Environment, Inc.

LARRY E. O'BRIAN
FOUNDER

STEVAN L. O'BRIAN
PRESIDENT

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September 5, 2025

via e-mail nikie.gagnon@state.co.us
Ms. Nikie Gagnon
Division of Reclamation, Mining & Safety
1313 Sherman St., #215
Denver, CO 80215

Dear Nikie;

RE: L.G. Everist, Inc.
Fort Lupton Sand and Gravel, Permit # M-1999-120
Adequacy Response #4

On behalf of my client L.G. Everist, Inc., I will respond to your August 25, 2025, adequacy review letter, as needed, in the order and number format presented in those documents. We have copied each inquiry into this document for ease of review. I have also revised the Reclamation Cost Estimate (Exhibit L) to add the groundwater drains to Table L11n.

1. Please commit to installing two drains within the permit area.
   - A north-south drain along the western edge of the Heins West slurry wall.
   - An east-west drain along the southern edges of the Southern Complex (Funakoshi, Parker 1-4, and Parker-Adams phases).

L.G. Everist, Inc. commits to installing 2 groundwater drains as recommended by Schnable Engineering in the revised Heins Ground-water Model memo (dated 08/12/25). A north-south groundwater drain is proposed to be installed along the west side of the Northwest Phase; and an east-west groundwater drain is proposed to be placed on the southern side of the Parker #4 Phase in the approximate locations shown on Exhibit C-1 -Mining Plan and Exhibit F - Reclamation Plan Maps.

2. Please revise and resubmit the mining and reclamation plans and maps in Amendment 3 as necessary to include the installation of the two groundwater drains. This should include a discussion of the timing for the drain installations.

Attached are revised **Map Exhibit C-1 Mining Plan** and **Map Exhibit F - Reclamation Plan** map that have been updated to add the approximate location of both groundwater drains. We added text to **Exhibit D - Mining Plan** and **Exhibit E - Reclamation Plan** as requested. Full copies of all Exhibits are attached for the file. I also sent along pages from both exhibits showing what was changed.

3. Prior to any mining disturbance within the Heins West and Southern Complex (Funakoshi, Parker 1-4, and Parker-Adams) phases, please commit to submitting the engineered designs and configurations for the required drains through a Technical Revision to the Division.

L.G. Everist, Inc. commits to filing a Technical Revision (TR) containing an engineering design and configuration for the groundwater drains located west of the Northwest phase and south of the Parker #4 phase. The TR and the designs will be filed prior to any mining disturbance occurring in either Phase.

4. Beginning with the 4th quarter 2025, please commit to submitting the monthly water level data for the active monitoring wells in and around the mining operation to the Division quarterly. The Division will review the quarterly data and determine if additional mitigation measures are needed to maintain hydraulic gradients, prevent excessive buildup, and ensure groundwater movement. Consistent with previous reporting, please highlight any values that are outside the historic high/low baseline range and provide a discussion of the observations.

L.G. Everist, Inc. commits to submitting the monthly water level data for the active monitoring wells in and around the mining operation to the Division on a quarterly basis. Any values that are outside the historic high/low baseline range will be highlighted and a discussion of the observations will be provided.

Exhibit L – Reclamation costs

Attached is a revised **Exhibit L - Reclamation Cost Estimate** which incorporates the new information needed to add a cost estimate of the groundwater drain on Table L11n for the Northwest phase. This will have no effect on the current bond calculation since mining on those Phases will not start until sometime in the future. A Technical Revision will be filed to address the groundwater drain design, location, and any bonding changes.

List of attachments to this response:

Exhibit C-1 - Mining Plan Map revised
Exhibit D - Mining Plan revised
Exhibit E - Reclamation Plan revised
Exhibit F - Reclamation Plan Map Revised
Exhibit L - Reclamation Cost Estimate revised
Heins Groundwater Model memo (dated 8/12/2025)

I hope these responses have addressed the adequacy questions you had. I will place a copy of this packet with the Weld County Clerks' office as required and send you a copy fo the proof of placement. If you have any questions please call me.

Sincerely,
Environment, Inc

Stevan L. O'Brian
President

cc L.G. Everist, Inc.
Weld County Clerk
file

enclosures

Division of Water Resources specifications around the perimeter of each additional mine area prior to commencement of mining in the new phases. This isolates each mining area from the surrounding groundwater table and allows for dry-mining of each mine area. However, if a slurry wall is not feasible, the Applicant will utilize a compacted liner to seal the reservoir areas for the end use as water storage. Design of the liner will follow the Division of Water Resources Guidelines also. Slurry wall design documents were submitted and deemed adequate to the Division in 1999. Slurry walls installed using this design, have been constructed successfully on the 5 lined areas currently completed (and the 6 already released from the permit).

Prior to mining the phases, a groundwater drain will be installed along the west side of the Northwest phase (AKA Heins West) and along the south side of the Parker #4 phase (AKA Southern Complex). The approximate locations of both proposed drains are shown on the Mining and Reclamation Plan maps. The drains will be installed in conjunction with the liner installation in that section of the phase. A Technical Revision will be filed containing an engineering design and drain configuration for each drain prior to mining activities starting in the 2 phases affected.

Additional monitoring wells have been installed along the western, eastern, and northern sides of the new areas in the amendment area. Ground water monitoring, and ground water quality testing plans are included in **EXHIBIT G - WATER** for the amendment areas.

Prior to mining moving into those areas just north of WCR 14.5, the Plant Site will be moved to the Parker #4 Phase in the southern area, adjacent to the access road that now serves the agricultural areas.

Mining operations within each new phase area will include topsoil and overburden stripping, and excavation of dewatering trenches, and settling ponds. Raw materials will be excavated with excavators, front-end loaders, scrapers and/or bulldozers. As areas are cleared and stripped, previously mined slopes will receive backfill material to establish the permanent design side slopes. A conveyor is used to transport the raw material from the areas north of WCR 18 to the Plant Site in the existing mine. Explosives will not be used at this operation.

The reservoir access roads will be placed in the 25 foot wide setback between the slurry wall and the top of the slope into the reservoir. The disturbed areas from the setback line to the top of bank armoring, will be left as a gravel surface instead of being resoiled and seeded. The slope area between the top of slope and highwater line will be resoiled and revegetated. Adequate amounts of the stripped topsoil and overburden will be stockpiled for later use in reclamation in the areas that will be seeded. Topsoil and overburden stripped from subsequent mine areas may be placed directly on the seed bed in previous mine areas so it only has to be handled once and the disturbed areas will be concurrently reclaimed. The exact location of topsoil and overburden piles are unknown at this time, so we have shown the approximate location on **EXHIBIT C-1 - MINE PLAN MAPS**.

Mining within each phase will begin once topsoil and overburden has been removed from that phase area. Excavated materials (pit run) will be removed via front-end loaders, or excavators and may be

Overview

Unless specifically discussed below, the methods described and approved in the original Reclamation Plan will remain unchanged. This will remain a dry mining operation. All of the map exhibits have been labeled North area and South area for easier review. When referring to a map exhibit it is inferred that both should be reviewed. **EXHIBITS C - CURRENT CONDITIONS MAP** show the current permit area and the area being added to the permit.

The current post mining land uses are listed as developed water storage surrounded by access roads, gravel surface areas and revegetated areas. The following information makes change to the reclamation around the reservoirs. The plan is to reduce the resoiling and revegetating. Instead of revegetating to the water line, a gravel surface will be created from the mine setbacks to the top of slope around the reservoirs. Resoiling and revegetation will be done from the tops of slope to the highwater line, except on bank armoring areas where no cover will be placed on the armoring. A gravel access road will be placed around the reservoir. Including the slopes into the reservoirs there are three areas that will need revegetation, The scale house triangle in Parker-Panowicz, the area south of and around the Sandstead Reservoir and Deep Lake. All other disturbed areas will have a gravel surface. More detail is provided in the following Reclamation Plan text and a typical cross section showing this is provided on the **EXHIBIT F - RECLAMATION MAP**.

As with the currently permitted mine area, the new properties will be reclaimed as lined water storage reservoirs. Each of the additional properties will either be sealed with a slurry wall or clay liner. Prior to mining, two of the phases will have groundwater drains installed in conjunction with the installation of the liner - proposed locations are shown on **MAP EXHIBIT F - RECLAMATION PLAN MAP**. In the Northwest Phase it will be along the west side and in the Parker #4 phase it will be along the south side. Information on the engineering design and drain configuration will be available for review in the Technical Revisions filed prior to mining beginning in each phase.

The applicant proposes to bond each phase prior to mining and to determine the type of lining prior to posting a bond for that phase. Please refer to **TABLE E-1 RECLAMATION TIMETABLE** for information on each Phase of Reclamation.

Reclamation Plan

Currently, the undisturbed and amendment areas of the mine site are primarily irrigated agricultural land. The area is broken into 6 different use areas. Please refer to the **VEGETATION MAP** in **EXHIBIT I/J - SOILS AND VEGETATION** for the location of each area described. The current uses are, mining operations area; non-irrigated pasture; irrigated crop areas; ditch & river corridors & wetland area, oil/gas operations areas and high capacity gas pipeline ROW's. The agricultural uses will continue as mining progresses until an area is taken out of agricultural production

The bond currently held by the Division for the existing mining operation is adequate to do the reclamation needed at the existing stages in mine at this time. Since the plan is to add a liner to the Sandstone pond in the future and start liner construction in the Northeast #1 Phase this fall, we have revised the cost estimate to include those two liners and associated work and costs to reclaim the existing stages in their current state of disturbance. Tables L-1n to L-8n and Tables L-9n to L-11n show the areas and cost to reclaim each Phase in the northern permit area.

Current bond information:
Fort Lupton Sand & Gravel Mine $ 2,002,400.00

The following recap explains the changes to the site that we have discussed in detail throughout this amendment application. These changes may affect the reclamation bond. The current conditions discussion following this section has tables showings the remaining activities to be used in estimating the financial warranty needs at this time. The applicant asks the Division to include the following items in its Circes© bonding calculations for this amendment:

Bonding Decrease

Reclamation Work completed (noted as of 10/21/2024)
- Swingle North (2022,)Parker-Panowicz (2014) and Ft. Lupton West (2004) areas - slurry walls certified by the DWR (13,080');
- Swingle-South - installed slurry wall (certification test in progress, 6400 ft)
- Blue Ribbon - installed slurry wall (certification test in progress, 5675')
- Backfilling, sloping and grading is done on Blue Ribbon, Swingle North and parts of Swingle South and Parker-Panowicz.

Possible Bonding Increase

Installed slurry walls
- Sandstead - bond to install slurry wall (2945 ft)
- Northeast #1 - bond to install slurry wall (7350 ft)

In conjunction with the installation of the new slurry walls, there were necessary surface disturbances including (a) the working platform that is built for the equipment that is constructing the slurry wall, (b) areas where the material was taken from to construct the platform, and haul roads between the slurry wall platforms and the material gathering areas. These areas will need only grading and seeding.

Mining in Existing area
All of the areas currently in the mine are bonded for surface disturbance, liner installation and reclamation. Mining is complete in Parker-Panowicz, Swingle North, Deep Lake and Blue Ribbon and all sloping is done. In Swingle South and Ft. Lupton West mining continues.

Current Conditions
This reclamation cost estimate is based on the assumption that at the current time no more then 300.00 acres will need some form of

reclamation at any-one-time. Of this, 45.78 acres will be gravel surface area needing only grading, 78.82 acres requiring resoiling and seeding and there is 157.97 acres of future reservoir area that needs no work to reclaim. There is sufficient amounts of growth medium in Swingle South to place 8 inches on the above water area in Parker-Panowicz, the above water area in Swingle South, the backfilled area in Sandstead, Deep Lake and on the Plant Site.

