STATE OF COLORADO

Gagnon - DNR, Nikie <nikie.gagnon@state.co.us>

Pit 29 Groundwater

1 message

Alex Schatz <aschatz@brannan1.com> Wed, Apr 17, 2024 at 2:56 PM
To: "Gagnon - DNR, Nikie" <nikie.gagnon@state.co.us>, Permits <Permits@brannan1.com>
Cc: Fred Marvel <fmarvel@brannan1.com>, Brad Hagen <brad@civilresources.com>

Nikie –

Attached you will find Brannan's response to ongoing questions concerning groundwater levels at the eastern boundary of Pit 29 (M-1980-183).

As requested, Brannan has collected additional data and expanded its analysis to include information submitted by the adjacent operator, E-470 PHA. We support the Division's goal of better understanding hydrologic balance in the area of Pit 29 and Sandy Acres. While there is no definitive conclusion yet, Brannan's further evaluation of the questions related to ponding on Sandy Acres increases our confidence that hydraulic mounding at the Pit 29 boundary is not a cause for elevated groundwater that is likely (and in evidence) regional in nature.

We appreciate the effort the Division has put into investigating this, and hope for a resolution that is acceptable to all involved. To that end, you will note that Brannan's response includes some robust points about the process. It is our expectation that we will continue to cooperate. But Brannan cannot accept the continuation of "Corrective Action" correspondence and citations to disturbance of the hydrologic balance without a clear explanation on the record, either that (a) no violation has been established and that Brannan is continuing in this process voluntarily or that (b) the Division has a factual basis to demand "Corrective Action" and to produce correspondence characteristic of enforcement action.

Thank you for coordinating with us, especially if a follow up meeting or call is appropriate. I will be happy to coordinate as needed on Brannan's end. We look forward to resolving this with the fullest possible view of the facts and best outcome.

Alex

Alex Schatz

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BRANNAN Sand and Gravel Co. Founded 1906

Pit29-DRMSGroundwaterSubmittal-041724.pdf
2139K

BRANNAN
Companies

17 April 2024

Nikie Gagnon
Division of Reclamation, Mining and Safety
1313 Sherman Street, Room 215
Denver, CO 80203

by email to nikie.gagnon@state.co.us

Re: Resolution of Groundwater Comments, M-1980-183

Ms. Gagnon:

Thank you for the opportunity to address the Division's concerns over groundwater at Pit 29 (M-1980-183).

As stated in the Division's letter to Brannan dated March 4, 2024, those concerns are twofold: First, that groundwater levels at Pit 29 have risen since the eastern slurry wall was repaired to complete functionality after 2018. Second, that water is ponding on the adjacent permitted mine site, conventionally known as "Sandy Acres" (Henderson Development, M-1980-110). Brannan has evaluated additional data since our initial writing to the Division on this matter in a letter dated February 13, 2024.

Regarding the rise in groundwater levels at Pit 29 since 2018, this corrects an artificially low water table caused during an interim period when dry mining was occurring in Pit 29 without the benefit of a fully functional slurry wall between Pit 29 and the adjacent Sandy Acres pit. Brannan is unaware of any precedent that would reestablish or revise the baseline expectation for groundwater levels on the basis of drawdown that was not consistent with permitting and long-term plans. Groundwater at Pit 29 monitoring wells rapidly normalized to current levels after completion of slurry wall repairs, and have remained consistent for the last several years, with minimal seasonal variations.

As to a causal connection between current ponding in Sandy Acres and Pit 29, the merits are dubious. Brannan reiterates its concerns and impressions from Brannan and Civil Resources materials submitted February 13. In addition, we note presently that E-470's March 28 materials do not demonstrate, and may not have been intended to demonstrate, a causal connection between Pit 29 and Sandy Acres ponding.

Brannan objects to inferences regarding Pit 29 drawn from E-470's March 28 letter on a number of grounds. We discuss certain points relevant to the Pit 29 slurry wall below, but in general believe E-470's March 28 letter is improperly directed and applied to Pit 29. It relies heavily on information irrelevant to the slurry wall on Pit 29's eastern boundary, fails to adequately explore the regional groundwater influences affecting Pit 29, and jumps to unsupported conclusions about Pit 29, particularly that Pit 29 "exacerbated" groundwater elevations in Sandy Acres. As noted in Brannan's February 13 letter, it is unclear whether the Division regards E-470 materials as having any bearing on the Pit 29 permit, as they are filed and discussed within the purview of another permit.

Unfortunately, the informal process by which potential problems are identified and corrective actions demanded lends itself to misinterpretation. For example, in the present situation, the March 28 submittal from E-470 states that Pit 29 "has affected local ground water elevations and locally increased water elevations to the point that corrective action was required." Indeed, in 2015, an area of Pit 29 hydrologically distinct from the current case experienced presumed mounding. See the enclosed sketch overlaying E-470 Figure 1, showing in red relevant slurry wall limits and the area affected by presumed mounding ("2015 perimeter drain"). For mounding above the North Cell rather than shadowing below the South Cell to have been the primary groundwater influence in this area, the blue sketched line shows the maximum deflection from south-to-north groundwater gradient that is consistent with these 2015 hydrology conditions. The 2015 groundwater mounding event therefore provides no information relevant to the current situation other than to indicate that groundwater flow trends strongly south-to-north in the vicinity of Pit 29.

Within the purview of the Pit 29 permit, the Division requested additional data and analyses regarding groundwater conditions. Brannan submits that Pit 29 bears no substantial responsibility for elevated groundwater in Sandy Acres. Speculation otherwise is contrary to known facts affecting the groundwater situation at Pit 29's eastern edge:

- First and foremost, the Division's correspondence indicates a strong preference for analysis of groundwater data. A comprehensive review of available Pit 29 groundwater data was prepared by Civil Resources and is enclosed with this letter ("Civil Resources April 16 Letter Report"). Civil Resources' analysis agrees with the view that the Pit 29 slurry wall is not a substantial contributor to the current elevated groundwater situation at Sandy Acres.
- According to best available knowledge of groundwater flow subparallel to the South Platte River, groundwater in most to all inundated areas of Sandy Acres should migrate toward land that is not in the path of the Pit 29 slurry wall. Refer to discussion above and attached sketch.
- Sandy Acres is experiencing a great deal of variability in groundwater conditions year to year, including recent ponding. This does not correlate with the equilibrium state at the relevant Pit 29 monitoring well (see Civil Resources April 16 Letter Report).
- The regional nature of this groundwater problem is evident from other sites in the area. Across the South Platte River valley, groundwater has been trending higher due to curtailment of agricultural groundwater pumping, an additional factor having nothing to do with irrigation canals and surface water delivery. In this vicinity, agricultural conservation is coupled with land use change (rapid urbanization) as a significant reason why groundwater may be trending higher. (See decadal trends, showing more frequent shallow groundwater, i.e., elevated water table, in Denver-area subwatersheds of the South Platte River system at https://pubs.usgs.gov/sir/2015/5015/pdf/sir2015-5015.pdf)
- Climatic variation will affect the hydrologic balance. Attached is a compilation of monthly and annual precipitation data for the Denver area from the National Weather Service. Last year, coincident with ponding in Sandy Acres, was a record year for precipitation. It is entirely possible, if not likely, that groundwater variability in 2023 and other years correlates with climate and other watershed- and landscape-level factors external to the immediate vicinity.
- Central to the situation at Sandy Acres is a lack of surface outlet for oncoming surface drainage and groundwater. Low permeability materials in the Sandy Acres backfill and surrounding eolian soils are an impediment to natural infiltration. In March 28 materials, E-470 acknowledges that the effects of highway construction are unknown but could be a factor. An obvious question is the consequence of

placing embankment for the eastbound on-ramp (see E-470 March 28 submittal, Figure 3) in the location of the natural easement downgradient of Sandy Acres.

Lined pits in the groundwater regime are analogous to an emergent rock in the river: There is a ripple at the edge of the rock, but one rock does not necessarily, much less typically, raise the level of the entire river. As noted in E-470's March 28 submittal, "Ground water mounding is a change in elevations in certain areas of the alluvial aquifer which, in and of itself, is not a change to the hydrologic balance around a gravel [pit] and is an inherent result of lined and backfilled gravel pits." It is undisputed that the Pit 29 slurry wall has a hydraulic effect that is both expected and within the approved scope of its Reclamation Permit. Nowhere, however, is it reasonably established that this hydraulic effect propagates to the extent that it is a disturbance to the hydrologic balance or requires corrective action for any reason.

It is incumbent on the Division to clarify the record in this case. When we spoke on March 4, between Brannan and the Division, Ms. Eschberger stated that the Division had yet to find a violation of Rule 3.1.6(1) at Pit 29. Brannan continues to regard this as an informational process, consistent and coincident with the submittal of groundwater monitoring data. There remains no diagnostic conclusion, as the contribution of Pit 29's slurry wall to Sandy Acres groundwater remains speculative and evidenced weakly, if at all. The application to this situation of Rule 3.1.6(1) is without any clear standard.

Brannan welcomes your close and careful consideration of the record, including the materials submitted today supporting our position. Again, Brannan agrees that continued close examination of quarterly well monitoring results is appropriate. We will also continue to review and respond to any collateral information developed on behalf of the operator at Sandy Acres. At this time, no change to Pit 29 mining or reclamation plans is anticipated.

Please contact me with any questions or to arrange for further discussion.

Sincerely,

BRANNAN SAND AND GRAVEL COMPANY, LLC

Alex Schatz

encl: Civil Resources April 16 Letter Report, including exhibits
Sketch of Projected Groundwater Flow, Overlaying E-470 Figure 1
National Weather Service, Denver-area Precipitation Data (2000-2024)

cc: Fred Marvel
Brad Hagen
Kyle Regan
Scott Legg
Emily Schallenkamp
Steve Kelton

CIVIL RESOURCES, LLC
ENGINEERS & PLANNERS

April 16, 2024

Colorado Division of Reclamation, Mining & Safety
Ms. Nikie Gagnon
1313 Sherman Street, Room 215
Denver, CO 80203

RE: Groundwater Mounding East of Pit 29 (Permit M-1980-183), Adams County, Colorado

Dear Ms. Gagnon:

DRMS has presented a claim that Pit 29 slurry wall (or the repair thereof) has caused a hydrologic imbalance due to a rise in local groundwater levels on the east side of the pit after the 2018 repair of the slurry wall. It is Brannan's contention that the only hydrologic imbalance that remains is the inflow and evaporation of exposed groundwater at the Sandy Acres site. Pit 29 did create a hydrologic imbalance during mining and prior to repair of the North Pit slurry wall in 2018 but now that the slurry wall has been repaired it is no longer affecting the alluvial groundwater balance. The following information supporting this conclusion was obtained largely from the DRMS permit record, additional review of the local hydrogeology and information presented by E-470 in their latest submittal to DRMS.

