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Oklahoma Water Resources Board

18644 County Road 1720
Stonewall, OK 74871
580-777-2735
Pontotoc Sands LLC

March 31, 2023

Mr. Chris Neel
Oklahoma Water Resources Board
3800 N. Classen, Suite 213
Oklahoma City, OK 73118

VIA EMAIL

**Re: 2022 Annual Update of Pit Water Assessment Summary
Pontotoc Sands Company
PS1 – LE 1995**

Mr. Neel:

Please find enclosed our annual assessment and disposition determination regarding mine trapped water encountered in 2022. Please refer to the attached Pit Water Assessment Summary report.

Based on our assessment, we believe we are using less than five ac-ft of pit water which, according to 785:30-15-3(b), makes the Pontotoc Sands facility exempt from 785:30-15 as provided in 82 O.S. §1020.2(D)(2). This conclusion is based on the following three facts: (A) There is no overt evidence of ground water infiltrating the mine pit; (B) The facility's water balance demonstrates a dependence on inputs or outside water sources for make-up water; and (C) The mine floor elevation is above any documented water producing strata. These factors are discussed in the document enclosed with this letter.

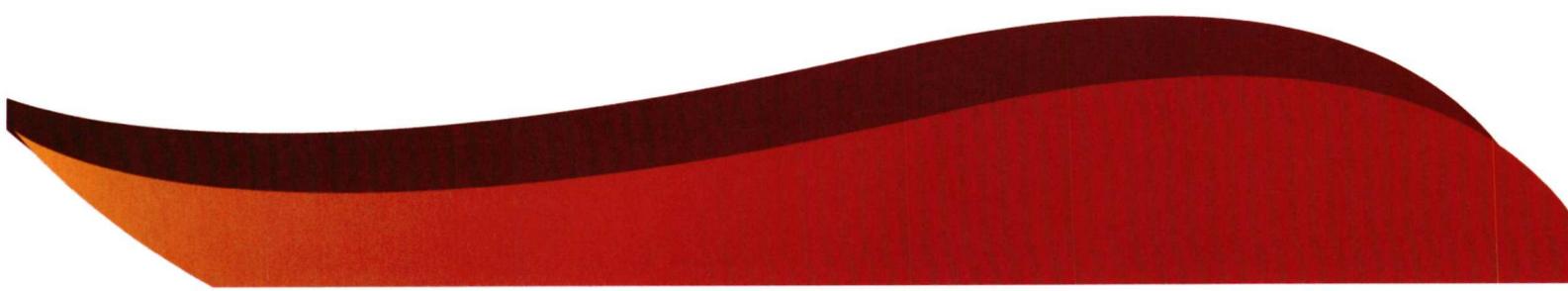
After reviewing the information, I am confident that you will conclude that Pontotoc Sands continues to be in compliance with 82 O.S. §1020.2(D) and exempt from 785:30-15. Also, as required by 785:5-1-21, the annual review fee of \$250 has been paid separately (documentation attached).

Please feel free to contact me if you need additional information.

Sincerely,

Tim Lochridge,
General Manager

cc: OWRB (Jason Tutkowski & Matt Cogburn)
OK Department of Mines
File



Your Receipt

PURCHASE RECEIPT

Water Resources Board

3800 North Classen Blvd. Suite 100
Oklahoma City OK 73118
(405)530-8800
OTC Local Ref ID: 80741994
3/31/2023 02:03 PM

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Thank you!

Status: **APPROVED**
Customer Name: Melissa Feuerborn
Type: Visa
Credit Card Number: **** * 7681

Items	Quantity	TPE Order ID	Total Amount
Pit Water - annual de minimis review	1	110262200	\$250.00
Company Name: Pontotoc Sands Company			
Quarry / Site Name: PS1			
Mailing Address: 18644 CR 1720			
City: STONEWALL			
State: OK			
Zip Code: 74871			
Phone Number: 580-777-2735			
Email Address: josh@cavecitysand.com			
Total remitted to the Water Resources Board			\$250.00
Service Fee	1	110262202	\$7.67
Total amount charged			\$257.67



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2022 ANNUAL PIT WATER ASSESSMENT SUMMARY

PREPARED FOR:

