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November 16, 2022

Ms. Kelly Keel
Executive Director
Texas Commission on Environmental Quality
12100 Park 35 Circle
Austin, TX 78753

Re: Objections to Applications for:

Edwards Aquifer Permit 11003759

Edwards Aquifer Permit 11003760

1. The Trinity Edwards Springs Protection Association, "TESPA," objects to these applications for issuance of permits for the construction and operation of a proposed limestone quarry mining and related rock crushing activities, hereafter referred to as "quarry" and/or "quarry mining," over the Edwards Aquifer Recharge Zone in Hays County, Texas, between Wimberley and San Marcos. TESPA includes individuals and entities with interest in protection of water quality that may be adversely impacted in the event these applications are granted. As relevant questions of facts exist that bear on the decision by this commission, TESPA requests a contested case hearing on these applications based on the objections of fact and law as follows.

ISSUES AND FACTS

2. As shown in the application and the report of expert hydrogeologist, Doug Wierman, P.G., the proposed quarry operations will occur in the Edwards Aquifer Recharge Zone. See report of Doug Wierman submitted concurrently with this comment and Exhibit 1 below for a map.

3. The quarry mining is proposed to occur in a 100-year flood plain. See, Doug Wierman report. The applicant has failed to apply for, much less obtain, the required authorization from Hays County, Texas, which is mandatory.[1]

4. The proposed quarry mining will use a blasting slurry known as "ANFO," which is an abbreviation for ammonium nitrate fuel oil, which is a mixture of ammonium nitrate and diesel. ANFO was used to bomb and destroy the federal courthouse in Oklahoma City in 2001.

5. As with car engine combustion, some of the explosive slurry is not completely consumed in the explosion. Over time, the residue of uncombusted nitrates and diesel accumulates in the groundwater and surface water. Both surface water and groundwater in this area flows into the Edwards Aquifer as this is in the Recharge Zone, and towards and into San Marcos Springs, and the San Marcos River.

6. The threat of polluting drinking water is very real. The City of Miami had to shut down some of its municipal water wells due to pollution from benzene, an established human carcinogen, from blast residue from a limestone quarry operation.[2]

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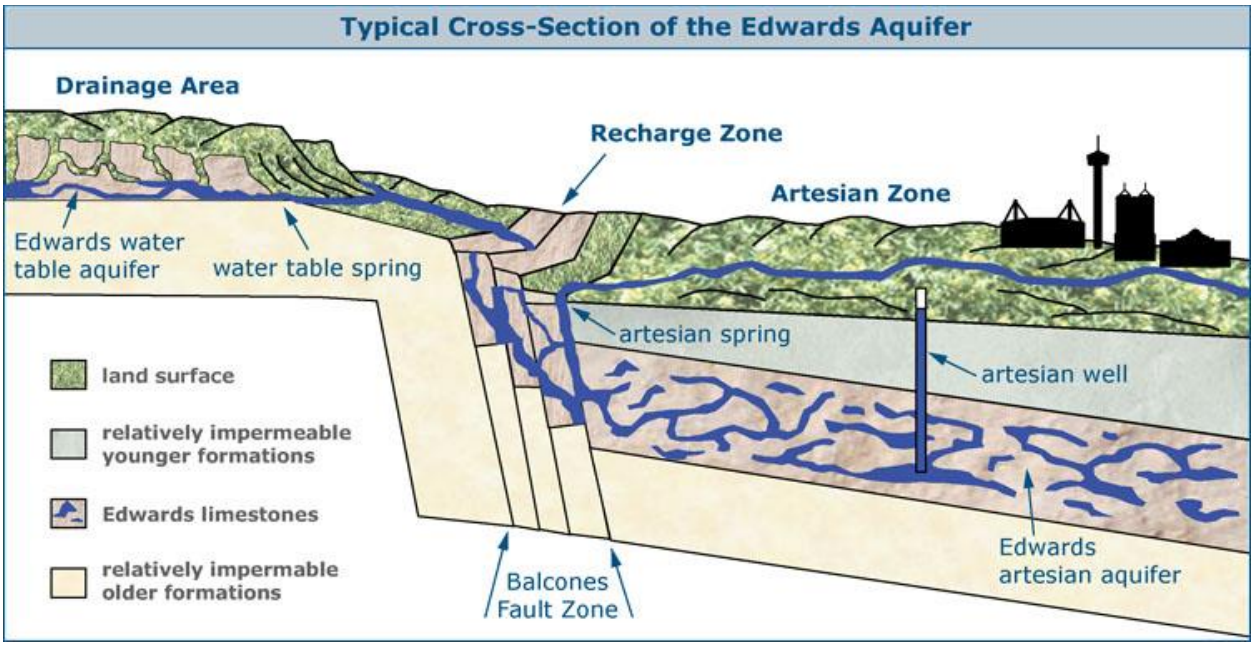
[1] https://hayscountytx.com/departments/development-services/permitting/

[2] *See, Sierra Club v. Strock*, 495 F. Supp. 2d 1188, 1196–97 (S.D. Fla. 2007), *vacated sub nom. Sierra Club v. Van Antwerp*, 526 F.3d 1353 (11th Cir. 2008).

7. The application fails to address uncombusted blast slurry accumulating in ground water and surface water and polluting the nearby springs and river. Subsumed within that failure is the failure to address the accumulation of nitrates and diesel fuel including benzene, an established human carcinogen, from entering the Edwards Aquifer, San Marcos Springs, and San Marcos river.

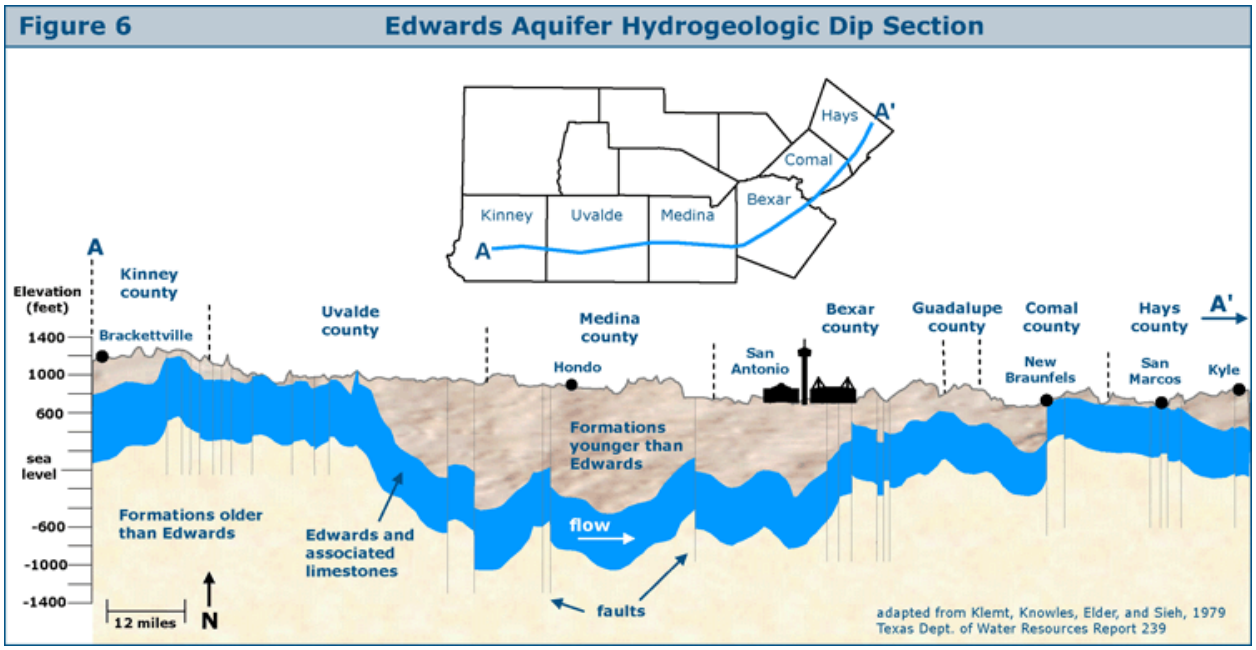
EDWARDS AQUIFER FACTS

8.

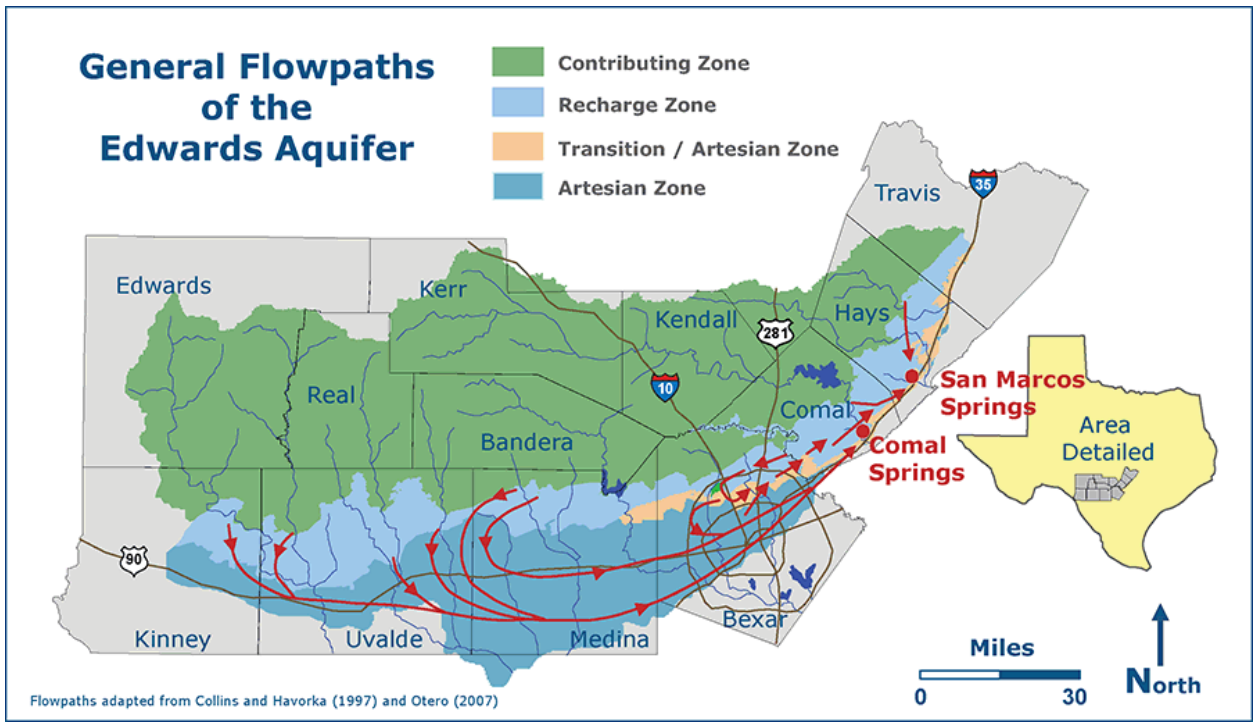


9. The Edwards Aquifer is relatively near the surface in the San Marcos, Hays County area.[3]

[3] https://www.edwardsaquifer.net/geology.html

1. 

