ENGINEER'S INSPECTION REPORT

INSPECTOR: JAB

OFFICE OF THE STATE ENGINEER - DIVISION OF WATER RESOURCES - DAM SAFETY BRANCH 1313 SHERMAN STREET, ROOM 818, DENVER, CO 80203, (303) 866-3581

DAM NAME:	JUNIATA			T: 120S	R: 0970W	S: 31	COUNTY: MESA	DATE OF INSPECTION:	5/22/2023
DAM ID:	420128	YRCompl:	1979	DAM HEIGHT(FT):	98.3	SPILLWAY WIDTH(FT):	30.0	PREVIOUS INSPECTION:	5/6/2022
CLASS:	High hazard			DAM LENGTH(FT):	2000.0	SPILLWAY CAPACITY(CFS):	1000.0	NORMAL STORAGE (AF):	7281.0
DIV:	4	WD:	42	CRESTWIDTH(FT):	30.0	FREEBOARD (FT):	5.2	SURFACE AREA(AC):	150.0
EAP:	3/5/2019			CRESTELEV(FT):	5759.8	DRAINAGE AREA (AC.):	1350.0	OUTLET INSPECTED:	7/24/2017

CURRENT RESTRICTION: -- NONE --

OWNER:	CITY OF GRAND JUNCTION	OWNER REP.:	MARK RITTERBUSH
ADDRESS:	333 WEST AVENUE	CONTACT NAME:	MARK RITTERBUSH
	GRAND JUNCTION CO 81501-0000	CONTACT PHONE:	(970) 256-4185X

INSPECTION PARTY : S. Connell; J. Blumberg

REPRESENTING : Owner; CO DNR

FIELD CONDITIONS OBSERVED

WATER LEVEL: BELOW DAM CREST _____ FT. Below Spillway _____ FT. GAGE ROD READING 5750.6

GROUND MOISTURE CONDITION: [✓] DRY [ ] WET [ ] SNOWCOVER OTHER _____

DIRECTIONS: MARK AN X FOR CONDITIONS FOUND AND UNDERLINE WORDS THAT APPLY

UPSTREAM SLOPE

PROBLEMS NOTED: [✓] (0)NONE [ ] (1)RIPRAP - MISSING, SPARSE, DISPLACED, WEATHERED [ ] (2) WAVE EROSION - WITH SCARPS

[ ] (3) CRACKS WITH DISPLACEMENT [ ] (4) SINKHOLE [ ] (5) APPEARS TOO STEEP [ ] (6) DEPRESSIONS OR BULGES [ ] (7) SLIDES

[ ] (8) CONCRETE FACING - HOLES, CRACKS, DISPLACED, UNDERMINED [ ] (9) OTHER

Changes: none observed. No signs of distress noted. Slopes appears stable, with good riprap coverage.

Actions: none

CONDITIONS OBSERVED: [ ] Good [X] Acceptable [ ] Poor

CREST

PROBLEMS NOTED: [✓] (10) NONE [ ] (11) RUTS OR PUDDLES [ ] (12) EROSION [ ] (13) CRACKS - WITH DISPLACEMENT [ ] (14) SINKHOLES

[ ] (15) NOT WIDE ENOUGH [ ] (16) LOW AREA [ ] (17) MISALIGNMENT [ ] (18) IMPROPER SURFACE DRAINAGE [ ] (19) OTHER

Changes: crest appears generally unchanged from previous inspection; exhibits good grade, alignment and gravel cover. No signs of distress observed.

Actions: none at this time.

CONDITIONS OBSERVED: [ ] Good [X] Acceptable [ ] Poor

DOWNSTREAM SLOPE

PROBLEMS NOTED: [✓] (20) NONE [ ] (21) LIVESTOCK DAMAGE [ ] (22) EROSION OR GULLIES [ ] (23) CRACKS - WITH DISPLACEMENT [ ] (24) SINKHOLE

[ ] (25) APPEARS TOO STEEP [ ] (26) DEPRESSIONS OR BULGES [ ] (27) SLIDE [ ] (28) SOFT AREAS [ ] (29) OTHER

Changes: none observed. Slope appears stable and generally consistent with previous inspection.

Actions: none

CONDITIONS OBSERVED: [ ] Good [X] Acceptable [ ] Poor

SEEPAGE

PROBLEMS NOTED: [ ] (30) NONE [✓] (31) SATURATED EMBANKMENT AREA [✓] (32) SEEPAGE EXITS ON EMBANKMENT

[ ] (33) SEEPAGE EXITS AT POINT SOURCE [ ] (34) SEEPAGE AREA AT TOE [ ] (35) FLOW ADJACENT TO OUTLET [ ] (36) SEEPAGE INCREASED / MUDDY

DRAIN OUTFALLS SEEN [ ] No [✓] Yes Show location of drains on sketch and indicate amount and quality of discharge. [ ] (37) FLOW INCREASED / MUDDY [ ] (38) DRAIN DRY / OBSTRUCTED

[✓] (39) OTHER submerged toe drain

(31, 32) Staked seepage areas high on the right side downstream embankment exhibited moist soils and alkali salts, but no flowing or standing water. Willow shoots establishing in the area should be removed. Seepage appears when reservoir levels exceed the elevation of the original spillway.

(39) Blue PVC toe drain collects from VCP system that is visible at the bottom of the manhole on the right side of the access road. The drain was submerged at the time of the inspection.

Actions: visually inspect the staked seepage area high on the right side downstream embankment for changes in seepage rate or clarity, as the reservoir fills.

CONDITIONS OBSERVED: [ ] Good [X] Acceptable [ ] Poor

OUTLET

PROBLEMS NOTED: ☐ (40) NONE ☐ (41) NO OUTLET FOUND ☐ (42) POOR OPERATING ACCESS ☐ (43) INOPERABLE

☐ (44) UPSTREAM OR DOWNSTREAM STRUCTURE DETERIORATED (45) OUTLET OPERATED DURING INSPECTION ☐ YES ☑ NO

INTERIOR INSPECTED ☑ (120) NO ☐ (121)YES ☐ (46) CONDUIT DETERIORATED OR COLLAPSED ☐ (47) JOINTS DISPLACED ☐ (48) VALVE LEAKAGE

☑ (49) OTHER broken air vent prohibits video inspection

Juniata is equipped with a mid- and low-level outlet.

(49) Efforts are ongoing to repair the broken air vent that serves the low-level outlet. A break most likely occurred at the concrete intake structure and at several points along the line, and possibly in the steel pipe that connects the valves to the concrete intake structure. Recent dive inspection revealed the valves are not braced and that they extend approximately one foot beyond the concrete intake stucture, contrary to what is shown on plans (ref C-0661A). Video inspection of the low-level outlet cannot occur until the air vent is replaced as flows from the outlet pipe prohibit forward movement by a camera crawler. As such, condition of the conduit is unknown.