**PONTOTOC SANDS COMPANY, LLC
18644 COUNTY ROAD 1720
STONEWALL, OK 74871
PONTOTOC COUNTY**

MARCH 2023

PIT WATER ASSESSMENT SUMMARY

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OVERVIEW

Pontotoc Sands Company, LLC (Pontotoc Sands) operates the PS1 Mine located at 16644 County Road P720 Stonewall, OK in Pontotoc County. The facility is permitted by the Oklahoma Department of Mines (ODM) (LE-1995), and overlies the Arbuckle-Simpson Aquifer (ASA). Pontotoc Sands “dry-mines” industrial sand (i.e., a dredge is *not* used for excavation) from the Simpson Group lithology within the Bromide-Tulip Creek and McLish Formations, and, according to 82 O.S. §1020.2, could be subject to the rules associated with taking, using, or disposing water trapped in producing mines. However, in 2022, Oklahoma Water Resources Board (OWRB) reconfirmed their determination¹ that less than five acre-feet (ac-ft) of pit water was being used. According to 785:30-15-3(b), this makes Pontotoc Sands exempt from 785:30-15—as provided for in 82 O.S. §1020.2(D)(2).

Given the dynamic nature of mining, the OWRB requires Pontotoc Sands to assess its water use and generate an annual Pit Water Assessment Summary report. This report and the associated information fulfill that requirement. As part of the on-going regulatory oversight, Pontotoc Sands submits the report annually to the OWRB to aid in the protection of ASA’s water resources.

PIT WATER ASSESSMENT

The determination that the facility is using less than five acre-feet of pit water is based on the following three factors: (A) There is no overt evidence of ground water infiltrating the mine pit; (B) The facility’s water balance demonstrates a dependence on inputs or outside water sources for make-up water; and (C) The mine floor elevation is well-above any documented water producing strata. These items are outlined and discussed below.

A. Pit Water Infiltration

Pontotoc Sands mines within a layer of sand/sandstone roughly 80 to 150 feet thick, with economically viable sand currently extending to approximately $\pm 90^2$ feet deep. The deepest pit floor elevation in 2022 was less than 90 feet or so below the ground surface—estimated to be approximately 75-85 feet. The mining area captures storm water runoff and impoundment overflows, but mining has not pierced a geologic layer or lens that produces ground water in any noticeable quantities.

B. Water Balance

The amount of pit water³ used by the facility cannot be measured directly, so it is estimated using a water balance approach (supported by other factors). A water balance was compiled from information and data collected between January 1, 2022 and December 31, 2022. The water balance was based on specific measurements or reasonable estimates of water ‘inputs’ to the process system (i.e., imported/outside water, storm water runoff, direct interception, permitted water well withdrawals, etc.), and water ‘losses’ from the system (i.e., water vapor emitted through the dryer, surface water pond evaporation, facility discharges, miscellaneous uses, etc.). The water inputs and losses are presented below. Refer to Table 1 for a summary of the water balance values.

¹ OWRB (Chris Neel) letter dated 10/20/2022

² Based on reserve assessments information. The geology may vary based location.

³ As defined by 785:30-15-2: Pit Water = means groundwater trapped or collecting in a producing mine pit that emanates from a Sensitive Basin

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Definitions & Methodology

Inputs:

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- **Water Imports:** This includes water brought to the site from outside locations. In drought years, Pontotoc Sands relied on water hauled to the facility from other outside sources (e.g., Jennings' Fittstone facility). No outside water was imported in 2022, however.
- **Surface Water Runoff:** Storm water runoff was determined by measuring the drainage area that contributes to the mine pit and impoundments. The surface water contribution was estimated by calculating runoff using the SCS runoff model to predict storm event volumes based on precipitation. The facility was divided into drainage basins, and site-specific runoff coefficients were applied to each watershed. Precipitation values were obtained from the Fittstown, OK Mesonet Station⁴ (#127), but the facility also measures rain events.
- **Direct Interception/Precipitation:** The amount of water added to the system from direct interception was estimated by measuring the surface area of the impoundments and multiplying it by the amount/depth of precipitation. Precipitation values were obtained from the Fittstown, OK Mesonet Station⁴ for use in the report, but the facility also measures rain events. (The Fittstown station is located approximately 5.75 miles northwest of the facility.) Wetted surface areas were measured from geo-referenced, recently flown aerials.
- **Groundwater Well Withdrawals⁵:** The amount of water pumped from the production well, under OWRB permit #2018-531, was measured using an in-line flow meter. This water is used in the process water system and for ancillary purposes.