10. The general flow path of this area is towards San Marcos.[4]

11. 

[4] https://www.edwardsaquifer.net/geology.html

12. The rock matrix in this area, somewhat similar to Swiss Cheese, is known as "karst." 95% of the water in this area is stored in the rock matrix and flows through conduits in the rock matrix.

13. **Recharge Zone**

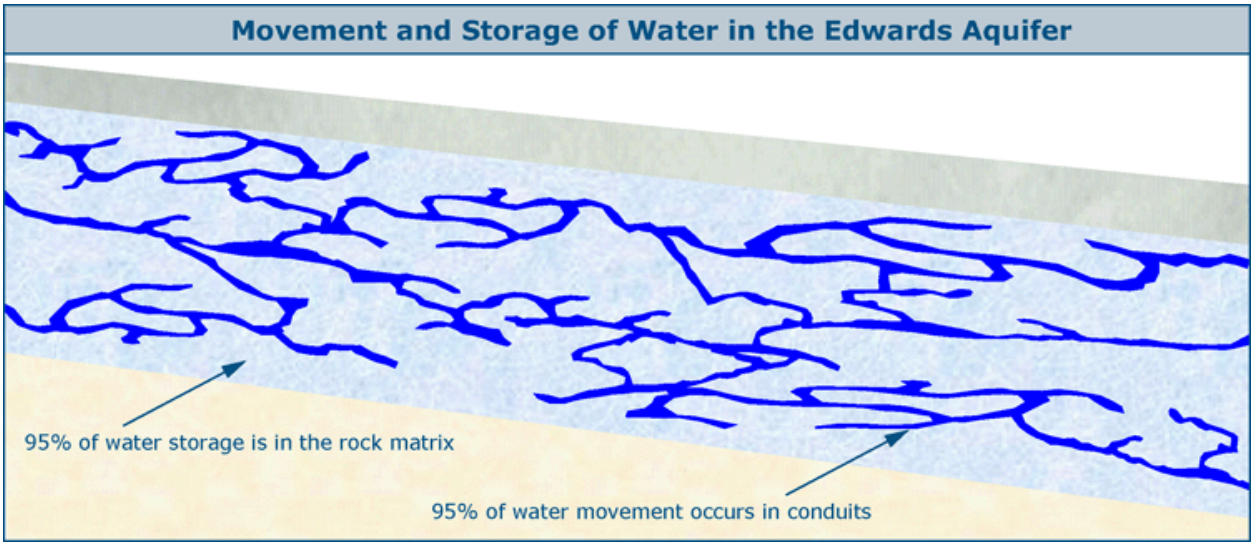
The recharge zone is a 1,250 square mile area where highly faulted and fractured Edwards limestones outcrop at the land surface, allowing large quantities of water to flow into the Aquifer. For this reason, the Edwards is often called a fault-zone aquifer (see section on Faults & Caves for fault map and photos). About 75-80% of recharge occurs when streams and rivers cross the permeable formation and go underground. This is called *allogenic* recharge. Most of the remaining percentage of recharge occurs when precipitation falls directly on the outcrop. This is called *autogenic* recharge.[5]

14. 

[5] https://www.edwardsaquifer.net/intro.html

15. While the general flow direction is towards San Marcos, the matrix contains irregular water flow paths.[6]

16.



APPLICANT'S LIMESTONE MINING

INVOLVES INJECTION WELLS PROHIBITED IN THE EDWARDS AQUIFER

17. Defendant will bulldoze the surface, drill injection wells, inject explosive ANFO slurry, blast, mine, cut or crush to size, and then transport an estimated 100+ truckloads of rock per day and the quarry foreseeably will operate 100 or more years into the future.

18. Modern blasting techniques in quarry operations utilize a wet slurry mixture of ammonium nitrate mixed with fuel oil, typically diesel, called "ANFO," short for ammonium nitrate fuel oil. This mixture is tremendously destructive. This ANFO explosive is what was used to attack and destroy the federal courthouse in Oklahoma City. The slurry is used to fill blast holes drilled into the rock and then ignited with TNT and a blasting cap.

[6] https://www.edwardsaquifer.net/geology.html

19. Here is a real example of the blasting method:

https://www.youtube.com/watch?v=P8VTWqTI154

20. Please note that the video clearly proves that the quarry activity involves drilling an injection well as defined, and prohibited, in the TCEQ's Edwards Aquifer Protection regulations.

30 T.A.C. § 213.3 Definitions

(39) Well--A bored, drilled, or driven shaft, or an artificial opening in the ground made by digging, jetting, or some other method, where the depth of the well is greater than its largest surface dimension. A well is not a surface pit, surface excavation, or natural depression.

The video at 1:40 is measured at 43' deep, and obviously is no more than 10" – 12" wide at most. As such, it meets the TCEQ's definition of a "well."

21. TCEQ's own Edwards Aquifer protection regulations clearly and unambiguously prohibit this injection well in the Edwards Aquifer.

30 T.A.C. § 213.8(c): Prohibited Activities

(c) Additional prohibitions. For applications submitted on or after September 1, 2001, injection wells that transect or terminate in the Edwards Aquifer, as defined in § 331.19 of this title (relating to Injection Into or Through the Edwards Aquifer), are prohibited except as provided by § 331.19 of this title.

22. The applicant is clearly drilling "wells" to inject the blast slurry.

23. The only question remaining is one of fact, whether the explosive slurry injection wells "transect" or "terminate" in the Edwards Aquifer. The applicant gives no explanation or supporting information or a reference of any kind to show they are not drilling into the Edwards Aquifer.

24. Applicant states[7]: "It is not expected that any significant amount of groundwater will be encountered in the quarry excavation. In order to maintain an appropriate separation from the groundwater the quarry floor will not be lower than 686 ft amsl."

25. First and foremost, Applicant ignores the plain language of the TCEQ regulations prohibiting ANY injection well into the Edwards Aquifer. ***The test is not what aquifer contact Applicant determines is "significant" in the Applicant's opinion. The legislature and TCEQ have mandated zero contact. The application fails on this misapprehension of the protective laws in place as well as the failure to discuss at all the accumulation of blast residue containing benzene and nitrates.***

26. As explained by Doug Wierman, in this area, the Edwards Aquifer is mostly near or at the surface level, which is why there are so many springs in this area – the aquifer is flowing out of cracks in the ground as the aquifer is at the surface. Doug Wierman in his report identifies a nearby reference well with data from the Texas Water Development Board, which puts the Edwards Aquifer water level above the reported level of the quarry floor, and well above the depth of the injection well drilling.

27. At a minimum, there is a question of fact which should be referred to SOAH for fact finding on whether the applicant's drilling of injection wells will "transect" or "terminate" in the Edwards Aquifer. Due to the failure to provide any supporting information in the application on this question, the Commission could and should outright deny the application as a matter of law.

28. The TCEQ requires a 25' buffer between the bottom of any depth of the quarry operations will reach. While applicant provides information on the surface level at which they will begin their quarry mining, Applicant provides zero information about how deep they will drill, inject,

[7] Application, General Information Form Attachment C, page 2, paragraph 3.

blast, and remove rock. There is no information showing how deep they plan to go down from the surface.

29. While Doug Wierman identifies a TWDB reference well showing the aquifer level is at or near surface level, applicant in no way accounts for the current extreme drought conditions in this area of Hays County and the effect of the water level if and when rains return and the aquifer rises.

30. Here are actual examples of blasting in limestone quarry operations:

https://www.youtube.com/watch?v=NYh5ZQGCP7g

https://www.youtube.com/watch?v=feQbBw16jag

31. Here are limestone quarries:

https://www.youtube.com/watch?v=o-ZWmdzMiMY

32. Here are the Defendant's own videos of blasting limestone at its limestone mine in Tuleta, Texas, (DEFENDANT IS WARNED NOT TO REMOVE OR DESTROY THESE PUBLICLY AVAILABLE VIDEOS WHICH WOULD CONSTITUTE SPOILATION OF EVIDENCE):

1. FSM Tuleta Blast 1: https://www.youtube.com/watch?v=wqLEem-8am4
2. FSM Tuleta Blast 2: https://www.youtube.com/watch?v=AlkiLRe7oOw
3. FSM Tuleta Blast 3: https://www.youtube.com/watch?v=4dtGSHVvCt4
4. FSM Tuleta Blast 4 is missing from the videos posted by FSM on its youtube channel.
5. FSM Tuleta Blast 5: https://www.youtube.com/watch?v=IRmXc7ZodGI

33. This video is posted by FSM, but appears to be from the History Channel. It is unknown if this blasting operation in granite is by FSM or another mining company, but FSM appears to think it is of interest and representative. https://www.youtube.com/watch?v=W3Q6Dq9x2oA

34. See also, Exhibits 3 – 20, photographs from FSM's website, Photos section, of its operations: https://www.farsouthmining.com/photos/

35. Defendant's mining foreseeably can last 100 or more years into the future. So, the impacts of the mining must be viewed through the lens of the cumulative impact day after day, week after week, month after month, and year after year, through wet years and dry and even drought years, which tend to concentrate contaminants in water.