Historic Water Levels

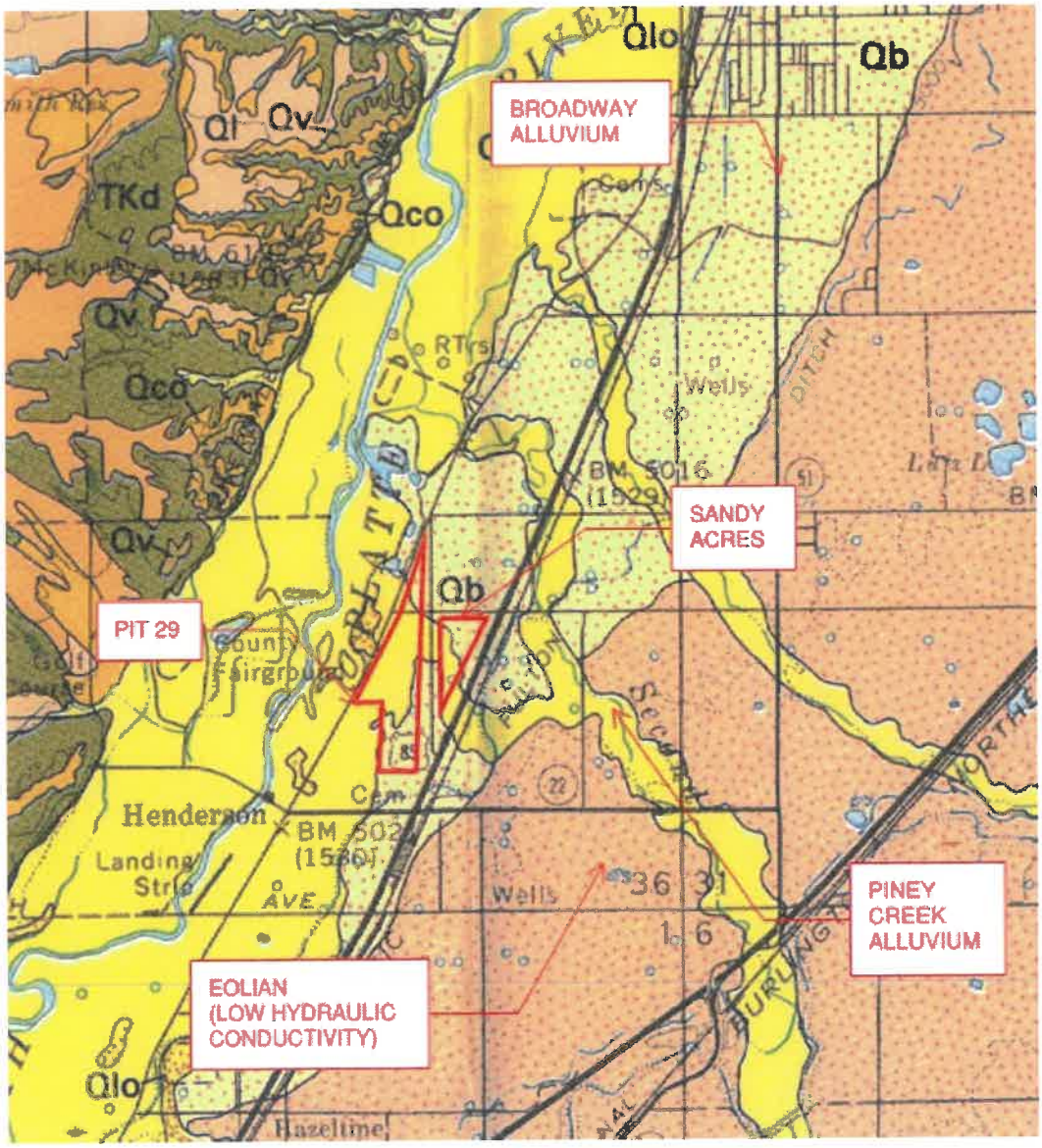
After further review of the DRMS permit record, CR identified a report completed by Blatchley Associates Inc. which presented pre-mining groundwater levels at the proposed Pit 29 Site. The investigation included forty six (46) test holes drilled to bedrock at the site on: April 7, April 17, May 29, June 2, and June 3 1980. The groundwater measurements were taken from twenty-six (26) of these test holes 3 to 6 days after drilling (April 21 for holes drilled April 17 and June 6 for test holes drilled May 29, June 2, and June 3) and were used to generate the presented groundwater contours. Obtaining water levels multiple days after drilling would allow the water table to recover from any disturbance from the drilling process and provide reliable groundwater elevation data. The seventeen (17) test holes not used in the groundwater level analysis had water levels taken on the same day as drilling and were considered less reliable. Figure 1 shows the locations of the test holes and corresponding groundwater level data and Figure 2 depicts the drill logs.

As noted in a September 24, 2018 Brannan letter to the Division (See Attachment A), the pre-mining groundwater contour map produced in 1980 was created utilizing the vertical datum NGVD 29 whereas subsequent data is on the NAVD 88 vertical datum. NOAA's "Online Vertical Data Transformation" tool was utilized to shift the 1980 NGVD 29 contour elevations to NAVD 88. The data transformation shift from NGVD 29 to NAVD 88 at the Site is +2.882 feet with a vertical uncertainty of (+/-) 0.322 feet. The adjusted (NAVD88) water elevation contour values and the approximate locations of MW-1 OUT, MW-2 OUT, and MW-4 OUT are shown in red on Figure 1 for comparison. MW-1 OUT is the upgradient well located closest to the Sandy Acres site which has reflected the rebounded groundwater elevations in question. As shown on Figure 1, the historic pre-mining groundwater elevation at MW-1 OUT is approximately 5014.18 feet. Groundwater elevation data was initially collected in 2005 to 2006 and has been collected for MW-1 OUT since the leak test was performed in 2010 as presented in Table 1. Key takeaways from this data are summarized below:

- *Slurry Wall Constructed with No Dewatering or Shallow Dewatering (2005 to 2006; 2010 to 2012):* The slurry wall around the north and south cell was completed in 2003-2004. Quarterly water levels were taken starting in December 2005 and ending May 2006. During this time groundwater elevation at MW-1 OUT ranged from 5008.8 to 5011.3 feet. This equates to approximately 3.9 to 5.4 feet below historic. During this period, no dewatering had yet occurred in the Pit 29 North Pit therefore the head differential across the slurry wall would

be close to zero and leakage would have been negligible. No groundwater levels were taken at the Site between May 2006 to September 2010 when monitoring was resumed due to a mounding complaint to the southwest of the slurry wall. The measurements taken in September 2010 through September 2012 are relatively close to the historic groundwater elevation to lower than historic by 1.3 to 3.3 feet. This period is slightly higher than the 2005 to 2006 period, likely due to the groundwater table recovering after slurry wall construction or natural variability (variable precipitation, river levels, etc.).

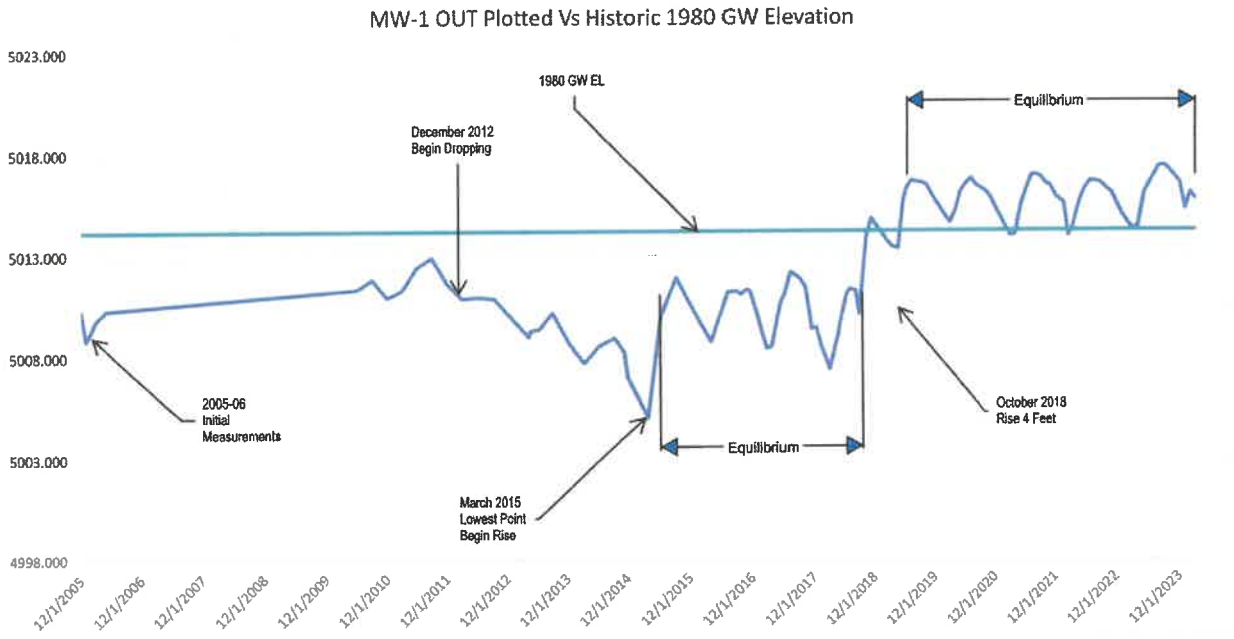
As shown in the geologic map below (Trimble 1979), the Pit 29 slurry wall was constructed to within 800 feet of the low conductivity eolian deposits to the east of Highway 85. This may have decreased the amount of flow to the northeast essentially putting the eastern side of the Site including the Sandy Acres Site in the groundwater shadow. The groundwater shadow in conjunction with evaporation from the unlined Sandy Acres Site would account for the drop in groundwater elevation during this period.



- *Full Dewatering in North Pit (2012 to 2015):* Starting in December 2012 groundwater elevation at MW-1 OUT began dropping reaching it's lowest elevation in March 2015 at 5005 feet or 9.2 feet below historic. During this period, Brannan opened a new siltation pond outside of the slurry wall lined pit and started actively dewatering the pit. As the water level in the pit dropped the amount of water passing through the inadequately keyed in section of the slurry wall increased and drew down the groundwater table east of the slurry wall.

- *Filling of Sandy Acres Site (2015 to 2018):* From March 2015 to September 2015, groundwater elevation then rose approximately 7 feet to 5011.9 feet or 2.3 feet below historic. This coincides with the filling of Sandy Acres with low permeability fill. As shown in the USGS geologic map (Trimble 1979) above, the location of the Sandy Acres Site is located in what was likely a channel of the Second Creek drainage consisting of Piney Creek Alluvium and Broadway alluvium, both with relatively high hydraulic conductivity. Filling in this historic stream bed with low permeability material potentially cut off flow to the north causing the observed mounding and abrupt rise in groundwater elevation. Even considering this rise in groundwater elevation, groundwater elevation at MW-1 OUT is consistently lower than the 1980 groundwater elevation during this time period.

- *Post Slurry Wall Repair (2018 to current):* Groundwater elevation then remained at levels that would be expected from seasonal variability until October 2018 when groundwater rose approximately 4 feet in one month to 5013.8 feet or 0.4 feet below historic. Since October 2018, groundwater has remained relatively consistent ranging from 5013.3 feet (0.9 feet below historic) to 5017.4 (3.2 feet above historic). The graph below shows the changes in groundwater elevation at MW-1 OUT in relation to the 1980 water elevation.