A combined rating of Acceptable and Poor is given, due to the unknown condition of the low-level conduit, but to acknowledge that the City has hired an Engineer to design a repair that can be implemented by a Diving Team.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☒ Poor

SPILLWAY

PROBLEMS NOTED: ☑ (50) NONE ☐ (51) NO EMERGENCY SPILLWAY FOUND ☐ (52) EROSION WITH BACKCUTTING ☐ (53) CRACK - WITH DISPLACEMENT

☐ (54) APPEARS TO BE STRUCTURALLY INADEQUATE ☐ (55) APPEARS TOO SMALL ☐ (56) INADEQUATE FREEBOARD ☐ (57) FLOW OBSTRUCTED

☐ (58) CONCRETE DETERIORATED / UNDERMINED ☐ (59) OTHER

Spillway activation observed during site visit on 6Mar2023. Control weir, riprap channel and grouted riprap channel sections all appear to be functioning as intended.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

MONITORING

EXISTING INSTRUMENTATION FOUND ☐ (110) NONE ☑ (111) GAGE ROD ☑ (112) PIEZOMETERS ☐ (113) SEEPAGE WEIRS / FLUMES

☑ (114) SURVEY MONUMENTS ☑ (115) OTHER toe drain

MONITORING OF INSTRUMENTATION ☐ (116) NO ☑ (117) YES PERIODIC INSPECTIONS BY: ☑ (118) OWNER ☐ (119) ENGINEER

PZ-3 reading a little high but within expected range, PZ-5B and PZ-6A reading low but within expected range (were reported as low last season also). Toe drain reading low but within reasonable range (see attached monitoring plots).

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

MAINTENANCE AND REPAIRS

PROBLEMS NOTED: ☐ (60 NONE ☐ (61) ACCESS ROAD NEEDS MAINTENANCE ☐ (62) LIVESTOCK DAMAGE

☑ (63) BRUSH ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☐ (64) TREES ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE

☐ (65) RODENT ACTIVITY ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☐ (66) DETERIORATED CONCRETE - FACING, OUTLET, SPILLWAY

☐ (67) GATE AND OPERATING MECHANISM NEED MAINTENANCE ☑ (68) OTHER two Russian Olive trees in lower spillway

(63) We discussed clearing the brush that has established on different aspects of your dam. Please also remove the willow shoots that are beginning to establish in the staked seepage area, high on the right side downstream slope.

(68) We also discussed clearing the two Russian Olive trees that have established in the lower part of the spillway channel.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

Go to next page for Overall Conditions and Items Requiring Actions

OVERALL CONDITIONS

Overall, Juniata Dam appears stable, with no obvious signs of distress. In general, your EAP is up-to-date with the exception of:
CDHSEM Field Manager has changed from Drew Peterson to Bobbie Lucero
NWS Warning Hydrologist has changed from Aldis Strantins to Erin Walter
Ruby Halpern, our Program Assistant, will work with your staff, Marc Ciarlo, to update this and your other High and Significant Hazard EAPs. Once finalized, please distribute to your EM team.

Your routine monitoring and continued maintenance are greatly appreciated. Please continue to coordinate with our offices on the repair of the air vent that serves your low-level outlet.

Based on this Safety Inspection and recent file review, the overall condition is determined to be:

☑ (71) SATISFACTORY ☐ (72) CONDITIONALLY SATISFACTORY ☐ (73) UNSATISFACTORY

ITEMS REQUIRING ACTION BY OWNER TO IMPROVE THE SAFETY OF THE DAM

MAINTENANCE - ORDINARY REPAIR - MONITORING

☐ OTHER
5/18/2019 - **Remove roots from drain VCP visible in manhole to allow free flow of water ONGOING AS NEEDED**

☐ LUBRICATE AND OPERATE OUTLET GATES THROUGH FULL CYCLE
4/20/2020 - **Annually, as is typical for Juniata Dam. ONGOING.**

☐ MONITOR
4/20/2020 - **Continue your excellent monitoring program and reporting ONGOING (thank you!)**

☐ CLEAR TREES AND/OR BRUSH FROM
5/22/2023 - **u/s & d/s slopes & crest; remove Russian Olive trees from lower spillway**

☐ MONITOR
5/22/2023 - **visually monitor seepage area high on the right d/s embankment as reservoir fills**

ENGINEERING - EMPLOY AN ENGINEER EXPERIENCED IN DESIGN AND CONSTRUCTION OF DAMS TO

☐ PERFORM AN INTERNAL INSPECTION OF THE OUTLET
5/6/2022 - **following air vent repair - RETAINED**

☐ PREPARE PLANS AND SPECIFICATIONS FOR REHABILITATION OF THE DAM
5/22/2023 - **continue working with your Engineer to develop a repair for the low-level outlet air vent**

The State Engineer, by providing this dam safety inspection report, does not assume responsibility for any unsafe condition of the subject dam. The sole responsibility for the safety of this dam rests with the reservoir owner or operator, who should take every step necessary to prevent damages caused by leakage or overflow of waters from the reservoir or floods resulting from a failure of the dam.

SAFE STORAGE LEVEL: RECOMMENDED AS A RESULT OF THIS INSPECTION

☑ (101) FULL STORAGE
☐ (102) CONDITIONAL FULL STORAGE
☐ (103) RECOMMENDED RESTRICTION
☐ (104) CONTINUE EXISTING RESTRICTION

→ { _____ FT. BELOW DAM CREST
_____ FT. BELOW SPILLWAY CREST
_____ FT. GAGE HEIGHT
☐ ☐ NO STORAGE-MAINTAIN OUTLET FULLY OPEN

REASON FOR RESTRICTION

ACTIONS REQUIRED FOR CONDITIONAL FULL STORAGE OR CONTINUED STORAGE AT THE RESTRICTED LEVEL:

Engineer's Signature _____ INSPECTED BY
Owner's Signature _____ OWNER/OWNER'S REPRESENTATIVE
DATE: ___/___/___

GUIDELINES FOR DETERMINING CONDITIONS

CONDITIONS OBSERVED - APPLIES TO UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, OUTLET, SPILLWAY

GOOD
In general, this part of the structure has a near new appearance, and conditions observed in this area do not appear to threaten the safety of the dam.

ACCEPTABLE
Although general cross-section is maintained, surfaces may be irregular, eroded, rutted, spalled, or otherwise not in new condition. Conditions in this area do not currently appear to threaten the safety of the dam.

