



**E-470 Public Highway Authority**  
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Adams County  
Arapahoe County  
Aurora, CO  
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Douglas County  
Parker, CO  
Thornton, CO

June 26, 2024

Department of Natural Resources  
Attn: Nikie Gagnon  
Colorado Division of Reclamation, Mining & Safety  
1313 Sherman Street Room 215  
Denver, CO 80203-2243

Re: Sandy Acres Pit, DRMS Permit No. M-1980-110  
Technical Revision 6 (TR6) additional information

Dear Ms. Gagnon:

This is a response to the Division's April 18, 2024 letter requesting additional information for TR6 that the Authority submitted in March.

The attached report from BBA Water Consultants addresses the items requested by the Division except for the updated reclamation plan map. Based on discussions at our April 25, 2024 meeting with the Division it is our understanding that the updated reclamation plan map is not required at this time. I believe all the other items are addressed in the attached report.

If you have any other questions, need more information, or if you would like to meet, please email me at [dslack@e-470.com](mailto:dslack@e-470.com) or call me at (303) 537-3710.

Sincerely

A handwritten signature in black ink that reads "Derek Slack".

Derek Slack, P.E.  
Roadway Maintenance Manager



Christopher J. Sanchez  
Jeffrey A. Clark  
Daniel O. Niemela  
Jonathan D. George  
Kristina L. Wynne  
Austin P. Malotte  
Michael A. Sayler  
Charles E. Stanzione

June 26, 2024

Nikie Gagnon  
Division of Reclamation, Mining and Safety  
1001 E 62<sup>nd</sup> Ave, DRMS Rom 215  
Denver, CO 80216

RE: Hendersen Development / Sandy Acres, Permit No. M-1980-110, Technical Revision (TR-06), Response to Request for Additional Information

Dear Nikie:

This letter provides a response to the Division of Reclamation, Mining and Safety's (DRMS) April 18, 2024 request for additional information associated with Technical Revision 06 (TR-06) for Permit No. M-1980-110 to address issues of concern and allow the revision to be considered for approval.

Specifically, the DRMS requested additional information and clarifications associated with:

- Details regarding initial perimeter drainage investigation and infrastructure construction,
- Actual backfill conditions in the pit,
- Assumptions used for the planning of the backfill for the pit,
- A new ground water monitoring plan,
- Existing ground water conditions surrounding the pit,
- A new mitigation plan to address standing water conditions in the pit, and
- Compliance with Division of Water Resources requirements.

The request for additional information and clarifications has been addressed in the text below and the attached Monitoring Plan summary attached as Appendix A.

### **Initial Perimeter Drain Investigation and Infrastructure Construction**

On January 12, 2022, E-470 submitted a request for a technical revision for the Sandy Acres Pit to allow for the installation of a passive drainage system around the pit. The purpose of the passive drainage system was to intercept ground water from the alluvial aquifer surrounding the southern portions of the Sandy Acre Pit before it entered the pit and convey that ground water to the north around the perimeter of the pit to be discharged to the north where ground water elevations are deeper. This passive drainage system was pursued because a passive remedy was desired to mitigate the standing water conditions in the pit. The installation of the recommended passive drain system was intended to be performed in a manner that would allow for the investigation of the effectiveness of such a system prior to full installation. The system could then be extended if the system successfully reduced alluvial ground water levels and helped mitigate standing water conditions based on measurements collected in existing monitoring wells and visual observations of the pit.

Regarding the initial passive drainage system investigation and infrastructure construction, the DRMS has requested that E-470:

- Confirm whether the initial perimeter drain structure was installed consistent with TR-05, when the installation occurred, what observations were made during the installation and whether BBA Water Consultants, Inc. (BBA) were onsite during the installation.
- Provide additional information regarding the northeastern portions of the perimeter drain structure (trench and sump) that appear to be installed in non-native or fill material.
- Confirm whether the trench and sump portions of the drain system in the northeastern portions of the pit were installed in accordance with TR-05.
- Provide as-built drawings of the perimeter drain.

The proposed passive drainage system was a French drain-style system consisting of an excavated trench, conductive gravel, piping, geotextile fabric and a sump structure. It was recommended that trenching for the system be a minimum of 24 inches wide, constructed in native granular material within 5 to 10 feet (outside) of the Sandy Acres Pit fill and be graded to the north to allow for northly flow of intercepted water through the system. It was recommended that gravel material be installed in the bottom of the trenching to act as bedding, then a minimum 6-inch diameter perforated PVC or HDPE pipe be installed on top of the bedding gravel before backfilling the remainder of the trenching with additional gravel material. It was recommended to wrap the gravel material in geotextile fabric to minimize sediment from entering the system. It was also recommended that cleanouts be installed as part of the system. The top of the trench was to be backfilled with native fine-grained material. It was intended that the trenching and piping be connected to a sump structure designed to collect and discharge the conveyed water. It was recommended that the sump be approximately 20 feet by 20 feet in size and excavated to a depth of at least 10 feet into native granular material.

The initial trenching and investigation was recommended to start along the eastern side of the Sandy Acres Pit in a section of the perimeter identified as “Zone B”, an area in which ground water was expected to be encountered within 2 to 3 feet of the ground surface at certain times of the year. A minimum initial trenching of 300 feet was recommended with up to 500 to 1000 feet considered to ensure that water was encountered during the initial investigation.

The main goals of the initial investigation discussed with E-470 were to confirm that a passive drainage system could effectively and efficiently:

- 1) Encounter and capture ground water inflow from outside of the Sandy Acres Pit backfill before the ground water could be discharged into the pit and contribute to the standing water conditions.
- 2) Convey captured ground water inflow from the southern portions of the pit to the northern portions of the pit.
- 3) Discharge the captured ground water inflow to the north of the pit.

On November 5, 2021, BBA accessed the Sandy Acres Pit with E-470 and their contractor to begin the initial trenching for the passive drainage system investigation and installation on the eastern side of the pit generally within the zone identified as “Zone B” as recommended. An approximately 36-inch-wide trench was excavated using a backhoe into native granular material at the edge of the pit. Water was initially observed flowing up through the bottom of the trench as it was excavated. Ground water continued to flow into the trench as it was extended. Approximately 300 feet of initial trenching was excavated during the first day of investigation. The initial excavation confirmed that a passive drainage system could successfully encounter and capture ground water outside of the backfill in the Sandy Acres Pit.

Over the following three days, the trench filled almost completely with ground water discharging to the now open trench. BBA was not onsite for the following days, but E-470 provided photographs of the site and communicated with BBA regarding investigation and construction progress. During these three days, geotextile fabric was installed, the initial trench was backfilled with #89 gravel material as a bedding material, perforated PVC pipe was installed and the remainder of the trench was backfilled with gravel and topped with a layer of native material.

By April of 2022, the initial passive drainage system had been extended north and south to a total length of approximately 800 feet. The southern and northern termini of the passive drainage system were left open so that flow through the initial installation could be observed. No water or flow was observed in the system by E-470 during April of 2022. The lack of observed flow was expected as “Zone B” is only expected to have shallow (<3-foot depth) ground water conditions during portions of the year, such as during runoff or other periods of high stream flow / alluvial underflow. It is likely that the water table associated with the lack of inflow during April of 2022 was simply deeper due to annual fluctuations and did not exist at an elevation great enough to interact with the drain system during that period of observation.



On April 27, 2022, the construction of a sump structure commenced with excavation into native, granular material on the north (down ground water gradient) side of the pit. A 40-foot long x 10-foot wide by 15-foot deep initial sump structure was excavated and backfilled with gravel material to test the ability of a sump to discharge intercepted inflows. The sump structure was constructed such that it could be enlarged if it was determined additional discharge capacity was needed based on operational observations.

On May 13, 2022, a temporary ditch was excavated from the sump structure into the interior of the Sandy Acres Pit to allow standing water in the pit to drain to the sump. This ditch was constructed to test the ability for the sump to discharge water, but also to drain existing water from the Sandy Acres Pit to facilitate extension of the passive drain system to the sump. Initial observations indicated that the sump structure was capable of discharging water introduced to the structure evidenced by observation of water levels in the sump structure which were lower in elevation than the elevation of the standing water in the pit. The relative elevations confirm a gradient into the sump structure and into the surrounding alluvial aquifer.