Losses:

- **Dryer Evaporation:** Processed sand that enters the dryer is sampled several times daily for moisture content. Consequently, the amount of water lost to dryer evaporation can be accurately determined based on moisture content and sand throughput. For the time period of interest, the median monthly moisture content was multiplied by the monthly production and converted to a water volume. Median moisture content ranged from about 5.5 to 7.3%, and production ranged from 58,000 tons to more than 100,000 tons per month. (Actual monthly data values were used for the calculations.)
- **Impoundment Evaporation:** The volume of water lost via surface evaporation was calculated by measuring the wetted surface area of the impoundments and then multiplying it by the amount/depth of daily evaporation. Pan evaporation data was obtained from the Fittstown, OK Mesonet Station⁴, which was converted to lake evaporation values by multiplying by 0.7. Wetted surface areas were measured from geo-referenced, recently flown aerials. For the additional import water described above, impoundment evaporation for the receiving pond during the date range encompassing the imports, was calculated using the method described above and then added to the total impoundment evaporation calculated for the entire site for the year. Totals for the entire site as well as import-specific evaporation are presented in the Discussion section below.
- **Water Discharges:** Pontotoc Sands is permitted under an OPDES permit OKG950065, which allows for offsite discharges. The facility primarily functions as a retention facility; however, sometimes water has to be pumped off of the facility. Pumping records are used to track the total amount of water discharge, which is submitted to the Department of Environmental Quality (DEQ) as part of the discharge monitoring reporting (DMR) requirements. For the water balance calculation, the amount of loss due to direct discharge is used in the calculation.

⁴ https://www.mesonet.org/index.php/sites/site_description/FITT

⁵ This value corresponds to the amount reported in the annual OWRB Water Use Report

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- Miscellaneous Uses: Water used for other purposes (e.g., dust suppression) was also considered and included in the water balance. Dust suppression logs are kept at the facility. Water applied for travel-way dust control was considered to be lost to evaporation.

Table 1: 2022 Water Balance Summary Information

WATER BALANCE					
1/1/2022 - 12/31/2022					
SYSTEM INPUTS		Units	SYSTEM LOSSES		Units
Imported Water	0.0	gal	Dryer Evaporation	15,095,202.4	gal
Surface Runoff	43,378,160.1	gal	Impoundment Evaporation	28,308,739.3	gal
Direct Interception	18,442,759.3	gal	Direct Discharge	3,712,500.0	gal
Production Well	217,035.0	gal	Misc. Uses	5,474,000.0	gal
Total	62,037,954.4	gal	Total	52,590,441.7	gal
	190.4	ac-ft		161.4	ac-ft

Discussion

According to the Fittstown Mesonet⁶ site, 2022 was a drier precipitation year, with 15% less rainfall than average. (The average annual rainfall for Pontotoc County is 41.17 inches⁷, and the Fittstown Mesonet⁸ site logged 34.83 inches.) Rain gauge measurements taken at the facility logged 32.7 inches, or 21% lower precipitation than normal and ~2 inches less than the Mesonet site. The calculations associated with this report used the Mesonet data to remain consistent across reporting years.

Review of the water balance results suggests that a significant amount of water is added to the system from outside sources (i.e., non-pit sources) in order to maintain the process. If pit water were a contributing component, there would not be a reliance on “input water”—that is, runoff, direct precipitation, and the production well. (Surface water runoff and direct interception are the major inputs into the system.) One would assume pit water would enter the system and supply the make-up water needed for sand processing. Also, Pontotoc Sands would have to discharge significant quantities of water to keep the active mine pit dry enough to mine. (This is not a dredging operation.) In many other mining operations in the ASA, pit water accumulates in excess and has to be managed by augmentation, direct discharge, or other means. This is not the case at the Pontotoc Sands facility—total direct discharge did not exceed the amount calculated for surface runoff and direct interception. Furthermore, discharge events were not consistent. Pumping typically followed large rain events or during the wet season. In fact, the facility only discharged for a few days in June 2022 following a significant rain event. This is an 88% decrease in discharge volume from 2021; further demonstrating inconsistent surface water availability and highlighting the importance of water needs from outside sources. If pit water was a contributing factor, large volumes of water would be encountered, and consistent/regular pumping would be required to keep the mine pit dry.

Again in 2022, the amount of “input” water exceeded the measured “losses”, which suggests there is another loss variable—most likely seepage/infiltration. Given that the impoundments were constructed out of the *in situ* sandy material, it is very plausible that water infiltrates the geologic formation. Water appears to be percolating into the formation.

⁶ https://www.mesonet.org/index.php/sites/site_description/FITT

⁷ https://climate.ok.gov/county_climate/Products/QuickFacts/pontotoc.pdf

⁸ https://www.mesonet.org/index.php/sites/site_description/FITT

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C. Geologic & Well Information: Oklahoma Water Resources Board

Based on review of the generalized geology and hydrologic information for this portion of the ASA, it appears that the mine pit is situated within the Simpson Group sandstone, above the Arbuckle limestone formation. Three other wells were identified within the same section (25-01N-06E)⁹ as the mine pit. These wells varied in total depth from 60 to 143 feet below the surface. Based on the lithology, as reported on the OWRB well completion reports, it appears these wells were completed in the limestone versus the sandstone. Review of the reported static water levels and OWRB monitoring data suggests that these wells were completed within a confined aquifer with highly varied depth-to-water levels. Consequently, these wells do not reflect the conditions observed in the mine pit's sandstone formation.