POOR
Conditions observed in this area appear to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO SEEPAGE

GOOD
No evidence of uncontrolled seepage. No unexplained increase in flows from designed drains. All seepage is clear. Seepage conditions do not appear to threaten the safety of the dam.

ACCEPTABLE
Some seepage exists at areas other than the drain outfalls, or other designed drains. No unexplained increase in seepage. All seepage is clear. Seepage conditions observed do not currently appear to threaten the safety of the dam.

POOR
Seepage conditions observed appear to threaten the safety of the dam. Examples:
1) Designed drain or seepage flows have increased without increase in reservoir level.
2) Drain or seepage flows contain sediment, i.e., muddy water or particles in jar samples.
3) Widespread seepage, concentrated seepage, or ponding appears to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO MONITORING

GOOD
Monitoring includes movement surveys and leakage measurements for all dams, and piezometer readings for High hazard dams. Instrumentation is in reliable, working condition. A plan for monitoring the instrumentation and analyzing results by the owner's engineer is in effect. Periodic inspections by owner's engineer.

ACCEPTABLE
Monitoring includes movement surveys and leakage measurements for High and Significant hazard dams; leakage measurements for Low hazard dams. Instrumentation is in serviceable condition. A plan for monitoring instrumentation is in effect by owner. Periodic inspections by owner or representative. OR, NO MONITORING REQUIRED.

POOR
All instrumentation and monitoring described under "ACCEPTABLE" here for each class of dam, are not provided, or required periodic readings are not being made, or unexplained changes in readings are not reacted to by the owner.

CONDITIONS OBSERVED - APPLIES TO MAINTENANCE AND REPAIR

GOOD
Dam appears to receive effective on-going maintenance and repair, and only a few minor items may need to be addressed.

ACCEPTABLE
Dam appears to receive maintenance, but some maintenance items need to be addressed. No major repairs are requirecl

POOR
Dam does not appear to receive adequate maintenance. One or more items needing maintenance or repair has begun to threaten the safety of the dam.

OVERALL CONDITIONS

SATISFACTORY
The safety inspection indicates no conditions that appear to threaten the safety of the dam, and the dam is expected to perform satisfactorily under all design loading conditions. Most of the required monitoring is being performed.

CONDITIONALLY SATISFACTORY
The safety inspection indicates symptoms of structural distress (seepage, evidence of minor displacements, etc.), which, if conditions worsen, could lead to the failure of the dam. Essential monitoring, inspection, and maintenance must be performed as a requirement for continued full storage in the reservoir.

UNSATISFACTORY
The safety inspection indicates definite signs of structural distress (excessive seepage, cracks, slides, sinkholes, severe deterioration, etc.), which could lead to the failure of the dam if the reservoir is used to full capacity. The dam is judged unsafe for full storage of water.

SAFE STORAGE LEVEL

FULL STORAGE
Dam may be used to full capacity with no conditions attached.

CONDITIONAL FULL STORAGE
Dam may be used to full storage if certain monitoring, maintenance, or operational conditions are met.

RESTRICTION
Dam may not be used to full capacity, but must be operated at some reduced level in the interest of public safety.

HAZARD CLASSIFICATION OF DAMS

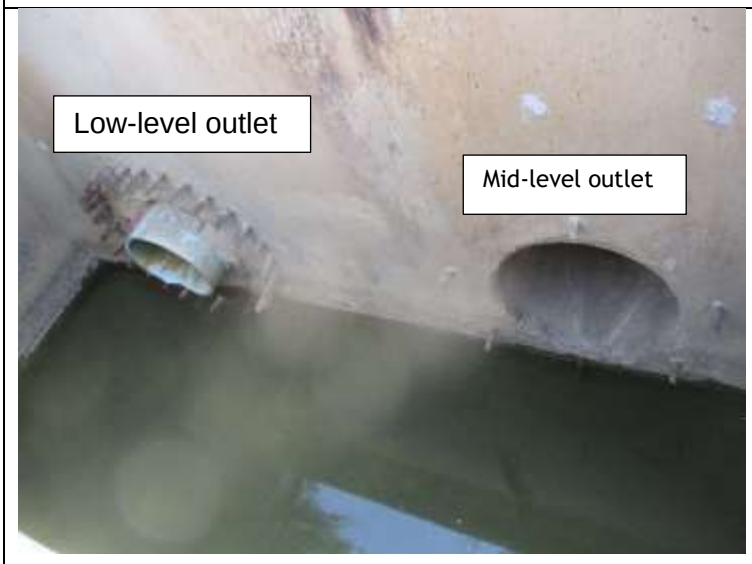
High hazard
Loss of human life is expected in the event of failure of the dam, while the reservoir is at the high water line.

Significant hazard
Significant damage to improved property is expected in the event of failure of the dam while the reservoir is at the high water line, but no loss of human life is expected.

Low hazard
Loss of human life is not expected, and damage to improved property is expected to be small, in the event of failure of the dam while the reservoir is at high water fine.