The **Tables L1**, **L2**, and **L3** contain all the base information used to calculate this estimate. The disturbed areas include, the plant site; roads; slurry wall construction pads and staging areas; gravel surfaces on the above water areas around certified reservoirs and Blue Ribbon. Also the active mining areas that are stripped, partially mined or partially reclaimed areas.

There are three Division of Water Resources (DWR) certified slurry walls. There are two installed slurry walls (12,075 ft total) which are being tested at this time and we assume they will pass certification standards within the next few months. and both are covered by the SWSP water; and We have included a factor of 20% for the 12,075 feet in those phases to cover remedial work on the completed liners until the DWR certification is received. Finally, there are 2 slurry wall (Sandstead & Northeast #1) that will be installed in the next 2 years. Both of the new slurry walls will be fully bonded as they are not installed yet. The slurry wall depths to bottom of the key trench and as built lengths are shown in the Table L3. We have included a factor of 20% for the 12,075 feet in those phases to cover remedial work on the completed liners until the DWR certification is received.

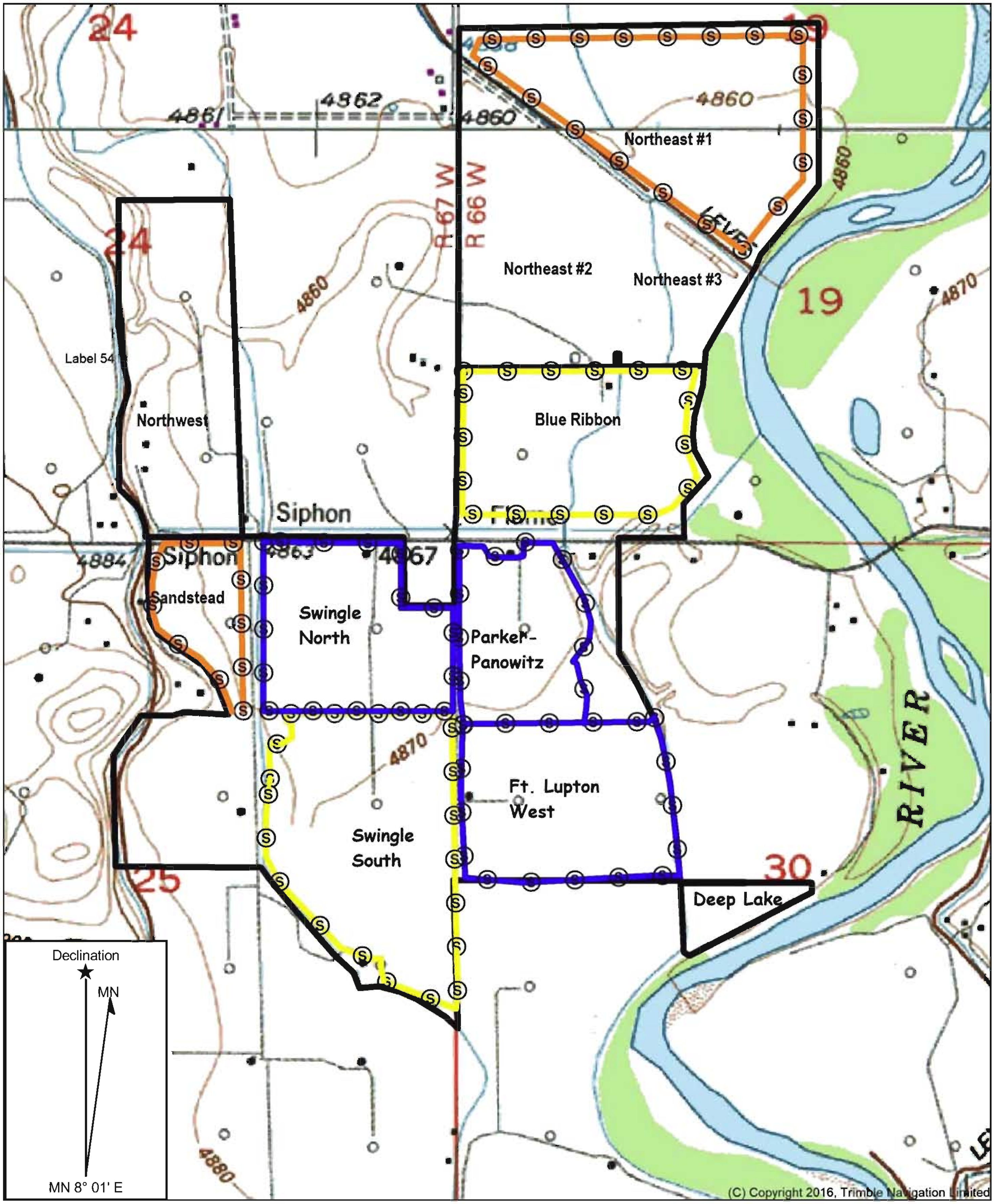
The total potential water surface area in Swingle South, is estimated to be 37.3 acres at this time. Interior sloping is completed on the Blue Ribbon, and approximately 50% of the Swingle South reservoir. The dewatering calculation for Swingle South is shown in **Table L2**, Blue Ribbon would not need dewatering as all slopes are done in that phase. Ft. Lupton West is a certified reservoir, so the slopes could be built using the cut/fill method as the below water slope are dry at this time. We rounded the pumping time for Swingle South to the next day and used 72,300 gal/day as a transmissivity number to figure inflow from the aquifer. This figure is then used in the calculations for the bond amount.

In this estimate we would have to complete bank backfilling on 3,040 linear feet at an average of 41.67 cyd/linear feet in Swingle South.

The volume of concrete contained in the foundations of the scale and the processing plant is 125 yards. The conveyor is temporary and portable so only removal of 100 yards of concrete foundations for the grade crossing over WCR 18 is included in the cost estimate.

A 627C Cat motor scraper or similar equipment will be used to resoil the areas needing to be soiled and revegetated. A 140G Cat motor grader or similar equipment will be used to shape the seed bed, the resoiled areas, grade the graveled surfaces and rip the Plant Site. A D8N Cat dozer or similar equipment will be used to reconstruct the slopes around the perimeter of the reservoirs. Cut/fill sloping is need in the Plant Site active mining area as mining has not reached the reservoir area sides,

The tables below outline, the various areas of disturbance at this time. As mining moves into the amendment area, the total disturbance will begin to reduce as reclamation is completed in the 7 stages in the existing active mine area.



Name: FORT LUPTON
Date: 06/17/25
Scale: 1 inch = 1,000 ft.

LOCATED IN PARTS OF , SECTIONS 19, 30 & 31, T-2-N, R-66-W, AND PART OF SECTION 25 & 36, T-2-N, R-67-W, 6TH P.M., WELD COUNTY, COLORADO

L.G. EVERIST, INC.
FT. LUPTON SAND AND GRAVEL MINE
FIGURE L - SLURRY WALLS

TABLE L1

CALCULATION FACTORS		
Explanation	**Quantity**	**Units**
Soil depth	8.00	Inches
Lake bank sloping re-construction (Swingle South)	41.67	cy/Lft
Lake bank sloping re-construction (Northeast #1)	74.05	cy/lft
Slurry wall installation cost	$6.25	sq-ft
Non certified Slurry wall bond factor	20%	
Swingle South slope construction time	267	days
Weed control costs	$5,000.00	Per year

TABLE L2

DEWATERING DATA (Swingle South only)		
Description	**Amount**	**Units**
Area 100% of lake depth	28.65	acres
maximum depth	33	feet
length of ½:1 slopes	3,400	feet
Unit volume of water on ½:1 slopes	156.25	cft/Lft
length of 3:1 slopes	3,040	lft
Unit volume of water on 3:1 slopes	937.5	cft/lft
Gallon conversion factor	7.48	gal/cft
Transmissivity #	72,300	gal/day
Pump rate minimum	6,000	gpm
CALCULATED VOLUMES AND TIMES		
Slope water volumes		
½ :1 slope capacity	6,9963,880	gal
100% depth	383,018,863	gal
Total pumping volume	452,982,743	gal
Pumping time		
Dewater lake	45.14	Days
Slope construction time	13.06	Days
Recharge factor for inflow during sloping time and Dewatering	0.49	Days
TOTAL PUMPING TIME*	**59.00**	**Days**

*NOTE: pumping time rounded to next full day

TABLE L3 - CURRENT CONDITIONS (revised 6/2025)

RECLAMATION ACTIVITY	STAGE								
	Parker Panowicz	Swingle North	Fort Lupton West	Swingle South	Blue Ribbon	Sandstead	Deep Lake	Northeast #1	TOTALS
GRAVEL SURFACE GRADE (ac)	9.49	6.86		12.48	7.96			8.98	45.78
REVEGETATE & GRADE (ac)	6.28	2.46	35.14	19.83	2.64	32.94	3.98	2.48	105.75
RESOIL VOLUMES @ 8 inches	6,754	2,646	37,795	21,328	2,839	35,430	4,281	2,667	113,740
½ :1 SLOPE CUT/FILL SLOPING (yds)			39,440	126,67				31,391	197,508
½ :1 SLOPE BACKFILL SLOPING (yds)								74,050	74,050
Bank Armoring (lft)								1,030	1,030
DEWATER (hrs)				59.00					59.00
BACKFILLING SETTLING POND (yds)						72,146			72,146
SLURRY WALL LENGTH (Lft)	certified	certified	certified	6,400*	5,675*	2,945		7,350	10,295
SLURRY WALL COLOR (Figure L)	BLUE	BLUE	BLUE	YELLOW	YELLOW	ORANGE		ORANGE	
SLURRY WALL DEPTH (ft)				33.0	43.0	30.00		38.00	
CONCRETE DEMOLITION (yds)		25	100		100				225
ROADS (ac)	5.97	1.35	1.77	1.54	1.54	2.11		0.70	14.98

Note * slurry walls complete but not certified

ESTIMATED UNIT COSTS FOR RECLAMATION ITEMS:

		Unit Cost
1.	Revegetation includes grass seed mix and labor to drill	$1,700.00/AC.
2.	Re-spreading soil and/or growth media with **627-E Motor Scraper, Haul distance less than 900**	$1.929/YD^3
3.	Rip seed bed in plant site, **140G motor grader**	$193.69 ac.
4.	Grade and shape gravel surfaces, **140G motor grader** . . .	$193.69 ac
5.	Pumping costs includes, full service rental of self contained pump, fuel, maintenance and servicing daily.	$221.67/day**
6.	Cut/Fill ½ 1 slope areas **D8N Dozer push distance Less than 120 feet**	$1.08/YD^3
7.	Backfill ½ 1 slope areas **D8N Dozer push distance Less than 120 feet**	$1.25/YD^3
8.	Backfill Sandstead Settling Pond.	$2.22/YD^3
9.	Slurry wall construction	$6.25/sq-FT
10.	Slurry wall repair bonding	$1.25/sq-FT
11.	Bank Armoring Place Materials	$2.70 /Yd
12.	Concrete demolition & on-site disposal	$8.30/Yd.
13.	Conveyor crossing foundation demolition.	$8.30/yd
14.	Secondary Revegetation seeding only	$1,262.00/ac

RECLAMATION COSTS

1.	Revegetation, 105.75 ac @ $1,700.00/ac		$179,775.00
2.	Resoiling, 113,740 x 1.12 @ $1.929/yd^3		$219,404.46
3.	Rip plant site & seed beds 105.45 ac @ $193.69/ac.		$20,482.72
4.	Grading gravel surface & Seedbeds 158.54 ac. @ $193.69/ac		$30,707.61
5.	Dewatering, 59 days @ $221.67/day		$13,078.53
6.	Cut/fill and compact side slopes, 197,508 yds @ $1.08/yd^3		$213,308.86
7	Backfill and compact side slopes, 74,500 yds @ $1.25/yd^3		$92,562.50
8.	Backfill settling pond, 72,146 CYD @ $2.22/yd^3		$160,163.42
9.	Slurry installation fee. 367,650 sq-ft @ $6.25/ft		$2,187,687.50
10.	Slurry contingency fee. 455,225 sq-ft @ $1.25/ft		$305,031.25
11.	Bank Armoring 2,421 cyd @ $2.22/cy		$6,535.35
12.	Demolition & on-site disposal 225 yds@ $8.30/yd^3.		$1,867.50
13	Secondary revegetation 105.75 x 25% x $1,262.00/ac		$33,364.13
14	Weed control costs		$5,000.00
		Direct Cost Total	$3,468,968.82
Mobilization			$6,406.48
		Indirect Costs	
Liability insurance @ 2.02%			$70,073.17
	Contingency @ 3.00%		$104,069.06
	Profit @ 10%		$346,896.88
		Total Indirect costs	$521,039.12
Engineering and Management			
Bond Processing Fee			$500.00
Reclamation Management @ 4.0%			$138,758.75
Engineering @ 5.23%			$181,427.07
		Total bond estimate	$4,345,003.28

Request Bond be set at $4,345,000.00

Equipment listed in this estimate is used for the calculations and similar types may be used in the actual reclamation activities at the mine.