Conclusion

The following conclusions should be drawn from this presentation of data:

- The historic groundwater elevations were measured once in April to June 1980. The groundwater elevation at the Site typically starts to rise in March and peaks in late Summer into Fall and therefore it is likely that the groundwater elevations observed in Spring/early Summer of 1980 were not peak groundwater elevations.

- Prior to dewatering the Pit 29 North Pit, the slurry wall was likely acting as an adequate barrier, yet groundwater elevations at MW-01 OUT were approximately 2 to 3 feet below the elevation observed in June 1980. It is likely that a large portion of the drop in groundwater elevation was due to the hydrologic imbalance caused by evaporation of the unlined Sandy Acres Site immediately to the east of MW-01 OUT which was demonstrated when groundwater elevation rose 2 feet from 2014 to 2015 when the Sandy Acres site was filled in with low permeability fill.

- After the slurry wall was repaired and the water table returned to equilibrium the maximum groundwater elevation above the 1980 baseline at MW-1 OUT is less than 2.5 feet when comparing measurements in June during some historically wet years.

- Hydrologic Imbalance Isolated to Sandy Acres: Evaporation at the Sandy Acres pit is the only current contributor to a potential hydrologic imbalance.

    - E-470 Backfill is obstructing 2nd Creek Alluvial Flows from being conveyed to the SPR. This is evident in aerial photography that shows another pond East of Sandy acres filling with water after the backfill material was added to Sandy Acres.

    - E-470 Backfill Level is Inadequate: According to the grading plan provided by E-470's report (see Attachment B sheet 5), the Sandy Acres pit was filled to an elevation of 5012 feet in the southern end. This is approximately 3 feet below the pre-mining groundwater elevation of 5014.18 feet and therefore it is no surprise that groundwater inflow is being observed.

- No Hydrologic Imbalance Caused by Pit 29: Since the repair of the slurry wall was completed in 2018, groundwater elevation east of Pit 29 is currently stable within annual and seasonal variability.

- Observed Mounding: E-470 Acknowledges that groundwater mounding is primarily observed on its south boundary which directly infers that the groundwater flow is from that direction. Similarly, groundwater mounding caused by Pit 29 has been observed to occur on its south boundary. Regardless, the Pit 29 mounding was either previously mitigated or determined to have no deleterious effects on adjacent properties to its south.

We appreciate your review. Should you have any questions, please contact us.

Sincerely,
CIVIL RESOURCES, LLC.

Brad L Hagen, P.E.

Kyle S. Regan, P.G.

Cc:
Fred Marvel
Alex Schatz
Emily Schallenkamp

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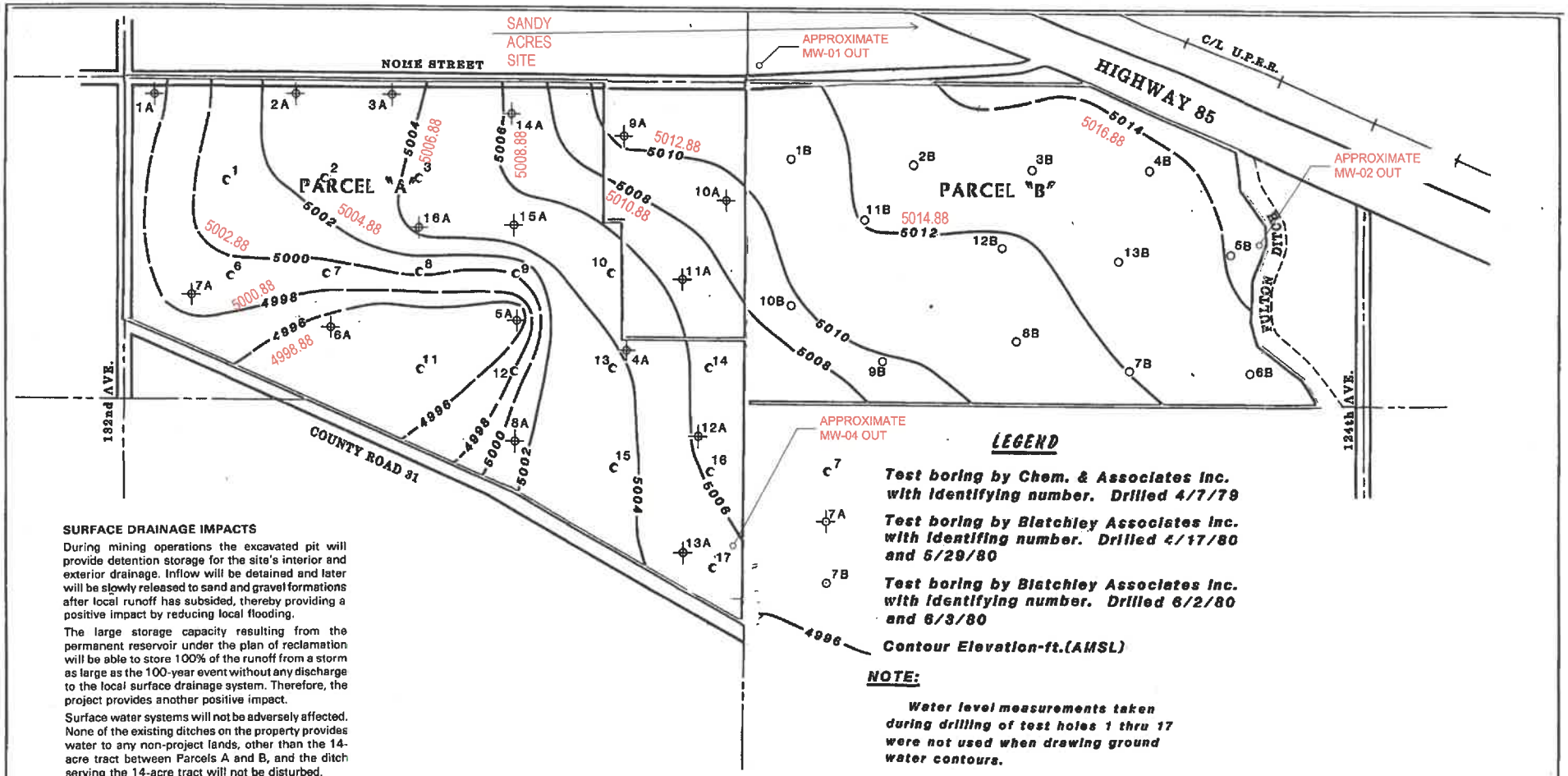
TABLES