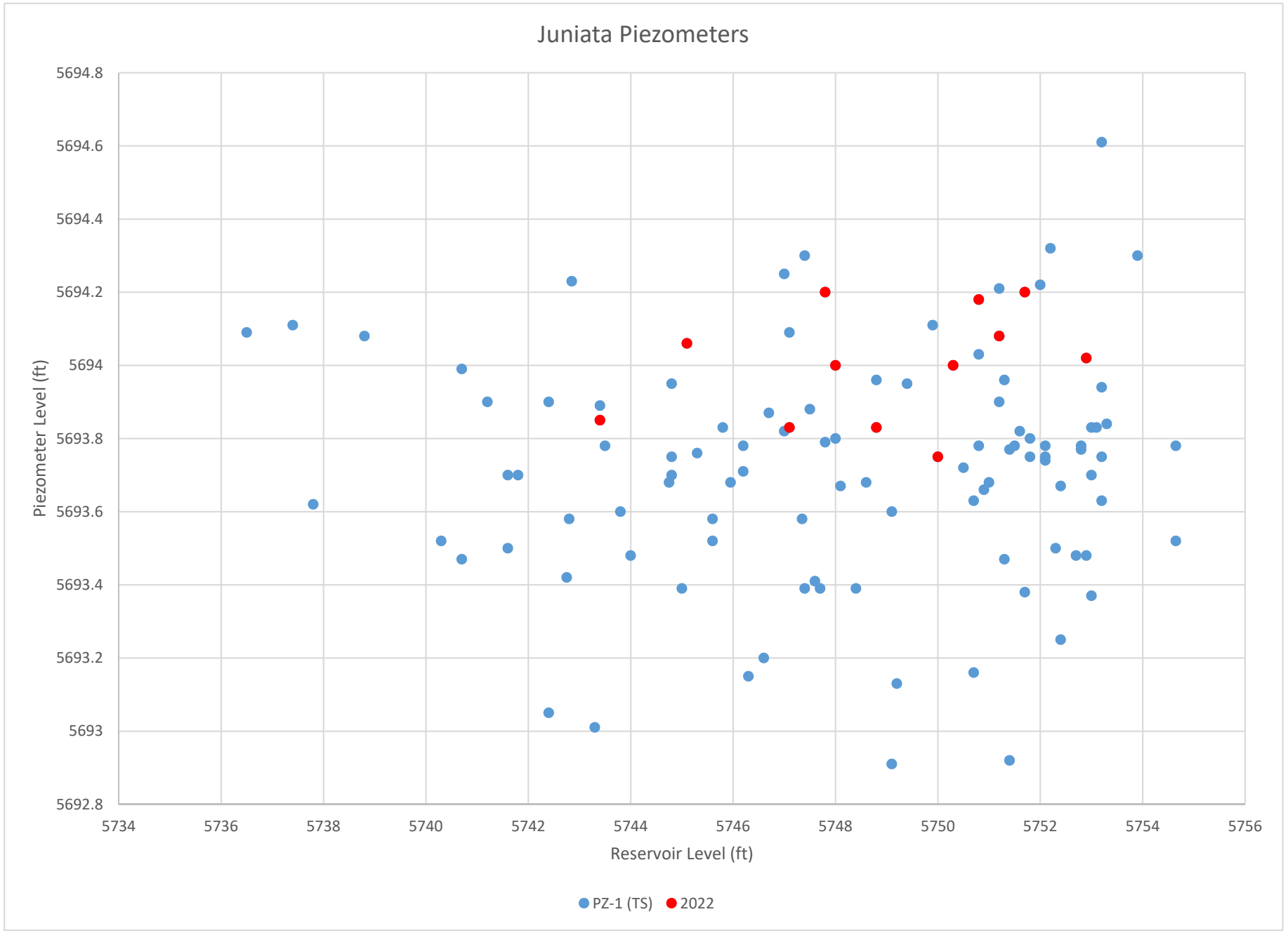
NPH hazard - No loss of life or damage to improved property, or loss of downstream resource is expected in the event of failure of the dam while the reservoir is at the high water line.

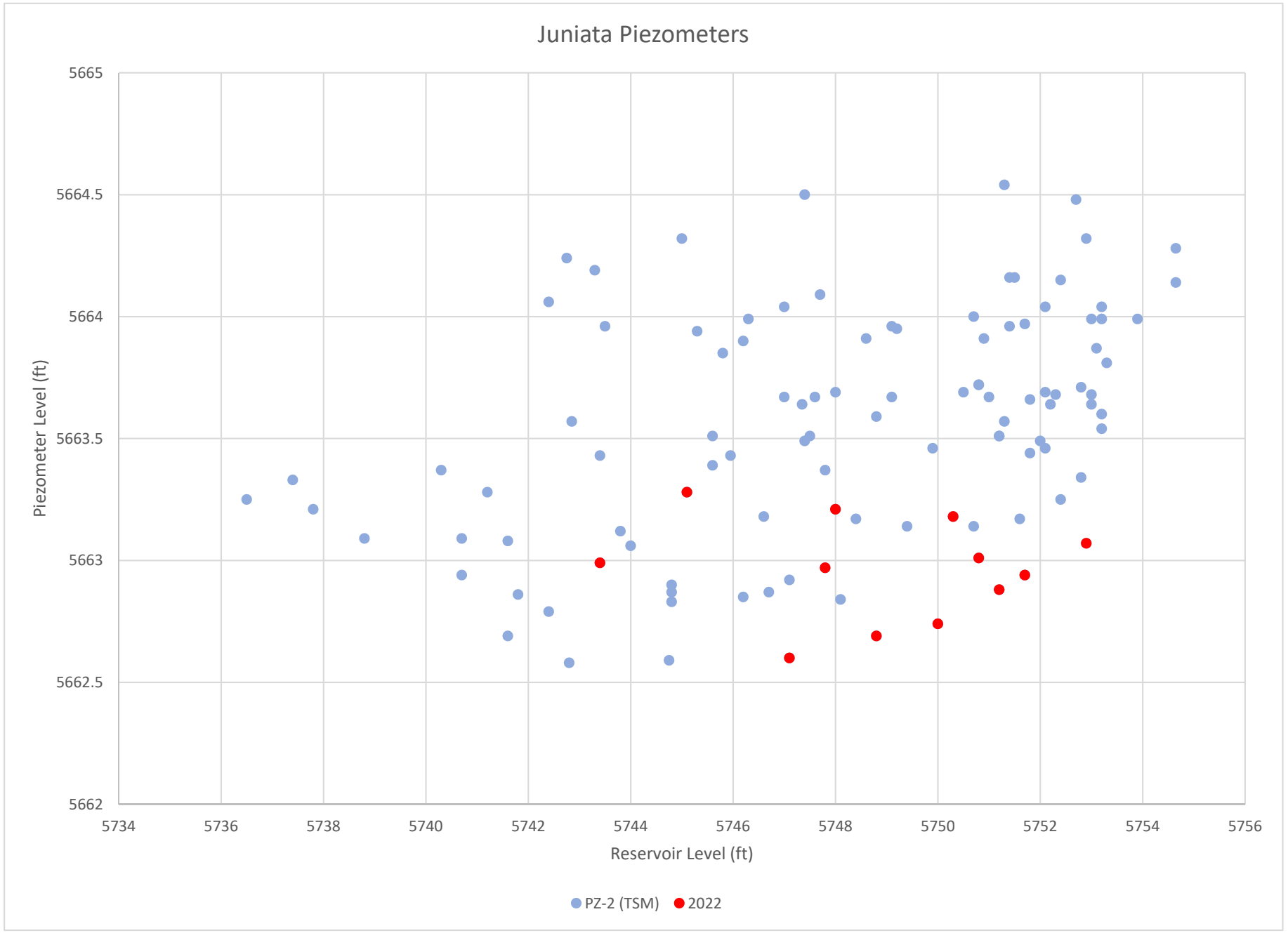
PHOTOGRAPHS	
	*Looking across the upstream slope toward the right abutment.*
	*View of the crest from the right side.*
	*Looking across the downstream slope from the right side.*