* Estimate for services from Rain for Rent, Ft. Lupton, CO (970) 535-4963

Table L-1n

Task	Parker/Pano	Acres	Length	Average Depth (FT)	CYD/FT	Volume (Cyds or Sqft)	Push/Haul Distance	Unit Cost	Total cost
	TOTAL AREA	43.51							
	TOTAL MINED	20.60							
	WATER AREA	20.45							
	Undisturbed (AC)	2.99							
001	Revegetate (AC.)	6.28						$1,700.00	$10,676.00
002	Resoil (AC.)	6.28		0.67		6,754	900	$1.929	$13,029.41
003	Rip seed bed (AC.)	6.28						$193.69	$1,216.37
004	Grading and Shaping (AC.) includes resoiled and graveled areas	15.77						$193.69	$3,054.49
005	Dewatering (per day)		0.00					$221.67	$0.00
006	Cut Fill Sloping (CYD)					complete		$1.08	0
007	Backfill sloping (Cuyds)					complete	500	$1.25	0
008	Slurry wall (LINEAR SQ-FT.)		Certified	28				$6.25	0
010	Concrete Demo Plant (Cuyds)					25		$8.30	$207.50
011	Secondary seeding (AC.)@25%	1.57						$1,262.00	$1,981.34
012	Annual Weed Control								$500.00
013	Backfill Setteling Pond (Cyd)					0.00		$2.22	$0.00
014	Reservoir armoring (Feet)		0		2.35	0	500	$2.70	$0.00
015	Underdrain Instalation (Feet)		0					$82.03	$0.00
						Phase total project			$30,665.11

Table L-2n

Task	Swingle North	Acres	Length	Average Depth (FT)	CYD/FT	Volume (Cyds or Sqft)	Push/Haul Distance	Unit Cost	Total cost
	TOTAL AREA	42.02							
	TOTAL MINED	31.88							
	WATER AREA	29.53							
	Undisturbed (AC)	3.33							
001	Revegetate (AC.)	2.46						$1,700.00	$4,182.00
002	Resoil (AC.)	2.46		0.67		2,646	900	$1.929	$5,103.88
003	Rip seed bed (AC.)	2.46						$193.69	$476.48
004	Grading and Shaping (AC.) includes resoiled and graveled areas	13.14						$193.69	$2,545.09
006	Cut Fill Sloping (CYD)					Complete		$1.08	0.00
007	Backfill sloping (Cuyds)					Complete	500	$1.25	0.00
008	Slurry wall (LINEAR SQ-FT.)		Certified	38				$6.25	0.00
011	Secondary seeding (AC.)@25%	0.62						$1,262.00	$776.13
012	Annual Weed Control								$500.00
						Phase total project			$13,583.57

Table L-3n

Task	Swingle South	Acres	Length	Average Depth (FT)	CYD/FT	Volume (Cyds or Sqft)	Push/Haul Distance	Unit Cost	Total cost
	TOTAL AREA	67.45							
	TOTAL MINED	52.31							
	WATER AREA	48.70							
	Undisturbed (AC)	4.85							
001	Revegetate (AC.)	19.83						$1,700.00	$33,711.00
002	Resoil (AC.)	19.83		0.67		21,328	900	$1.929	$41,142.23
003	Rip seed bed (AC.)	19.83						$193.69	$3,840.87
004	Grading and Shaping (AC.) includes resoiled and graveled areas	32.31						$193.69	$6,258.12
005	Dewatering (per day)		59.00					$221.67	$13,078.53
006	Cut Fill Sloping (CYD)		3040		41.67	126,677	200	$1.08	$136,810.94
007	Backfill sloping (Cuyds)					0		$1.25	$0.00
008	Slurry wall (LINEAR SQ-FT.)		complete	33				$6.25	$0.00
009	Slurry wall Contingency fee 20% (LINEAR SQ-FT.)		6,400	33				$1.25	$264,000.00
011	Secondary seeding (AC.)@25%	4.96						$1,262.00	$6,256.37
012	Annual Weed Control								$500.00
						Phase total project			$505,598.06

Table L-4n

Task	Ft Lupton West	Acres	Length	Average Depth (FT)	CYD/FT	Volume (Cyds or Sqft)	Push/Haul Distance	Unit Cost	Total cost
	TOTAL AREA	47.81							
	TOTAL MINED	41.25							
	WATER AREA	41.39							
	Undisturbed (AC)	0.29							
001	Revegetate (AC.)	35.14						$1,700.00	$59,738.00
002	Resoil (AC.)	35.14		0.67		37,795	900	$1.929	$72,906.60
003	Rip seed bed (AC.)	35.14						$193.69	$6,806.27
004	Grading and Shaping (AC.) includes resoiled and graveled areas	38.61						$193.69	$7,478.37
006	Cut Fill Sloping (CYD)		3400			39,440	200	$1.08	$42,595.20
007	Backfill sloping (Cuyds)					0	500	$1.25	0.00
008	Slurry wall (LINEAR SQ-FT.)		Certified	33.00				$6.25	0.00
010	Concrete Demo Plant (Cuyds)					100		$8.30	$830.00
011	Secondary seeding (AC.)@25%	8.79						$1,262.00	$11,086.67
012	Annual Weed Control								$500.00
						Phase total project			$201,941.11

Table L-5n

Task	Blue Ribbon	Acres	Length	Average Depth (FT)	CYD/FT	Volume (Cyds or Sqft)	Push/Haul Distance	Unit Cost	Total cost
	TOTAL AREA	55.55							
	TOTAL MINED	37.77							
	WATER AREA	37.04							
	Undisturbed (AC)	8.17							
001	Revegetate (AC.)	2.64						$1,700.00	$4,488.00
002	Resoil (AC.)	2.64		0.67		2,839	900	$1.929	$5,477.33
003	Rip seed bed (AC.)	2.64						$193.69	$511.34
004	Grading and Shaping (AC.) includes resoiled and graveled areas	10.33						$193.69	$2,000.82
006	Cut Fill Sloping (CYD)					0		$1.08	$0.00
007	Backfill sloping (Cuyds)					0	500	$1.25	$0.00
008	Slurry wall (LINEAR SQ-FT.)		complete	43.00				$6.25	$0.00
009	Slurry wall Contingency fee 20% (LINEAR SQ-FT.)		5,675	43.00				$1.25	$7,093.75
010	Concrete Demo Plant (Cuyds)					100		$8.30	$830.00
011	Secondary seeding (AC.)@25%	0.66						$1,262.00	$832.92
012	Annual Weed Control								$500.00
						Phase total project			$21,734.16

Table L-6n

Task	Sandstead (Dodge)	Acres	Length	Average Depth (FT)	CYD/FT	Volume (Cyds or Sqft)	Push/Haul Distance	Unit Cost	Total cost
	TOTAL AREA	50.05							
	TOTAL MINED	36.64							
	WATER AREA	10.35							
	Undisturbed (AC)	4.65							
001	Revegetate (AC.)	32.94						$1,700.00	$55,998.00
002	Resoil (AC.)	32.94		0.67		35,429	900	$1.929	$68,342.16
003	Rip seed bed (AC.)	32.94						$193.69	$6,380.15
004	Grading and Shaping (AC.) includes resoiled and graveled areas	32.94						$193.69	$6,380.15
005	Dewatering (per day)		0.00					$221.67	$0.00
008	Slurry wall (LINEAR SQ-FT.)		2,945	30.00				$6.25	$552,187.50
011	Secondary seeding (AC.)@25%	8.24						$1,262.00	$10,392.57
012	Annual Weed Control								$500.00
013	Backfill Setteling Pond (Cyd)					72,146		$2.22	$160,163.42
						Phase total project			$860,343.94

Table L-7n

Task	Deep Lake	Acres	Length	Average Depth (FT)	CYD/FT	Volume (Cyds or Sqft)	Push/Haul Distance	Unit Cost	Total cost
	TOTAL AREA	7.90							
	TOTAL MINED	5.75							
	WATER AREA	3.62							
	Undisturbed (AC)	0.30							
001	Revegetate (AC.)	3.98						$1,700.00	$6,766.00
002	Resoil (AC.)	3.98		0.67		4,281	900	$1.929	$8,257.49
003	Rip seed bed (AC.)	3.98						$193.69	$770.89
004	Grading and Shaping (AC.) includes resoiled and graveled areas	3.98						$193.69	$770.89
005	Dewatering (per day)		0.00					$221.67	$0.00
011	Secondary seeding (AC.)@25%	1.00						$1,262.00	$1,255.69
012	Annual Weed Control								$500.00
					Phase total project				$18,320.95

Table L-8n

Task	Northeast # 1	Acres	Length	Average Depth (FT)	CYD/FT	Volume (Cyds or Sqft)	Push/Haul Distance	Unit Cost	Total cost
	TOTAL AREA	70.87							
	TOTAL MINED	56.82							
	WATER AREA	53.68							
	Undisturbed (AC)	6.25							
001	Revegetate (AC.)	2.48						$1,700.00	$4,216.00
002	Resoil (AC.)	2.48		0.67		2,667	900	$1.929	$5,145.37
003	Rip seed bed (AC.)	2.48						$193.69	$480.35
004	Grading and Shaping (AC.) includes resoiled and graveled areas	11.46						$193.69	$2,219.69
005	Dewatering (per day)		0.00					$221.67	$0.00
006	Cut Fill Sloping (CYD)		1,695		18.52	31,391		$1.08	$33,902.71
007	Backfill sloping (Cuyds)		1,000		74.05	74,050		$1.25	$92,562.50
008	Slurry wall (LINEAR SQ-FT.)		7,350	38.00				$6.25	$1,745,625.00
011	Secondary seeding (AC.)@25%	0.62						$1,262.00	$782.44
012	Annual Weed Control								$500.00
014	Reservoir armoring (per foot)		1,030		2.35	2,421		$2.70	$6,535.35
					Phase total project				$1,891,969.41

Table L-9n

Task	Northeast # 2	Acres	Length	Average Depth (FT)	CYD/FT	Volume (Cyds or Sqft)	Push/Haul Distance	Unit Cost	Total cost
	TOTAL AREA	67.00							
	TOTAL MINED	56.47							
	WATER AREA	49.45							
	Undisturbed (AC)	4.11							
001	Revegetate (AC.)	7.02						$1,700.00	$11,934.00
002	Resoil (AC.)	7.02		0.67		7,550	900	$1.929	$14,564.72
003	Rip seed bed (AC.)	7.02						$193.69	$1,359.70
004	Grading and Shaping (AC.) includes resoiled and graveled areas	13.44						$193.69	$2,603.19
006	Cut Fill Sloping (CYD)		1,398		7.82	10,932		$1.08	$11,806.95
007	Backfill sloping (Cuyds)		1,000		31.3	3,130	500	$1.25	$3,912.50
008	Slurry wall (LINEAR SQ-FT.)		6,880	38.00				$6.25	$1,634,000.00
012	Annual Weed Control								$500.00
						Phase total project			$1,680,681.07