Additional excavation was performed in the northwest portions of the Sandy Acres Pit to investigate the potential to install a second sump structure, if necessary, but nonnative fill material was identified from those additional excavation efforts. Accordingly, the additional excavation indicated that there was not an opportunity to construct a second sump structure at the location of the investigatory excavation.

Photographs collected by E-470 from April 27, 2022 through June 2, 2022 (after the sump structure was connected to the standing water in the pit) showed a reduction in the standing water in the Sandy Acres Pit indicating that the sump structure was successfully discharging introduced water over an extended period of time.

By the end of 2022, E-470 worked with their contractor to extend the passive drainage system installed on the east side of the Sandy Acre Pit to the sump structure along the eastern, northeastern and northern perimeter of the pit. Once connected, water was observed flowing from the passive drainage system into the sump structure. Again, the water level in the sump structure was lower than the passive drainage system and the standing water in the pit suggesting that water was discharging into the alluvial aquifer to the north of the pit. As E-470's contractor extended the passive drainage system around the northeastern corner of the pit and along its northern edge, non-native fill material was encountered in the trench excavation. The location of this non-native fill material is consistent with previous backfilling work performed to allow for the construction of the E-470 highway embankment. The non-native material is not detrimental to the design and operation of the drain system as this portion of the system is expected to be above the ground water table throughout the year and the system only needs to convey ground water through this area.

In March of 2023, the interior pit ditch was extended further into the pit interior to help dewater additional standing water from the pit. A connector trench was excavated between the southern and northern pond areas (the pit has two distinct ponded areas with a topographic high between them) to facilitate the drainage of both ponded areas to the north and through the sump structure.

Photographs of the pond collected by E-470 through this period continued to show reduced standing water conditions in the pit confirming the ability of the sump to discharge introduced water and the system's ability to mitigate standing water issue.

BBA completed a site visit to the Sandy Acres Pit on April 19, 2023 to observe the standing water conditions in the pit, the presence or absence of water flowing through the passive drainage system, the operation of the sump structure and to discuss the extension of the passive drainage system to the south to capture additional ground water. Water was not observed in the passive drainage system's collector trenching / piping at the time of the site visit, but was not expected at this time of year. The sump continued to appear to be working properly and discharging water from the pit (through the connected interior ditch). The extension of the passive drainage system to the south and the interior ditch was discussed while onsite. Difficulties with extending the system to the south identified during the site visit included site topography and wet conditions associated with the standing water.

Based on our observations of the system construction and the ongoing communication with E-470, the initial passive drainage system construction and implementation were in accordance with TR-05. The system appeared to effectively capture, convey and discharge ground water inflows from the alluvial aquifer in areas surrounding the eastern side of the Sandy Acres Pit. The sump also appears to be capable of discharging introduced water. The construction and operational observations of the passive drainage system suggest that extension of the system is warranted.

The location of the initial trenching, the sump structure and the extended / connected trenching along with the interior ditch efforts have been presented in the attached Figure 1. A cross section of the drainage system trench construction is provided in the attached Figure 2.

On May 12, 2023, a rain event increased streamflow and shallow ground water levels were observed and documented. This event resulted in an increase of standing water in the Sandy Acres Pit contrary to the previous trend of reduced and receding standing water conditions. The observation of increased standing water indicated that while the initial passive drainage system investigation had proven the recommended system could mitigate water levels, the system would need to be extended to the south as the current installation is insufficient to mitigate the standing water conditions.

### **Existing Hydrogeology and Ground Water Monitoring Plan**

In March of 2020, E-470 installed six monitoring wells (MW-1 through MW-6) around the Sandy Acres Pit to monitor ground water levels in the South Platte River alluvial aquifer. In July of 2020, two additional monitoring wells (NW-1 and NW-2) were constructed. The elevation of the monitoring wells were surveyed and the water level data from the monitoring wells is used to identify alluvial ground water elevations surrounding the pit. The locations of the wells are presented in Figure 1.

Based on the lithologic logs for the monitoring wells, the alluvial material surrounding the Sandy Acres Pit generally consists of tan to brown clay, clayey sand, silty sand, sand and gravel. Based on the same lithologic logs, the bedrock below the South Platte River alluvium at this location consists of brown to gray claystone. All of the monitoring wells were constructed to fully penetrate the alluvial material surrounding the pit and were completed with screened intervals in the alluvial material. All of the monitoring wells encountered alluvial ground water and water level data collected from the wells is representative of alluvial ground water conditions in the South Platte River alluvial aquifer.

Water level data collected from the wells is used to determine well specific ground water level elevations, update an existing water level data spreadsheet and maintain hydrographs of the water levels surrounding the pit. The data from the wells can be used to plot the water level elevations around the pond to understand general ground water flow directions in the general vicinity of the pond. Regional water level data available from the South Platte Decision Support System can be used to understand the local context of the Sandy Acres Pit and regional ground water trends. We note that the datum used for the monitoring wells and the datum used for the South Platte Decision Support System data are not the same. Due to this discrepancy and the timing of the water level data (the monitoring well data is from a specific measurement event while the South Platte Decision Support System data is a combination of historic data points), the two data sets cannot be combined. Figure 3 presents the ground water conditions in the area of the Sandy Acres Pit based on the monitoring well data. Figure 4 presents the regional water level conditions based on the South Platte Decision Support System data.

The monitoring wells will continue to be monitored and maintained with water level data collected consistent with the monitoring plan presented in the attached Appendix A – Ground Water Monitoring Plan

### **Backfill Design and Installation**

The DRMS has requested additional information regarding the design and installation of the backfill in the Sandy Acres Pit including:

- Survey data / elevations for the installed pit backfill.
- Confirmation of the static water level used to determine the required backfill.
- The amount of fill that was added in relation to the identified static water level.

Survey data of the pit backfill was previously provided to the DRMS, but we understand that the as-built information provided may have been difficult to identify / read. The as-built pit backfill information was provided as three surveyed transects that were collected across the pit after the installation of the backfill. Accordingly, the survey data represents the elevation of the pit backfill at the time it was installed. The transects were provided on a general location map that included both the proposed and installed pit backfill elevations. The presentation of both the proposed and

as-built pit backfill conditions allows for comparison and confirmation that the pit backfill was installed as proposed and approved.

The general location map that presents both the proposed and as-built pit backfill elevations has been represented as the attached Figure 5. As indicated in the attached figure, the as-built elevations are at least the proposed elevation of 5012 feet at the edges of the pit and at least the proposed elevation of 5009 feet in the center of the pit. Accordingly, based on the information that has been provided by E-470 for our review, the pit backfill was installed in accordance with the proposed grading plan.

The original reclamation plan that proposed the pit backfilling submitted in Amendment Application AM-06 on March 4, 2014 identified a minimum backfill elevation of 5006.5 feet. On April 9, 2014, the reclamation plan was updated in a Resubmittal of Amendment Application AM-06 to identify a minimum backfill elevation of 5009 feet. The 5009-foot elevation was based on installing fill to an elevation a minimum of 2 feet above the static water level elevation. Based on our review of the available information, we understand that the static water level elevation identified at the time of the amendment application was 5006.5 feet and the revision of the pit backfill elevation to 5009 feet allowed for variation of the fill elevation of approximately 0.25 feet with an additional 0.25 feet of elevation to ensure the minimum 2-foot depth above the static water level elevation was achieved.

### **DWR Communication**

E-470 and BBA have been in communication with the Division of Water Resources (DWR) regarding the standing water issue in the pit and continue to support a Substitute Water Supply Plan (SWSP) associated with the prior exposure of ground water in the pit. That SWSP remains in effect through September 30, 2024 and the DWR has not yet requested a new SWSP be pursued. To support this effort, BBA communicated again with the DWR to confirm that the Sandy Acres Pit was either “in compliance with DWR” or to “show evidence that the operator is working with the DWR to bring the site into compliance.” As indicated in the attached communication with Ioana Comaniciu from the DWR, the DWR was waiting until the source of the ponding water in the pit was identified and communicated to the DWR. As requested in the DWR correspondence, they are seeking confirmation of the source of the standing water within 60 days. At that time, a new SWSP will be required if it is determined that the gravel pit was not properly backfilled and the source is in fact ground water.

### **Proposed Future Mitigation**

We agree that, based on the available information including but not limited to observation of standing water in the Sandy Acres Pit, the previously installed pit backfill material was insufficient to mitigate the exposed water at the site. The DRMS has requested an updated mitigation plan that will be implemented at the site to address the exposed water concerns.