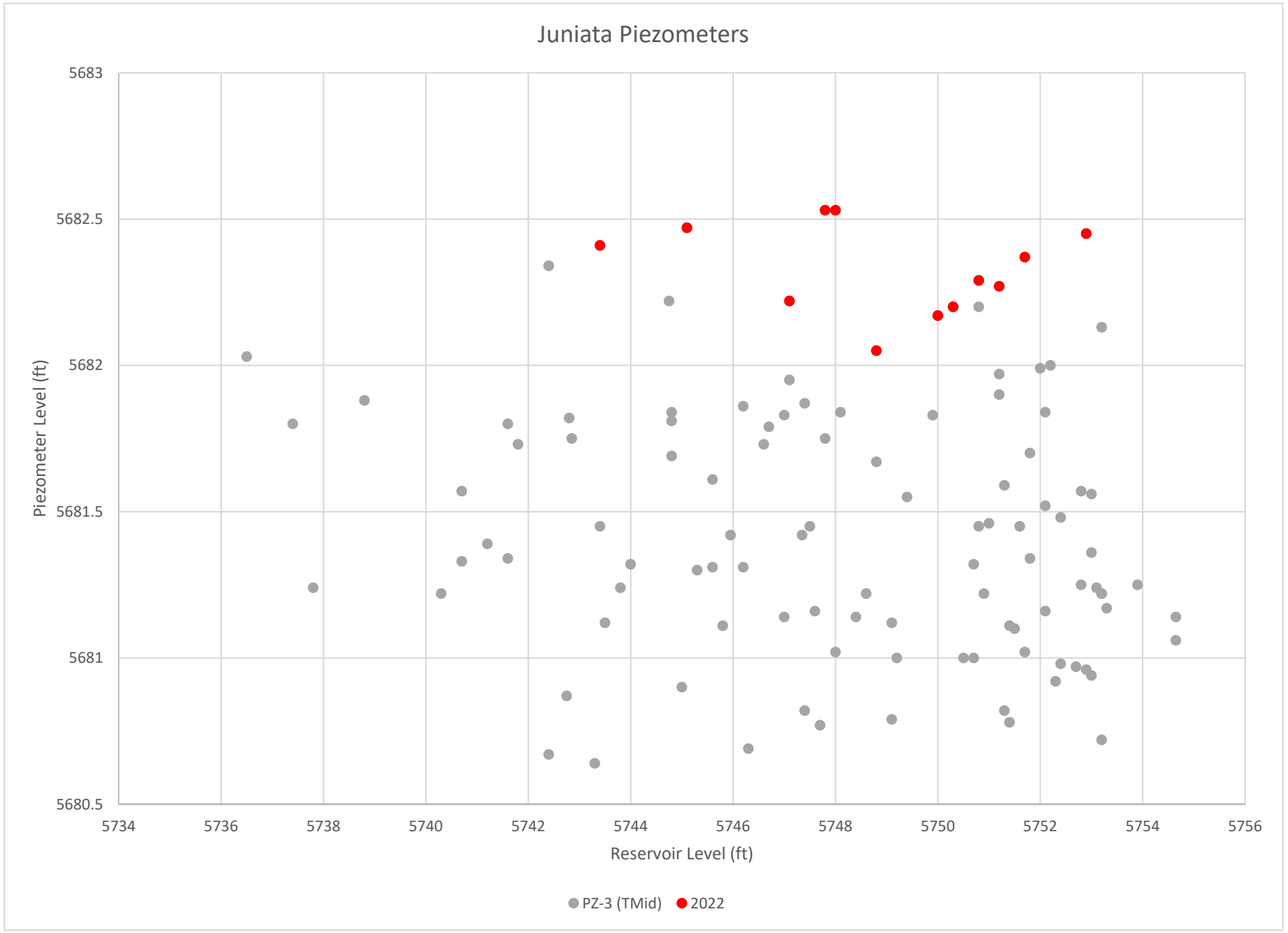
PHOTOGRAPHS	
	*Google imagery showing downstream slope. Seepage area identified.*
	*Seepage area, marked by moist soils and alkali salts. Recommend to visually observe as reservoir levels continue to rise.*
	*Mid- and low-level outlet terminal ends.*

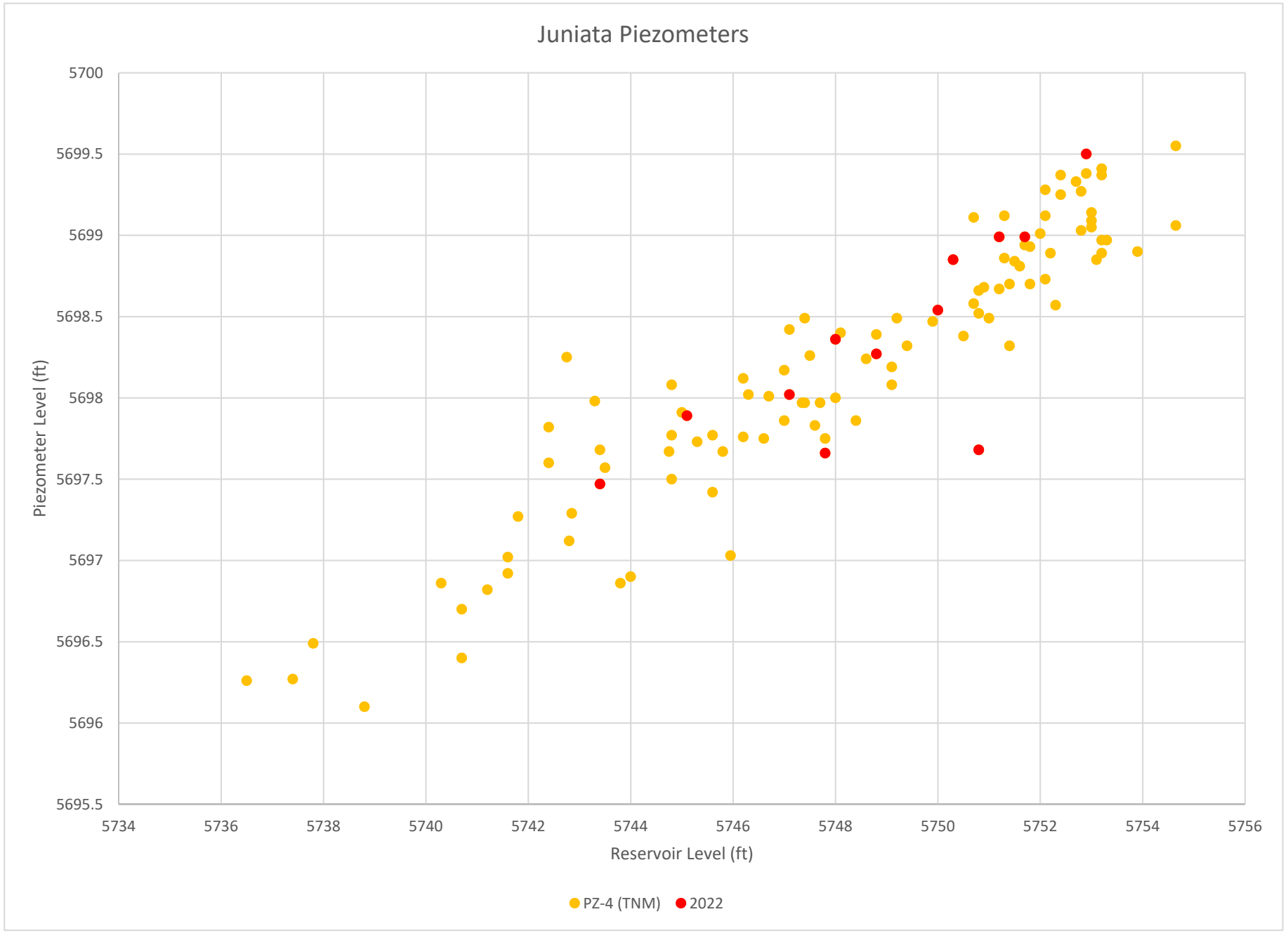
PHOTOGRAPHS	
	*VCP runs through bottom of manhole.*
	*Submerged toe drain.*
	*Spillway activation photo taken 6Mar2023.*