36. The residue of the ANFO blasting slurry causes petrochemicals to accumulate in the groundwater. Such limestone mining blast residue accumulation caused benzene contamination in the aquifer supplying the drinking water to Miami causing the shutdown of municipal water wells causing it to shutdown multiple municipal drinking water wells.[8]

37. Water pollution and contamination require management decades even after the mine closes.[9]

38. Even some limestone mining companies acknowledge the adverse impacts such as pollution, groundwater contamination, subsidence, habitat destruction, and dust emissions from limestone mining in areas of karst and groundwater.[10]

39. Seattle has similar groundwater contamination due to limestone mining of limestone deposits with karst and groundwater interactions.[11]

40. The aquatic endangered species made the basis of this action are likely to be adversely impacted and cannot simply swim away somewhere else far from Defendant's unyielding and

[8] *See, Sierra Club v. Strock*, 495 F. Supp. 2d 1188, 1196–97 (S.D. Fla. 2007), *vacated sub nom. Sierra Club v. Van Antwerp*, 526 F.3d 1353 (11th Cir. 2008)(emphasis added)(action under the

[9] https://www.safewater.org/fact-sheets-1/2017/1/23/miningandwaterpollution

[10] https://miamilimestone.com/potential-environmental-hazards-of-limestone-mining/#What_are_the_environmental_impacts_of_quarries

[11] https://education.seattlepi.com/environmental-hazards-limestone-mining-5608.html

never-ending blasting, seismic shock waves, and pollution including but not limited to benzene, an established human carcinogen.

41. Doug Wierman, a preeminent and the most experienced hydrogeologist for this area shows the surface and ground water flows toward source of drinking water and aquatic habitat occupied by endangered species of this area.

42. Simply stated, Defendant's mining likely will have adverse impacts on water as it flows downhill, which will cause adverse impacts down gradient i.e., water flows downhill due to gravity towards the human drinking water and aquatic endangered species.

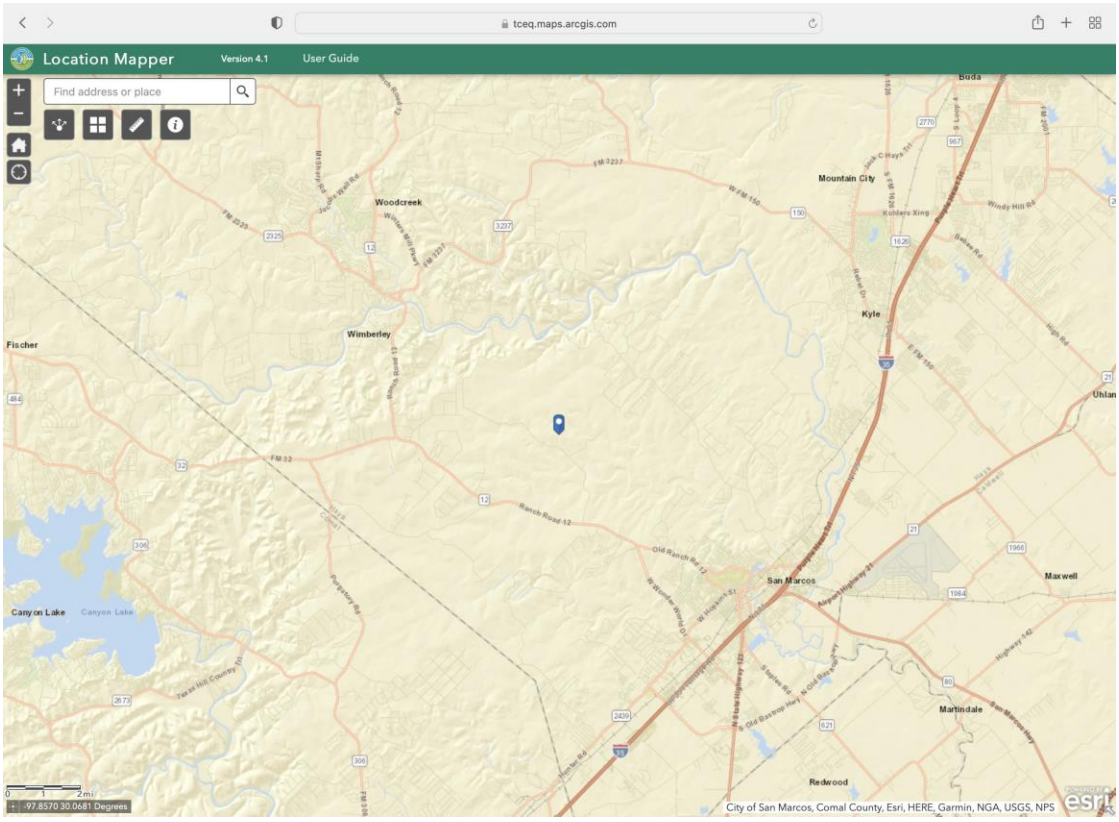
43. The TCEQ's Edwards Aquifer Protection regulations make exceedingly clear, the rules have one overarching goal – to protect water quality of the Edwards Aquifer and hydrologically connected surface waters.

> 30 TAC § 213.1 Purpose
>
> The purpose of this chapter is to regulate activities having the potential for polluting the Edwards Aquifer and hydrologically connected surface streams in order to protect existing and potential uses of groundwater and maintain Texas Surface Water Quality Standards. The activities addressed are those that pose a threat to water quality.
>
> (1) Consistent with Texas Water Code, § 26.401, the goal of this chapter is that the existing quality of groundwater not be degraded, consistent with the protection of public health and welfare, the propagation and protection of terrestrial and aquatic life, the protection of the environment, the operation of existing industries, and the maintenance and enhancement of the long-term economic health of the state.
>
> (2) Nothing in this chapter is intended to restrict the powers of the commission or any other governmental entity to prevent, correct, or curtail activities that result or may result in pollution of the Edwards Aquifer or hydrologically connected surface waters. In addition to the rules of the commission, an applicant may also be required to comply with local ordinances and regulations providing for the protection of water quality.

44. Further, the Legislature deems the protection of water quality so important to this state, it empowered this commission with broad authority to assure protection of this critical public

resource. "The commission may use any means provided by this chapter to prevent a discharge of waste that is injurious to public health." Texas Water Code § 26.041.

45. ***Exhibits 3 – 20 are actual photos of Far South Mining's operations and mining at other of its mining operations showing its activity.***[12]

46. 

https://tceq.maps.arcgis.com/apps/webappviewer/index.html?id=db5bac44afbc468bbddd360f8168250f&marker=-98.0197%2C29.9431&level=12

EDWARDS AQUIFER AUTHORITY – RED ZONE

47. This proposed activity the Edwards Aquifer Authorities' jurisdictional red zone: https://www.arcgis.com/home/webmap/viewer.html?webmap=aed0e4eddc794ec49d740a267d42560a&extent=-101.1491,28.3085,-96.6364,30.6845

[12] https://www.farsouthmining.com/photos/

OTHER KEY RELEVANT LAW PROVISIONS

48. Limestone mining operations have a notorious history of polluting groundwater including but not limited to polluting municipal drinking water wells including contamination with benzene, a Class 1, human carcinogen, from the blasting slurry residues accumulating over time. Such pollution violates the Clean Water Act and also the federal Safe Drinking Water Act.

49. A federal district judge in Miami found:

> Shockingly, the Court learned for the first time during the evidentiary hearing, in June 2006, that benzene, a carcinogen,[9] had been detected as early as January 2005 in the water being pumped from the Biscayne Aquifer ("Aquifer"), "the primary source of drinking water for the Miami–Dade County area." AR1028,[10] p. 4. The contamination was found in the area where limestone mining, which uses explosives[11] to remove the limestone from the Aquifer, is proceeding pursuant to the challenged permits. The contamination was so significant[12] that Miami–Dade County's Water and Sewer Department ("WASD") (the agency responsible for the delivery of drinking water for the County) shut down seven of the fifteen production wells which draw water from the Aquifer in that area, known as the Northwest Wellfield ("Wellfield"), and pump it to water treatment plants several miles away.[13] More than two years after the initial contamination incident,[14] Miami–Dade County's Department of Environmental Resources Management ("DERM"), the agency responsible for protecting the Wellfield, announced that it could not eliminate the mining-related blasting as a source of the benzene.[15] DERM's report concluded that the *1192 two reported contamination periods (January 2005 to February 2006, and a second episode beginning in August 2006) were *not* caused by several other potential sources.[16]
>
> Despite protestations to the contrary, it appears likely that the Corps-permitted mining activities, specifically the blasting used to dislodge the limestone[17] from the Aquifer, are a source of the benzene. A significant portion of the mining occurs in this same Wellfield where the contamination was discovered—some of the active mining operations are less than 3000 feet from the production wells. The Court need not determine conclusively[18] whether *1193 the benzene originated from mining-related blasting as the contamination itself (and the Corps' failure to treat it as significant) is sufficient to expose the Corps' ongoing violations and dereliction of their duties under the CWA, NEPA, and APA.[19]
>
> *Sierra Club v. Strock,* 495 F. Supp. 2d 1188, 1191–93 (S.D. Fla. 2007), *vacated sub nom. Sierra Club v. Van Antwerp,* 526 F.3d 1353 (11th Cir. 2008)

ENDANGERED SPECIES ACT

50. The Endangered Species Act, 16 U.S.C.A. § 1538 Prohibited Acts (also referred to as Section 9) – provides:

(a) Generally

(1) Except as provided in sections 1535(g)(2) and 1539 of this title, with respect to any endangered species of fish or wildlife listed pursuant to section 1533 of this title it is unlawful for any person subject to the jurisdiction of the United States to--

…

(B) take any such species within the United States or the territorial sea of the United States; …or

(G) violate any regulation pertaining to such species or to any threatened species of fish or wildlife listed pursuant to section 1533 of this title and promulgated by the Secretary pursuant to authority provided by this chapter.