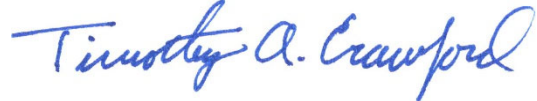
E-470 now proposes the following mitigation plan to provide “next steps” for the correction of the exposed water issue:

- Additional mitigation efforts will mainly target controlling inflow to the southern portions of the Sandy Acres Pit.
- A berm is proposed to separate the southern portion of the Sandy Acres Pit from the northern portion of the pit. The berm will consist of clay or other low permeable material. The berm will be approximately 1 to 4 feet in height and restrict water that enters the southern portion of the Sandy Acres Pit from flowing to the north. The berm will be constructed to allow for equipment to access the pit and construct the berm which may require additional berm height.
- The northern portion of the pit will be dewatered through the existing sump structure utilizing the existing interior trench. Interior trenching in the northern portion of the pit may be extended and/or maintained as needed to facilitate dewatering.
- In the southern portions of the pit, an interior berm will be installed generally in a “horseshoe” shape at the edge (inside and on top) of the backfill in the pit. The berm will be installed approximately 2 to 10 feet inside the edge of the backfill in the pit. The interior “horseshoe” berm will consist of clay or other low permeable material. The berm will initially be approximately 1 to 4 feet in height
- The purpose of the “horseshoe” berm will be to capture water inflow before contributing to the interior of the pit. This “horseshoe” berm may be increased in height if necessary to restrict water from entering the southern portion of the pit or to facilitate construction as needed to allow for equipment access.
- Between the “horseshoe” berm and the edge of the backfill in the pit (within 1 to 5 feet), E-470 may excavate a trench to further control inflow. The trench will be constructed in the fine-grained fill material and will be approximately 2 to 3 feet in depth.
- The berming and the trenching will effectively capture ground water inflow before it contributes to the interior of the pit, control that inflow and convey the inflow around the perimeter of the pit to the north.
- The trenching will initially be left open so that the effectiveness of the trench can be observed. These observations will help determine whether the berming and trenching is sufficient to capture and convey the ground water inflow and whether the mitigation plan needs to be modified further.
- If the system works to effectively capture and convey water then the system can be 1) extended to the north, 2) connected to the existing or new passive drainage system so that it discharges to and through the existing sump structure, 3) backfilled with gravel and 4) capped with native material to provide for a passive system to mitigate the exposed ground water in the pit. These additional actions will only be implemented if warranted based on observations of the effectiveness of the berming and trenching.

We hope that this summary and the attached supporting information provide the additional information requested by the DRMS. We are available to discuss the mitigation efforts further or to provide additional information that would help clarify observations, activities and future mitigation efforts at the Sandy Acres Pit.

Very truly yours,

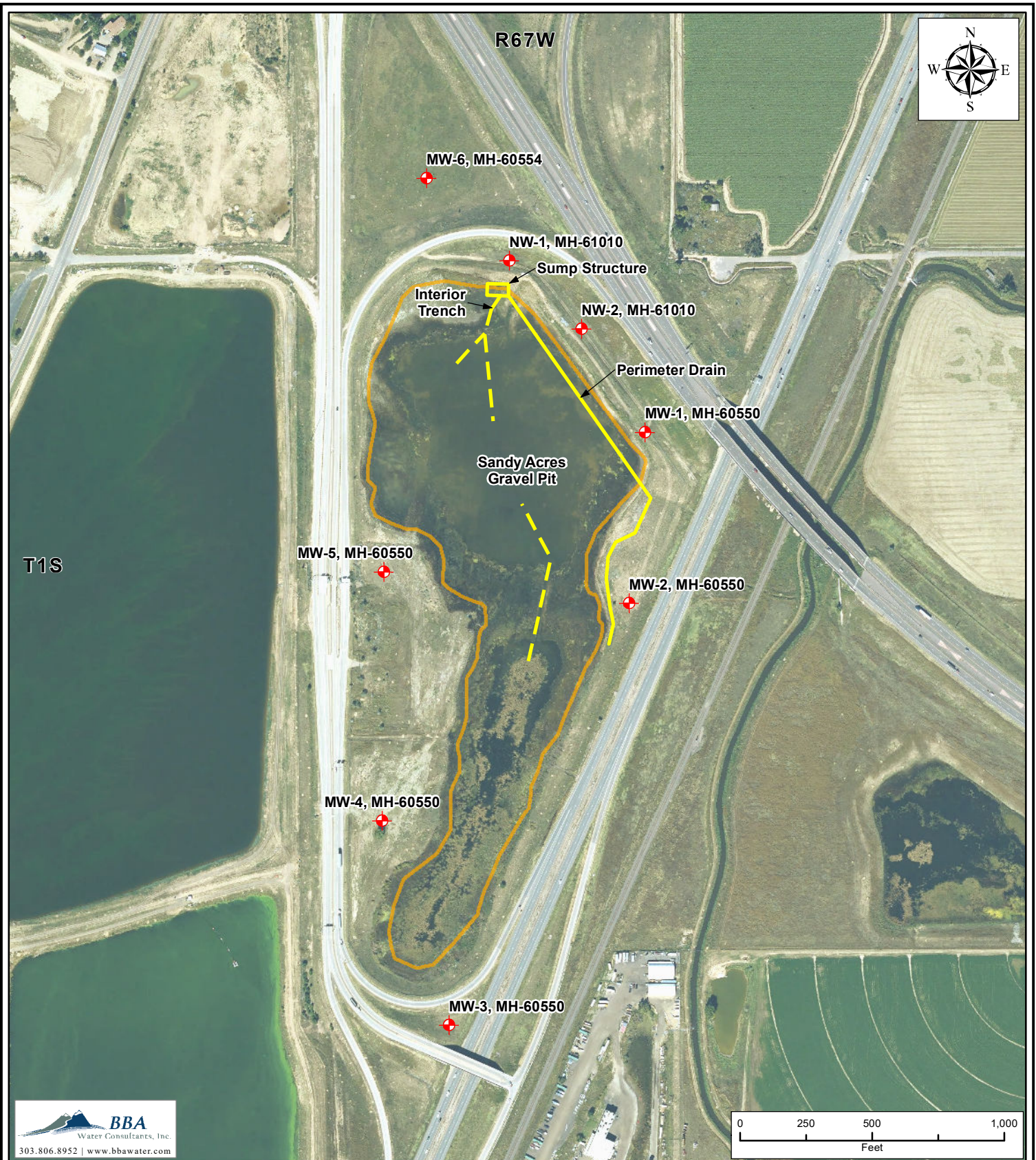
BBA Water Consultants, Inc.



Timothy A. Crawford, P.G.  
Project Manager - Hydrogeologist

TAC/jeb  
Enclosures  
9607.00





**Figure 1**  
**E-470 Sandy Acres Pit**  
**General Location Map**

Date: 6/25/2024 | Job No. 9607.00  
 Aerial Photo Date: 9/25/2023 NAIP USDA  
 Data Source: CDSS, CDOT, USGS, BLM