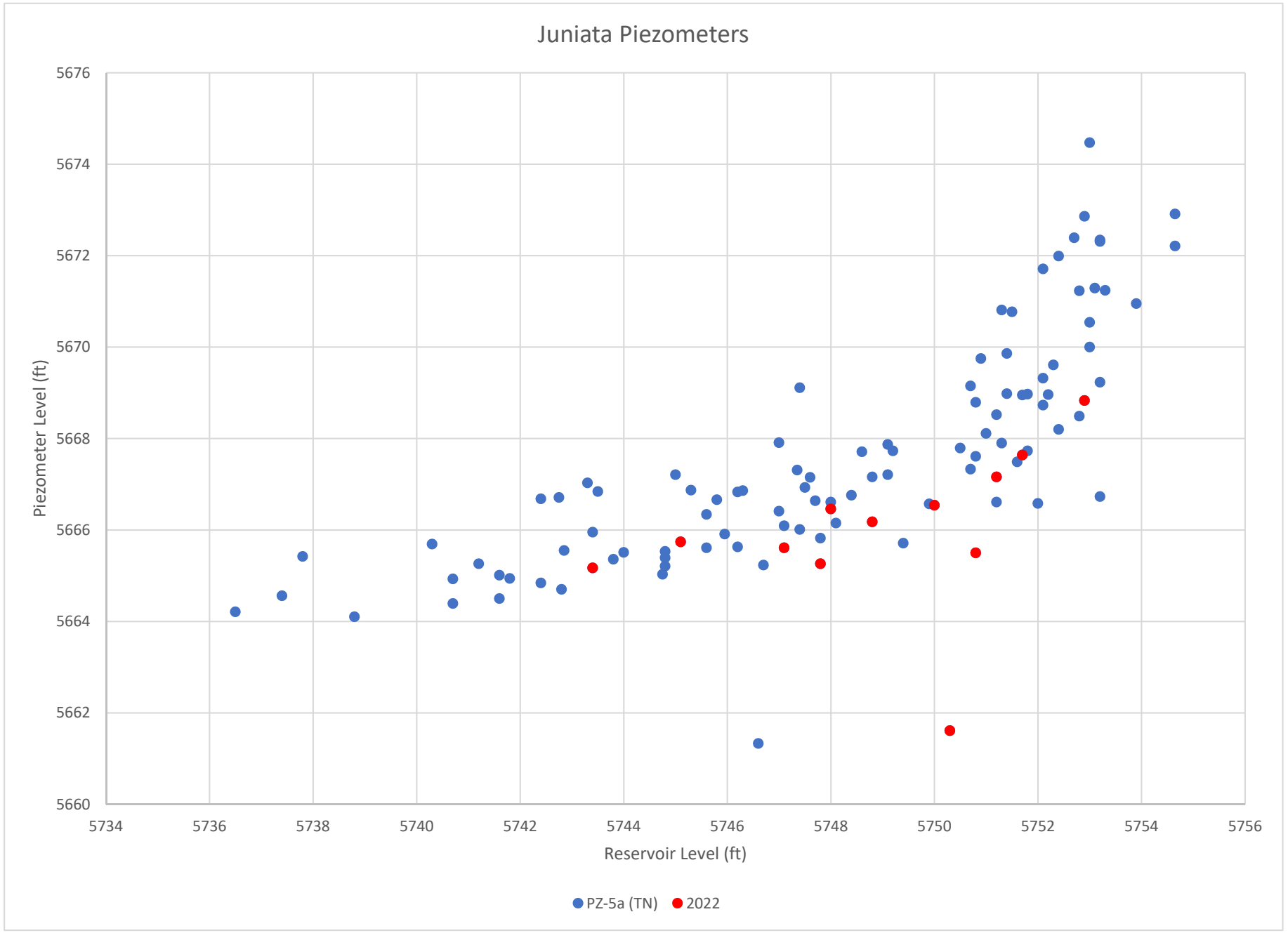
PHOTOGRAPHS	
	*Spillway activation photo taken 6Mar2023.*
	*Spillway activation photo taken 6Mar2023.*