51. Definition of "Take" - 16 U.S.C.A. § 1532 (19) The term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

50 C.F.R. § 17.3 further defines the definition of "take":

"Harass" in the definition of "take" in the Act means an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering….

"Harm" in the definition of "take" in the Act means an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

ENDANGERED SPECIES – CRITICAL HABITAT DESIGNATION

52. The ranch on which this operation proposes to operate the quarry and rock crushing includes Fern Bank Springs, which is designated as "critical habitat" under the Endangered Species Act for a federally protected endangered species, the Comal Springs Dryopid Beetle *Stygoparnus comalensis*. See, 72 FR 39248-01; 78 FR 63100-02.

Critical habitat is defined in the Endangered Species Act, 16 U.S.C. § 1532 as:

(5)(A) The term "critical habitat" for a threatened or endangered species means--
(i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 1533 of this title, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and

(ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 1533 of this title, upon a determination by the Secretary that such areas are essential for the conservation of the species.

DESIGNATION OF FERN BANK SPRINGS AS CRITICAL HABITAT

Critical habitat receives protection under section 7 of the Act through the requirement that Federal agencies ensure, in consultation with the Service, that any action they authorize, fund, or carry out is not likely to result in the destruction or adverse modification of critical habitat. The designation of critical habitat does not affect land ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area. Such designation does not allow the government or public to access private lands. Such designation does not require implementation of restoration, recovery, or enhancement measures by non-Federal landowners. Where a landowner requests Federal agency funding or authorization for an action that may affect a listed species or critical habitat, the consultation requirements of section 7(a)(2) of the Act would apply, but even in the event of a destruction or adverse modification finding, the obligation of the Federal action agency and the landowner is not to restore or recover the species, but to implement reasonable and prudent alternatives to avoid destruction or adverse modification of critical habitat.

Endangered and Threatened Wildlife and Plants; Revised Critical Habitat for the Comal Springs Dryopid Beetle, Comal Springs Riffle Beetle, and Peck's Cave Amphipod, 78 FR 63100-02

FSM'S INTERFERENCE WITH REGIONAL ENDANGERED SPECIES HABITAT CONSERVATION PLANS

53. Hays County and the Edwards Aquifer Authority both have developed Habitat Conservation Plans, "HCP's," applicable to the geographic area proposed for the FSM quarry and rock crushing operations with a heavy focus on listed aquatic species such as the San Marcos Springs salamander and Texas Blind Salamander. Both entities have invested tens of thousands of hours and millions of dollars in public fund developing the HCP's to assure compliance with the Endangered Species Act through developing the HCP's under Section 10 of the Endangered Species Act with a heavy focus on protection of listed aquatic species. Far South Mining has made no known efforts to participate in the Habitat Conservation Plans, yet it's mining is likely to

violate Section 9 of the Endangered Species Act starting with clearing surface habitat for the listed Golden-cheeked Warbler.

54. "The Hays County Commissioners Court voted to implement its federally approved Regional Habitat Conservation Plan (RHCP) in July 2013 following six years of staff development that culminated in federal approval."[13] Hays County has an Endangered Species Act form for submitting a project for review to obtain permitting to assure compliance with the Endangered Species Act, which on information and belief, ***Far South Mining has neither applied for nor obtained***.[14]

55. Similarly, the Edwards Aquifer Authority has an even more extensive Endangered Species Act Habitat Conservation Plan, especially focused on water quality, water flows, and adverse impacts to aquatic habitat and species. Again, on information and belief, Far South Mining has done nothing to assure its mining will not interfere with or frustrate the purposes of the EAA's Habitat Conservation Plan, which is especially focused on aquatic habitats. Far South Mining's operations likely will adversely impact the aquatic habitats sought to be protected through the Edwards Aquifer Authorities' Habitat Conservation Plan through the long-term cumulative impacts of its operations.[15]

[13] https://hayscountytx.com/departments/development-services/hays-county-regional-habitat-conservation-plan/

[14] https://hayscountytx.com//www/wp-content/uploads/2021/04/FINAL-2020-HAYS-COUNTY-ESA-FORM.pdf

[15] https://www.edwardsaquifer.org/habitat-conservation-plan/

TCEQ QUARRY BMP'S DO NOT AVOID ESA ENFORCEMENT AND 2007 TUGGLE "NO TAKE" LETTER IS INAPPLICABLE & UNENFORCEABLE

56. If these applications are granted or Applicant begins work without the EAPP permits, TESPA will seek a declaratory judgment pursuant 28 U.S.C. § 2201 to determine the applicability and legal effects, if any, of the 2007 letter from Benjamin Tuggle[16], then the Regional Director for the Southwest Region of the USFWS, to the Edwards Aquifer Authority in which he stated he would support a "no take" opinion on the application of the Endangered Species Act as to certain listed endangered species including certain listed salamander species found in San Marcos Springs and Fern Bank Springs.

57. The Tuggle letter does not include the Comal Springs Dryopid Beetle, and should not apply to any other endangered or threatened species such as the Texas Blind Salamander or San Marcos Springs Salamander as applied to this proposed operation.

58. The TESPA ESA and declaratory judgment action will challenge the "no take" opinion of the 2007 Tuggle letter as applied to the Far South Mining LLC's operation of quarries and rock crushing within the Edwards Aquifer Authority's jurisdiction. As the TCEQ has noted in its best management practices for quarries in the Edwards Aquifer:

> The optional water quality measures and best management practices (BMPs) contained in this document have been reviewed by the United States Fish and Wildlife Service (USFWS), which has issued a concurrence that these voluntary enhanced water quality measures will protect endangered and candidate species from impacts due to water quality degradation. USFWS approved the predecessor document to this revised appendix on February 14, 2005. This revised and updated appendix was approved by correspondence from Dr. Benjamin N. Tuggle, USFWS Regional 2 Director to Governor Rick Perry dated September 4, 2007. This letter identified the following species as being included under this "no take" concurrence:

[16] https://www.tceq.texas.gov/downloads/permitting/edwards-aquifer/forms/usfw-sep-4-2007-to-tceq-a.pdf

Barton Springs salamander (Eurycea sosorum),

Fountain darter (Etheostoma fonticola),

Georgetown salamander (Eurycea naufragia),

San Marcos salamander (Eurycean nana), and

San Marcos gambusia (Gambusia georgei).

This concurrence is not a delegation of the USFWS's responsibilities under the Endangered Species Act (ESA), but rather an acknowledgement that the TCEQ Edwards Aquifer Protection Program with these enhanced water quality measures addresses known threats to the identified species.

59. Neither EAA nor Dr. Tuggle's letter consider the effects of the alteration of water flows and flow patterns changing due to blasting in a quarry and/or increases in residue contaminants from the blasting agents, ammonium nitrate and diesel/petroleum products, not consumed in the blast.

60. In the unlikely event the 2007 Tuggle letter is found enforceable as applied to this proposed quarry and rock crushing operation, the 2012 TCEQ/EAA's "best management practices" [17] for quarry operations did not even exist, and thus, could not fall within the scope of potential impacts considered by Tuggle in his 2007 opinion letter. Further, the 2007 letter does not cover the Dryopid beetle found in Fern Bank Springs, the habitat which is designated as "critical habitat" under the Endangered Species Act. Thus, the TCEQ's quarry specific best management practices, "BMP's," do not apply to this species, even if the Tuggle letter is upheld – which it should not be.

61. TCEQ plainly states in its Quarry BMP document:

If these practices contained in this document are used, they are expected to result in "no take" of these species from degradation of water quality by non-Federal landowners and other non-Federal managers. This "no take" concurrence does not cover projects that: (1) occur outside the area regulated under the Edwards Aquifer Rules; (2) result in water quality impacts that

[17] TCEQ Publications RG348A and RG500.

may affect Federally-listed species not specifically named above; (3) result in impacts to Federally-listed species that are not water quality related; or (4) occur within one mile of spring openings that provide habitat for Federally-listed species.
It is the responsibility of the applicant to determine the potential for impacting endangered species and take appropriate action based upon this information.

62. **As the TCEQ notes in the BMP's:**

Section 9 of the Endangered Species Act (Act) and Federal regulations adopted under section 4(d) of the Act prohibit the "take" of endangered and threatened species without special exemption. Take of listed species is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in such conduct. Harass is further defined as an intentional or negligent act or omission that creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns. Harm includes significant habitat modification or degradation that results in death or injury to listed species.