Brannan Pit #29

Water Level Measurements

Date Month-Year	Depth to Water (ft)										
	MW-1 OUT	MW-1 Historic GW Elevation (AM-02 Datum Shift Memo to DRMS 9-25-18 - NAD88 Datum)	MW-2 OUT	MW2 GW Elevation	MW-2 Historic GW Elevation (AM-02 Datum Shift Memo to DRMS 9-25-18 - NAD88 Datum)	MW 2 Historic June 1980 (Pre-mining GW Contour Map - Blatchley and Associates - NGVD 29 Datum)	MW-3 OUT	MW-4 OUT	MW-4 GW Elevation	MW-4 Historic GW Elevation (AM-02 Datum Shift Memo to DRMS 9-25-18 - NAD88 Datum)	MW-4 Historic May 1980 (Pre-mining GW Contour Map - Blatchley and Associates - NGVD 29 Datum)
12/1/2005	21.50	5014.18	22.50	5010.15	5016.88	5014	11	NA	NA	5008.877	5006
1/1/2006	23.00	5014.18	23.00	5009.65	5016.88	5014	13	NA	NA	5008.877	5006
3/1/2006	22.00	5014.18	20.00	5012.65	5016.88	5014	11.5	NA	NA	5008.877	5006
5/1/2006	21.50	5014.18	20.00	5012.65	5016.88	5014	10.5	NA	NA	5008.877	5006
6/1/2010	20.50	5014.18	17.70	5014.95	5016.88	5014	N/A	NA	NA	5008.877	5006
9/1/2010	20.00	5014.18	18.90	5013.75	5016.88	5014	N/A	21.40	4996.48	5008.877	5006
12/1/2010	20.90	5014.18	23.17	5009.48	5016.88	5014	N/A	26.25	4991.63	5008.877	5006
3/1/2011	20.57	5014.18	19.40	5013.25	5016.88	5014	N/A	24.66	4993.22	5008.877	5006
6/1/2011	19.40	5014.18	15.74	5016.91	5016.88	5014	N/A	21.80	4996.08	5008.877	5006
9/1/2011	18.94	5014.18	18.63	5014.02	5016.88	5014	N/A	21.08	4996.80	5008.877	5006
12/1/2011	20.20	5014.18	21.10	5011.55	5016.88	5014	N/A	21.15	4996.73	5008.877	5006
3/1/2012	20.95	5014.18	10.30	5022.35	5016.88	5014	N/A	17.75	5000.13	5008.877	5006
6/1/2012	20.89	5014.18	18.47	5014.18	5016.88	5014	N/A	14.09	5003.79	5008.877	5006
9/12/2012	20.97	5014.18	19.21	5013.44	5016.88	5014	N/A	5.64	5012.24	5008.877	5006
11/12/2012	-	5014.18	-	-	5016.88	5014	N/A	4.84	5013.04	5008.877	5006
12/12/2012	21.79	5014.18	20.54	5012.11	5016.88	5014	N/A	5.67	5012.21	5008.877	5006
4/13/2013	22.84	5014.18	18.16	5014.49	5016.88	5014	N/A	5.61	5012.27	5008.877	5006
4/22/2013	22.55	5014.18	19.70	5012.95	5016.88	5014	N/A	5.30	5012.58	5008.877	5006
6/13/2013	22.48	5014.18	18.78	5013.87	5016.88	5014	N/A	5.60	5012.28	5008.877	5006
9/1/2013	21.66	5014.18	19.15	5013.50	5016.88	5014	N/A	4.52	5013.36	5008.877	5006
12/13/2013	23.19	5014.18	20.60	5012.05	5016.88	5014	N/A	5.60	5012.28	5008.877	5006
3/14/2014	24.15	5014.18	16.75	5015.90	5016.88	5014	N/A	6.09	5011.79	5008.877	5006
6/14/2014	23.32	5014.18	17.76	5014.90	5016.88	5014	N/A	5.18	5012.71	5008.877	5006
9/14/2014	22.91	5014.18	18.80	5013.85	5016.88	5014	N/A	4.64	5013.24	5008.877	5006
11/14/2014	23.60	5014.18	19.62	5013.03	5016.88	5014	N/A	5.22	5012.66	5008.877	5006
12/1/2014	24.85	5014.18	20.48	5012.17	5016.88	5014	N/A	6.02	5011.86	5008.877	5006
3/31/2015	26.87	5014.18	17.50	5015.16	5016.88	5014	N/A	6.78	5011.10	5008.877	5006
6/15/2015	21.79	5014.18	16.69	5015.96	5016.88	5014	N/A	4.79	5013.09	5008.877	5006
9/15/2015	19.94	5014.18	17.75	5014.90	5016.88	5014	N/A	5.27	5012.61	5008.877	5006
12/15/2015	21.42	5014.18	19.15	5013.50	5016.88	5014	N/A	6.54	5011.34	5008.877	5006
4/6/2016	23.11	5014.18	20.06	5012.59	5016.88	5014	N/A	9.15	5008.73	5008.877	5006
7/13/2016	20.66	5014.18	18.64	5014.01	5016.88	5014	N/A	6.33	5011.55	5008.877	5006
8/30/2016	20.61	5014.18	19.86	5012.79	5016.88	5014	N/A	9.01	5008.87	5008.877	5006
9/27/2016	20.78	5014.18	20.37	5012.28	5016.88	5014	N/A	8.77	5009.11	5008.877	5006
10/31/2016	20.53	5014.18	20.91	5011.74	5016.88	5014	N/A	9.09	5008.79	5008.877	5006
11/21/2016	20.58	5014.18	21.05	5011.60	5016.88	5014	N/A	9.05	5008.83	5008.877	5006
12/28/2016	21.61	5014.18	21.93	5010.72	5016.88	5014	N/A	9.15	5008.73	5008.877	5006
1/26/2017	22.49	5014.18	22.31	5010.34	5016.88	5014	N/A	9.20	5008.68	5008.877	5006
2/27/2017	23.44	5014.18	22.60	5010.05	5016.88	5014	N/A	9.20	5008.68	5008.877	5006
3/28/2017	23.35	5014.18	19.78	5012.87	5016.88	5014	N/A	9.19	5008.69	5008.877	5006
5/22/2017	21.12	5014.18	19.25	5013.40	5016.88	5014	N/A	8.90	5008.98	5008.877	5006
6/14/2017	20.76	5014.18	18.88	5013.77	5016.88	5014	N/A	8.91	5008.97	5008.877	5006
7/17/2017	19.68	5014.18	18.60	5014.05	5016.88	5014	N/A	8.94	5008.94	5008.877	5006
8/11/2017	19.81	5014.18	19.5	5013.15	5016.88	5014	N/A	8.11	5009.77	5008.877	5006
9/11/2017	19.97	5014.18	19.60	5013.05	5016.88	5014	N/A	8.96	5008.92	5008.877	5006
10/16/2017	20.42	5014.18	20.30	5012.35	5016.88	5014	N/A	8.99	5008.89	5008.877	5006
11/21/2017	22.48	5014.18	21.58	5011.07	5016.88	5014	N/A	9.12	5008.76	5008.877	5006
12/19/2017	22.39	5014.18	22.14	5010.51	5016.88	5014	N/A	9.06	5008.82	5008.877	5006
1/19/2018	23.32	5014.18	22.58	5010.07	5016.88	5014	N/A	9.22	5008.66	5008.877	5006
2/16/2018	23.90	5014.18	22.81	5009.84	5016.88	5014	N/A	9.27	5008.61	5008.877	5006
3/12/2018	24.48	5014.18	23.00	5009.65	5016.88	5014	N/A	9.38	5008.50	5008.877	5006
4/30/2018	22.80	5014.18	20.19	5012.46	5016.88	5014	N/A	9.22	5008.66	5008.877	5006
5/21/2018	21.95	5014.18	19.75	5012.90	5016.88	5014	N/A	9.18	5008.70	5008.877	5006
6/22/2018	20.80	5014.18	19.08	5013.57	5016.88	5014	N/A	9.05	5008.83	5008.877	5006
7/12/2018	20.50	5014.18	19.24	5013.41	5016.88	5014	N/A	9.06	5008.82	5008.877	5006
8/15/2018	20.60	5014.18	19.83	5012.82	5016.88	5014	N/A	9.01	5008.87	5008.877	5006
9/5/2018	21.75	5014.18	20.11	5012.54	5016.88	5014	N/A	9.05	5008.83	5008.877	5006
10/18/2018	17.95	5014.18	20.81	5011.84	5016.88	5014	N/A	9.05	5008.83	5008.877	5006
11/19/2018	17.04	5014.18	21.48	5011.17	5016.88	5014	N/A	9.15	5008.73	5008.877	5006
12/14/2018	17.34	5014.18	21.87	5010.78	5016.88	5014	N/A	9.20	5008.68	5008.877	5006
2/28/2019	18.21	5014.18	22.49	5010.16	5016.88	5014	N/A	9.30	5008.58	5008.877	5006
3/28/2019	18.44	5014.18	22.61	5010.04	5016.88	5014	N/A	9.31	5008.57	5008.877	5006
4/30/2019	18.52	5014.18	19.60	5013.05	5016.88	5014	N/A	9.23	5008.65	5008.877	5006
5/31/2019	16.18	5014.18	19.12	5013.53	5016.88	5014	N/A	9.12	5008.76	5008.877	5006
6/20/2019	15.56	5014.18	18.57	5014.08	5016.88	5014	N/A	9.05	5008.83	5008.877	5006
7/18/2019	15.19	5014.18	17.86	5014.79	5016.88	5014	N/A	9.00	5008.88	5008.877	5006
9/27/2019	15.29	5014.18	19.29	5013.36	5016.88	5014	N/A	9.01	5008.87	5008.877	5006
10/21/2019	15.40	5014.18	19.69	5012.96	5016.88	5014	N/A	9.01	5008.87	5008.877	5006

FIGURES



LEGEND

- C7 — *Test boring by Chem. & Associates Inc. with identifying number. Drilled 4/7/79*
- 7A — *Test boring by Blatchley Associates Inc. with identifying number. Drilled 4/17/80 and 5/29/80*
- 7B — *Test boring by Blatchley Associates Inc. with identifying number. Drilled 6/2/80 and 6/3/80*
- 4996 — *Contour Elevation-ft.(AMSL)*

NOTE:

Water level measurements taken during drilling of test holes 1 thru 17 were not used when drawing ground water contours.

SURFACE DRAINAGE IMPACTS

During mining operations the excavated pit will provide detention storage for the site's interior and exterior drainage. Inflow will be detained and later will be slowly released to sand and gravel formations after local runoff has subsided, thereby providing a positive impact by reducing local flooding.

The large storage capacity resulting from the permanent reservoir under the plan of reclamation will be able to store 100% of the runoff from a storm as large as the 100-year event without any discharge to the local surface drainage system. Therefore, the project provides another positive impact.

Surface water systems will not be adversely affected. None of the existing ditches on the property provides water to any non-project lands, other than the 14-acre tract between Parcels A and B, and the ditch serving the 14-acre tract will not be disturbed.

It is proposed that the water supply for the lots resulting from the reclamation plan will be provided by a plan of augmentation utilizing shares of the Fulton Ditch. At the appropriate time prior to subdividing the lots under the augmentation plan, specific details will be developed and implemented through the plan for augmentation through the Water Division Number 1 Water Court. At this time, it is proposed that the domestic in-house water and irrigation water will be provided by individual domestic wells.

Brannan owns 35 shares of Fulton Ditch Water for this purpose.

BLATCHLEY ASSOCIATES, INC.
Consulting Water Engineers

Permit Number 7911980-183
Class: ☒ Permit
Section/Exhibit:
Class: ☐ Revision
Type/Seq:
Class: ☐ Report ☒ Hydro Division
Doc Type: Ground Water Contours
☐ Application (Cost only) ☐ Bond ☐ Enforcement ☐ Inspection

THE BRANNAN SAND & GRAVEL CO.

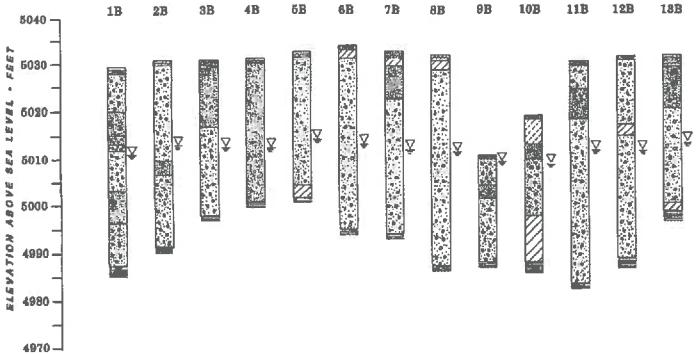
BRANNAN PIT #29

GROUND WATER CONTOURS

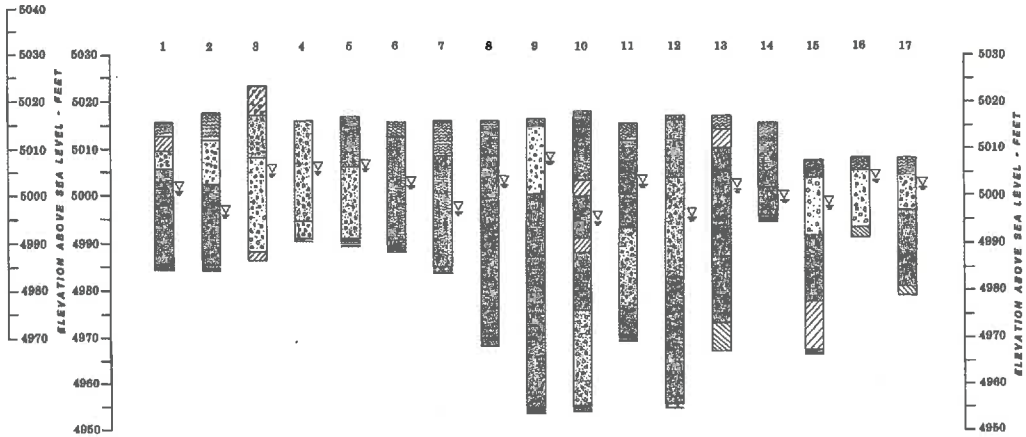
FIGURE 1

00014613

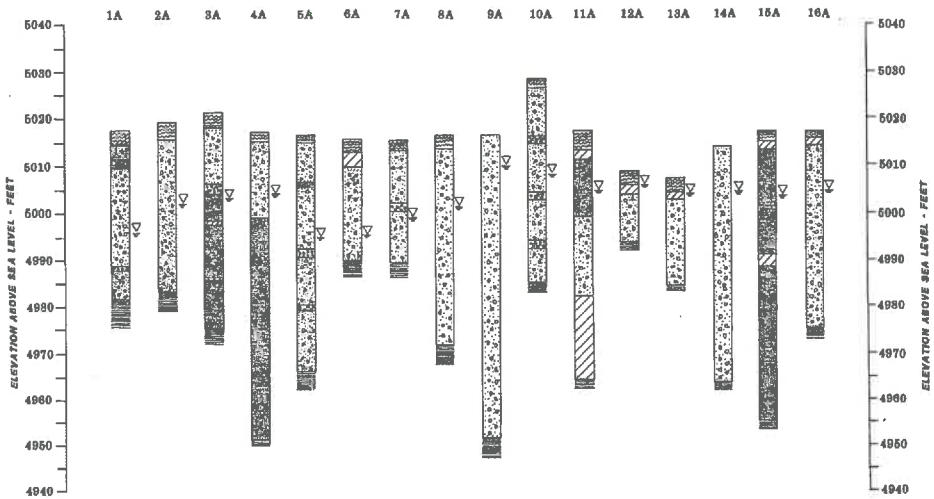
SCALE 0 100' 200' 300' 600'



NOTES:
1.) TEST HOLES WERE DRILLED 6/2/80 AND 6/3/80 WITH 6" DIAMETER CONTINOUS FLIGHT HOLLOW AUGER.
2.) WATER LEVELS WERE MEASURED 6/6/80



NOTES:
1.) TEST HOLES WERE DRILLED 4/7/79 WITH CONTINOUS FLIGHT POWER AUGER.
2.) WATER LEVELS WERE MEASURED 4/7/79
3.) WATER LEVEL MEASUREMENTS FOR TEST HOLES 1 THRU 17 WERE NOT USED IN DRAWING THE GROUND WATER CONTOUR MAP.