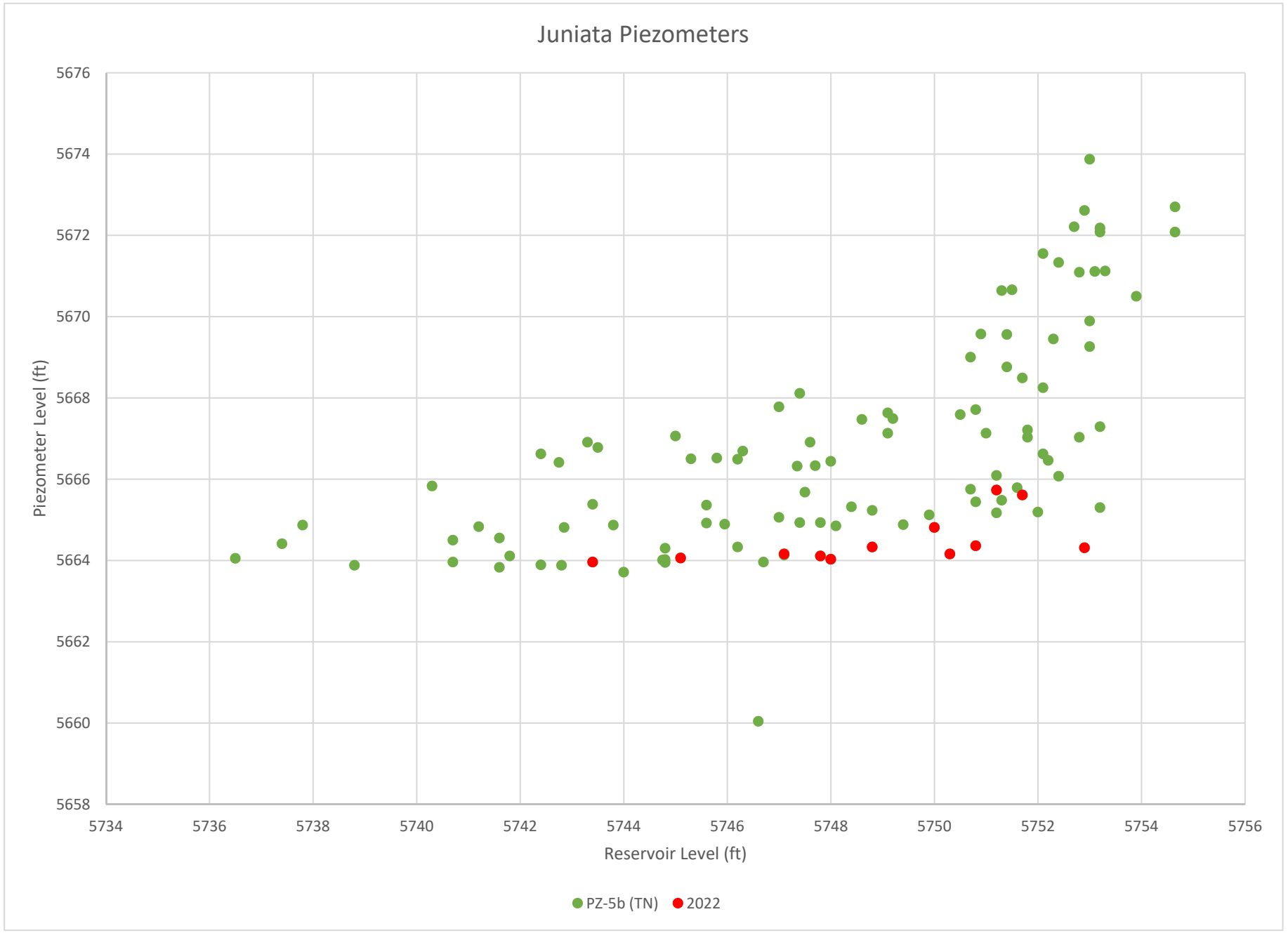

Juniata Piezometers
Piezometer Level (ft)
5694.8
5694.6
5694.4
5694.2
5694
5693.8
5693.6
5693.4
5693.2
5693
5692.8
5734
5736
5738
5740
5742
5744
5746
5748
5750
5752
5754
5756
Reservoir Level (ft)
PZ-1 (TS)
2022

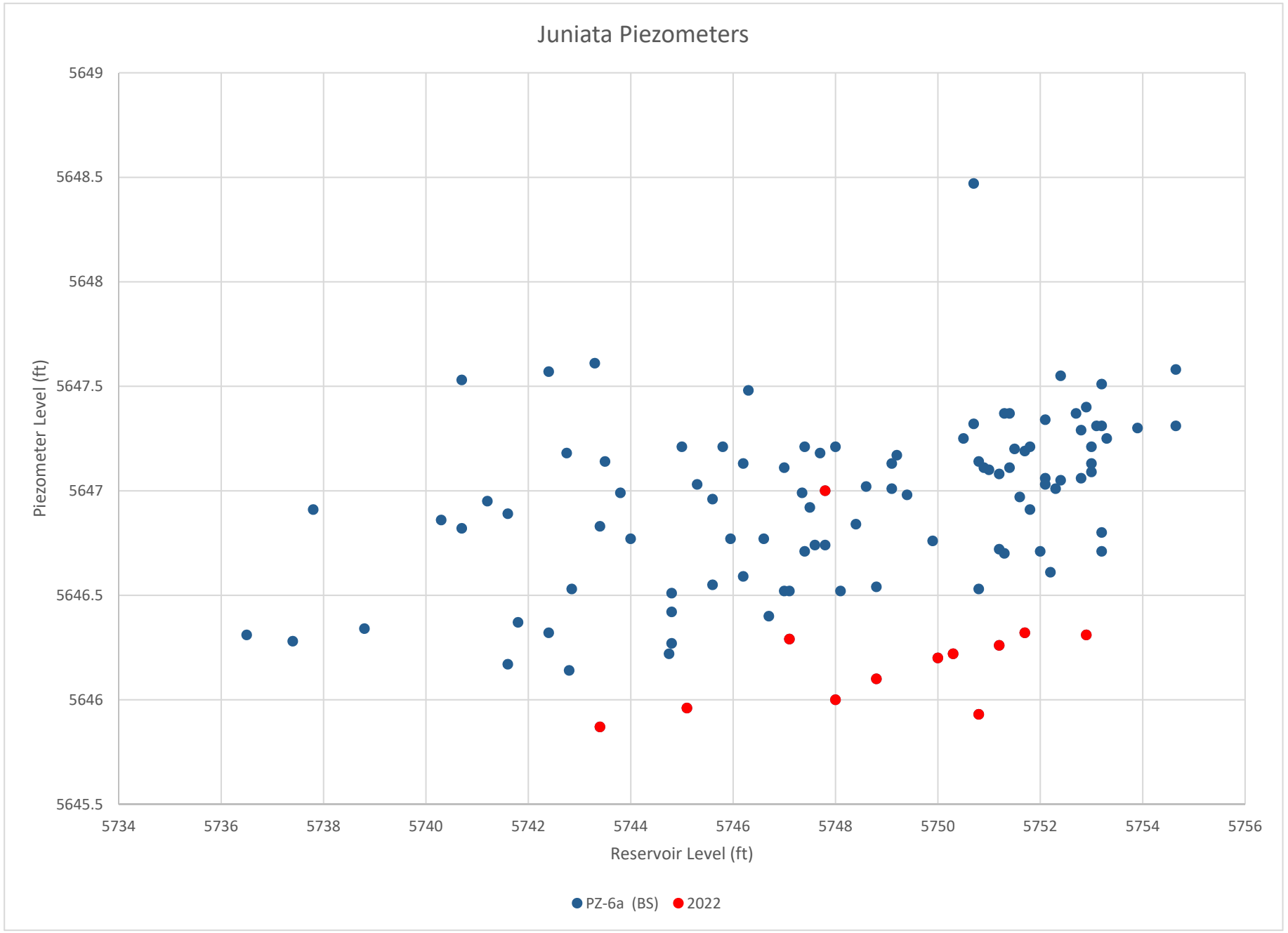

Juniata Piezometers
5665
5664.5
5664
5663.5
5663
5662.5
5662
Piezometer Level (ft)
5734
5736
5738
5740
5742
5744
5746
5748
5750
5752
5754
5756
Reservoir Level (ft)
PZ-2 (TSM)
2022