63. **Finally, and perhaps most importantly of all, Dr. Tuggle was the subject of a federal whistleblower action which produced sworn testimony that Dr. Tuggle was not enforcing the Endangered Species Act in Texas due to political considerations rather than basing decisions on the "best available science" as required by the Endangered Species Act.[18]**

REPRESENTATIVE SCIENTIFIC LITERATURE OF IMPACTS TO WATER IN KARST

64. Quarrying Impacts on Groundwater Flow Paths

Green, Jeffrey A; Pavlish, Jeremy A; Leete, Jeanette H; Alexander Jr., E. Calvin; Merritt, RG (Proceedings of the Ninth Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst. © 2003 American Society of Civil Engineers. Published online: April 26, 2012, 2003)

[18] https://peer.org/scientific-fraud-infests-fish-and-wildlife-service-top-ranks/

https://conservancy.umn.edu/handle/11299/188252

Abstract
Quarrying in limestone aquifers can interfere with groundwater flow paths. Quarries can pirate karst conduit flow by physically breaking into the conduits and changing the groundwater discharge points. Another mechanism of groundwater flow interference occurs as quarry dewatering lowers the water table changing groundwater flow directions. Dye tracing is an effective tool to evaluate and quantify these impacts. In Minnesota, tracing investigations have been conducted at two quarries. The Big Spring quarry near Harmony, Minnesota is in the Ordovician Galena Formation. The quarry is 500 meters from Big Spring, the headwater spring of Camp Creek, a Minnesota designated trout stream. Although the quarry is nominally above the water table, beginning about forty years ago, the quarry intercepted conduits carrying groundwater to the spring. Groundwater that formerly discharged from Big Spring now rises in the quarry then flows overland joining Camp Creek 100 meters downstream of Big Spring. About 90 percent of the mapped groundwater basin of Big Spring is now routed through the quarry. The Osmundson quarry is in the Devonian Lithograph City Formation at LeRoy, Minnesota. This sub-water table quarry requires seasonal dewatering at 1,000-3,000 liters/minute. When the quarry is being dewatered, Sweets Spring, approximately 300 meters to the southeast, stops flowing. Dye tracing has verified that the quarry pirates the flow to the spring. Both of these cases demonstrate the utility of using dye traces to determine the impact of limestone quarrying on groundwater flow paths. This information can be used to evaluate proposed quarry sites for their potential alterations of groundwater flow paths.

65. Quarrying in Karst: Geotechnical Estimation of Environmental Risk

September 2008

Geotechnical Special Publication

DOI:10.1061/41003(327)68

Conference: 11th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst

Quarrying in karst poses potential environmental risk. Historically, well-documented, large-scale negative impacts related to extensive and deep quarries, include dewatering of aquifers, changes in groundwater flow, and induction of land subsidence and sinkholes. Estimating and mitigating risk prior to quarrying is difficult. Some geotechnical techniques in karst may be unreliable or imprecise owing to a high degree of anisotropy and heterogeneity transmitting groundwater exclusively through fractures (secondary porosity) and dissolutionally enlarged openings (tertiary porosity). Surficial geophysical investigations, (e.g. electrical resistivity, ground-penetrating radar, seismic exploration, lineament analysis) are useful but rarely definitive in characterizing a quarry site. Borehole geophysics, although very precise within each well, may not reflect the true configuration of conduit flow within the footprint of the quarry. Statistically, wells drilled in dense

bedrock with wide fracture spacing may intersect few, if any, significant openings. Geophysical parameters and pump tests from such wells may lead to erroneous hydrogeologic conclusions about the site, including the areal extent of influence of a quarry. Dye-trace studies typically provide a better indication of potential risk. Quarries close to zones of recharge may introduce steep hydraulic gradients near the excavation, augmenting discharge into the opening. Conversely, quarries distant from such zones may produce much gentler gradients and have a reduced environmental impact.

66. Environmental Impacts on Surface Water and Groundwater for Expanding Urban Water Supply Capacity Using Stone Quarries

May 2009
DOI:10.1061/41036(342)189
Authors:

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Auburn University

Ni-Bin Chang
University of Central Florida

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Lorraine Wolf
Auburn University

A quarry reservoir can become thermal stratification during summer if it is deep enough, and the stratification can lead to oxygen depletion in the bottom waters, and then it may require hypolimnetic oxygenation (aeration) to improve water quality. A lake water quality model is used to examine water quality dynamics in different types of stone quarry reservoirs under different climate and watershed input scenarios.

67. **Marble Slurry's Impact on Groundwater: The Case Study of the Apuan Alps Karst Aquifers**, Piccini, et al

https://www.mdpi.com/2073-4441/11/12/2462/htm

Abstract

Modern sawing techniques employed in ornamental stones' exploitation produce large amounts of slurry that can be potentially diffused into the environment by runoff water. Slurry produced by limestone and marble quarrying can impact local karst aquifers, negatively affecting the

groundwater quality and generating a remarkable environmental and economic damage. A very representative case-study is that of the Apuan Alps (north-western Tuscany, Italy) because of the intensive marble quarrying activity. The Apuan Alps region extends over about 650 km^2; it hosts several quarries, known all over the world for the quality of the marble extracted, and a karst aquifer producing about 70,000 m^3/day of high-quality water used directly for domestic purposes almost without treatments. In addition, Apuan Alps are an extraordinary area of natural and cultural heritage hosting many caves (about 1200), karst springs and geosites of international and national interest. During intense rain events, carbonate slurry systematically reaches the karst springs, making them temporarily unsuitable for domestic uses. In addition, the deterioration of the water quality threatens all the hypogean fauna living in the caves. This paper provides preliminary insights of the hydrological and biological indicators that can offer information about the impact of the marble quarrying activities on groundwater resources, karst habitats and their biodiversity.

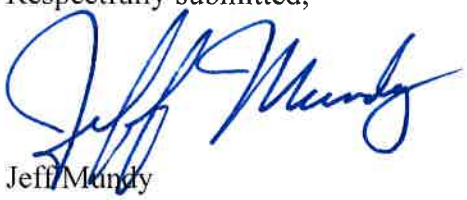
CONCLUSION

68. As the activity proposed in this quarry application will include drilling injection wells that transect or terminate in the Edwards Aquifer, the proposed activity is prohibited by 30 T.A.C. § 213.8(c), and the legislative intent to protect aquifer as mandated at Texas Water Code § 26.401, as well as, the inevitable pollution of surface and groundwater with ANFO blast slurry residue containing benzene and nitrates, which pose real and significant danger to humans and aquatic species, including but not limited to those protected by the Endangered Species Act, 16 U.S.C. § 1540(g), the Clean Water Act 33 U.S.C. § 1365(b), and the Safe Drinking Water Act 42 U.S.C. § 300j-8. TESPA respectfully requests the TCEQ DENY the applications for the quarry mining and related activities on: Edwards Aquifer Permit 11003759 and Edwards Aquifer Permit 11003760.

69. In the alternative, the applicant has not shown that its proposed quarry drilling, injection, blasting, mining, and related rock crushing activities are at least 25’ above the water level of the Edwards Aquifer as required by TCEQ. At a minimum, a dispute of fact exists on this issue as well as whether there is a likelihood of Applicant’s mining and related activities will result in

pollution of the surface, ground, and drinking water, which should be referred to SOAH for fact finding and a proposal for decision.

Respectfully submitted,



Jeff Mundy
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Ms. Kim Bannerman
United States Solicitor for USFWS Texas

Mr. Ed McCarthy
Attorney for Needmore Ranch aka NR Ranch II and related business entities of Greg LaMantia and related LaMantia business entities