More indicative was Pontotoc Sands' 2018 well drilling activities at the facility. A domestic water well was drilled/completed circa January 21, 2018 (Well ID #185223). Based on discussions with the well driller (L&W Drilling, DPC 0901; OP-2004), it appears that the upper 100 feet of sand has little to no water available. The formation was a slightly cementitious sand/sandstone with observed "first water" at 74 ft. The driller went on to report "...this well never really encountered a real water zone, just a lightly moist sand at 70-92 ft". "Moist sand" may have been encountered at 74 feet below the surface, but no "meaningful" water producing zones were encountered. The well was completed with the hopes of making enough water to support the office's sanitary needs; unfortunately, it did not. The well has since been plugged.

Given the historical need for additional water to operate the facility, a groundwater permit was obtained (2018-531) and a water well (Well ID# 189151) was drilled in June 2018. Mr. Robert Keys of Associated Environmental Industries Corporation (DPC-0269, OP-0472) was the licensed driller of record, and logged the well's lithology. As reported by the well driller, the top 170 feet of the formation was a mix of shale and sandstone with no significant quantities of water encountered. The first zone of saturated geology was between 115 to 125 feet below the surface with a reported depth-to-water of ~125 feet¹⁰. From 170 to 520 feet below the surface, the formation was a mix of sandstones with thin layers of limestone and dolomite. At depths greater than 520 feet, the formation was consistently limestone with significant amounts of water observed. This layer is assumed to be the Arbuckle formation.

Based on this lithology, it appears that groundwater will not be encountered until approximately 125 feet below the surface, but maybe even deeper in the consolidated rock formations. If one presumes the 125-foot depth is the surficial water table and the deepest pit floor in 2022 was ~75-85 feet, then the mining operations are still well above the ground water table.

DISCUSSION

Using the information collected as part of this review, it appears that the mine has not encountered a source of pit water and is not using pit water in any quantifiable amount. This is supported by the following findings/information:

1. There is no obvious infiltration of ground water into the mine pit. If the mine encountered pit water, there should be some overt inflow of ground water (e.g., a spring or seep) observed emanating from the pit walls or floor. Mining activities have not encountered any infiltrating ground water.
2. If the facility was mining within the ground water table, one would assume that a discharge pump would be operated continuously or at some frequent interval; however, this is not the case. The discharge pump is used only to manage excessive amounts of stormwater runoff and process water return flow. In 2022, discharge volumes were less than the volumes of water calculated for surface runoff or direct interception.

⁹ OWRB well record search <http://www.owrb.ok.gov/wd/search/search.php>

¹⁰ As determined by Mr. Robert Keys (Associated Environmental Industries) production well lithology (ID#189151) and personal communication (2018)

If pit water was infiltrating the mine system, then there should be more constant/consistent pumping to manage the excess water, but there was not. The mine only discharged for a few days in June 2022, following a significant rainfall event. (Side note—there has been no discharge since the date of this report. That means from June 16, 2022 to February 28, 2023 (8⁺ months) there has been no offsite pumping.)

3. As revealed from the water balance, more water is put into the system than is accounted for as a loss. That means more water is infiltrating the sand formation than is being used in the production operation or being discharged. If pit water was encountered, one would assume that there would be excess water entering the system, or at least an amount that would offset the need for inputs. This was not the case. The dependence on storm water runoff, the well water, and precipitation is a strong indication that pit water is not a contributing factor in the water balance.
4. The observed well lithology strongly supports the conclusion that the mine pit has not encountered groundwater. The deepest mine floor depth in 2022 was ~75-85 ft below the surface. The first zone of saturated lithology encountered while drilling the well was located at 125 ft below the surface. This suggests that the mine floor is located well above any observed or potential water zones, and that the mine excavation has not encountered a source of pit water.

CONCLUSION

After assessing the facility's operation, water balance, and associated geology, it appears that: (A) There is no overt evidence of infiltrating pit water; (B) The facility's water balance demonstrates a dependence on inputs of water for plant operations; and (C) The mine floor elevation is well-above any observed water producing strata. Based on these factors, one could conclude that less than five acre-feet of pit water is being used. According to 785:30-15-3(b), this makes the Pontotoc Sands facility exempt from 785:30-15—as provided for in 82 O.S. §1020.2(D)(2).

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