**Legend**

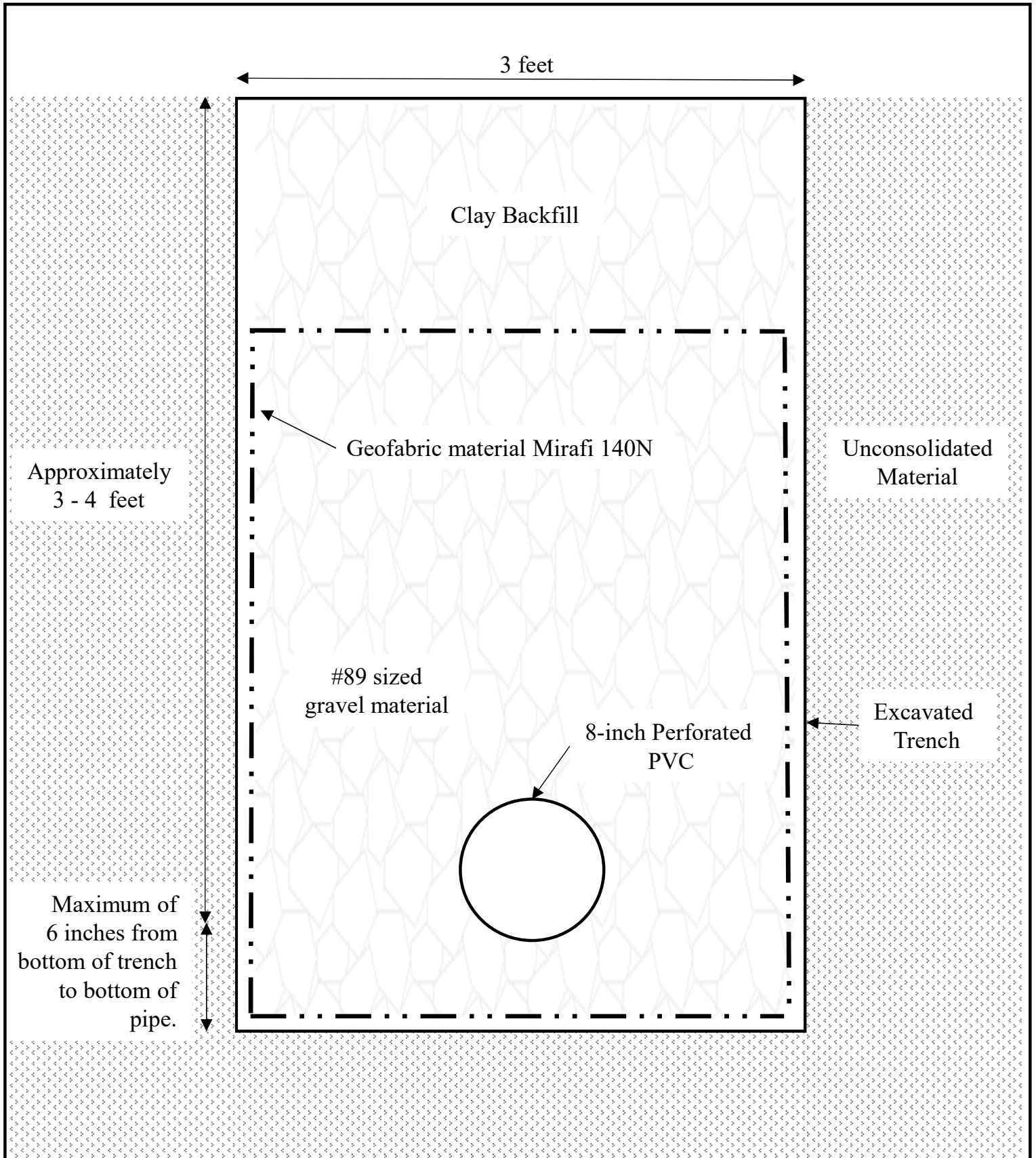
- Monitoring Holes (Name, Permit No.)
- Passive Drainage System Infrastructure
- - - Interior Trench - Approx.
- Former Pond High Water Line

**Overview Map**

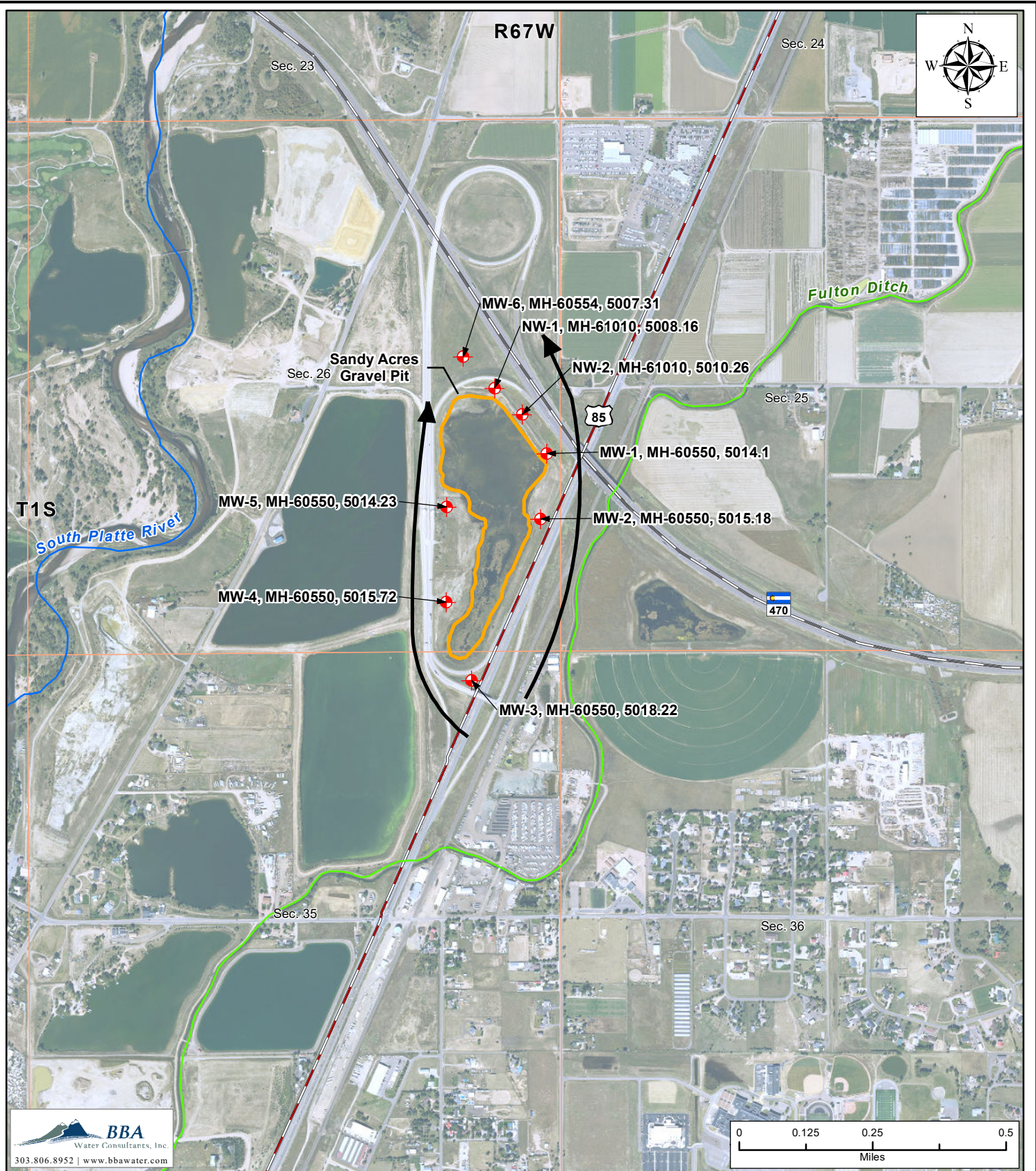




Figure 2  
E-470  
Sandy Acres Pit  
Cross Section of As-Built Trench Construction







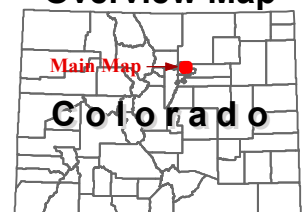
**Figure 3**  
**E-470 Sandy Acres Pit**  
**Water Level Map**

Date: 6/18/2024 | Job No. 9607.00  
Aerial Photo Date: 9/25/2023 NAIP USDA  
Data Source: CDSS, CDOT, USGS, BLM