EXHIBIT 1

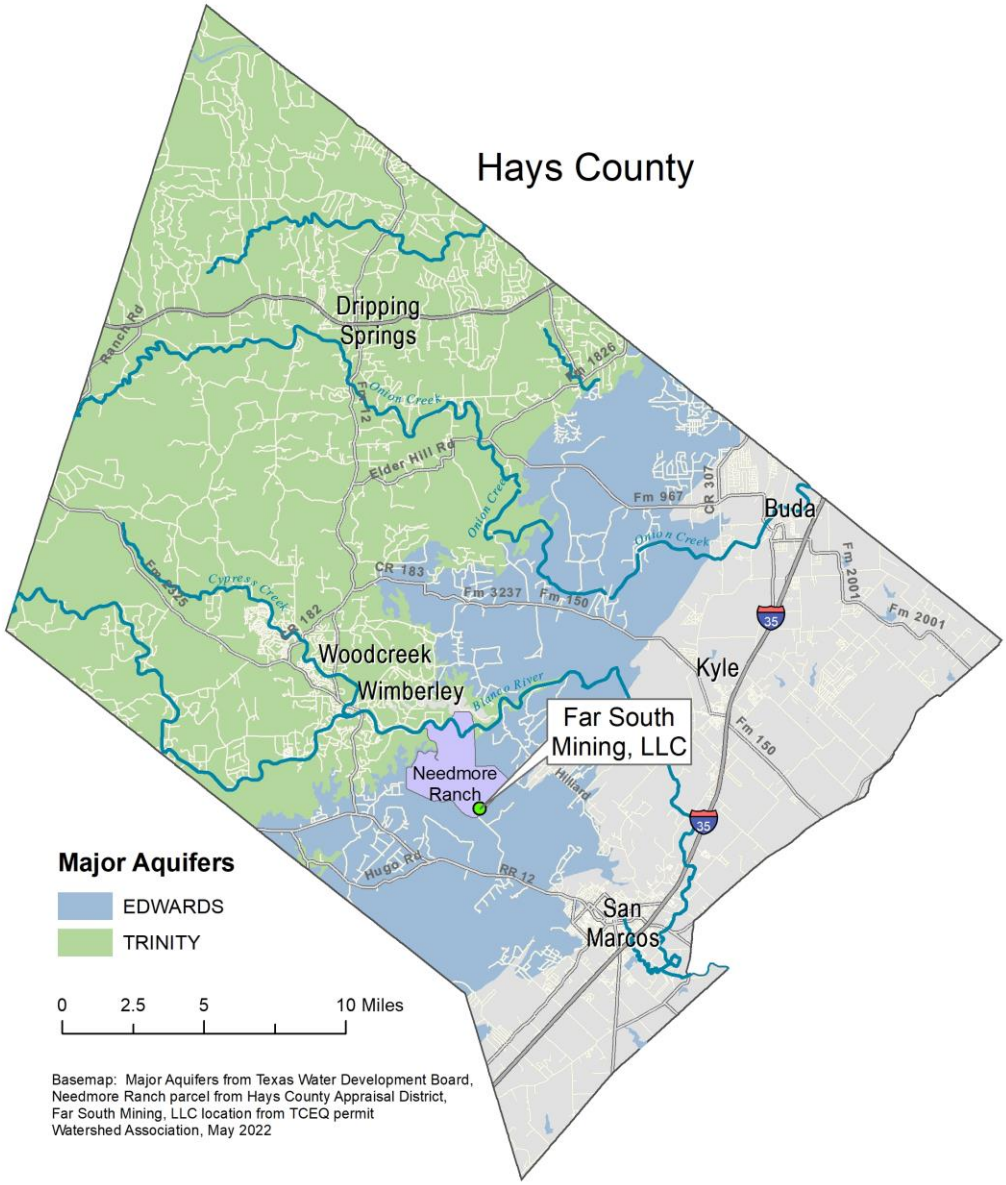
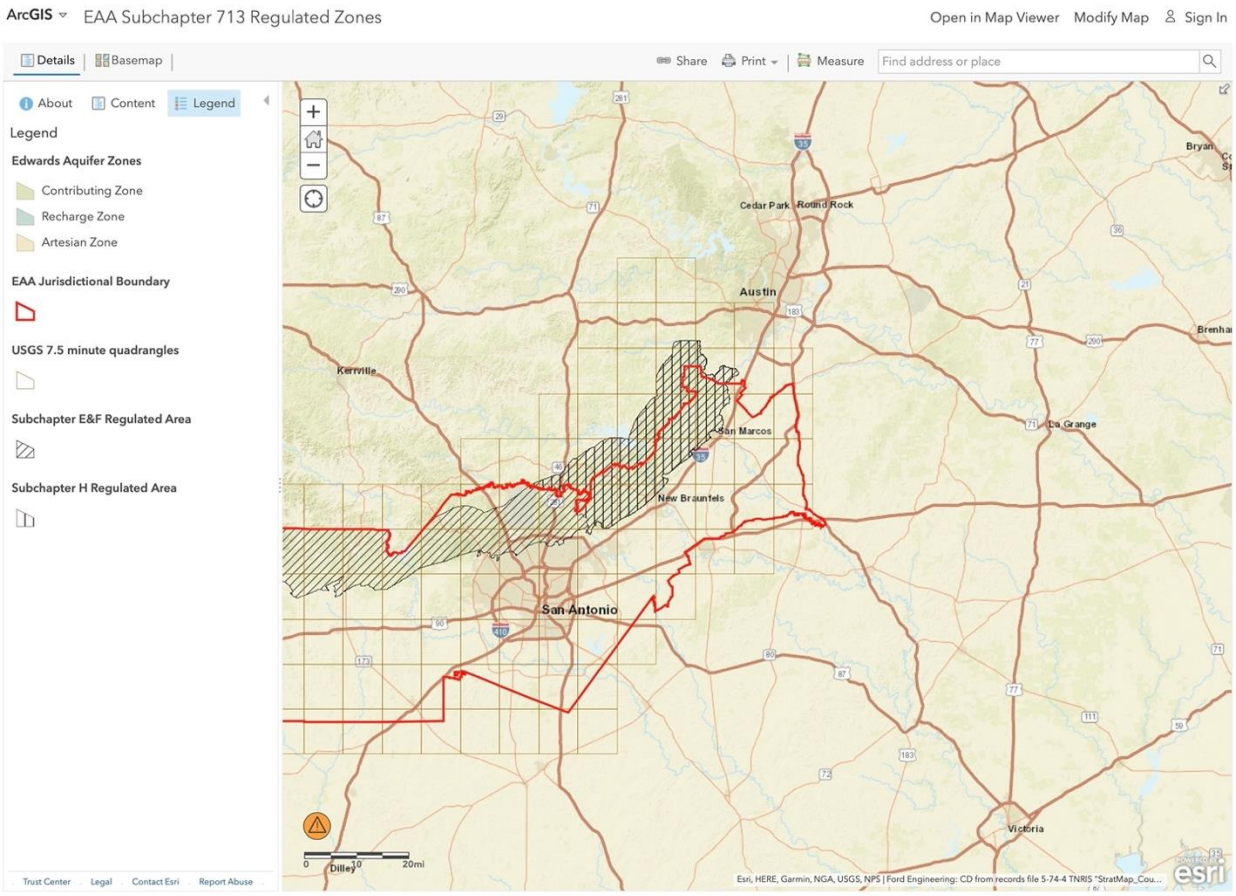

Hays County
Dripping Springs
Ranch Rd
RR 1826
Onion Creek
Elder Hill Rd
Fm 967
CR 307
Buda
Onion Creek
CR 183
Fm 3237
Fm 150
Fm 2001
Cypress Creek
CR 182
Woodcreek
Wimberley
Blanco River
Kyle
Far South Mining, LLC
Needmore Ranch
Hilliard
Hugo Rd
RR 12
San Marcos
Major Aquifers
EDWARDS
TRINITY
0 2.5 5 10 Miles
Basemap: Major Aquifers from Texas Water Development Board,
Needmore Ranch parcel from Hays County Appraisal District,
Far South Mining, LLC location from TCEQ permit
Watershed Association, May 2022

EXHIBIT 2



https://www.arcgis.com/home/webmap/viewer.html?webmap=aed0e4eddc794ec49d740a267d42560a&extent=-101.1491,28.3085,-96.6364,30.6845

EXHIBIT 3

EXHIBIT 4

EXHIBIT 5

6. 

EXHIBIT 6

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EXHIBIT 7

EXHIBIT 8

EXHIBIT 9

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EXHIBIT 11

EXHIBIT 12

EXHIBIT 13

EXHIBIT 14

EXHIBIT 15

EXHIBIT 16

EXHIBIT 17

EXHIBIT 18

EXHIBIT 19

EXHIBIT 20

EXHIBIT 21: FSM Tuleta Blast 1: https://www.youtube.com/watch?v=wqLEem-8am4

EXHIBIT 22: FSM Tuleta Blast 2: https://www.youtube.com/watch?v=AlkiLRe7oOw

EXIBHIT 23: FSM Tuleta Blast 3: https://www.youtube.com/watch?v=4dtGSHVvCt4

EXHIBIT 24: FSM Tuleta Blast 4 is missing from the videos posted by FSM on its youtube channel.

EXHIBIT 25: FSM Tuleta Blast 5: https://www.youtube.com/watch?v=IRmXc7ZodGI

END OF DOCUMENT

Blue Creek Consulting, LLC
129 Waving Muhly Drive
San Marcos, TX 78666
512-826-2729

November 15, 2023

Mr. Jeff Mundy
The Mundy Firm
4131 Spicewood Springs Rd., Ste. O-3
Austin, TX 78759

Subject: Technical Comments – Far South Mining LLC, Needmore Ranch Quarry
TCEQ Water Pollution Abatement Program (11003759 and 11003760)

Dear Mr. Mundy,

As you have requested, attached are technical comments relating to the Water Pollution Abatement Program and Aboveground Storage Tank Facility Plan for the Far South Mining LLC, Needmore Ranch Quarry in Wimberley, TX. The plan was prepared by Westward of Boerne, TX and dated August, 2023.

The comments were prepared by and under the supervision of Douglas A. Wierman, P.G., with contributions by Dr. James Doyle. If you have any questions or comments, please contact me at your convenience.

Sincerely,

Douglas A. Wierman, Texas Licensed Geoscientist #4062
Blue Creek Consulting LLC, TBPG Geoscience Firm #50541

Technical Comments – TCEQ Water Pollution Abatement Plan (WPAP)

Far South Mining LLC - Needmore Quarry Ranch

Blue Creek Consulting LLC has prepared the following technical comments regarding the TCEQ Water Pollution Abatement Plan (WPAP) prepared for Far South Mining LLC - Needmore Quarry Ranch, dated 9/1/2023, prepared by Westward, Boerne (TCEQ reference numbers 11003759 and 11003760).

The proposed quarry is located on the recharge zone of the Edwards Aquifer. Recharge occurs from the surface through fractures and faults, surficial karst features, such as caves, sink holes and direct recharge from streams. Numerous dye studies conducted in the region over the years indicate that San Marcos Springs is a regional discharge point for the Edwards Aquifer, including the proposed site area (Johnson, et al, 2012). Sink Creek has been identified as a local source of recharge to San Marcos Spring (Johnson, et al, 2012). Contaminants entering the aquifer from the quarry site can rapidly migrate through the fractured and karstic aquifer and impact San Marcos Springs.

The WPAP states" It is not expected that any significant amount of groundwater will be encountered in the quarry excavation. In order to maintain appropriate separation from the groundwater the quarry floor will not be lower than 686ft.amsl."

TCEQ typically requires a 25' separation distance between the floor of the quarry and groundwater. This requirement is meant to afford some protection from mining impacts to the Edwards Aquifer, particularly in the recharge zone. The WPAP does not provide any explanation or factual reference for a quarry floor base elevation of 686ft.amsl.

Texas Water Development Board monitored a well very near the proposed quarry excavation for a number of years (SWR# 6808601). Well information can be found at: https://www3.twdb.texas.gov/apps/waterdatainteractive//GetReports.aspx?Num=6808601&Type=GWDB)

The reference well is 275' deep from the surface, or elevation 686' amsl, which also is the depth of the proposed quarry floor. Per the TWDB, the well is a shallow Edwards Aquifer well. Previous groundwater levels measured at the well ranged from elevations 746 and 819 feet amsl. These elevations are significantly higher than 686 ft amsl. The applicant needs to provide explanation for the proposed elevation of the floor of quarry, including, the bore depth after drilling a test well at the proposed quarry location to support their proposal that the quarry operations including the deepest depth of boring, blasting, and rock removal will maintain at least a 25' buffer above the highest water level of the Edwards Aquifer in the footprint and impacted area of the quarry operations.

The project proposes mining across a mapped 100-year flood plain. The flood plain is a headwaters tributary to Sink Creek. In numerous places in the WPAP, the applicant states they will obtain permits for mining across 100-year flood plain at a later date. Sink Creek enters the San Marcos River just above Spring Lake and San Marcos Springs (Spring Lake). The tributary is a direct surface water pathway for increased sediment impacts to the creek and downstream receptors as well as a pathway for other contaminants such as residual ANFO. Due to the karstic nature of the aquifer, increased contaminant loads to the creek may also contribute to impacts to the aquifer.