NOTES:
1.) TEST HOLES WERE DRILLED 4/17/80 AND 5/29/80 WITH 6" DIAMETER CONTINOUS FLIGHT HOLLOW AUGER.
2.) WATER LEVELS WERE MEASURED 4/21/80 AND 6/6/80.

LEGEND

TOPSOIL	GRAVEL	GRAVEL, SANDY	SAND, SCATTERED GRAVEL
CLAY	SAND & GRAVEL	CLAY FILL	WEATHERED CLAYSTONE
SAND	GRAVEL, CLAYEY	BEDROCK	GROUND WATER LEVEL

Permit Number 7/11980-183
Class: Permit
Section/Exhibit: Logs of test holes
Class: Revision
Type/Desc:
Class: Report Hydro General
Doc Type:
Application (Cost only) Bond Enforcement Inspection

THE BRANNAN SAND AND GRAVEL CO.

BRANNAN PIT #29

LOGS OF TEST HOLES

00014611

FIGURE 2

GROUND WATER HYDROLOGY

INTRODUCTION

There are two potential impacts with the mining of sand and gravel deposits that the proposed MCA 29 pit could have on ground water resources of the area. These are: Lowering of the ground water table and pollution of the ground water. It will be shown that neither the lowering of the ground water table nor pollution from the mining operations will have any permanent effect on the ground water resources of the area.

Ground Water Description

A number of registered wells were found within a circle of 1/2-mile radius drawn around the center of both Parcels A and B of the project area, as shown on the **Well Location Map, p.10** . It is possible other wells not shown on the well location map exist in the vicinity, but they are unlisted or nonregistered with the State Engineer's Office. On the basis of 42 registered wells located within the 1/2-mile radii, of which 32 are shallow alluvial wells, the median depth to water level was determined to be about 23 feet. Test holes drilled on the MCA 29 site on April 7, 1979 through June 1980, indicate that the water table ranges from 3 to 26 feet below the ground surface elevation. The ground water table elevations at the project site range from about 4996 feet along the extreme northwest portion of the proposed pit to 5014 feet, in the extreme southeast area of the property, as shown on the **Ground Water Contour Map, p.18** . The test hole data confirms the general southeast to northwest direction of ground water flow established using data for the wells listed in the Colorado Ground Water Basic Data Report No. 15 and field measurements of selected wells within the 1/2-mile radius of the site.

POLLUTION OF GROUND WATER

Since mining will be accomplished by the wet pit method below the average existing ground water surface in each parcel, no adverse effects on the existing water quality within or in the vicinity of the pit(s) will occur due to mining operations. The initial mining phase above the water table, will not result in any increase or different ground water contamination, if any, than would be occurring as a resulting normal runoff prior to mining. Sediment from storm runoff will enter the pit but should settle out within the confines of the pit as described in the Surface Drainage Section. An NPDES Permit Application has been made to The Environmental Protection Agency and the Colorado Department of Health.

Sanitary facilities will be provided during the mining operation for the labor force.

GROUND WATER IMPACT

The mining operations are proposed to be operated "in the wet". This will not require dewatering of the areas to be mined. The mining of the sand and gravel deposit will be accomplished in two phases in each of the two parcels A and B. The initial mining in Parcel A above the water table will be accomplished by the open pit method with 25-foot setbacks and 3:1 (horizontal to vertical) slopes from the Parcel boundaries down to the average water table elevation of 5002 feet. At that point dragline operations will commence. The remaining gravel deposit will be mined by the wet pit method to the full depth. The slopes will continue 3:1 (horizontal to vertical) to 10 feet below the average existing water surface of 5002 feet and 2:1 (horizontal to vertical) from that point to the bedrock surface.

Similarily Parcel B will be mined in two phases. The open pit method will be utilized down to the average ground water surface of 5012 feet with 25-foot setbacks and 3:1 slopes. At that point wet pit methods will be utilized with a dragline operation removing the gravel deposit. The 3:1 (horizontal to vertical) slopes will continue. 10 feet below the average existing ground water surface with 2:1 (horizontal to vertical) slopes from that point to the bedrock surface.

The parcels will have different normal water surfaces to minimize the impact of the mining operations on the wells in the vicinity of the pits. The normal water surface in Parcel B will average 5012 feet in elevation. The normal water surface in Parcel A will average 5002 feet in elevation.

As stated under the Description of Ground Water Section all registered wells within a ½-mile radius of the pit have been located as shown on the **well location map, p.10** . All wells in the vicinity of the proposed pit are at a relatively safe distance from the proposed pit and should not be adversely affected by any localized depression of the water table. Considering the proposed normal water pool of Parcel B will be at about 5012 ft. and the water level in Mrs. Allen's well (the closest well to the mining operation) is at an elevation of 5005.5 feet (measured Dec. 10, 1979) the mining operations should not have any adverse effects on the well.

As shown on the **Ground Water Contour Map, p.18,** the existing water table generally slopes from southeast to northwest. The proposed water surfaces for each of the pits (Parcels A and B) will be maintained at different levels to lessen the impact on neighboring wells. The "averaging" of the water surface in Parcel B at 5012 feet will cause the water table along the extreme east and south perimeters of that parcel to be lowered about 2 feet. The closest well is about 150 feet from the south perimeter of the proposed pit. At that distance the effect of the mining operations should be less than 1 foot on the water table in that well. The closest shallow well to Parcel A is more than 1,000 feet from the perimeter of the proposed pit. As a result the "averaging" of the water table in the pit due to wet pit mining operations at 5002 feet will not have any adverse effect on neighboring wells.

The ground water flow through the project area will not be altered after reclamation procedures are completed. The resultant change in ground water flow pattern will only have a localized effect near the perimeter of the pit as explained earlier and will not affect the regional ground water flow patterns either during mining or after reclamation of the area with permanent reservoirs. However, a ground water table monitoring program will be instituted prior to gravel extraction to insure the vicinity water users will no be materially injured. The monitoring of ground water levels will continue until the mining and construction begins. At the time the mining and construction operations begin, an accelerated localized monitoring program will begin. Sufficient readings will be made depending upon the operation being initiated. Should any adverse effect be detected, corrective action will be determined and implemented appropriately.

SURFACE DRAINAGE

INTRODUCTION

The mining and subsequent reclamation of the proposed mining site near 132nd Avenue and Nome Street will have no adverse effects on local or regional drainage. No increase in surface runoff exiting at the site will occur, because the mine and the resultant permanent reservoirs will provide sufficient storage to control incoming runoff.

The proposed mineral conservation area is not located within the present one-percent frequency flood plain of the South Platte River.

HISTORIC SURFACE DRAINAGE

The **Historic Surface Drainage Map, p.19** , describes existing drainage patterns within MCA 29. Within Parcel A the drainage generally flows westward from Nome Street toward Brighton Road. An existing gravel pit, located near the southeast corner of Parcel A, detains a small portion of runoff originating within Parcel A, as well as a portion of runoff which enters the site from the area to the east of Nome Street. Any discharge from this gravel pit would exit from the northwest corner of the pit. Practically all of the runoff originating from Parcel A exits the site through a 24-inch, concrete-encased, corrugated metal culvert pipe beneath Brighton Road, located 1,100 feet from the southwest corner of Parcel A. The irrigation ditches within Parcel A, also shown on the **Historic Surface Drainage Map, p.19** , assist in the carrying of runoff westward toward the culvert under Brighton Road. The remaining and smaller portion of runoff originating from Parcel A exits the site at the intersection of 132nd Avenue and Brighton Road. Runoff from Parcel A eventually reaches the South Platte River, located 1,000 feet to the west of MCA 29.

The majority of surface runoff from Parcel B flows toward the northeast corner of Parcel B, from which it then flows into a gully in the 14-acre tract between Parcels A and B. This portion of runoff from Parcel B then flows through the southwest corner of Parcel A, eventually exiting MCA 29 through the above-referenced 24-inch culvert pipe beneath Brighton Road. A smaller portion of runoff from Parcel B, generally originating within 300 feet of the west property line of Parcel B and from the northwest corner of Parcel B, flows into an existing gravel pit, located in the northwest corner of Parcel B. This gravel pit has sufficient storage so that none of the runoff entering the pit from Parcel B leaves MCA 29 by surface flow.

In addition to the surface runoff originating within Parcels A and B, runoff from a major storm would enter the site from a total of 290 acres which are generally located to the east of Parcels A and B, and to the west of Parcel B. Practically all of the runoff from these 290 acres would exit MCA 29 through the 24-inch culvert under Brighton Road.

EXISTING IRRIGATION DITCHES

Historically, various crops on both Parcels A and B have been irrigated by surface water provided by the Fulton Ditch, which is shown on the **Historic Surface Drainage Map, p.19** , Parcel A received water from Fulton Ditch from a lateral ditch which entered Parcel B at a point approximately 400 feet north-northeast of the southeast corner of Parcel B. The lateral then followed the eastern boundary of Parcel B and crossed the 14-acre tract lying between Parcels A and B, eventually diverging into several smaller ditches within Parcel A.

Fulton Ditch water formerly entered Parcel B directly by means of a headgate located approximately 450 feet northeast of the southwest corner of Parcel B. From this point a series of field ditches carried irrigation water to the majority of Parcel B.

It is noted no land beyond MCA 29 is irrigated by the irrigation ditches which are located in MCA 29, other than the 14-acre tract between Parcels A & B. The owner of the 14-acre tract has retained ownership of ten shares in the Fulton Ditch. The irrigation ditch which lies along the western side of Nome Street and carries water northward to the 14-acre tract will be left intact during and following mining operations so that the owner may exercise her rights to use her shares of the Fulton Ditch on the 14-acre tract.

SURFACE DRAINAGE DURING MINING OPERATIONS

Surface drainage within MCA 29 will be altered somewhat during mining operations. Since the mining of MCA 29 will be accomplished "in the wet" and in phases, there will be a body or bodies of water during mining operations. The mine itself will serve as a detention basin, allowing for temporary storage of surplus runoff to the mine and also allowing for adequate sedimentation of any waters which may need to be removed from the mine. Although most of the surface runoff to the mine is expected to be removed naturally by percolation to existing sand and gravel formations adjacent to MCA 29, the need may arise to pump such surplus runoff from the mine. Any pumpage from the mine will eventually be discharged to the local exterior surface drainage systems via the 24" culvert beneath Brighton Road and will only be allowed to occur after other local runoff has subsided so that local runoff conditions will not be adversely affected.