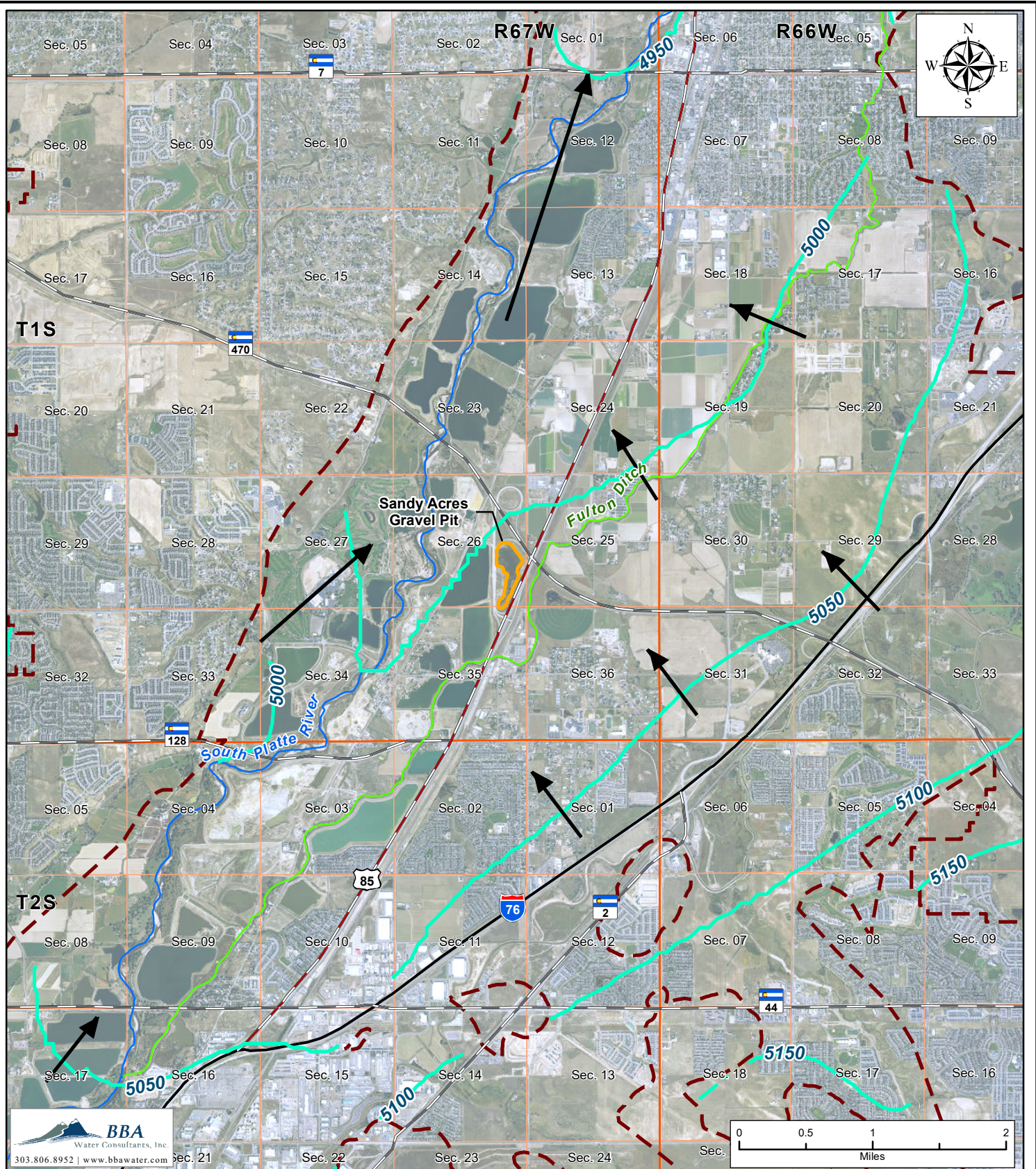
**Legend**

- Monitoring Holes (Name, Permit No., Water Elev. - Ft.)
- Ground Water Flow Direction
- Sandy Acres Pit Former High Water Line
- SPDSS Alluvial Boundary

**Overview Map**



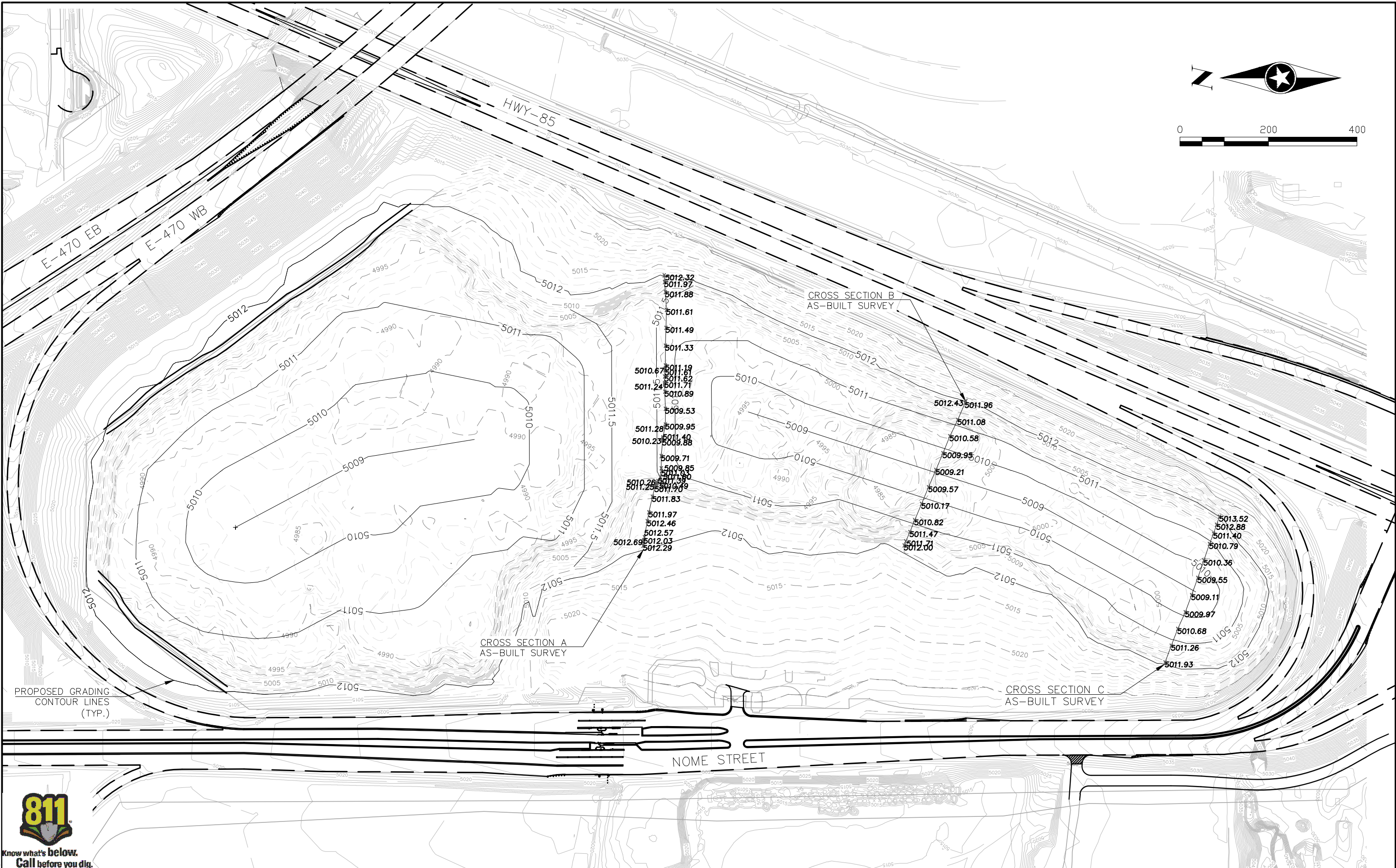






PLOT DATE: \$DATE\$

FILE NAME: \$FILE\$. \$



Know what's below.  
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ISSUE RECORD											
NO.	BY	PURPOSE	DATE	NO.	BY	PURPOSE	DATE	NO.	BY	PURPOSE	DATE



