit that would accept fluid.***" The petitioner agrees with this statement. After this point of agreement the EPA the launches this absurdity: "*The injection zone is separated from the lowest USDW by 2436 feet of geologic strata. Many of the formations between the injection zone and the USDW are layered with impermeable shale and other rock types which will also prevent movement of the injected fluid into the USDW.*"

First the EPA ignores the fact that the defendants are planning on injecting 1,200 BWPD of water with a sodium content of 37,600 mg/l into the Anhydrite rock strata at a pressure of 682 psi for 30 years. It is my understanding that one atmosphere (101 kPa or 14.7 psi) can lift water by 34 feet so if West Bay's permit allows them to inject at 682 psi, they could conceivably lift the brine/water 1530 feet (45 atmosphere's times 34 feet) if the anhydrite cap is breached. This does not take into account the additional pressure dynamics resulting from the swelling and expansion of the anhydrite. As I mentioned previously, these forces can be immense and would

surely push the liquid even farther than the injection pressure alone once the anhydrite cap was breached.

Nor does the EPA take into account the fact that there is a known vertical component to the Michigan hydraulic gradient which will move this brine upwards naturally through pre-existing fractures in the overburden rock formations which the EPA cites. I have looked at maps of the entire overburden in the Michigan basin. Contrary to the EPA's glib statements, none of the overlying layers are impermeable. Transport of fluid upwards, even considered as simple particle velocity, will occur. It is clear from the basic scientific facts that the fluid could be transported vertically into the USDW and the burden of proof lies with the EPA to show that this will not occur.

There are several studies that document cross-formational pathways in the Michigan basin which have allowed deeper saline water to migrate into shallower freshwater aquifers. This upward migration of saline fluid into the overlying glacial sediments was interpreted to reflect isostatic rebound following the retreat of the glaciers, leading to fracture intensification and increased permeability of the near surface layers above 1000 feet. (see Weaver, Frappe, Cherry, *Geol. Soc. Am. Bull.* 107 (1995) – RECENT CROSS-FORMATIONAL FLUID FLOW AND MIXING IN THE SHALLOW MICHIGAN BASIN; see also Long, Wilson, Takacs, Rezabek, *Geol. Soc. Am. Bull.* 100 (1988) – STABLE-ISOTOPE GEOCHEMISTRY OF SALINE NEAR-SURFACE GROUNDWATER: EAST-CENTRAL MICHIGAN BASIN).

The EPA must also document which formations it believes to be impermeable. It cannot just make off-the-cuff general statements. The strata of the intervening layers include limestone, sandstone, dolomite, cherty limestone, gypsum, and a band of narrow bell shale. (see Briggs, *Journal of Sedimentary Petrology*, Vol. 28 No. 1 (March 1958) EVAPORITE FACIES; see also Landes, Geological Survey Circular 133 (September 1951) DETROIT RIVER GROUP IN THE MICHIGAN BASIN) None of these layers are impermeable. The EPA must provide a specific stratigraphic column showing the layers, thickness, and depth and designate which layers it claims to be impermeable.

Finally the petitioner believes that recent scientific findings show that migration of injected fluid through strata is far more common and widespread than previously believed. The reason the EPA and the oil & gas industry has been able to claim that waste injection and fracking are safe is because there has never been sufficient investigation of their claims. A Duke University study (see Warner; Jackson; Darrah; Osborn; Down; Zhao; White; Vengosh. *Proceedings of the National Academy of Sciences*, (May 2012) GEOCHEMICAL EVIDENCE FOR POSSIBLE NATURAL MIGRATION OF MARCELLUS FORMATION BRINE TO SHALLOW AQUIFERS IN PENNSYLVANIA) demonstrates that deep formation brine may migrate to shallow aquifers. The EPA in Document # 600/R-00/000 (December 2011) INVESTIGATION OF GROUND WATER

CONTAMINATION NEAR PAVILLION WYOMING concluded that "...when considered together with other lines of evidence, the data indicates likely impact to ground water that can be explained by hydraulic fracturing." In another study independent researcher Tom Myers used computer modeling and concluded that "...fluid can migrate through thousands of feet of rock and endanger water supplies." (see Myers, *Ground Water*, (April 2012) POTENTIAL CONTAMINANT PATHWAYS FROM HYDRAULICALLY FRACTURED SHALE TO AQUIFERS).

While these studies dealt with hydraulic fracturing, the mechanism of pressure, cracking, and gas or fluid migration does not differ from this Waste Injection situation. The EPA cannot claim that the findings of these studies may not also be applied to the waste injection process.