ULTIMATE PLAN OF SURFACE DRAINAGE

After removal of the sand and gravel deposits from MCA 29, the property will be graded as shown in the **Final Configuration Plan, p.22** . MCA 29 will be formed into two separate reservoirs which will have sufficient capacity to store the runoff from the 100-year storm with no resultant discharge to local surface drainage systems. It is noted that the **Final Configuration Plan** makes allowances for development of approximately 16 acres for commercial-industrial purposes and approximately 8 acres for residential use.

The permanent reservoir in Parcel A is expected to have a normal water surface elevation of 5,002 feet. Beginning at a setback distance of 25 feet from the property line or from rights-of-way, the reservoir will partially have side slopes on one vertical to three horizonal. The 3:1 side slope will continue downward to elevation 4992, which is a vertical distance of ten feet below the normal water surface elevation. From elevation 4992 downward to the bottom of the pit, the side slopes will be one vertical to two horizontal.

After the period of mining during which various fine materials will seal the northern perimeter of Parcel B, the normal reservoir level in the reservoir within Parcel A is expected to stabilize at Elevation 5,012. A side slope of 3:1 will extend from the setback line to Elevation 5002, and from Elevation 5002 to the bottom of the pit, the slope will be 2:1.

Both the duration and intensity of a storm are important considerations in analyzing the effects of a reservoir on local surface drainage. Since the reservoirs have substantial storage, the duration of the 100-year storm was taken to be twenty-four hours. Rainfall from the twenty-four hour, 100-year storm was estimated to be 3.40 inches, based on the report, **Urban Storm Drainage Criteria Manual,** prepared for the Denver Regional Council of Governments. The corresponding depth of runoff was estimated to be 0.58 inches, based on estimated infiltration and detention/depression losses of 0.08 inches per ten minutes and 0.55 inches, respectively. The relatively high value for detention/depression losses is based on flat topography and the storage effects of the U.S. Highway 85 and Union Pacific Railroad embankments to the east of MCA 29.

The 100-year volume of inflow to the Parcel A reservoir was estimated to be 29.1 acre-feet, consisting of 11.5 acre-feet of runoff from a total of 238 acres draining into the reservoir, and 17.6 acre-feet of direct rainfall falling on the reservoir's surface area of 62 acres. Assuming that no outflow would occur under the 100-year storm, the reservoir level would rise to Elevation 5002.5 Since the invert of the existing 24" culvert beneath Brighton Road lies at approximately Elevation 5004 feet, no surface discharge from the reservoir in Parcel A is expected to occur during the 100-year storm. Following any storm, including the 100-year storm, runoff to the reservoir will be temporarily detained and then will percolate through existing sand and gravel formation to the South Platte River.

A further analysis of the Parcel A reservoir was made which assumed that 100% of the 100-year rainfall would be effective in producing runoff. Under this assumption, a total inflow to the reservoir of 85 acre-feet would occur. With no outflow from the reservoir, the reservoir level would rise to Elevation 5003.4 feet. Therefore, no surface discharge from the reservoir in Parcel A is indicated under this extreme condition, since the invert elevation of the existing 24" culvert is 5004 feet.

With respect to the reservoir in Parcel B, the estimated volume of inflow under the 100-year storm is 15.0 acre-feet. This volume consists of 4.2 acre-feet of runoff from the 86 acres which drain into the reservoir, and 10.8 acre-feet of direct rainfall on the reservoir's surface area of 38 acres. As there will be no surface drainage outlet for this reservoir, the reservoir level is expected to increase to Elevation 5012.4 during the 100-year storm. If 100% of the 100-year rainfall were to result in runoff, a total inflow of 35.1 acre-feet would occur, causing the reservoir level to increase to Elevation 5012.9 feet. Under either circumstance the reservoir in Parcel B will have sufficient detention storage so that no surface discharge will occur. Temporarily detained runoff will percolate to the South Platte River through existing sand and gravel formations.

Since there will be no surface discharge from either reservoir under conditions at least as severe as the 100-year storm, the plan for final reclamation of the project will not aggravate local flooding. The plan for final reclamation will actually result in a lesser degree of local flooding by retaining all of the runoff which enters the reservoir, including that which would have passed through the property under pre-mining conditions. This storm water will not be lost to the South Platte River basin but will percolate to the river through the sands and gravels existing between the mine and the river itself.

FLOOD HAZARD INFORMATION

The South Platte River flood plain immediately west of MCA 29 has been defined in a report,, entitled "Flood Hazard Area Delineation, South Platte River, Adams County," prepared for the Urban Drainage and Flood Control District and the Colorado Water Conservation Board, dated September 1977. According to this report, the one-percent frequency flood plain of the South Platte River lies completely to the west of Brighton Road in the vicinity of MCA 29. The only location where the one-per-cent flood could encroach upon MCA 29 is at the existing 24-inch culvert beneath Brighton Road, approximately 1,100 feet northeast of the southwest corner of Parcel A. Based on the above-referenced report, the one-percent frequency flood elevation of the South Platte River at the 24" culvert is 5003.7. According to a 2-foot contour interval topographic map prepared for Brannan Sand and Gravel Company, the minimum surface elevation of Parcel A near the 24-inch culvert is no lower than 5004. Therefore, no flood hazard from the South Platte River exists.

WATER RIGHTS

The irrigation ditches which currently provide water for agricultural purposes within MCA 29 enter Parcel A from its southeast corner along Nome Street and enter Parcel B directly from a headgate on the Fulton Ditch (refer to **Historic Surface Drainage Map), p. 19.** No laterals within the proposed mining area extend beyond the mining area to serve other lands, except for the 14-acre tract between Parcels A and B. The ditch which supplies water to the 14-acre tract will be kept intact during and following the mining operations so that the 14-acre tract may continue to be irrigated. Therefore, the mining of MCA 29 does not adversely affect local water rights, and no ditches need to be relocated or restored after final reclamation.

THE BRANNAN SAND & GRAVEL CO.

BRANNAN PIT #29

HYDROLOGY TEXT

FIGURE 4

Permit Number 7711980-183
Class: ☐ Permit
Section/Exhibit :
Class: ☐ Revision
Type/Seq :
Class: ☐ Report ☒ Hydro ☐ General
Doc Type: Hydrology Text
☐ Application (Explain) ☐ Biology ☐ Enforcement ☐ Inspection

00014614

ATTACHMENT A

noaa.gov

Online Vertical Datum Transformation
Integrating America's Elevation Data

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  - User FAQs
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  - Command-line Guide
  - API Guide
  - Datum Tutorial
  - Manual, Presentations & Publications
  - Interpolation and Transformation Grid Format
- Contact Us

Regional Information

* Region : Contiguous United States

Horizontal Information

	Source	Target
Reference Frame:	NAD 1927	NAD83(2011)
Reference Frame:	NAD83(2011)	NAD83(2011)
Reference Frame:	NAD83(2011)	NAD83(2011)
Reference Frame:	NAD83(2011)	NAD83(2011)
Coor. System:	Geographic (Longitude, Latitude)	Geographic (Longitude, Latitude)
Unit:	meter (m)	meter (m)
Zone:	AL E - 0101	AL E - 0101

Vertical Information

	Source	Target
Reference Frame:	NGVD 1929	NAVD 88
Reference Frame:	NGVD 1929	NAVD 88
Reference Frame:	NGVD 1929	NAVD 88
Reference Frame:	NGVD 1929	NAVD 88
Unit:	foot (U.S. Survey) (US_ft)	foot (U.S. Survey) (US_ft)
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- Point Conversion
- ASCII File Conversion

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Longitude:	-104.854678 (e.g. -118.7691 or -118 46 8.7600)	Reset	Longitude:	-104.8552070656
Height:	5008 (e.g. 3.037)	DMS	Height:	5010.882
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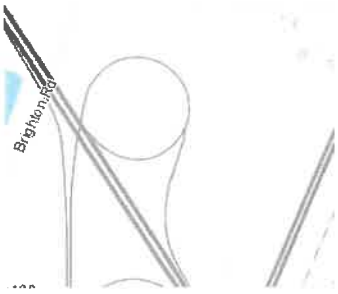
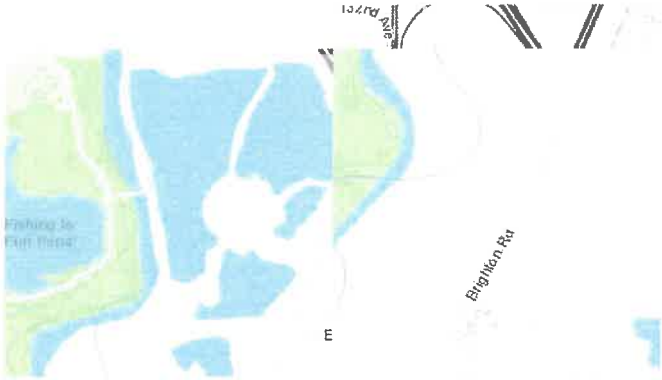
[x] CRD [x] IGLD85 [x] SVU area





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- Site Map
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- Web site owner:
- National Ocean Service
- NOAA
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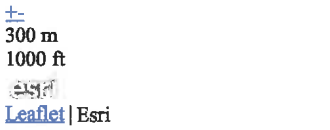
Version 4.6.1 (Spetember 2023)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STATE OF COLORADO

Ebert - DNR, Jared <jared.ebert@state.co.us>

Pit 29 Groundwater Data and Response to Zigan Complaint

Joshua Oliver <joliver@brannan1.com> Mon, Sep 24, 2018 at 8:24 AM
To: "Ebert - DNR, Jared" <jared.ebert@state.co.us>
Cc: Fred Marvel <fmarvel@brannan1.com>, Alex Schatz <aschatz@brannan1.com>, Drew Damiano <drew@unitedwaterdistrict.com>

Mr. Ebert,

Please find the attached letter and requested groundwater elevation table.

Let me know if there are any questions or further information that I can provide.

Joshua Oliver

Environmental Manager

BRANNAN Companies

joliver@brannan1.com

O: 303.853.5159 |M: 303.472.1736 |F: 303.853.5233

TOP WORK PLACES THE DENVER POST denverpost.com

2 attachments

9-24-18 Letter.pdf
110K

Pit 29 Piezometers Monitoring with Datum Shift and Elevations.pdf
36K

BRANNAN
Companies

September 24, 2018
Mr. Jared Ebert
Colorado Division of Reclamation, Mining and Safety
1313 Sherman St.
Denver, CO 80203

Mr. Ebert,

Please find the attached requested information regarding groundwater levels around Pit 29 reclamation permit M-1980-183.

MW-2 on the south side of the south cell and MW-4 on the southwest wide of the north cell are the two monitoring wells that are most applicable to the Zigan Homeowner's Association concerns.

The brief history associated with potential groundwater mounding in the area is:

- Slurry wall installed around the north and south cell of Pit 29 in the fall and winter of 2003-04
- Stagecoach (adjacent off-site property, operated by LaFarge/A.F.S.) slurry wall installed in 2005
- Leak test conducted on the south cell in 2006
- French drain installed in 2015 along the western half of the south side of the north cell
- French drain continues to be operational
- Groundwater level monitoring continues to be performed in accordance with TR-03

The groundwater elevation table in the area is attached. Well MW-4 was surveyed in 2014, and the elevation of MW-2 used was according to the 2004 well completion report associated with TR-03.