# Figure 5

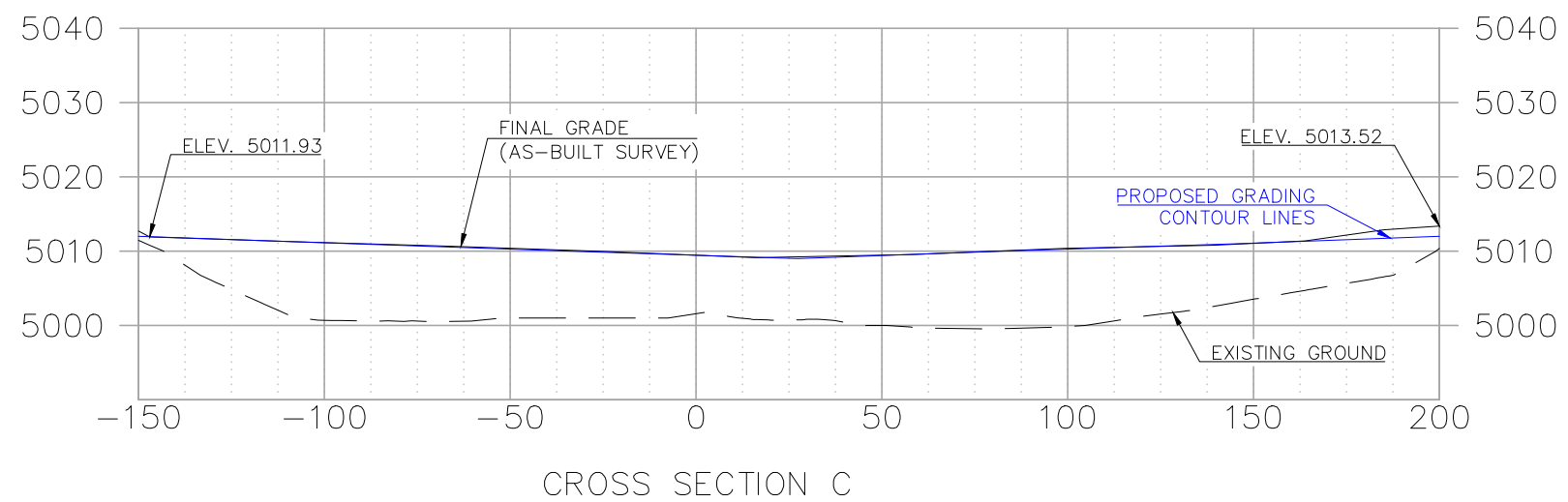
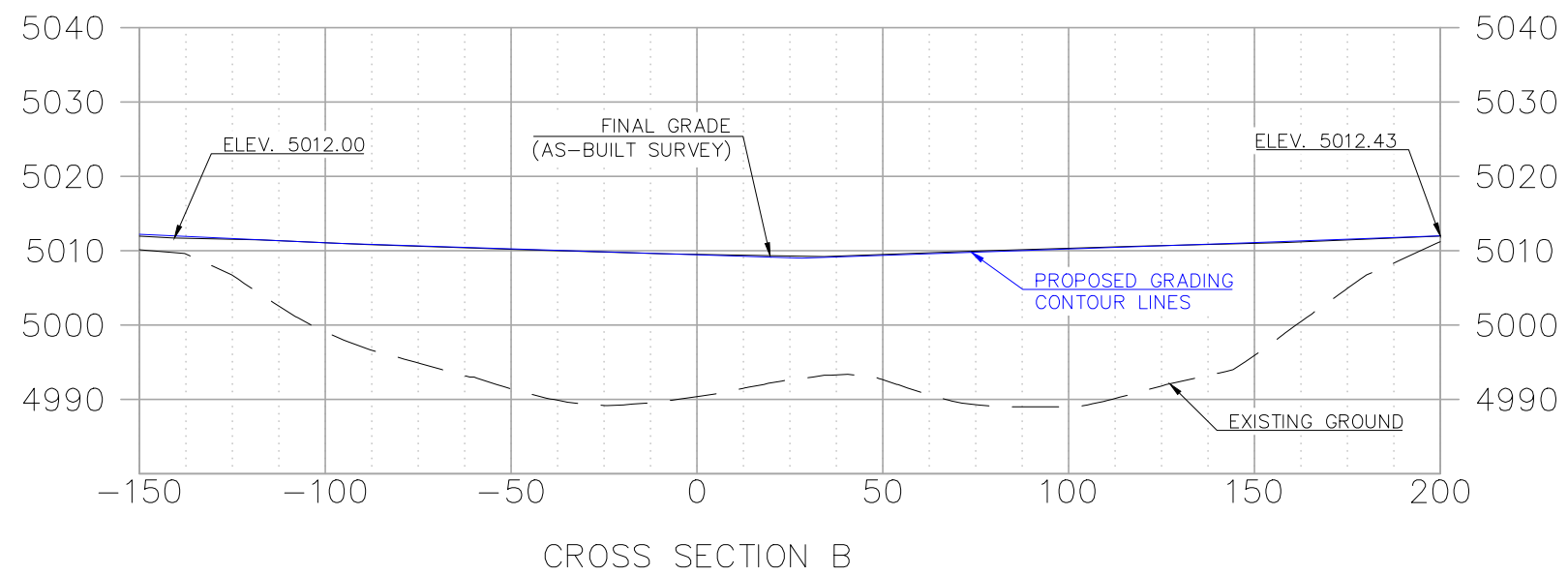
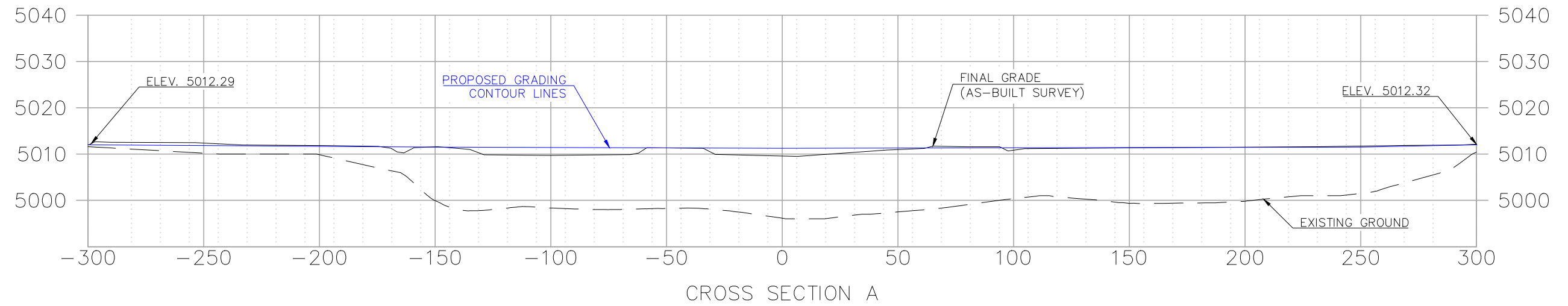
SANDY ACRES  
OVERVIEW

ISSUED DATE:  
STRUCTURE NUMBER:

ORIGINAL E-470  
CONTRACT NO.

SHEET NUMBER  
1

PLOT DATE: \$DATE\$



Know what's below.  
Call before you dig.

FILE NAME: \$FILE\$. \$

ISSUE RECORD											
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Figure 5

SANDY ACRES  
CROSS SECTIONS

ISSUED DATE:

STRUCTURE NUMBER:

ORIGINAL E-470  
CONTRACT NO.

SHEET NUMBER

2

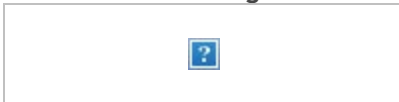


**From:** [Comaniciu - DNR, Ioana](#)  
**To:** [Austin Malotte](#)  
**Cc:** [Tim Crawford](#)  
**Subject:** Re: E-470 Sandy Acres  
**Date:** Monday, May 6, 2024 10:00:27 AM

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Good Morning,  
Thank you for the email on the Sandy Acres Gravel Pit ponding issues. In the January 29, 2024 meeting I indicated that a new SWSP is not required until information is provided on the source of the ponding water in the gravel pit. Although during the meeting we did not set up a deadline to have the information provided to DWR, since more than 3 month passed from the January meeting, it is requested that the information on the source of the ponding water be provided to DWR within 60 days from the date of this email. At that time a new SWSP will be required if it is determined that the gravel pit was not properly backfilled and the source is in fact groundwater.  
Please let me know if you have any other questions or concerns.  
Best regards,

Ioana Comaniciu, P.E.  
Water Resources Engineer



P 303-866-3581 x 8246  
1313 Sherman St., Suite 818, Denver, CO 80203  
[ioana.comaniciu@state.co.us](mailto:ioana.comaniciu@state.co.us) | [www.colorado.gov/water](http://www.colorado.gov/water)

On Fri, May 3, 2024 at 1:17 PM Austin Malotte <[amalotte@bbawater.com](mailto:amalotte@bbawater.com)> wrote:

Good afternoon Ioana,

E-470 Public Highway Authority (“PHA”) and BBA are continuing to work with DRMS to mitigate the ponding issues observed at the former Sandy Acres gravel pit site near the intersection of Highways E-470 and US-85. As part of that ongoing process, DRMS requested the PHA “provide demonstration that the site is in compliance with DWR or show evidence that the operator is working with DWR to bring the site into compliance.” During our 1/29/2024 online meeting, you had directed the PHA to continue its investigation as to the source of the ponded water and to work with DRMS to identify mitigation options. Additionally, you had said the PHA need not apply for a new SWSP until a decision is made (with DRMS approval) as to mitigation. If this all sounds correct to you, would you please respond to this email to confirm? And of course if I missed or misunderstood something, please let me know. We and the PHA want to maintain maximum transparency through this process.

Thank you,  
Austin

**Austin Malotte, P.E.**

BBA Water Consultants, Inc.