Table L-10n

Task	Northeast # 3	Acres	Length	Average Depth (FT)	CYD/FT	Volume (Cyds or Sqft)	Push/Haul Distance	Unit Cost	Total cost
	TOTAL AREA	12.12							
	TOTAL MINED	4.52							
	WATER AREA	4.22							
	Undisturbed (AC)	4.33							
001	Revegetate (AC.)	0.99						$1,700.00	$1,683.00
002	Resoil (AC.)	0.99		0.67		1,065	900	$1.929	$2,054.00
003	Rip seed bed (AC.)	0.99						$193.69	$191.75
004	Grading and Shaping (AC.) includes resoiled and graveled areas	2.58						$193.69	$499.72
006	Cut Fill Sloping (CYD)		730		31.3	22,849		$1.08	$24,676.92
008	Slurry wall (LINEAR SQ-FT.)		2,925	35.00				$6.25	$639,843.75
012	Annual Weed Control								$500.00
014	Reservoir armoring (per foot)		970		2.35	2,280	500	$2.70	$6,154.65
						Phase total project			$675,916.14

Table L-11n

Task	Northwest	Acres	Length	Average Depth (FT)	CYD/FT	Volume (Cyds or Sqft)	Push/Haul Distance	Unit Cost	Total cost
	TOTAL AREA	52.33							
	TOTAL MINED	27.47							
	WATER AREA	22.44							
	Undisturbed (AC)	18.76							
001	Revegetate (AC.)	5.03						$1,700.00	$8,551.00
002	Resoil (AC.)	5.03		0.67		5,410	900	$1.929	$6,957.32
003	Rip seed bed (AC.)	5.03						$193.69	$974.26
004	Grading and Shaping (AC.) includes resoiled and graveled areas	11.13						$193.69	$2,155.77
006	Cut Fill Sloping (CYD)		695		12.86	8,938		$1.08	$9,652.72
007	Backfill sloping (Cuyds)		500 500		70.42 44.95	57,455	500	$1.25	$71,818.75
008	Slurry wall (LINEAR SQ-FT.)		6,220	35.00				$6.25	$1,360,625.00
012	Annual Weed Control								$500.00
013	Backfill Setteling Pond (Cyd)					0		$2.22	$0.00
014	Reservoir armoring (per foot)		0		2.35	0	500	$2.70	$0.00
015	Ground water Drain Instalation (Feet)		2,540					$82.03	$208,356.20
						Phase total project			$1,671,177.98

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TECHNICAL MEMORANDUM

TO:	Lynn Mayer Shults	**DATE:**	August 12, 2025
COMPANY:	L.G. Everist, Mountain Division	**SUBJECT:**	Heins Property Groundwater Model Revision 2
ADDRESS:	7321 E. 88th Ave., Suite 200, Henderson, CO 80640	**PROJECT NAME/NO.:**	L.G. Everist Heins Property 20C26026.06
FROM:	Sampson Ash, PG Victor deWolfe, PE, PG	**CC:**	Susan Rainey, PE

INTRODUCTION

This memorandum discusses the groundwater impact analysis at the proposed Heins Property mine site. The purpose of the analysis is to provide information related to the potential impacts to the groundwater table in the vicinity of the site. This includes mounding upgradient and shadowing downgradient of the proposed slurry walls at the site. The site is located approximately three miles north of the town of Fort Lupton, Colorado. The mine plan for the site consists of two main mining areas (North and South) divided by the Meadow Island Ditch and, when constructed, the relocated east branch of the Lupton Bottom Ditch. There is a possible third or West cell. Slurry walls will be constructed around the perimeter of each of the planned cells to cut off groundwater, as shown on **Figure 1**. A standard offset of 200 feet from the river, and 15 feet from property lines, rights-of-way or utilities were used for the proposed slurry wall alignments.

Groundwater modeling was conducted to evaluate the impact of the proposed slurry walls on groundwater levels. The objectives of the groundwater modeling are to:

1. Approximate the existing hydrogeologic conditions pre-slurry wall using available data.
2. Simulate the hydrogeologic effects of the slurry walls by predicting potential groundwater mounding upgradient of the property and shadowing downgradient.

To satisfy these objectives, two steady-state (equilibrated) groundwater models were constructed for:

1. Pre-slurry wall conditions
2. Post-slurry wall construction conditions

This modeling memorandum presents the geologic setting; a general site conceptual model of the aquifer system; the groundwater modeling software used; construction of the model; calibration of the model in terms of target residuals and mass balance; and finally, a discussion of the predictive simulations and conclusions. The groundwater modeling was conducted in general conformance with ASTM standards for groundwater modeling.

GEOLOGIC SETTING

Geotechnical Investigations

The general subsurface lithology at the Heins Property consists of one to two feet of overburden at the surface, underlain by alluvial sand and gravel deposits ranging between 21.5 and 45.5 feet thick, followed by weathered Laramie Formation bedrock measuring about two feet thick, and finally less weathered Laramie Formation bedrock. The bedrock consisted of claystone, shale, and fine-grained cemented sandstone which are fine-grained rock types and therefore have a low hydraulic conductivity. The total depth to bedrock for the site was estimated to vary from about 23.5 to 47.5 feet deep or elevations 4812 to 4848 feet, respectively. The groundwater depths on the property range between 0.2 to 10 feet below ground surface or between elevations 4853 to 4869 feet, and the aquifer had a saturated thickness ranging between 16 to 30 feet.

Subsurface lithology data was obtained from the geotechnical investigation on the property, consisting of 26 borings, performed by Schnabel Engineering between September 23, and October 10, 2024. These boring locations are shown on **Figure 1**. The information from this investigation was used along with existing data from other projects in the domain to create the bedrock contours used in the groundwater model.

Site Conceptual Model

The site conceptual model of the South Platte Alluvial Aquifer as shown in **Diagram 1** below consists of two layers, the unconfined sand and gravel of the South Platte Alluvial Aquifer and the Laramie Formation. The overburden was removed from the model for simplification. Even though this material has a lower hydraulic conductivity it is insignificant in the contribution of the model. The highly conductive Alluvial Aquifer has an estimated hydraulic conductivity of 500 ft/day (0.17 cm/sec) (CDWR, 2024) and is bounded on the bottom by the fine-grained rock of the Laramie Formation. The Laramie Formation has an average hydraulic conductivity of 3.2×10^{-3} ft/day (1.2×10^{-6} cm/sec) as determined by packer testing during the geotechnical investigation. The rocks that comprise the Laramie Formation have a low hydraulic conductivity. In the model it acts as a no-flow boundary due to the orders of magnitude of difference in hydraulic conductivity between the two layers.

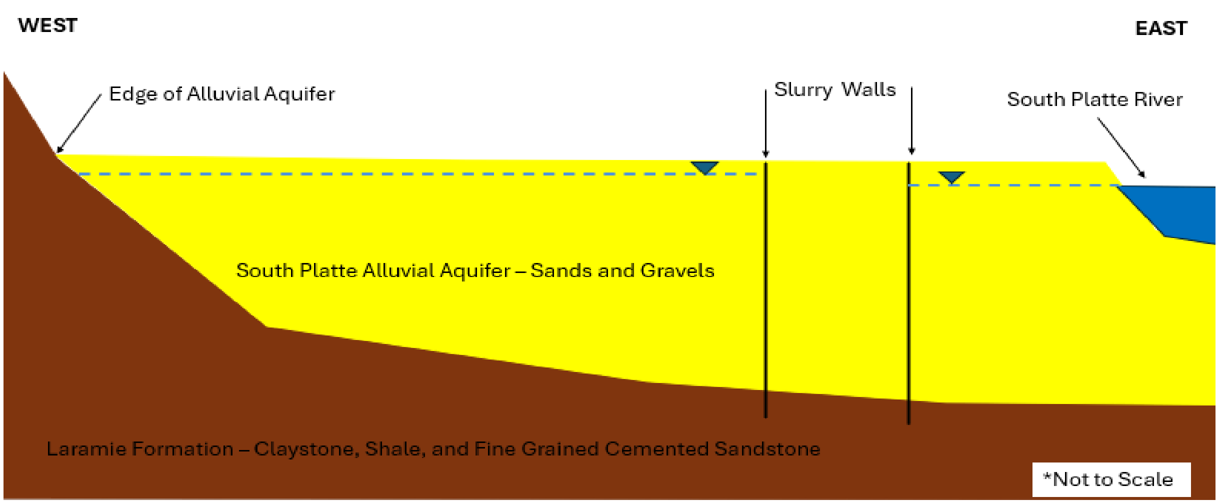

Diagram 1 – Site Conceptual Model

The primary sources of inflows into the alluvial aquifer are:

1. Subsurface inflow from the upgradient end of the aquifer and tributary valleys
2. Infiltration of precipitation and irrigation
3. Seepage from unlined ditches or reservoirs (depending on time of year)

The primary sink or area of outflow from the alluvial aquifer is the South Platte River because it is a gaining stream. However, water outflow from the aquifer also includes:

1. Seepage into unlined reservoirs or mines
2. Seepage into unlined ditches (depending on time of year)
3. Well withdraws
4. Subsurface outflow at the downgradient end of the aquifer

The model domain encompasses the South Platte River alluvial floodplain between Weld County Road 14 in the south and Weld County Road 24 in the north. The domain is set between the confluences of Big Dry Creek and Little Dry Creek within the South Platte River valley (**Figure 2**). The western boundary is set at the extent of the Alluvial Aquifer which is correlated to Elevation 4900 feet**.** The South Platte River is the primary surface discharge for groundwater in the area and is set as the eastern boundary of the model. The ditches and unlined ponds are drains in the model domain that can add or remove water to the aquifer depending on the head differences. Drains with outflow, for example, Little Dry Creek, return outflows to the South Platte River by surface flow and/or seepage into the aquifer.

The topography slopes gently down from south to north along the valley. The project area exhibits widespread aggregate mining where slurry walls and/or clay liners (low permeable barriers) have been installed. These low permeability features act as hydraulic barriers and redirect groundwater flow, creating mounding on the upgradient sides and shadows on the downgradient sides. Land use in the area consists of mining and agricultural uses.

ANALYSIS APPROACH – STEADY-STATE GROUNDWATER MODELING

Overview

The Heins groundwater model was developed using a combination Geographic Information System (GIS) database and GIS data analysis techniques (ESRI, 2024) as well as Leapfrog geologic modeling to create model layers (Leapfrog Geo, 2024). That data was then imported into the software Groundwater Vistas Version 7.0 (Rumbaugh & Rumbaugh, 2015), a graphical user interface for MODFLOW.

Groundwater Modeling Software

The MODFLOW-2005 computer code was used to simulate groundwater flow by solving the 3-dimensional groundwater flow equation using a finite-difference method where the model domain is subdivided into a grid of cells, and the hydraulic head is calculated at the centroid of each cell (Harbaugh, 2005). Groundwater flows into and out of the model via head-dependent flux boundaries. These flows are calculated in the same manner for each simulation. Pre- and post-processing of MODFLOW-2005 files were completed using Groundwater Vistas. Groundwater Vistas is a graphical user interface that facilitates model construction, runs MODFLOW, data analysis and data presentation. It summarizes results as contours, shaded contours, velocity vectors and detailed mass balance analyses. This section discusses the modeling assumptions, limitations, solution techniques, and the way that they affect the models.