The pre-mining groundwater contour map produced in 1979-80 was created on the vertical datum NGVD 29, and subsequent survey data used NAD 88. There is a datum shift associated with NGVD 29 and NAD 88 of about 2.877 feet. Note that associated discrepancies in elevation data were discussed in reference to TR-05. The datum shift adjustment is accounted for in the attached groundwater elevation tables.

According to the groundwater level monitoring data in MW-4, the French drain is keeping groundwater levels at pre-mining levels. The groundwater level in MW-2 is at a level slightly below pre-mining conditions. The level in this well fluctuates several feet regularly, likely associated with the Stagecoach Overflow Drain, serving Zigan Lake (installed by Albert Frei and Sons around 2010), and with the operations of the Fulton Ditch.

There are a number of other considerations in any discussion of hydrologic balance. First, the intersection of climate variation and baseline data. In the case of the Pit 29 vicinity, slurry walls were installed in the middle of a series of historically dry years. Second, seasonal

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weather patterns, including periods of days or weeks when soils in the South Platte valley become relatively saturated, are not unusual or at odds with the normal hydrologic balance. Finally, water management practices in the agricultural lands of Colorado, particularly in the vicinity of the South Platte River, yield very significant changes to groundwater levels. This includes changes to surface water diversions, development of stormwater facilities, in-stream flow rights, and augmentation rules that have notably been associated with a significant rise in groundwater and well levels.

Regarding Pit 29, the available data demonstrates that groundwater mitigation structures are managing groundwater levels properly and minimizing disturbance to the prevailing hydrologic balance.

The current activity at the Site is limited to repair of existing facilities and will not impact the local groundwater levels.

It is significant that the Stagecoach overflow Drain was specifically installed by Albert Frei and Sons to manage the Zigan Lake water levels. Additionally, it should be noted that we are unaware of any evidence that slurry wall repairs currently underway at Pit 29 have had any effect on hydrologic balance.

Please let me know if there is any further information that Brannan can provide.

Sincerely,

Joshua Oliver
Environmental Manager
Brannan Sand and Gravel Company, L.L.C.
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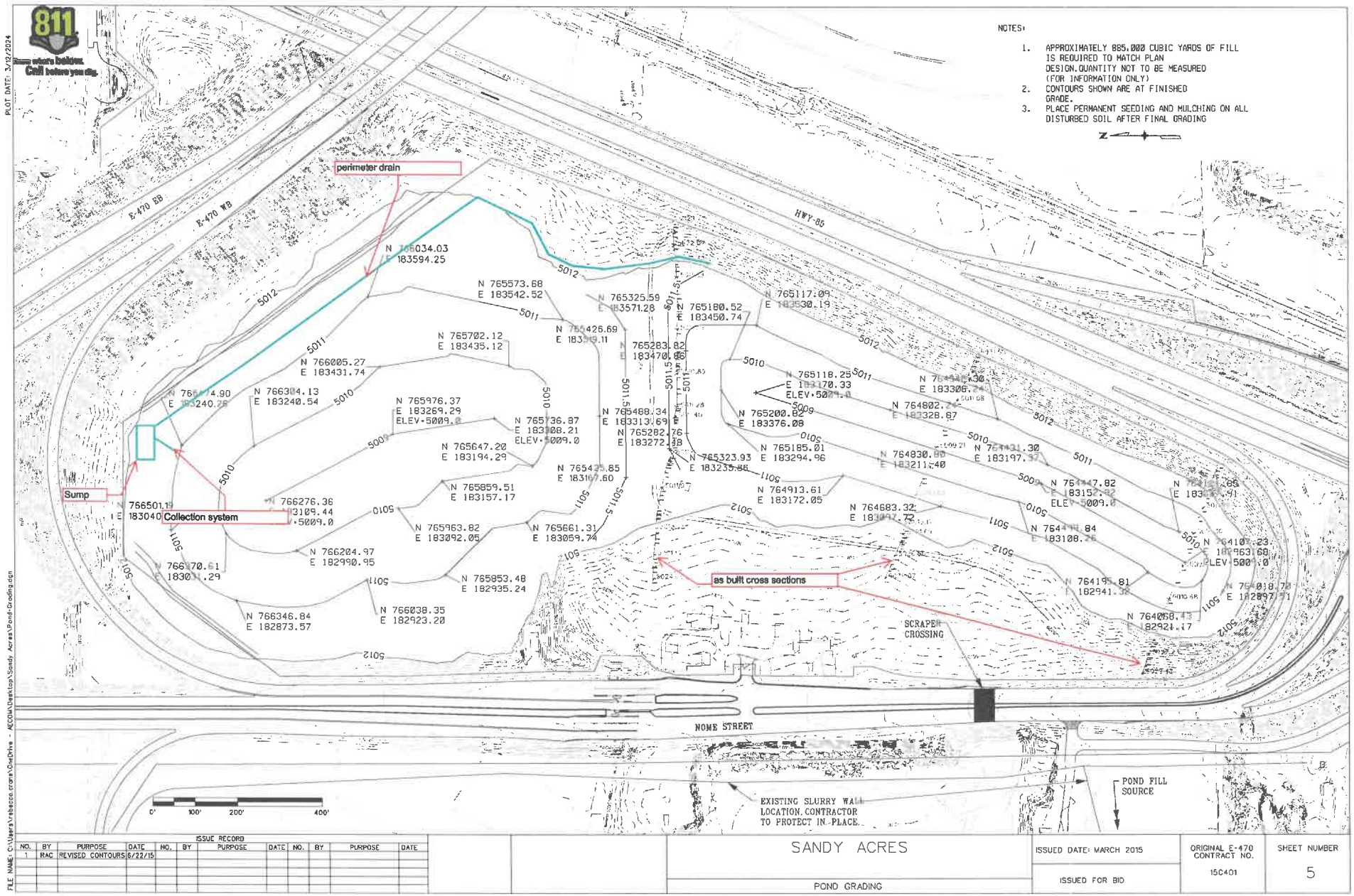
joliver@brannan1.com

Brannan Pit #29

Water Level Measurements

Date Month-Year	Depth to Water (ft)									
	MW-1 OUT	MW-2 OUT	MW2 GW Elevation	MW-2 Historic GW Elevation (AM-02 Datum Shift Memo to DRMS 9-25-18 - NAD88 Datum)	MW 2 Historic June 1980 (Pre-mining GW Contour Map - Blatchley and Associates - NGVD 29 Datum)	MW-3 OUT	MW-4 OUT	MW-4 GW Elevation	MW-4 Historic GW Elevation (AM-02 Datum Shift Memo to DRMS 9-25-18 - NAD88 Datum)	MW-4 Historic May 1980 (Pre-mining GW Contour Map - Blatchley and Associates - NGVD 29 Datum)
1/1/2005	21.50	22.50	5010.15	5016.88	5014	11	NA	NA	5008.877	5006
1/1/2006	23.00	23.00	5009.65	5016.88	5014	13	NA	NA	5008.877	5006
3/1/2006	22.00	20.00	5012.65	5016.88	5014	11.5	NA	NA	5008.877	5006
5/1/2006	21.50	20.00	5012.65	5016.83	5014	10.5	NA	NA	5008.877	5006
6/1/2010	20.50	17.70	5014.95	5016.88	5014	N/A	NA	NA	5008.877	5006
9/1/2010	20.00	18.90	5013.75	5016.88	5014	N/A	21.40	4996.48	5008.877	5006
12/1/2010	20.90	23.17	5009.48	5016.88	5014	N/A	26.25	4991.63	5008.877	5006
3/1/2011	20.57	19.40	5013.25	5016.88	5014	N/A	24.65	4993.22	5008.877	5006
6/1/2011	19.40	15.74	5016.91	5016.88	5014	N/A	21.80	4996.08	5008.877	5006
9/1/2011	18.94	18.63	5014.02	5016.88	5014	N/A	21.08	4996.80	5008.877	5006
12/1/2011	20.20	21.10	5011.55	5016.88	5014	N/A	21.15	4996.73	5008.877	5006
3/1/2012	20.95	10.30	5022.35	5016.88	5014	N/A	17.75	5000.13	5008.877	5006
6/1/2012	20.89	18.47	5014.18	5016.83	5014	N/A	14.09	5003.79	5008.877	5006
9/1/2012	20.97	19.21	5013.44	5016.88	5014	N/A	5.64	5012.24	5008.877	5006
11/12/2012	-	-		5016.88	5014	N/A	4.84	5013.04	5008.877	5006
12/12/2012	21.79	20.54	5012.11	5016.88	5014	N/A	5.67	5012.21	5008.877	5006
4/13/2013	22.84	18.16	5014.49	5016.88	5014	N/A	5.81	5012.27	5008.877	5006
4/22/2013	22.55	19.70	5012.95	5016.88	5014	N/A	5.30	5012.58	5008.877	5006
6/13/2013	22.48	18.78	5013.87	5016.88	5014	N/A	5.60	5012.28	5008.877	5006
9/1/2013	21.86	19.15	5013.50	5016.88	5014	N/A	4.52	5013.36	5008.877	5006
12/13/2013	23.19	20.60	5012.05	5016.88	5014	N/A	5.60	5012.28	5008.877	5006
3/14/2014	24.15	16.75	5015.90	5016.88	5014	N/A	6.09	5011.79	5008.877	5006
6/14/2014	23.32	17.76	5014.90	5016.88	5014	N/A	5.18	5012.71	5008.877	5006
9/14/2014	22.91	18.80	5013.85	5016.88	5014	N/A	4.84	5013.24	5008.877	5006
11/14/2014	23.60	19.62	5013.03	5016.88	5014	N/A	5.22	5012.66	5008.877	5006
12/1/2014	24.85	20.48	5012.17	5016.88	5014	N/A	6.02	5011.86	5008.877	5006
3/31/2015	26.87	17.50	5015.16	5016.88	5014	N/A	6.78	5011.10	5008.877	5006
6/15/2015	21.79	16.69	5015.96	5016.88	5014	N/A	4.79	5013.09	5008.877	5006
9/15/2015	19.94	17.75	5014.90	5016.88	5014	N/A	5.27	5012.61	5008.877	5006
12/15/2015	21.42	19.15	5013.50	5016.88	5014	N/A	6.54	5011.34	5008.877	5006
4/6/2016	23.11	20.06	5012.59	5016.88	5014	N/A	9.15	5008.73	5008.877	5006
7/13/2016	20.66	18.64	5014.01	5016.83	5014	N/A	6.33	5011.55	5008.877	5006
8/30/2016	20.61	19.86	5012.79	5016.88	5014	N/A	9.01	5008.87	5008.877	5006
9/7/2016	20.78	20.37	5012.28	5016.88	5014	N/A	8.77	5009.11	5008.877	5006
10/31/2016	20.53	20.91	5011.74	5016.88	5014	N/A	9.09	5008.79	5008.877	5006
11/21/2016	20.58	21.05	5011.60	5016.88	5014	N/A	9.05	5008.83	5008.877	5006
12/28/2016	21.61	21.93	5010.72	5016.88	5014	N/A	9.15	5008.73	5008.877	5006
1/26/2017	22.49	22.31	5010.34	5016.88	5014	N/A	9.20	5008.68	5008.877	5006
2/27/2017	23.44	22.60	5010.05	5016.88	5014	N/A	9.20	5008.68	5008.877	5006
3/28/2017	23.35	19.78	5012.87	5016.88	5014	N/A	9.19	5008.69	5008.877	5006
5/2/2017	21.12	19.25	5013.40	5016.88	5014	N/A	8.90	5008.98	5008.877	5006
6/14/2017	20.76	18.88	5013.77	5016.88	5014	N/A	8.91	5008.97	5008.877	5006
7/17/2017	19.68	18.60	5014.05	5016.88	5014	N/A	8.94	5008.94	5008.877	5006
8/11/2017	19.81	19.5	5013.15	5016.88	5014	N/A	8.11	5009.77	5008.877	5006
9/11/2017	19.97	19.60	5013.05	5016.88	5014	N/A	8.96	5008.92	5008.877	5006
10/16/2017	20.42	20.30	5012.35	5016.88	5014	N/A	8.99	5008.89	5008.877	5006
11/21/2017	22.48	21.58	5011.07	5016.88	5014	N/A	9.12	5008.76	5008.877	5006
12/19/2017	22.39	22.14	5010.51	5016.88	5014	N/A	9.06	5008.82	5008.877	5006
1/19/2018	23.32	22.58	5010.07	5016.88	5014	N/A	9.22	5008.66	5008.877	5006
2/16/2018	23.90	22.81	5009.84	5016.88	5014	N/A	9.27	5008.61	5008.877	5006
3/12/2018	24.48	23.00	5009.65	5016.88	5014	N/A	9.38	5008.50	5008.877	5006
4/30/2018	22.80	20.19	5012.46	5016.88	5014	N/A	9.22	5008.66	5008.877	5006
5/21/2018	21.95	19.75	5012.90	5016.88	5014	N/A	9.18	5008.70	5008.877	5006
6/22/2018	20.80	19.08	5013.57	5016.88	5014	N/A	9.05	5008.83	5008.877	5006
7/12/2018	20.50	19.24	5013.41	5016.88	5014	N/A	9.06	5008.82	5008.877	5006
8/15/2018	20.60	19.83	5012.82	5016.88	5014	N/A	9.01	5008.87	5008.877	5006
9/5/2018	21.75	20.11	5012.54	5016.88	5014		9.05	5008.83	5008.877	5006