720-245-2658 (direct)

[www.bbawater.com](http://www.bbawater.com)



## **APPENDIX A**

# MEMORANDUM



To: File  
From: Timothy A. Crawford  
Subject: E-470 Public Highway Authority– Sandy Acres Pit – Ground Water Monitoring Plan  
Job: 9607.00  
Date: June 6, 2024

This memorandum presents a ground water monitoring plan for the E-470 Public Highway Authority (E-470) Sandy Acres Pit located in Adams County, as presented in the attached Figure 1.

## Background

In March of 2020, E-470 installed six monitoring wells (MW-1 through MW-6) around the Sandy Acres Pit to monitor ground water levels in the South Platte River alluvial aquifer. In July of 2020, two additional monitoring wells (NW-1 and NW-2) were constructed. The water level data from the monitoring wells is used to identify alluvial ground water elevations surrounding the pit. The locations of the wells are presented in Figure 1. Construction details for the wells are summarized and presented in the attached Table 1.

Based on the lithologic logs for the monitoring wells, the alluvial material surrounding the Sandy Acres Pit generally consists of tan to brown clay, clayey sand, silty sand, sand and gravel. Based on the same lithologic logs, the bedrock below the South Platte River alluvium at this location consists of brown to gray claystone. All of the monitoring wells were constructed to fully penetrate the alluvial material surrounding the pit and were completed with screened intervals in the alluvial material. All of the monitoring wells encountered alluvial ground water and water level data collected from the wells is representative of alluvial ground water conditions in the South Platte River alluvial aquifer.

Water level data collected from the wells since they were installed is presented in the attached Table 2. As presented, each of the monitoring wells was surveyed to allow for the calculation of the water level elevation in each well for each data collection event. The water level elevations determined from the collected data are used to prepare and maintain a hydrograph of the water level elevations in the wells as presented in Figure 2.

## Ongoing Water Level Monitoring Plan

- The Sandy Acres Pit water level monitoring plan targets the collection of water level data in each of the existing monitoring wells.
- Additional monitoring wells can be added to the monitoring plan, if needed, as they are constructed in the future.
- Water levels in each of the monitoring wells will be collected using an electronic water level meter (m-scope).



- Depths to water below the top of casing will be measured during each water level measurement event.
- Water level measurement events shall be completed on a quarterly basis, weather and access permitting.
- E-470 will provide personnel to complete the water level measurement events.
- Depths to water below the top of casing will be recorded on a field sheet by the field personnel.
- Water level measurements will be used to update the water level data spreadsheet, presented in Table 2, and the water level hydrograph, presented in Figure 2.
- Water level data (updated table and hydrograph) will be reported to the Division of Reclamation, Mining and Safety on a quarterly basis along with a concise summary memorandum that presents details regarding the measurement events, data trends and any identified anomalies in the data.



**Figure 1**  
**E-470**  
**Sandy Acres Pit**  
**Monitoring Well Locations**

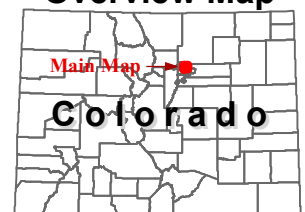
Date: 6/29/2021 | Job No. 9607.00

**Legend**

- Monitoring Holes (Name, Permit No.)
- Sandy Acres Pit Former High Water Line

Aerial Photo Date: 8/3/2019 NAIP-USA  
Data Source: CDSS, CDOT, USGS, BLM

**Overview Map**



**Table 1**

**E-470 Public Highway Authority**

**Summary of Monitoring Well Information**

Well Name	Permit Number	Location		Date Constructed	Well Depth (ft)	Casing Type	Screened Interval	Top of Casing Elevation
		UTM X	UTM Y					
MW-1	323625	513061	4420468	3/12/2020	43	2-inch PVC	8 - 43	5024.9
MW-2	323626	513043	4420271	3/12/2020	49	2-inch PVC	19 - 49	5033.78
MW-3	323879	512835	4419784	3/11/2020	44.75	2-inch PVC	14.75 - 44.75	5038.32
MW-4	323627	512758	4420020	3/12/2020	49	2-inch PVC	14 - 49	5033.32
MW-5	323628	512760	4420307	3/12/2020	45	2-inch PVC	10 - 45	5029.13
MW-6	323880	512809	4420761	3/11/2020	35	2-inch PVC	5 - 35	5014.51
NW-1	323629	512896	4420659	7/27/2020	40.5	2-inch PVC	20 - 40	5025.16
NW-2	323630	512977	4420606	7/27/2020	40.5	2-inch PVC	20 - 40	5022.66

Notes:

Information presented above based on the well permit files and data provided by E-470 Public Highway Authority for the referenced wells.