Hays County requires a permit for any construction activities within the 100-year flood plain. Rerouting the tributary around the excavation will be difficult and will likely reduce the carrying capacity of the tributary. Any reduction in size of the flood plain due to mining activities will increase to potential of downstream flooding on downstream properties. A permit from Hays County, including remapping the floodplain, must be obtained prior to reviewing the WPAP.

It has been documented that quarry operations have impacted the Edwards Aquifer with residuals from ammonium nitrate/fuel oil explosives (ANFO). Quarries are known to be sources of nitrate pollution of groundwater. (Alberts, 2016). The proposed quarry on the Needmore Ranch is located on the Edwards recharge zone where the Edwards Limestone is at the surface. If it goes forward as planned it will contribute nitrate contamination to the Edwards Aquifer.

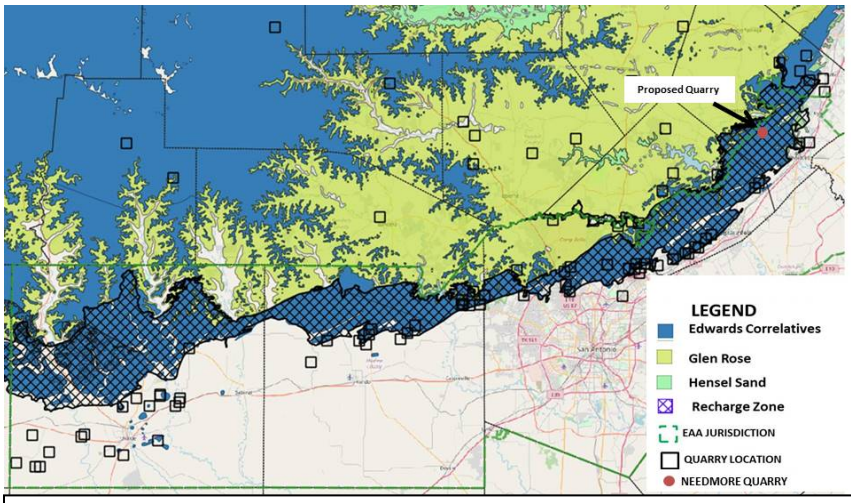


Figure 1. Quarry locations are shown with reference to outcrops of units correlative to the Edwards and Trinity Groups. Surface geology is from the USGS . Recharge zone and Edwards Aquifer Authority jurisdiction outline is from the EAA.

The aggregate industry mostly uses an ammonium nitrate fuel oil mixture (ANFO) as an explosive. ANFO mixtures vary somewhat, but typically are a stoichiometric composition of 94.5% ammonium nitrate (NH_4NO_3) and 5.5% fuel oil (Brochu, 2010). Ammonium nitrate is a salt which disassociates in water to NH_4^+ and NO_3^- and dissolves readily. Loss of ANFO by leaching from boreholes is variable and influenced by a number of factors including specifications of the explosive, nature of the site being mined, design of boreholes and explosive patterns and length of time between loading boreholes and detonation (Brochu, 2010, and Konya and Konya, 2019). ANFO is used in large quantities, typically 0.4-0.5 kg/m^3 (DynoNobel, 2010). Since about 28%-30% of ANFO used is not consumed in the blast (Alberts,

2016) it can also be dissolved after blasting. Once in groundwater, nitrification converts ammonium to nitrate (Musgrove and others, 2016) which is stable.

The Edwards limestone has been quarried extensively in the recharge zone of the San Antonio segment of the Edwards Aquifer, and the proposed Needmore quarry falls in that trend (Figure 1). Studies of nitrate in the Edwards Aquifer have noted that levels are elevated above an expected background level of 4.4 mg/L nitrate as NO_3 (1 mg/L nitrate as N) or less (Dubrovsky and others, 2010) but not offered an explanation, e.g., Bush and others, (2000). More recently, Musgrove and others (2016) ruled out contributions of nitrate from surface water and agriculture as causes of the higher measurements. Instead, they concluded that high nitrate levels in the eastern part of the San Antonio Segment result from urbanization on the recharge zone since 2000. However, they lacked historical data on nitrate concentrations and did not use data from rural counties to the west where they expected concentrations to be low.

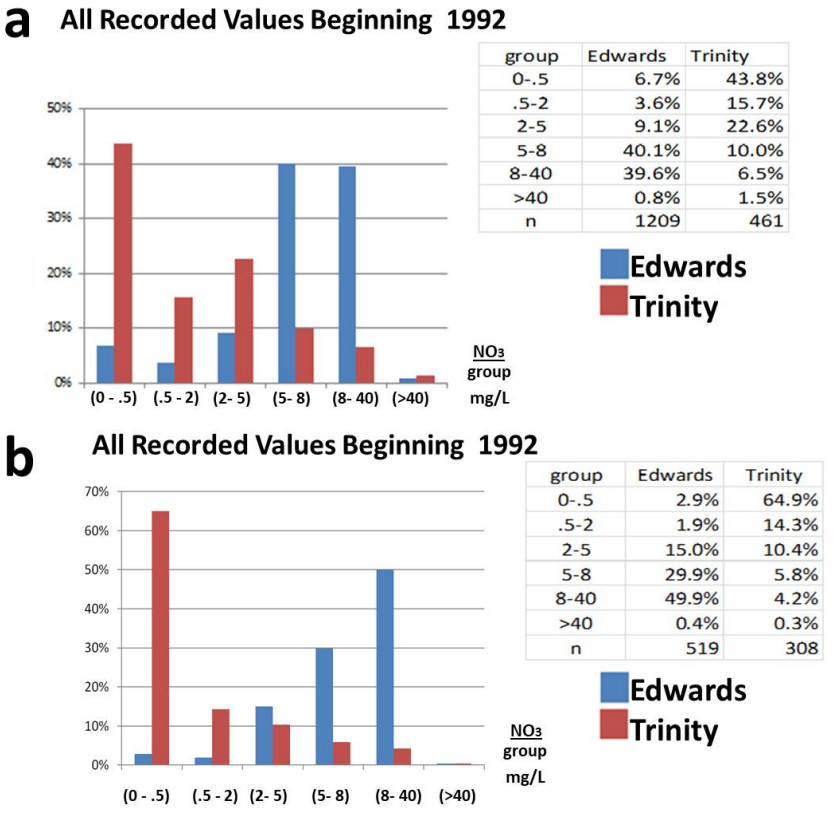
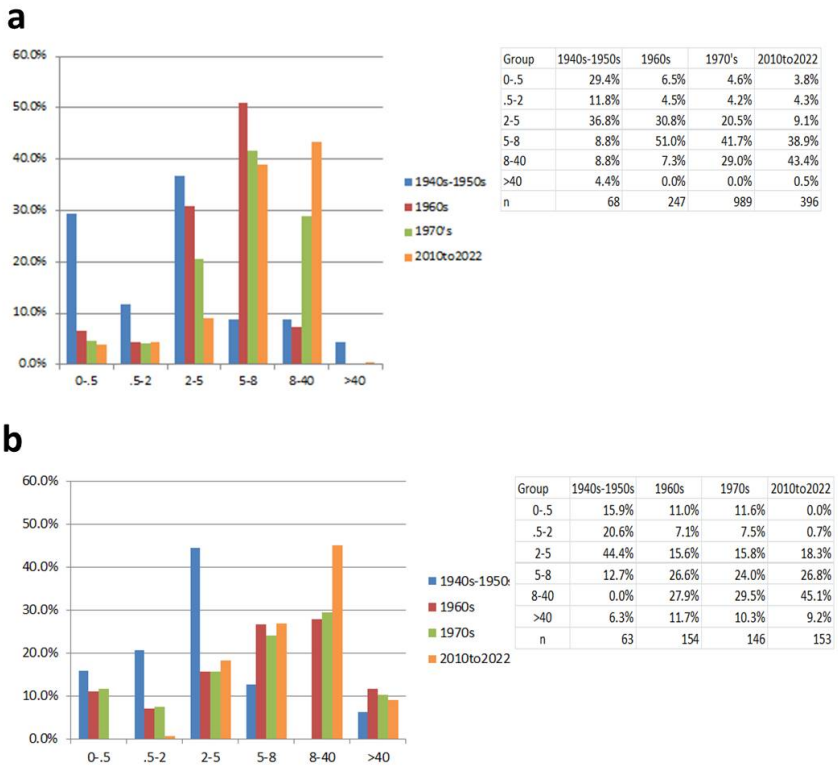


Figure 2. NO_3 measurements from the TWDB for wells in a) the Edwards Aquifer in Bexar, Guadalupe and Hays counties and Trinity Aquifer measurements in Bexar, Kendall, Comal and Hays counties and b) Edwards Aquifer measurements from wells in Medina and Uvalde counties and Trinity Aquifer measurements in Bandera, Kerr, Medina, Real and Uvalde Counties. The lowest three nitrate groups are consistent with background levels of nitrate.

Data from the Texas Water Development Board show urbanization alone cannot explain the geographic distribution of nitrate as shown by elevated concentrations in Medina and Uvalde counties (Figure 2). Besides surface water, the Edwards Aquifer is charged by cross-fault flow from the Trinity Aquifer which is clearly lower in saturation than the Edwards (Figure 2). Also, by the 1960's nitrate levels were elevated compared to background levels observed in the 1940's and 1950's, and levels have continued to increase since (Figure3). So, an additional explanation is required for both geographic distribution and timing of the increase in aquifer nitrate levels.