ATTACHMENT B



ISSUE RECORD

NO.	BY	PURPOSE	DATE	NO.	BY	PURPOSE	DATE	NO.	BY	PURPOSE	DATE
1	RAC	REVISED CONTOURS	6/22/15								

SANDY ACRES

POND GRADING

ISSUED DATE: MARCH 2015

ISSUED FOR BID

ORIGINAL E-470 CONTRACT NO. 15C401

SHEET NUMBER 5

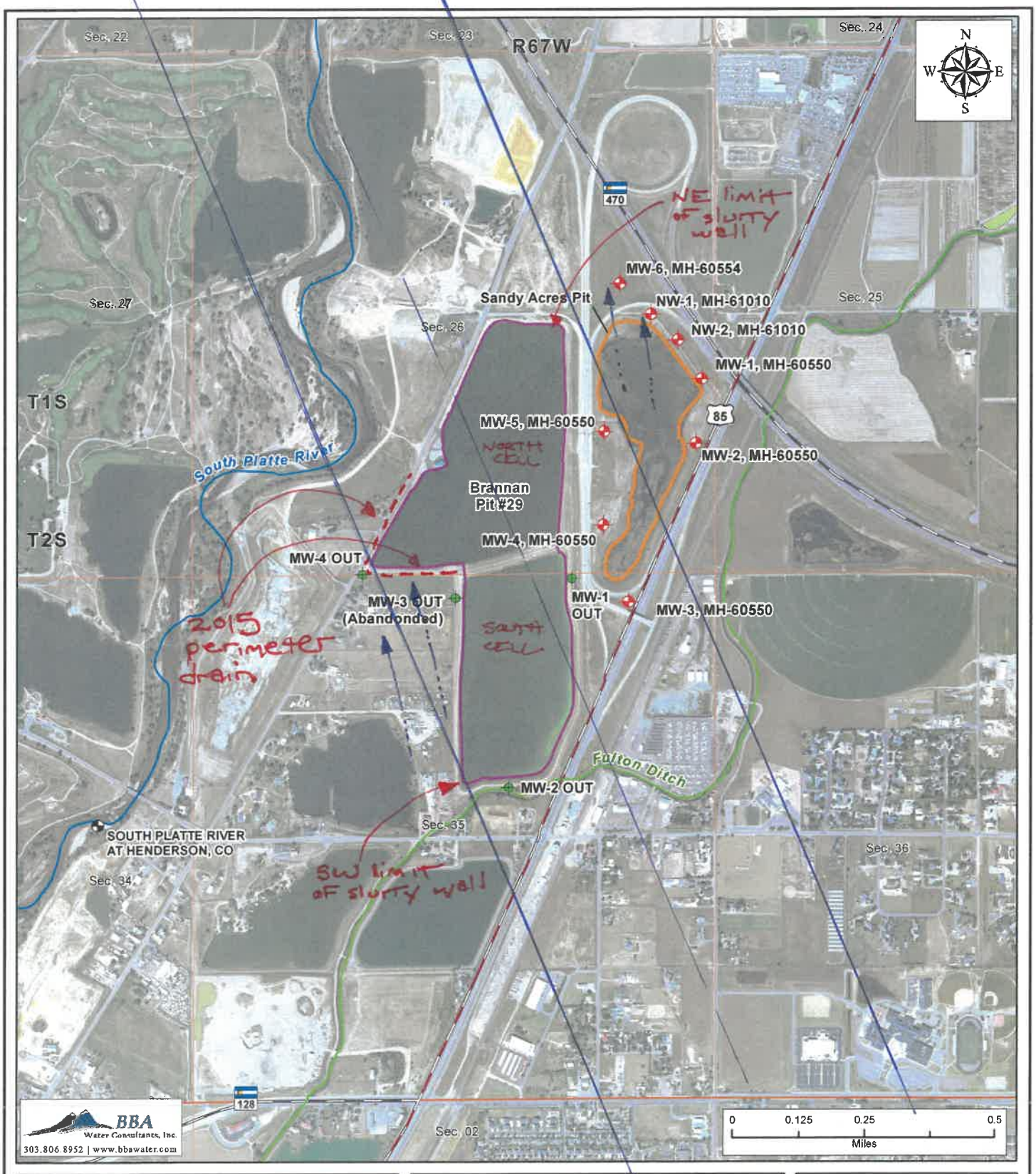


Figure 1
E-470 Sandy Acres Pit Monitoring Well Locations

Date: 2/8/2024 | Job No. 9607.00
Aerial Photo Date: 8/3/2019 NAIP-USDA
Data Source: CDSS, CDOT, USGS, BLM

Legend

- Stream Flow / Precipitation Gage
- Brannan #29 Pit Monitoring Wells
- Monitoring Holes (Name, Permit No.)
- Brannan Pit #29 Slurry Wall Liner
- Sandy Acres Pit Former High Water Line

Overview Map

Monthly Total Precipitation for Denver Area, CO (ThreadEx)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2000	0.24	0.23	1.96	0.71	3.09	0.79	1.42	3.06	1.52	0.52	0.61	0.27	14.42
2001	0.78	0.64	1.10	1.20	3.80	1.53	4.76	0.71	1.00	0.08	0.72	0.14	16.46
2002	0.48	0.32	0.53	0.23	0.94	1.45	1.39	0.78	0.58	0.49	0.24	0.05	7.48
2003	0.03	0.47	3.05	2.22	1.91	3.95	0.54	1.24	0.26	0.08	0.05	0.12	13.92
2004	0.23	0.21	0.14	1.76	1.30	2.33	2.51	2.84	1.99	0.86	0.45	0.04	14.66
2005	0.37	0.02	0.59	2.45	0.71	3.99	0.27	1.33	0.07	2.16	0.48	0.35	12.79
2006	0.28	0.15	0.56	0.67	0.94	0.12	1.37	1.13	0.84	1.03	0.34	1.21	8.64
2007	0.55	0.36	0.57	2.65	1.79	0.52	0.43	2.76	0.54	3.03	0.20	0.60	14.00
2008	0.08	0.18	0.14	0.32	1.56	0.73	0.24	4.03	1.04	1.44	0.18	0.24	10.18
2009	0.13	0.04	0.83	3.22	1.30	4.86	3.56	1.14	0.74	1.36	0.49	0.45	18.12
2010	0.07	0.30	0.80	2.51	1.52	1.60	3.70	1.05	0.06	0.54	0.49	0.22	12.86
2011	0.61	0.42	0.35	1.07	4.79	2.43	3.41	0.30	0.89	1.79	0.47	0.78	17.31
2012	0.26	0.90	0.03	1.39	1.01	1.22	0.48	0.11	2.95	1.22	0.27	0.27	10.11
2013	0.31	0.77	1.47	1.87	0.82	0.75	1.98	2.78	5.61	0.72	0.12	M	M
2014	0.94	0.19	0.83	1.24	3.51	1.82	3.85	2.73	1.79	0.52	0.76	0.59	18.77
2015	0.38	1.25	0.79	2.65	3.76	2.53	1.06	1.18	0.11	1.76	2.13	0.71	18.31
2016	0.50	0.48	1.18	2.56	2.38	1.62	1.07	0.22	0.28	0.26	0.52	0.78	11.85
2017	0.54	0.23	0.90	0.98	3.66	0.33	0.47	1.86	1.26	0.96	0.29	0.21	11.69
2018	0.54	0.31	1.02	0.86	1.86	0.43	1.03	0.93	0.18	0.99	0.35	0.03	8.53
2019	0.75	0.72	1.39	1.25	3.23	2.24	2.42	0.58	0.41	0.91	1.31	0.30	15.51
2020	0.14	0.88	1.26	0.54	1.65	0.71	0.95	0.35	0.93	0.26	0.50	0.57	8.74
2021	0.22	0.80	3.80	2.02	3.65	0.84	0.34	0.27	0.28	0.08	0.07	0.16	12.53
2022	0.78	0.94	1.17	0.06	2.59	0.58	0.99	1.45	1.25	0.46	0.47	1.18	11.92
2023	1.25	0.25	0.49	0.80	5.53	6.10	2.10	0.93	0.67	0.52	0.18	0.12	18.94
2024	0.28	1.46	1.65	M	M	M	M	M	M	M	M	M	M
Mean	0.43	0.50	1.06	1.47	2.39	1.81	1.68	1.41	1.05	0.92	0.49	0.41	13.38
Max	1.25 2023	1.46 2024	3.80 2021	3.22 2009	5.53 2023	6.10 2023	4.76 2001	4.03 2008	5.61 2013	3.03 2007	2.13 2015	1.21 2006	18.94 2023
Min	0.03 2003	0.02 2005	0.03 2012	0.06 2022	0.71 2005	0.12 2006	0.24 2008	0.11 2012	0.06 2010	0.08 2021	0.05 2003	0.03 2018	7.48 2002