When analyzing the groundwater flows in the model, as implemented, MODFLOW-2005 simulates the system as an unconfined aquifer with one value of hydraulic conductivity. One limitation is that cells can go “dry” or “flood”. If the calculated head is above the top of the aquifer (ground surface) at any model cell, then that cell is flooded and will be treated as if the aquifer is confined (i.e., the saturated thickness will equal the top-elevation minus the bottom-elevation). If the calculated head falls below the bottom of the aquifer, that cell is dry and will be assigned a zero value for hydraulic conductivity.

The preconditioned conjugate-gradient with Newton (PCGN) solver package of MODFLOW-2005 was used to solve the groundwater flow equations for the model. It combines the efficiency of the conjugate gradient method with Newton-Raphson iteration to handle nonlinearities commonly found in unconfined aquifers and head-dependent boundary conditions. The solver uses preconditioning techniques to improve convergence speed and stability, making it well-suited for large, complex, and nonlinear models where traditional solvers like PCG or SOR may struggle.

This package defines the number of outer and inner solver iterations, as well as criteria for both maximum head and residual change between iterations before allowing convergence. Tolerances for the maximum change in head and flow residual between iterations were specified as 1×10^{-3} feet and 100 cubic feet per day (cfd), respectively. These tolerances result in a mass balance of less than 0.001%, indicting model convergence and solution accuracy. Steady-state conditions were simulated because the maximum water level rise is of principal interest and the time required to reach steady state is not of concern.

Model Geometry and Spatial Discretization

The model was constructed by importing shapefiles made in GIS representing aquifer parameters and boundary conditions into Groundwater Vistas. The model domain is a rectangular area 12,760 feet wide by 23,120 feet long (**Figure 2**). The domain was divided into a grid of cells measuring 10 feet on each side. Active cells contain values representing the following parameters:

1. The elevation of the top of the aquifer
2. The elevation of the bottom of the aquifer
3. The hydraulic conductivity of the aquifer
4. The recharge applied to the cell
5. The initial groundwater head within the aquifer
6. The boundary conditions for the model

Layer Construction

The maximum top of the alluvial aquifer is represented by the topography of the ground surface. Topographic data used for this model input are from a 1-meter digital elevation model (DEM) obtained from the Colorado Hazard Mapping & Risk Map Portal (CWCB, 2024).

The bottom of the aquifer and model is the low permeability Laramie Formation bedrock. Therefore, the model contains an elevation map of the bedrock surface. To create this surface, bedrock elevation data was obtained from the geotechnical investigation described previously in this memo, data from previous projects done for L.G Everist in the area, and publicly available data from Colorado's Decision Support Systems (CDWR, 2024). The bedrock elevations were contoured in AutoCAD. Overall, the spatial reliability of the bedrock data is considered good and deemed appropriate for the scope of this groundwater model.

The DEM and the resulting bedrock elevation contour map were imported into Leapfrog to create the top and bottom of the alluvial aquifer. Due to the 10x10 foot grid size used, the topographic and rock elevation data were averaged within that area resulting in some variation between model elevations and contoured ground/rock elevations.

Aquifer Properties

The horizontal hydraulic conductivity (Kx and Ky) of the alluvial aquifer used in the model was input between the range of 500 feet per day (fpd), and areas with known wash fine fill had an input of approximately 50 fpd. This value is based on average values from the Colorado Decision Support Systems GIS map and our experience in the area. We assumed an anisotropy ratio of 0.5 (Kv/Kr), meaning that the value in the vertical direction (Kv) is half the value in the radial direction (Kr).

A groundwater elevation contour map for the alluvial aquifer provided the starting heads for the finite difference solution and was used to define general head boundary values. This surface was developed using the groundwater level data collected from monitoring wells in the area. This consists of wells owned by LG Everist on-site and off-site.

Boundary Conditions

The boundary conditions listed below define the sources and sinks for the water budget of the model. The system is assumed to be in equilibrium under pre-slurry wall conditions. The model domain is inactive outside of the defined boundary conditions. These boundaries are shown on **Figure 2**.

Exterior Boundary Conditions

The exterior or the outer boundary conditions used for the model include three general head boundaries, two no-flow boundaries, and the river boundary:

General Head Boundaries

1. Subsurface inflow from the upgradient portion of the alluvial aquifer (Southern Boundary).
2. Subsurface outflow from the downgradient portion of the alluvial aquifer (Northern Boundary).
3. Subsurface inflow from the tributary valley of Little Dry Creek (Part of the Western Boundary).

These edges of the aquifer were chosen to be modeled by the MODFLOW General-Head boundary package to allow groundwater to flow into and out of the model and to permit groundwater elevations to change at the boundaries in response to aggregate mining.

No-Flow Boundaries

1. The edge of the South Platte Alluvial Aquifer (Part of the Western Boundary).
2. The contact between the South Platte Alluvial Aquifer and Laramie Formation (Bottom Boundary).

The base and most of the western side of the model are simulated using the no-flow boundary (inactive cells) to represent the contact between the low-conductive Laramie Formation and the alluvial aquifer.

River Boundary

1. The South Platte River (Eastern Boundary). The elevations of the river were determined using river gauges near the site to estimate starting and ending elevation.

The South Platte River was simulated using the MODFLOW River package, which contributes water to or releases water from the aquifer at adjacent cells as determined by the hydraulic gradient between the aquifer and the river and as a function of streambed conductance. The unlined reservoirs or ponds within the model domain were also modeled as river boundaries.

Interior Boundary Conditions

Interior boundaries or inner boundaries included 6 drains, and 8 no-flow boundaries.

Drains

The ditches, unlined ponds, intermittent stream (Little Dry Creek), and the drain at the Zadel Pit within the model were simulated using the MODFLOW Drain Package which removes water from the adjacent cells as determined by the hydraulic gradient between the aquifer and the ditches and stream as a function of drain conductance.

No-Flow Boundaries

Aggregate mines that have installed slurry walls and/or clay slope liners around their properties were simulated using the no-flow boundary (inactive cells) as their contributions to the aquifer are negligible.

CALIBRATION

Calibration Process

Model Calibration is an iterative process of adjusting model parameters (aquifer properties) and boundary conditions to obtain a reasonable match between field measurements and model-computed values. Calibration was conducted for the steady-state models, which is assumed to represent conditions observed during the months of August 2024 and March 2025. August 2024 was used to calibrate flows from the Lupton Bottom West Branch Ditch and measured piezometric heads while the March 2025 calibration was used to calibrate the model to piezometric heads recorded after the installation of the Zadel Pit Drain.

The calibration targets for the two different models include the measured groundwater elevations observed in 34 monitoring wells (**Figure 2)** measured during the month of March 2025, and from 22 groundwater measurements taken during the geotechnical investigation described above.

The monitoring wells were the primary targets as they were recorded on specific dates, offering high reliability and spatial relevance; while the geotechnical borings and publicly available data were secondary targets as they included data outside the time frame of calibration, which while useful for broader context is considered less reliable due to potential inaccuracies and differences in aquifer conditions. The model was calibrated primarily to the project-specific data, with the secondary dataset used to support regional trends and assess model robustness.

Model calibration acceptability is subjective, but the following general guidelines for judging calibration sufficient for this model included:

- Overall calibration quality is determined through statistical comparison of model results with field measurements and observations. This model includes only water elevations.
- The primary statistic used in gauging and reporting "best fit" was the squared error of the measured and computed groundwater elevations.
- Calibration continued until the coefficient of determination (R^2) between the measured and observed groundwater elevations was within 10% of 1.

The goals of the predictive simulation targets are:

1. To show how field measured groundwater heads differ from those in the steady-state simulation.
2. To show how pre-slurry wall groundwater heads differ from those in the predictive simulations.

Calibration Results

The model is simple and homogeneous, containing heads that are well constrained by measured values for boundary conditions as well as a reasonable estimate of hydraulic conductivity. The calibration targets used for the pre-slurry wall condition steady state model illustrate that the input groundwater heads are generally within five feet of the measured values throughout the entire model. However, near the site where the mounding is expected the modeled heads are within two feet of the observed heads. Calibration plots for the two calibrated models show the residuals (Observed Head Values Vs. Modeled Head Values) for the site specific and publicly available data in **Figure 3**. The calibrated models both resulted in an R^2 value of 0.99 at the end of the calibration process. In **Figure 4** the groundwater elevation contours for the steady state calibrated model are shown.

Figure 5 shows the data in terms of groundwater depth below ground. The contours with zero labels show where groundwater is at or near the ground surface. These locations generally match the locations of unlined pits as well as ditches and drains cut into the land. This illustrates the model is well calibrated to the internal boundary conditions. There is a long zero contour south of the existing slurry wall complex that was not modeled as a drain. This area is along Little Dry Creek, which, along with the South Platte River, flooded in 2013. At this location the floodwaters breached both Suburban and Weast Meadows reservoirs and deposited eroded sediment from the floodplain in the vessels. The resulting erosion scarps formed basins flowing breach repairs. These depressions match the flood topography and are four to six feet deep. Onsite observations suggest that the water level in the upper "fingers" of the depressions is about a foot deep. This means that the water level in a 4-foot depression would have been 3 feet deep prior to the flood erosion. We understand that flood control studies are being conducted for Little Dry Creek.

The mass balance reported by MODFLOW for the steady state pre-slurry wall model in March 2025 is as follows:

March 28, 2025
Inflows = 1,214,888.2 cfd
Outflows = 1,222,461.4 cfd
Difference = - 7,573.2 cfd (-0.6%)

This illustrates that the initial steady-state model is accurately solved. Because the pre-slurry wall groundwater table represents data from measured groundwater levels, and the mass balance is accurate, this suggests the model is sufficiently calibrated to be used for predicting water levels after construction of the slurry walls.

PREDICTIVE SIMULATIONS

Using the steady state model for pre-slurry wall condition as the base model, predictive simulations were performed for groundwater mounding after the proposed slurry walls are constructed.

Predicted Unmitigated Groundwater Mounding

To understand the magnitude and extent of potential groundwater mounding upgradient of the Heins slurry walls, a steady state simulation including slurry walls was performed. The pre-slurry wall model was changed by inputting the Heins slurry walls as no-flow boundaries.

All other aquifer parameters and boundary conditions remained unchanged. Initial heads were the model simulated heads from the pre-slurry wall steady state model. The steady state model for the post-slurry wall conditions generally produced higher groundwater elevation heads than those produced for the pre-slurry wall steady state condition.

The groundwater elevations from the predictive simulation are shown in **Figure 6**. The difference between the pre- and post-slurry wall groundwater surfaces are the predicted mounding levels shown on **Figure 7**. For each of the predictive simulations, positive residuals are reported as values of groundwater mounding (warm colors) and negative values represent groundwater shadowing (cool colors). For this predictive simulation the magnitude of the maximum groundwater mounding is approximately 2.5 feet west of the Heins West and Zadel Pit.

For the Southern Slurry Wall Complex in this predictive simulation, the magnitude of groundwater mounding ranges from 1 foot on the southern side to maximum groundwater shadowing of 3 feet in the middle of the complex near Little Dry Creek on the north side.

The groundwater depth is closest to the surface on the west side of the Heins west cell as well as on the west side of the southern slurry wall complex as shown in **Figure 8**. A comparison of depths-to-groundwater on **Figures 5** and **8**, along with an inspection of **Figure 7** shows that the existing shallow groundwater in the eroded depressions south of the complex is in a groundwater shadow (blue colors on **Figure 7**) for the predictive simulation. The zero contours still follow Little Dry Creek, but groundwater mounding is shifted to the south of the proposed slurry walls.