Quarrying of the Edwards Limestone in the recharge zone has been intense for at least 80 years Forster, 2010) and covers the entire extent from Hays to Uvalde counties (Figure 1). Both distribution and timing of elevated nitrate measurements show quarries are necessary to explain the increase in nitrate in the Edwards Aquifer. In particular, the increase in nitrate concentrations throughout the San Antonio Segment (Figure 3) fits well with the history of ANFO use. ANFO was introduced on large scale to the explosives market in the mid 1950's and dominated the market by the 1960's (Moreira,2012). Levels have continued to rise coincident with increase in aggregate production. Recently measured levels mostly remain below concentrations harmful to humans which is 44 mg/L N as NO^3 (10 mg/L N), but most measurements are above 8 mg/L N as NO^3 (2 mg/L N) which is harmful to some freshwater aquatic organisms (Monson and others, 2016).

The Needmore Quarry is proposed to be $8.09X10^5$ m^2 (200 acres). Applying typical industry usage values of $0.45kg/m^3$ of ANFO would yield an estimate of $3.64X10^5$ kg of ANFO used for every 1 meter of rock removed over that area. In turn, applying 28% unexploded residual would lead after nitrification of ammonium to 1.49X105 kg (165 tons) of nitrate potentially available to leach into the formation from that single meter thickness. That ANFO is used in large volumes is confirmed by a report that the Servtex Plant in Comal County in a single day used 5897 kg (13000) pounds of explosives to break up $1.81X10^7$ kg (20,000 tons) of rock (Chasnof, 2021). That corresponds to ~.5 kg/m^3 of ANFO per cubic meter.



Group	1940s-1950s	1960s	1970's	2010to2022
0-.5	29.4%	6.5%	4.6%	3.8%
.5-2	11.8%	4.5%	4.2%	4.3%
2-5	36.8%	30.8%	20.5%	9.1%
5-8	8.8%	51.0%	41.7%	38.9%
8-40	8.8%	7.3%	29.0%	43.4%
>40	4.4%	0.0%	0.0%	0.5%
n	68	247	989	396

Group	1940s-1950s	1960s	1970s	2010to2022
0-.5	15.9%	11.0%	11.6%	0.0%
.5-2	20.6%	7.1%	7.5%	0.7%
2-5	44.4%	15.6%	15.8%	18.3%
5-8	12.7%	26.6%	24.0%	26.8%
8-40	0.0%	27.9%	29.5%	45.1%
>40	6.3%	11.7%	10.3%	9.2%
n	63	154	146	153

Figure 3. NO3 measurements from the TWDB for wells in a) the Edwards Aquifer in Bexar, Guadalupe and Hays counties and b) Medina and Uvalde counties show that across the San Antonio Segment nitrate in the Edwards was t background levels in the 1940s-1950s and were elevated beginning in the 1960s. Nitrate values since 2010 are shown for comparison and are the highest observed.

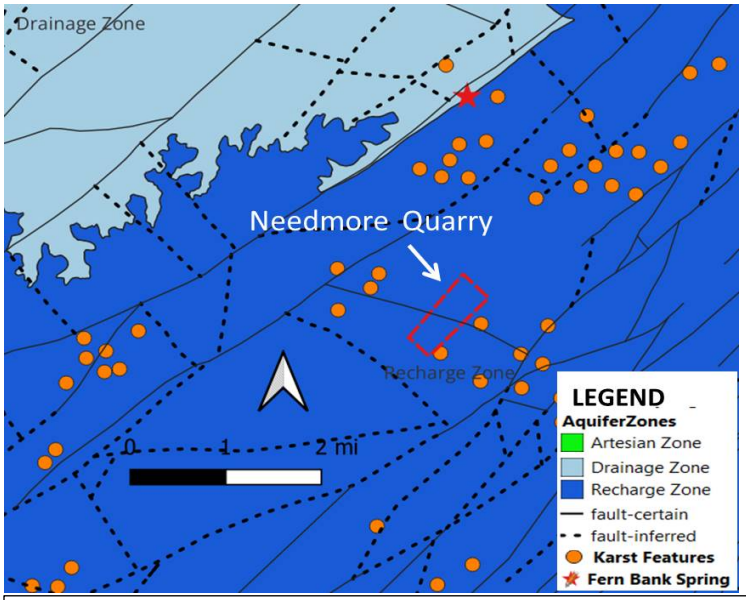


Figure 4. The proposed Needmore quarry is crossed by a fault (Clark and Others,2018) and nearby karst features (Wierman and Hunt, 2010) make it likely that a well developed fracture system will be present.

The geological report in the Needmore WPAP reported no sensitive features, even though the USGS mapped a fault crossing the proposed quarry (Figure 4). Faults will commonly have a zone of deformation including fractures that may be several hundred feet wide (Ferrill and others, 2011). The prevalence of karst features aligning with faults and in close proximity to the proposed quarry make it likely that a natural fracture system will be encountered. During the course of mining induced fractures from blasting will enhance passage of dissolved nitrate to the aquifer. Decreasing the distance between the quarry floor and the aquifer will increase that risk as well (Polemio and others, 2009). In short, with no modifications to the proposed WPAP, the Needmore Quarry will contribute to the problem of rising nitrate concentrations in the Edwards Aquifer.

Another impact from ANFO can be organic compounds, such as residual benzene from fuel oil has also been shown to potentially impact groundwater resources in

the vicinity of mining operations. In Miami –Dade County, it was found that benzene attributable to mining operations caused the seven of fifteen municipal water supply wells to be shut down. (Sierra Club v. Strock, 495 F. Supp. 2d 1188, 1196–97 (S.D. Fla. 2007), vacated sub nom. Sierra Club v. Van Antwerp, 526 F.3d 1353 (11th Cir. 2008).

Fern Bank Spring also known as Little Arkansas Spring, issues from the south bank of the Blanco River, several miles north of the proposed quarry, A dye trace study performed in 2008 (Johnson, et al, 2012) indicated there was a groundwater flow to the spring from the south.

Conclusion

There are two direct pathways for contaminants to reach the Edwards Aquifer and San Marcos Springs, home to several endangered species. Contaminants include ANFO residuals, such as nitrates and benzene, and sediment. Sink Creek and its tributaries provide a direct surface water contaminant pathway to the San Marcos River and San Marcos Springs. Groundwater flow through the fractured and karstic Edwards Aquifer is a pathway to groundwater users in vicinity and to the springs. Given the risk of widespread impacts to surface and groundwater and their users, this application should not be granted.

Respectfully,

Blue Creek Consulting LLC

Douglas A. Wierman, P.G. #4062

References

Alberts, Neil, 2016, Tackling nitrate contamination of water in mines: Mining News Digest, August 11.

Brochu, Sylvie, 2010, Assessment of ANFO on the environment: Defense R&D Canada – Valcartier Technical Investigation 09-01.

Bush, Peter W., Ann F. Ardis, Lynne Fahlquist, Patricia B. Ging,C. Evan Hornig, and Jennifer Lanning-Rush, 2000, Water Quality in South-Central Texas,1996–98: U.S. GEOLOGICAL SURVEY CIRCULAR 1212, 34p.

Chasnof, Bryan, 2021, From Garden Ridge to New Braunfels, 'Quarry Row' Has Residents Demanding Stricter Regulation: San Antonio Express News, October 6, 2021

Clark, Allan K, Diana E. Pedraza, and Robert R. Morris, 2018, Geologic Framework and Hydrostratigraphy of the Edwards and Trinity Aquifers Within Hays County, Texas: USGS Scientific Investigations Map 3418.

Dubrovsky, Neil M., Karen R. Burow, Gregory M. Clark, Jo Ann M. Gronberg, Pixie A. Hamilton, Kerie J. Hitt, David K. Mueller, Mark D. Munn, Bernard T. Nolan, Larry J. Puckett, Michael G. Rupert, Terry M. Short, Norman E. Spahr, Lori A. Sprague, and William G. Wilber, 2010, The Quality of Our Nation's Water— Nutrients in the Nation's Streams and Groundwater, 1992–2004: U.S. Department of the Interior U.S. Geological Survey Circular 1350, 174 p.

Dyno Nobel, 2010, Blasting and Explosives Quick Reference Guide: Dyno Nobel Asia Pacific Pty Limited, 32p.

Ferrill, David A., Alan P. Morris, Ronald N. McGinnis, Kevin J Smart, and William C. Ward, 2011, Fault zone deformation and displacement partitioning in mechanically layered carbonates: The Hidden Valley fault, central Texas: AAPG Bulletin, v. 95, no. 8 (August 2011), pp. 1383–1397

Forster Charles P., 2010, Recharge and Transition Zone Exception Request Form, Martin Marietta New Braunfels Quarry Operations Modification: https://www.cceo.org/ environmental/documents/ WPAP/ Martin_Marietta_Materials_New_Braunfels_Quarry.pdf

Johnson, S.,et, al., 2012. Tracing Groundwater Flowpaths in the Vicinity of San Marcos Springs, TX. Edwards Aquifer Authority publication.

Konya, Anthony and Calvin Konya, 2019, Blasting mechanics revisited: Characteristics of explosives: Pit and Quarry, March 20.

Monson, Philip, 2022, Aquatic Life Water Quality Standards Draft Technical Support Document for Nitrate: Minnesota Pollution Control Agency, 21p.

Musgrove, M., S.P. Opsahl, B.J.Mahler, C. Herrington, T.L. Sample, and J.R. Banta, 2016, Source, variability, and transformation of nitrate in a regional karst aquifer: Edwards aquifer, central Texas: Science of the Total Environment 568 pp. 457–469.

Polemio, M.; Casarano, D.; and Limoni, P. P., "Karstic aquifer vulnerability assessment methods and results at a test site (Apulia, southern Italy)" (2009). KIP Articles. 3006.
https://digitalcommons.usf.edu/kip_articles/3006

Wierman, Douglas A. and Brian P Hunt, 2010, Occurrence of Karst and Springs: in Douglas A. Wierman, Alex S. Broun, and Brian B. Hunt eds. Hydrogeologic Atlas of the Hill Country Trinity Aquifer

Blanco, Hays, and Travis Counties, Central Texas