Clearly the petitioner has proven that there is a sufficient likelihood and danger of the anhydrite cap being breached which would then allow vertical vector fluid migration and possible contamination of our underground sources of drinking water. Given these circumstances, the EPA is under legal obligation to revoke this permit upon review.

The petitioner also claims that the Indiana bat will be endangered by this activity within its known habitat. 40 CFR § 144.4(c) specifically states: *"The Endangered Species Act, 16 U.S.C. 1531 et seq. Section 7 of the Act and implementing regulations (50 CFR part 402) require the Regional Administrator to ensure, in consultation with the Secretary of the Interior or Commerce, that any action authorized by EPA is not likely to jeopardize the continued existence of any endangered or threatened species."* The Indiana bat was listed as an Endangered Species by the USFWS on March 11, 1967.

The petitioner personally sighted and identified an Indiana bat roosting under the 124 bridge over the Raisin River slightly over a mile from the well site on Ladd Rd. (see Affidavit of Peter Bormuth). The site of the permitted well on Ladd Rd. is open space with wooded borders and nearby are several wetland areas including two small ponds. It is within ½ mile of Vineyard Lake and within 1.5 miles of the Raisin River. That is perfect bat feeding habitat.

In Response #8 the EPA erroneously states: *"Briefly, the Indiana bat uses river corridors, woodlands and caves and mines;... -The area around the well is farmland, which generally provides no habitat for these species."*

Allan Kurta and Susan Murray are two scientists who have done significant research on the Indiana Bat. Kurta found that in southern Michigan, the general landscape occupied by Indiana bats consisted of open fields and agricultural lands (55%), wetlands and lowland forest (19%), other forested habitats (17%), developed areas (6%), and perennial water sources such as ponds and streams (3%). Kurta's scientific findings clearly contradict the EPA's statement. If

55% of the general landscape used by Indiana bats is open fields and agricultural lands, then bats will be found on the well site property.

Kurta found roosts in southern Michigan in an elm-ash-maple forest, a woodland/marsh edge, a lowland hardwood forest, small wetlands, a shrub wetland/cornfield edge, and a small woodlot. Moreover the EPA notes that Indiana bats use river corridors and the Raisin River corridor is less than a ½ mile away from the proposed well site. Kurta found that when switching between day roosts, Indiana bats may travel as far as 3.6 miles (5.8 km) though the average move was 0.6 miles (1.0 km). This means the Ladd Rd. property is well within the range of the Indiana bat and may possibly be used for day roosts as well as for feeding.

Murray and Kurta made some qualitative assessments of Indiana bat foraging habitat in Michigan: the majority of bats were found foraging in forested wetlands and other woodlands, while 1 bat foraged in an area around a small lake and another in an area with 50% woodland and 50% open fields. Another Indiana bat foraged over a river, while 10 others foraged in areas of farmland greater than 0.6 mile (1 km) from the same river. The farmland adjacent to the well site is therefore a foraging site of significance and cannot be dismissed by the EPA.

Distances seen between roosts and other habitat features may be influenced by the age, sex, and reproductive condition of the Indiana bats. In Illinois, most roosts used by adult females and juveniles were about 2,300 feet (700 m) or more from a paved highway, while adult males roosted less than 790 feet (240 m) from the road. In Michigan, roosts were only slightly closer to paved roads: 2,000 feet (600 m) on average for all roosts located. In general, roosts were located 1,600 feet (500 m) to 2,600 feet (800 m) from unpaved roads in Illinois and Michigan. Roost trees used during autumn in Kentucky were very close to unpaved roads at an average of 160 feet (50 m). This data indicates that the well site could conceivably be used both for foraging and adult male roosts.

Mass plays a significant role in mammalian toxicity. The Indiana bat, this endangered and protected species is already fighting a losing battle against the fungus *Geomyces destructans* that causes white-nose syndrome. Some scientists think herbicide/pesticide toxicity build-up in the cells of bats makes them more susceptible to the disease. Now the EPA is willing to expose these poor relatives of ours to toxic chemicals at this well site. Spills associated with these injection wells, pipelines, and trucks are frequent. In North Dakota 1,073 spills were reported in 2011. And this number does not include the many unreported spills. Why doesn't the EPA just say that the only thing they really care about is the political power of oil/gas/chemical companies and that there is no political will to protect the Indiana bat from extinction? The Christian concept of dominion and the Christian belief in forgiveness are the two great errors of western thought. There is no forgiveness for polluting this Earth. Humans are not separate from the web of life. Already 3 out of five Americans get some form of cancer in their lifetimes. We

will also face extinction. It will just take a little longer because we are bigger and more adaptable than bats. The petitioner requests that the EPA comply with 40 CFR § 144.4(c) and protect the Indiana bat.