CHANGE IN DISCHARGE TO ACCRETION BOUNDARIES

The installation of slurry walls around the site can impact groundwater flow dynamics, resulting in changes to discharge at accretion boundaries. By reducing horizontal hydraulic connectivity of the aquifer, the slurry walls have modified the natural flow regime, limiting groundwater movement into and out of the enclosed area. As a result, discharge patterns at accretion boundaries have shifted, particularly along downgradient zones where the walls intersect historic flow paths. These changes were incorporated into the groundwater model by updating boundary conditions and representing the slurry walls as zones of low permeability or no-flow barriers. The model was subsequently recalibrated using observed groundwater levels and flow data to ensure it reflects post-construction conditions. A summary of the changes in flow at accretion boundaries is provided in **Table 1** below.

Table 1 – Change in Discharge to Accretion Boundaries

Name	Discharge into Accretion Boundaries		Difference (CFD)	Difference (CFS)	Difference (GPM)
	Prior to Construction	After Construction			
South Platte	243,407.9	231,189.7	-12,218.2	-0.1	-63.5
Little Dry Creek	199258.9	55169.3	-144,089.6	-1.7	-748.5
Lupton Bottom Ditch West Branch	0.00	0.00	0.0	0.0	0.0
Lupton Bottom Ditch East Branch	89,028.5	148,144.0	59,115.5	0.7	307.1
Meadow Ditch	0.00	153,656.0	153,656.0	1.8	798.2
Coal Ridge	0.00	1,806.9	1,806.8	0.0	9.4
Unlined Pits	393,839.4	293,221.9	-100,617.5	-1.2	-522.7
Alluvial Underflow (Groundwater Flow)	153,275.1	121,267.2	-32,007.9	-0.4	-166.3
Totals	1,078,809.8	883,187.8	58,270.5	0.67	302.7

As shown, there is a small increase of about 300 gpm (5%) in the discharge to accretion boundaries with Heins slurry walls installed. The results illustrate that construction of the proposed slurry walls has a negligible impact on groundwater accretion to the South Platte River. Additionally, the outflows reported for Little Dry Creek flow into the South Platte River outside (downstream) of the model domain.

CONCLUSIONS

This groundwater impact analysis was performed to evaluate the mounding and shadowing effect the construction of slurry walls has on the local groundwater table. The model accurately replicated the conditions of the South Platte River alluvial aquifer based on data available from recent geotechnical investigations. Model construction was facilitated by using an extensive GIS to inventory, analyze, and present the data.

The steady-state models reasonably simulated the equilibrated hydrogeologic changes caused by construction of the slurry walls. The predictive simulation during irrigation season showed that the magnitude of the maximum groundwater mounding and shadowing for proposed slurry walls can cause mounding as high as about 2.5 feet, and a minimum depth to groundwater of about 0.5 feet, before a drain is installed. The simulation also indicates that the maximum shadowing effect caused by the construction of the slurry walls is almost three feet and is located along Little Dry Creek in the middle of the Fort Lupton Pits.

The groundwater flow pathways for return flows to the river have been lengthened due to slurry wall installation, the differences between flow paths can be compared in **Figure 4** and **Figure 6**. These lengthened flow paths can increase the timing it takes for groundwater to return to the South Platte River. However, as the results show, the change in outflows to the South Platte River is negligible between pre- and post-slurry wall conditions.

RECOMMENDATIONS

The installation of the Heins North and Heins South cells on the eastern side of the property have minimal effect on the surrounding groundwater. No drain installation is recommended for these areas at this time. The site wells will be monitored approximately monthly. If the depth to groundwater, following the construction of the slurry wall(s) in any exterior well approaches three feet below ground surface, we recognize that a drain may need to be installed.

The Heins West cell of the Northern Heins complex as well as the Southern complex have shown to cause a minimal amount of mounding. To mitigate potential groundwater mounding caused by the reduced flow through the slurry walls, a subsurface drain may be required. If groundwater levels rise to approximately three feet below the ground surface along the exterior of the proposed slurry wall complex, drains may be necessary to maintain hydraulic gradients, prevent excessive buildup, and ensure continued groundwater movement. The drains would help relieve pressure, reduce the risk of seepage or surface expression of groundwater, and maintain the effectiveness of the overall groundwater control system. The red groundwater mounding colors on **Figure 7** show locations to target with drains. These are primarily 1) along the western edge of the Heins West slurry wall and 2) along the southern edges of the Southern Complex. A north-south drain along the Heins West wall would help Little Dry Creek drain water away from the reservoir complex. An east-west drain along the eastern half of the southernmost slurry walls would help drain mounding groundwater towards the South Platte River.

We recommend such drains are installed as infiltration galleries with subsurface discharge. Essentially these drains are composed of slotted pipe in collection areas and discharge areas and operate using the hydraulic gradient to transfer and spread mounding groundwater closer the river. The pipes are buried at the depth required to maintain a groundwater depth threshold of 3 feet and bedded in a filter material to maintain good hydraulic connection with the aquifer materials. The below-grade discharge system ensures that groundwater is never consumed.

LIMITATIONS

These are steady-state models and cannot be used to evaluate groundwater return flow timing. The results of the groundwater modeling and conclusions drawn from them represent approximations and are based on the best available data and engineering judgement. Conservative assumptions were made during the calibration process so that groundwater mounding was not under-predicted. Given the unknown heterogeneity of the aquifer in the field and variations in ground surface from the topographic data used, the groundwater mounding and/or drainage mitigation may deviate from the model simulation.

There is a possibility that mounding may be higher than predicted, although the conservative assumptions of this work make the deviation toward a lower mound in the field a more likely possibility.

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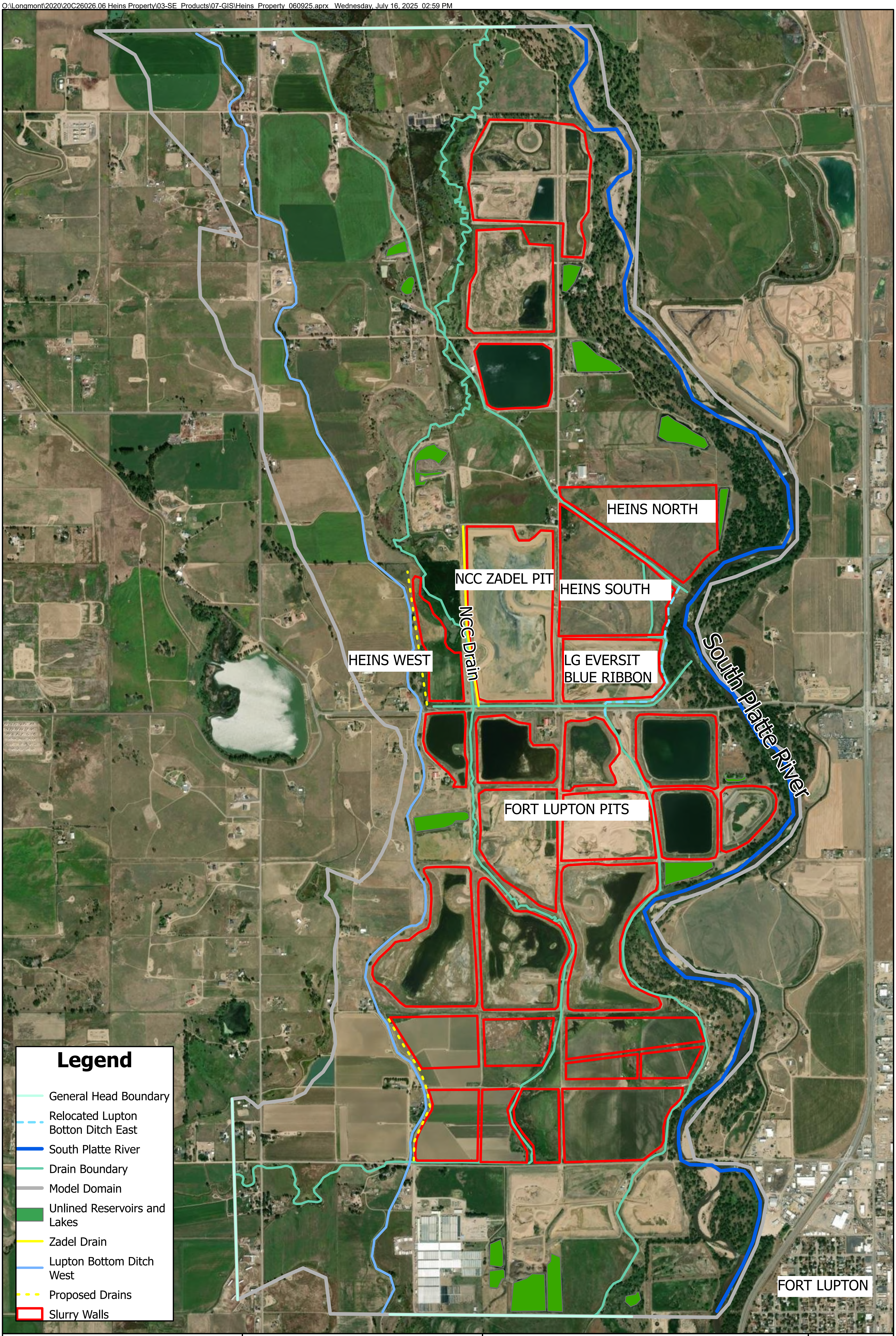


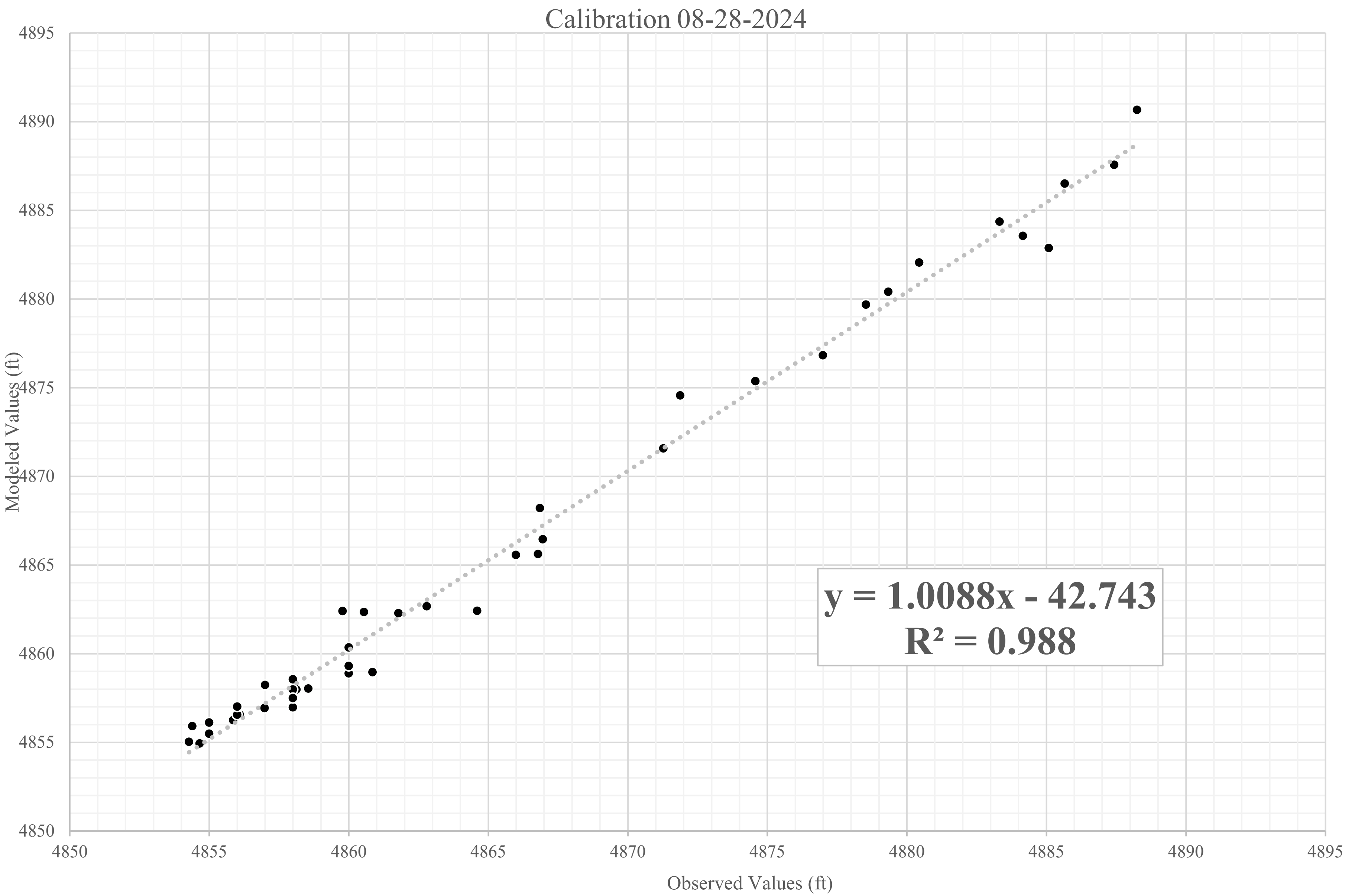
N
0 1,500 3,000 Feet
SCALE: 1 in = 1,500 feet