Table 2

## E-470 Public Highway Authority

## Summary of Monitoring Well Water Level Data

	Well #1		Well #2		Well #3		Well #4		Well #5		Well #6		NW-1		NW-2	
Elevation at top of tube	5024.901		5033.775		5038.318		5033.32		5029.13		5014.509		5025.162		5022.655	
Date	Reading	Elevation	Reading	Elevation	Reading	Elevation	Reading	Elevation	Reading	Elevation	Reading	Elevation	Reading	Elevation	Reading	Elevation
3/11/2020	16	5005.445			19	5016.32	16	5014.357	15	5011.402	5.5	5005.026				
4/8/2020	13.1	5011.80	20.6	5013.18	21.4	5016.92	19.2	5014.12	17.4	5011.73	10.4	5004.11				
4/20/2020	12.7	5012.20	20.4	5013.38	20.9	5017.42	18.9	5014.42	17.1	5012.03	10.2	5004.31				
4/29/2020	12.3	5012.60	19.9	5013.88	20.6	5017.72	18.7	5014.62	17	5012.13	9.9	5004.61				
5/7/2020	11.8	5013.10	19.5	5014.28	20.4	5017.92	18.4	5014.92	16.7	5012.43	9.7	5004.81				
5/13/2020	11.6	5013.30	19.4	5014.38	20.2	5018.12	18.3	5015.02	16.6	5012.53	9.4	5005.11				
5/20/2020	11.3	5013.60	19.1	5014.68	20.1	5018.22	18.1	5015.22	16.4	5012.73	9.4	5005.11				
5/28/2020	11.3	5013.60	19	5014.78	20.1	5018.22	18.1	5015.22	16.3	5012.83	9.1	5005.41				
6/4/2020	11	5013.90	18.7	5015.08	20	5018.32	17.9	5015.42	16.2	5012.93	9	5005.51				
6/11/2020	10.9	5014.00	18.6	5015.18	20	5018.32	17.9	5015.42	16.1	5013.03	8.9	5005.61				
6/18/2020	10.7	5014.20	18.5	5015.28	19.9	5018.42	17.8	5015.52	16	5013.13	8.8	5005.71				
6/25/2020	10.4	5014.50	18.4	5015.38	20	5018.32	17.8	5015.52	16.2	5012.93	8.6	5005.91				
7/6/2020	10.2	5014.70	18	5015.78	19.6	5018.72	17.5	5015.82	15.7	5013.43	8.5	5006.01				
7/15/2020	10.2	5014.70	18.1	5015.68	20	5018.32	17.6	5015.72	15.8	5013.33	8.3	5006.21				
7/22/2020	10.2	5014.70	18.1	5015.68	20	5018.32	17.6	5015.72	15.7	5013.43	8.1	5006.41				
7/30/2020	10.5	5014.40	18.3	5015.48	20.1	5018.22	18	5015.32	15.9	5013.23	8.2	5006.31			13.30	5009.36
8/5/2020	10.7	5014.20	18.4	5015.38	20.1	5018.22	17.7	5015.62	15.9	5013.23	8.4	5006.11	18.20	5006.96	13.20	5009.46
8/12/2020	10.6	5014.30	18.5	5015.28	20.1	5018.22	17.8	5015.52	16	5013.13	8.5	5006.01	18.30	5006.86	13.30	5009.36
8/20/2020	10.7	5014.20	18.6	5015.18	20.1	5018.22	18	5015.32	16.1	5013.03	8.6	5005.91	18.40	5006.76	13.30	5009.36
8/27/2020	10.8	5014.10	18.6	5015.18	20.2	5018.12	18.1	5015.22	16.1	5013.03	8.6	5005.91	18.50	5006.66	13.40	5009.26
9/2/2020	10.9	5014.00	18.8	5014.98	20.4	5017.92	18.2	5015.12	16.1	5013.03	8.6	5005.91	18.70	5006.46	13.50	5009.16
9/11/2020	11.1	5013.80	18.9	5014.88	20.5	5017.82	18.2	5015.12	16.2	5012.93	8.7	5005.81	18.80	5006.36	13.60	5009.06
9/18/2020	11.1	5013.80	19.1	5014.68	20.5	5017.82	18.2	5015.12	16.3	5012.83	8.8	5005.71	18.80	5006.36	13.80	5008.86
9/24/2020	11.1	5013.80	18.9	5014.88	20.3	5018.02	18.2	5015.12	16.3	5012.83	8.7	5005.81	18.80	5006.36	13.60	5009.06
10/1/2020	11.2	5013.70	19	5014.78	20.5	5017.82	18.2	5015.12	16.4	5012.73	8.8	5005.71	18.80	5006.36	13.70	5008.96
10/9/2020	11.1	5013.80	19	5014.78	20.4	5017.92	18.1	5015.22	16.3	5012.83	8.8	5005.71	18.70	5006.46	13.80	5008.86
10/30/2020	11.3	5013.60	19.1	5014.68	20.4	5017.92	18.2	5015.12	16.3	5012.83	8.7	5005.81	18.60	5006.56	13.60	5009.06
11/6/2020	11.4	5013.50	19.2	5014.58	20.5	5017.82	18.2	5015.12	16.3	5012.83	8.7	5005.81	18.80	5006.36	13.80	5008.86
11/13/2020	11.6	5013.30	19.5	5014.28	20.8	5017.52	18.4	5014.92	16.5	5012.63	8.9	5005.61	19.00	5006.16	14.00	5008.66
11/19/2020	11.9	5013.00	19.8	5013.98	21	5017.32	18.7	5014.62	16.7	5012.43	9.2	5005.31	19.20	5005.96	14.20	5008.46
12/24/2020	12.7	5012.20	20.5	5013.28	21.7	5016.62	19.2	5014.12	17.3	5011.83	10.1	5004.41	19.80	5005.36	15.10	5007.56
1/8/2021	12.9	5012.00	20.7	5013.08	21.9	5016.42	19.4	5013.92	17.6	5011.53	10.2	5004.31	20.10	5005.06	15.30	5007.36
1/21/2021	13.1	5011.80	20.9	5012.88	22	5016.32	19.6	5013.72	17.7	5011.43	10.3	5004.21	20.30	5004.86	15.20	5007.46
2/2/2021	13.3	5011.60	21.1	5012.68	22.1	5016.22	19.8	5013.52	17.8	5011.33	10.2	5004.31	20.40	5004.76	15.40	5007.26
3/4/2021	13.7	5011.20	21.1	5012.68	22.6	5015.72	19.5	5013.82	18.2	5010.93	10.7	5003.81	21.20	5003.96	16.20	5006.46
4/8/2021	13.9	5011.00	21.7	5012.08	22.5	5015.82	20	5013.32	18.1	5011.03	10.7	5003.81	21.00	5004.16	15.80	5006.86
4/15/2022	13.1	5011.80	20.8	5012.98	21.6	5016.72	19.5	5013.82	17.5	5011.63	10.3	5004.21	19.80	5005.36	15.30	5007.36
4/27/2022	12.9	5012.00	20.5	5013.28	21	5017.32	19.6	5013.72	17.7	5011.43	10.1	5004.41	19.90	5005.26	15.00	5007.66
5/10/2022	12	5012.90	17.6	5016.18	20.8	5017.52	19.2	5014.12	17	5012.13	9.7	5004.81	19.50	5005.66	14.60	5008.06
5/18/2022	11.8	5013.10	17.4	5016.38	20.7	5017.62	18.8	5014.52	16.8	5012.33	9.5	5005.01	19.20	5005.96	14.10	5008.56
5/26/2022	11.5	5013.40	19.6	5014.18	20.6	5017.72	18.5	5014.82	16.5	5012.63	9.3	5005.21	19.10	5006.06	14.00	5008.66
6/8/2022	11.4	5013.50	17.1	5016.68	20.2	5018.12	18.3	5015.02	16.3	5012.83	9	5005.51	17.10	5008.06	13.70	5008.96
6/28/2022	10.7	5014.20	18.4	5015.38	20	5018.32	18.1	5015.22	16	5013.13	8.6	5005.91	16.20	5008.96	13.10	5009.56
7/26/2022	10.1	5014.80	18.3	5015.48	19.8	5018.52	17.8	5015.52	15.6	5013.53	8.2	5006.31	17.90	5007.26	12.40	5010.26
8/24/2022	10.4	5014.50	18.3	5015.48	19.9	5018.42	17.9	5015.42	15.8	5013.33	8.3	5006.21	18.00	5007.16	12.50	5010.16
9/9/2022	10.2	5014.70	18.2	5015.58	20	5018.32	17.8	5015.52	15.4	5013.73	8.1	5006.41	17.90	5007.26	12.80	5009.86
9/30/2022	10.3	5014.60		5033.78		5038.32		5033.32		5029.13		5014.51	17.60	5007.56	12.40	5010.26
10/10/2022	10.4	5014.50	18.5	5015.28	20.1	5018.22	18	5015.32	15.6	5013.53	8.4	5006.11	18.10	5007.06	13.00	5009.66
12/21/2022	12	5012.90	20	5013.78	21.3	5017.02	18.9	5014.42	16.4	5012.73	8.4	5006.11	17.40	5007.76	13.40	5009.26
2/7/2023	12.75	5012.15	20.7	5013.08									19.00	5006.16	14.70	5007.96
2/14/2023	13.1	5011.80	21	5012.78	22.1	5016.22	20	5013.32	17.6	5011.53	0		19.50	5005.66	14.80	5007.86
3/1/2023	13.4	5011.50	21.2	5012.58	22.4	5015.92	20.1	5013.22	17.8	5011.33	10	5004.51	19.80	5005.36	15.00	5007.66
3/21/2023	13.8	5011.10	21.4	5012.38	22.5	5015.82	20.2	5013.12	18	5011.13	10.2	5004.31	20.00	5005.16	15.20	5007.46
4/11/2023	13.8	5011.10	21.4	5012.38	22.1	5016.22	20	5013.32	18.3	5010.83	10.5	5004.01	20.60	5004.56	15.60	5007.06
5/23/2023	12	5012.90	20	5013.78	20.6	5017.72	18.7	5014.62	16.8	5012.33	8.2	5006.31	18.40	5006.76	14.30	5008.36
7/17/2023	10.5	5014.40	17.9	5015.88	19.4	5018.92	17.4	5015.92	14.8	5014.33	6.8	5007.71	16.80	5008.36	12.00	5010.66
8/23/2023	9.3	5015.60	17.6	5016.18	19.4	5018.92	17.2	5016.12	14.5	5014.63	6.3	5008.21	15.60	5009.56	11.40	5011.26
10/2/2023	9.1	5015.80	17.1	5016.68	19.1	5019.22	16.8	5016.52	14.4	5014.73	5.9	5008.61	15.00	5010.16	10.60	5012.06
10/26/2023	9.2	5015.70	17.4	5016.38	19.4	5018.92	16.8	5016.52	14.3	5014.83	6.1	5008.41	15.30	5009.86	10.90	5011.76
11/29/2023	10.2	5014.70	17.9	5015.88	19.9	5018.42	16.9	5016.42	14.6	5014.53	6.5	5008.01	15.90	5009.26	11.40	5011.26
1/3/2024	10.8	5014.10	18.6	5015.18	20.1	5018.22	17.6	5015.72	14.9	5014.23	7.2	5007.31	17.00	5008.16	12.40	5010.26
1/31/2024	11	5013.90	18.9	5014.88	20.4	5017.92	17.8	5015.52	15.2	5013.93	7.2	5007.31	17.30	5007.86	12.90	5009.76
3/19/2024	11.3	5013.60	19.3	5014.48	20.3	5018.02	17.6	5015.72	15.2	5013.93	7.4	5007.11	17.50	5007.66	13.00	5009.66
4/24/2024	10.9	5014.00	18.7	5015.08	19.3	5019.02	17.5	5015.82	15.1	5014.03	7.4	5007.11	17.40	5007.76	12.90	5009.76

## Notes:

Surveying data and monitoring well water level data provided by E-470 Public Highway Authority.

Figure 2  
E-470 Public Highway Authority  
Summary of Monitoring Well Water Level Data