Sources cited:

Kurta; Kath; Smith; Foster; Orick; Ross. *The American Midland Naturalist*. 130(2) [53799] (1993) A MATERNITY ROOST OF THE ENDANGERED INDIANA BAT (*MYOTIS SODALIS*) IN AN UNSHADED, HOLLOW, SYCAMORE TREE (*PLATANUS OCCIDENTALIS*).

Kurta; King; Teramino; Stribley; Williams. *The American Midland Naturalist*. 129(1) [53800] (1993) SUMMER ROOSTS OF THE ENDANGERED INDIANA BAT (*MYOTIS SODALIS*) ON THE NORTHERN EDGE OF ITS RANGE

Kurta; Murray. *Bat Research News*. 42(2) [53801] (2001) PHILOPATRY AND MIGRATION OF BANDED INDIANA BATS.

Kurta; Murray; Miller. In: Kurta; Kennedy, eds. *The Indiana bat: biology and management of an endangered species*. Austin, TX: *Bat Conservation International* [53802] (2002) ROOST SELECTION AND MOVEMENTS ACROSS THE SUMMER LANDSCAPE

Kurta; Murray; Miller. *Bat Research News*. 42(2) Abstract. [54765] (2001) THE INDIANA BAT: JOURNEYS IN SPACE AND TIME.

Kurta; Whitaker. *The American Midland Naturalist*. 140(2) [53811] (1998) DIET OF THE ENDANGERED INDIANA BAT (*MYOTIS SODALIS*) ON THE NORTHERN EDGE OF ITS RANGE.

Kurta; Williams; Mies. In: Barclay, R. M. R.; Brigham, R. M., eds. *Bats and forests*. Victoria, BC: Ministry of Forests Research Program [53812] (1996) ECOLOGICAL, BEHAVIOURAL, AND THERMAL OBSERVATIONS OF A PERIPHERAL POPULATION OF INDIANA BATS (*MYOTIS SODALIS*)

Murray; Kurta. *Journal of Zoology*. 262(2) [53825] (2004) NOCTURNAL ACTIVITY OF THE ENDANGERED INDIANA BAT (*MYOTIS SODALIS*).

Murray. *Bat Research News*. 42(2) [Abstract]. [53903] (2001) VARIATIONS IN THE DIET OF THE INDIANA BAT.

Murray; Kurta. In: Kurta, Allen; Kennedy, Jim, eds. *The Indiana bat: biology and management of an endangered species*. Austin, TX: *Bat Conservation International* [53828] (2002) SPATIAL AND TEMPORAL VARIATION IN DIET.

CONCLUSION

The petitioner has demonstrated that review is warranted. The EPA reached a conclusion that the geologic siting of this well was safe and that the Virginia bat would not be found on this property. Both of these conclusions have been shown by the petitioner to be erroneous findings of fact.

Respectfully submitted,

A handwritten signature in black ink that reads "Peter Bormuth". The signature is written in a cursive style with a large initial "P" and "B".

Peter Bormuth
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(517) 787-8097
wardance@live.com

The petitioner regrets that he cannot include copies of the scientific studies he cites. He does not own a computer and does all his research and work at public libraries where printing costs are exorbitant. Presumably the EPA can afford to print the sources referenced.

AFFIDAVIT OF PETER BORMUTH

Peter Bormuth being duly sworn, says:


- 1) On September 1st, 2012 while canoeing Vineyard Lake and the Raisin River sometime between 1 and 3pm in the afternoon I did see and positively identify an Indiana bat (MYOTIS SODALIS) roosting underneath the state road 124 bridge over the Raisin River in Norvell Township, Michigan.
- 2) This site is within 1.5 miles of the Ladd Rd. location of the proposed West Bay #22 SWD.

Dated: January 7, 2013



Peter Bormuth

Subscribed and sworn before me this 7th day of January, 2013, by Peter Bormuth.



Notary Public

Jackson County, Michigan

Acting in Jackson County, Michigan

My commission expires: 4/23/2018

LINDA SAMON
NOTARY PUBLIC, Jackson County, MI
My Commission Expires April 23, 2018