Schnabel ENGINEERING

Heins Property Groundwater Model
Model Domain and Boundary Conditions

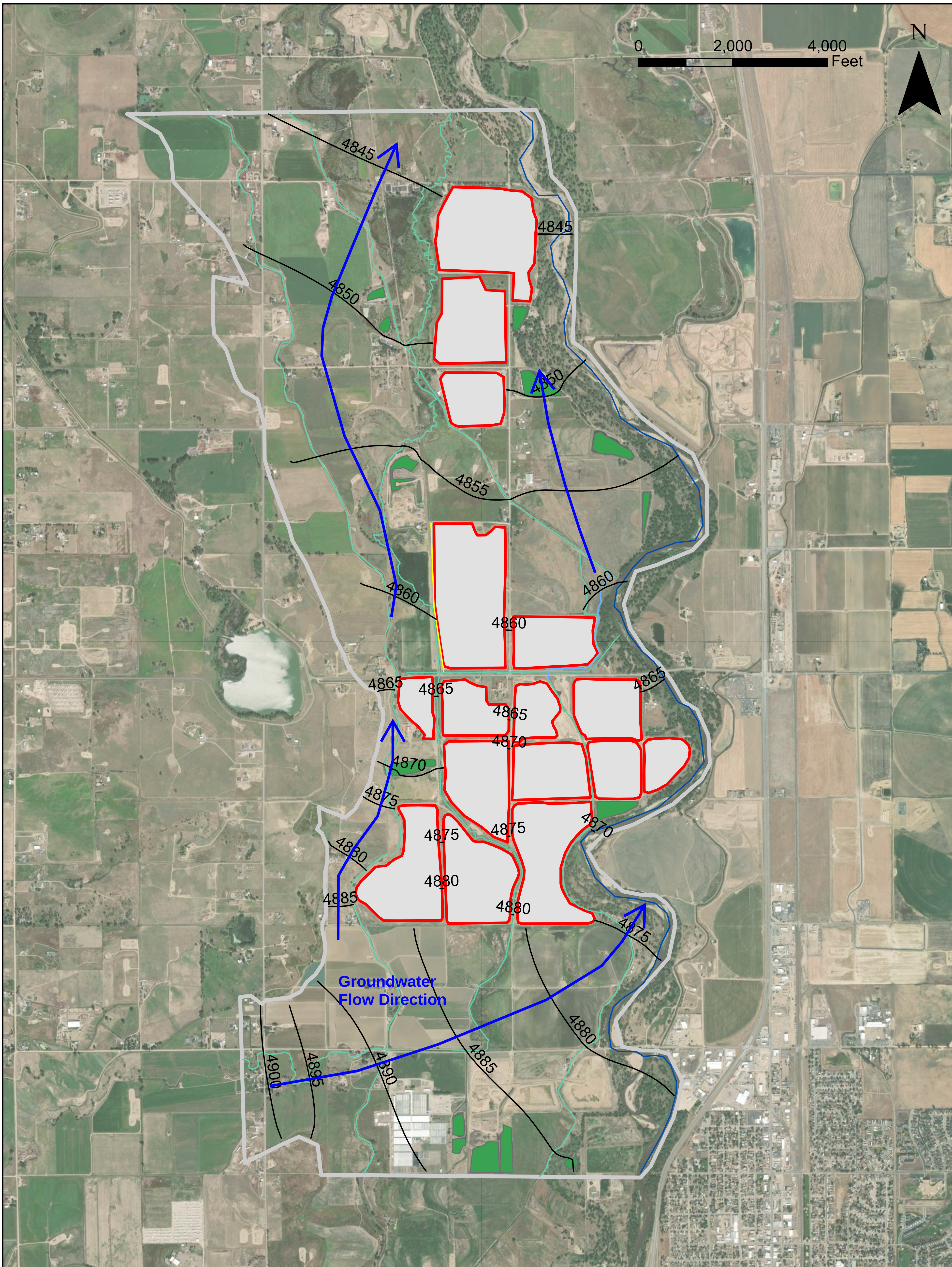
JOB NO: 20C26026.06 | DATE: 7/16/2025

FIGURE NO. 2



Note:

Schnabel Engineering	HEINS PROPERTY GROUNDWATER MODEL Calibration Plot		FIGURE NO. 3
	JOB NO: 20C26026.06	DATE: 06/10/2024	



Legend

- Groundwater Elevation Contour (C.I. = 5ft)
- Lupton Ditch
- South Platte River
- Zadel Drain
- Ditch Drains
- Model Domain
- Slurry Walls
- Lakes

Schnabel ENGINEERING

HEINS PROPERTY GROUNDWATER MODEL
Existing Conditions Steady State Results

7/16/2025	PROJECT NO. 20C26026.06	FIGURE #4

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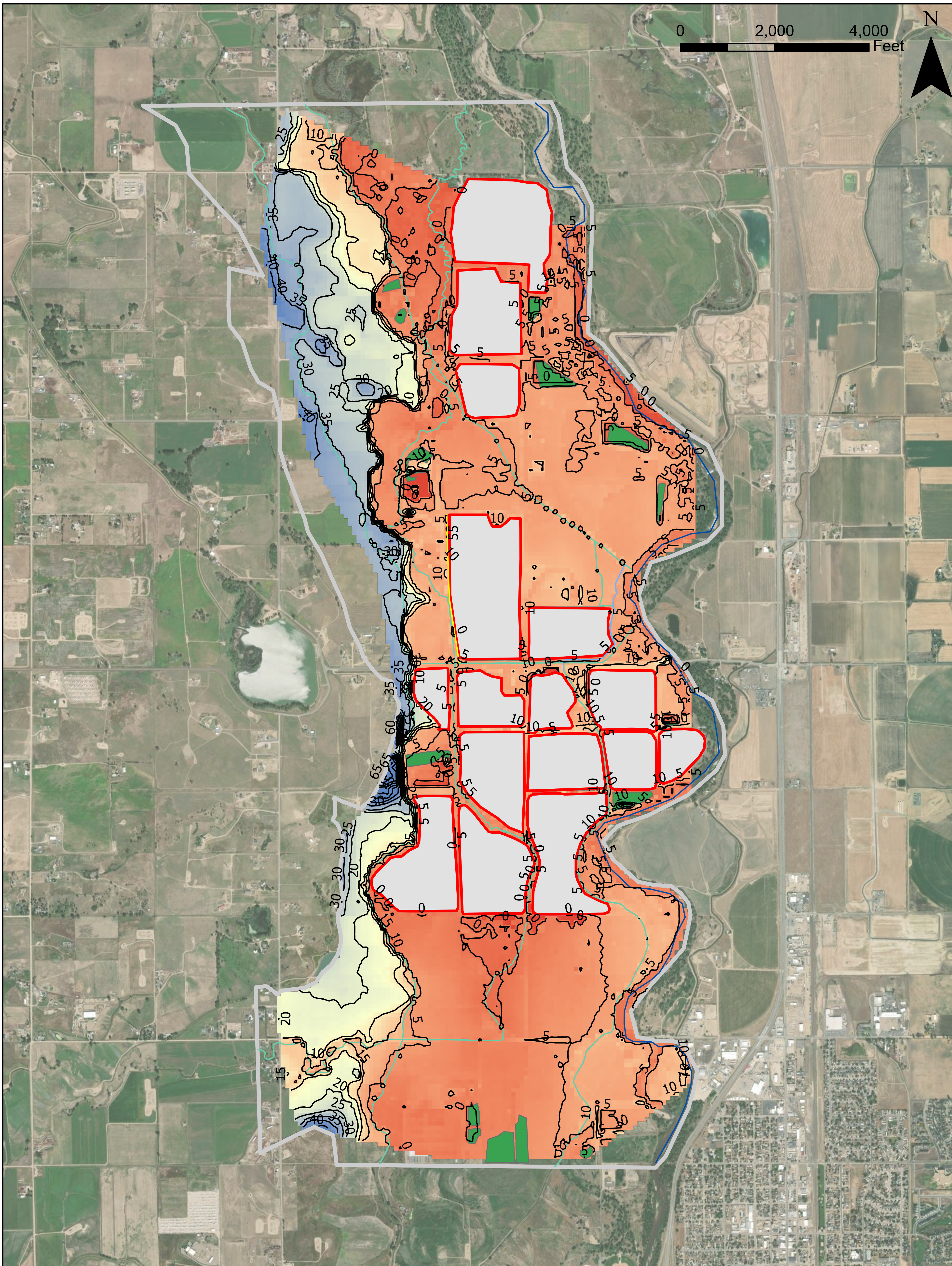

Legend

- Depth to Groundwater (C.I. = 5ft)
- Lupton Ditch
- South Platte River
- Zadel Drain
- Ditch Drains
- Model Domain
- Slurry Walls
- Lakes

Depth to Groundwater
Feet
69
0

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HEINS PROPERTY GROUNDWATER MODEL
Existing Conditions Depth to Groundwater

8/8/2025	PROJECT NO. 20C26026.06	FIGURE #5

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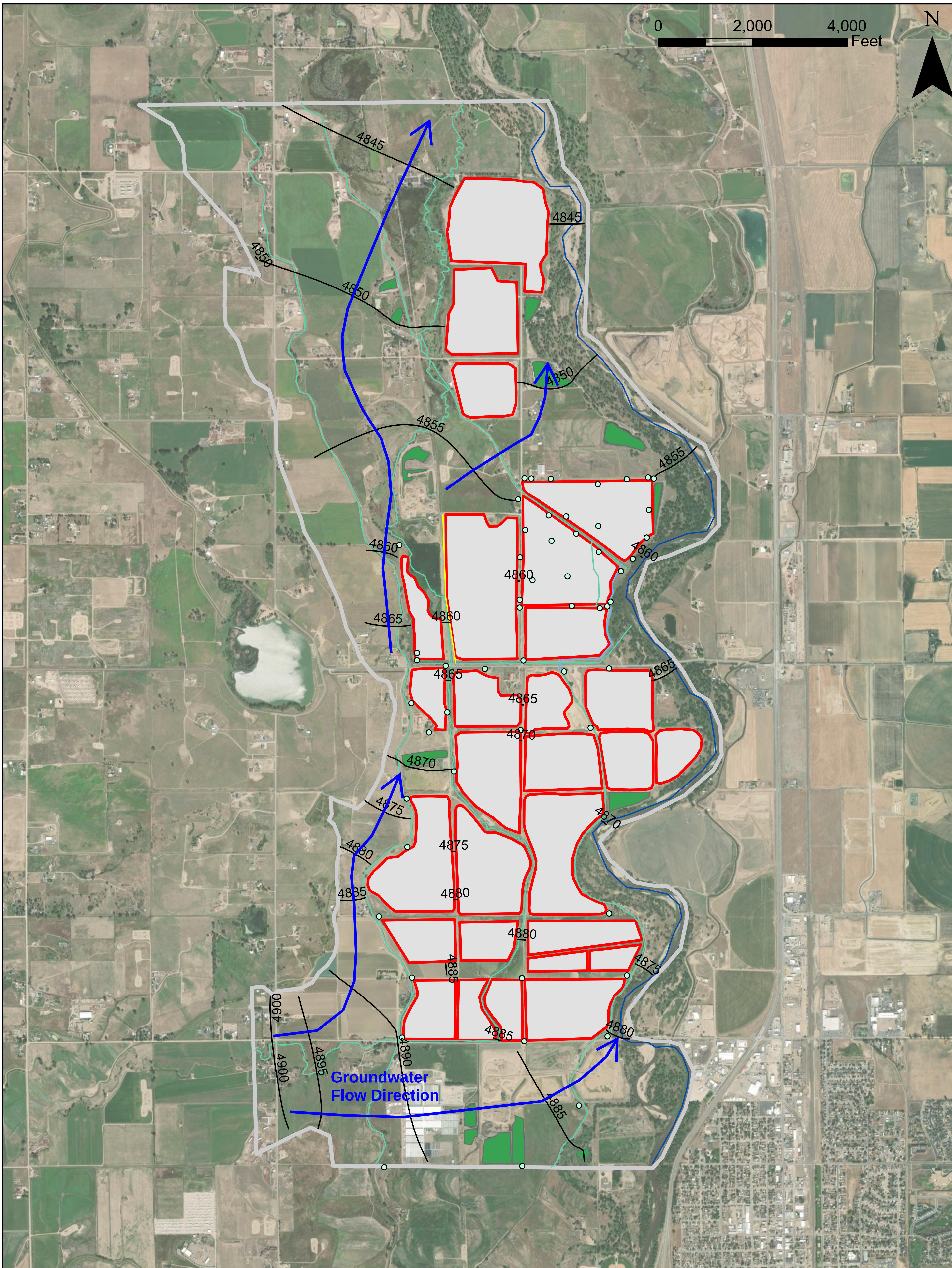

Legend

- Monitoring Wells
- Groundwater Elevation (C.I. = 5ft)
- Lupton Ditch
- South Platte River
- Zadel Drain
- Ditch Drains
- Model Domain
- Slurry Walls
- Lakes

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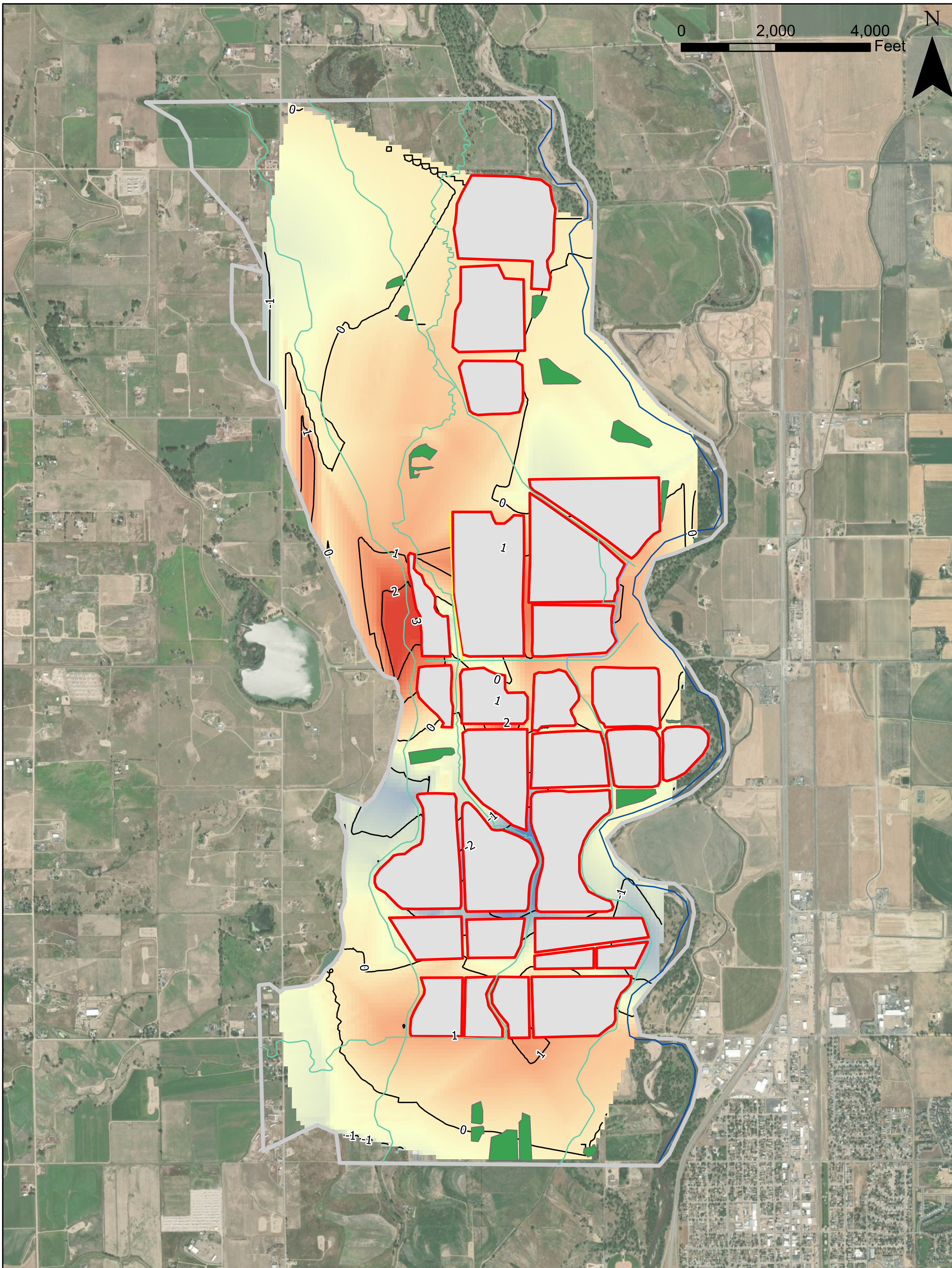
HEINS PROPERTY GROUNDWATER MODEL
Predictive Simulation Results

7/16/2025	PROJECT NO. 20C26026.06	FIGURE #6

6/13/2025 O:\Longmont\2020\20C26026.06 Heins Property\03-SE_Products\07-GIS\Heins_Property_060925.aprx



Legend

- Lupton Ditch
- South Platte River
- Zadel Drain
- Ditch Drains
- Model Domain
- Lakes
- Slurry Walls
- Change Contours (C.I. = 1ft)

Change from Existing Results (Feet)

3

-3

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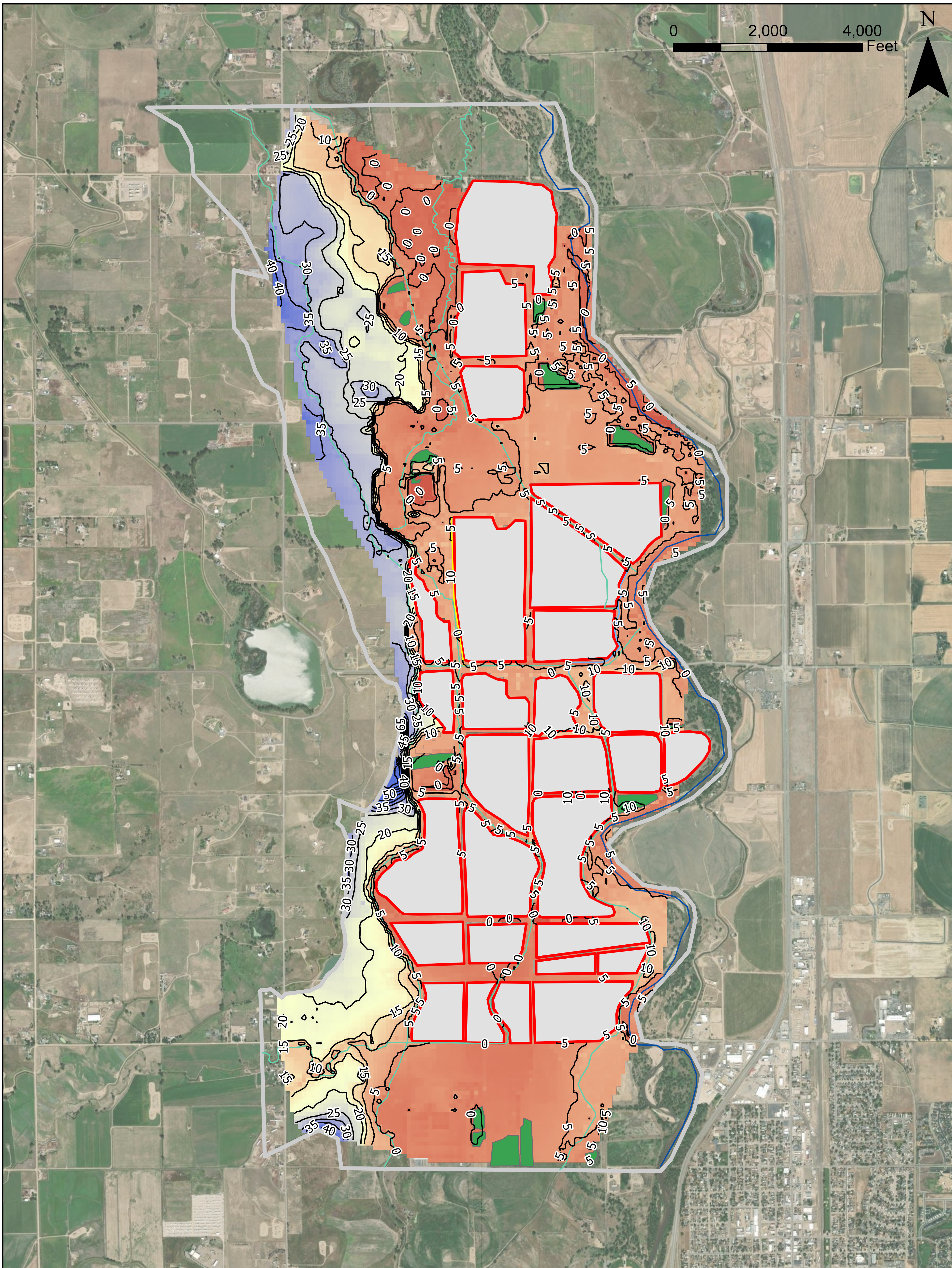
HEINS PROPERTY GROUNDWATER MODEL

Predictive Simulation Change from Existing

7/16/2025	PROJECT NO. 20C26026.06	FIGURE #7

6/13/2025 O:\Longmont\2020\20C26026.06 Heins Property\03-SE_Products\07-GIS\Heins_Property_060925.aprx



Legend

- Depth to Groundwater (C.I. = 5ft)
- Lupton Ditch
- South Platte River
- Zadel Drain
- Ditch Drains
- Model Domain
- Lakes
- Slurry Walls

Depth to Groundwater (Feet)
70
0

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HEINS PROPERTY GROUNDWATER MODEL
Predictive Simulation Depth to Groundwater

8/8/2025	PROJECT NO. 20C26026.06	FIGURE #8

8/7/2025 O:\Longmont\2020\20C26026.06 Heins Property\03-SE_Products\07-GIS\Heins_Property_060925.aprx