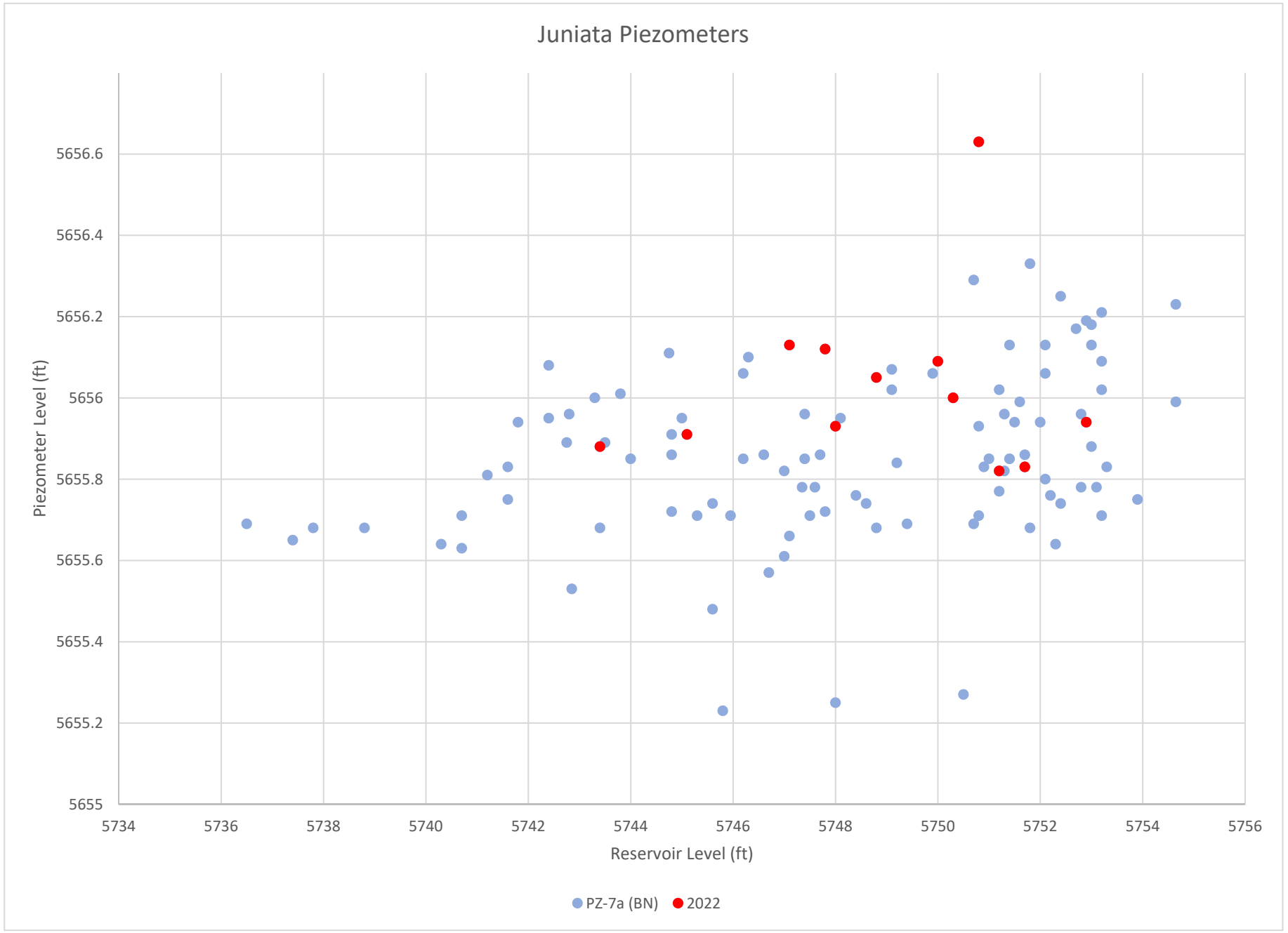

Juniata Piezometers
5683
5682.5
5682
5681.5
5681
5680.5
Piezometer Level (ft)
5734
5736
5738
5740
5742
5744
5746
5748
5750
5752
5754
5756
Reservoir Level (ft)
PZ-3 (TMid)
2022


Juniata Piezometers
Piezometer Level (ft)
5700
5699.5
5699
5698.5
5698
5697.5
5697
5696.5
5696
5695.5
5734
5736
5738
5740
5742
5744
5746
5748
5750
5752
5754
5756
Reservoir Level (ft)
PZ-4 (TNM)
2022


Juniata Piezometers
Piezometer Level (ft)
5676
5674
5672
5670
5668
5666
5664
5662
5660
5734
5736
5738
5740
5742
5744
5746
5748
5750
5752
5754
5756
Reservoir Level (ft)
PZ-5a (TN)
2022


Juniata Piezometers
Piezometer Level (ft)
5676
5674
5672
5670
5668
5666
5664
5662
5660
5658
5734
5736
5738
5740
5742
5744
5746
5748
5750
5752
5754
5756
Reservoir Level (ft)
PZ-5b (TN)
2022


Juniata Piezometers
Piezometer Level (ft)
5649
5648.5
5648
5647.5
5647
5646.5
5646
5645.5
5734
5736
5738
5740
5742
5744
5746
5748
5750
5752
5754
5756
Reservoir Level (ft)
PZ-6a (BS)
2022


Juniata Piezometers
Piezometer Level (ft)
5656.6
5656.4
5656.2
5656
5655.8
5655.6
5655.4
5655.2
5655
5734
5736
5738
5740
5742
5744
5746
5748
5750
5752
5754
5756
Reservoir Level (ft)
PZ-7a (BN)
2022

CITY OF GRAND JUNCTION, COLORADO
JUNIATA DAM
I.D. NUMBER 420128

PIEZOMETER READINGS

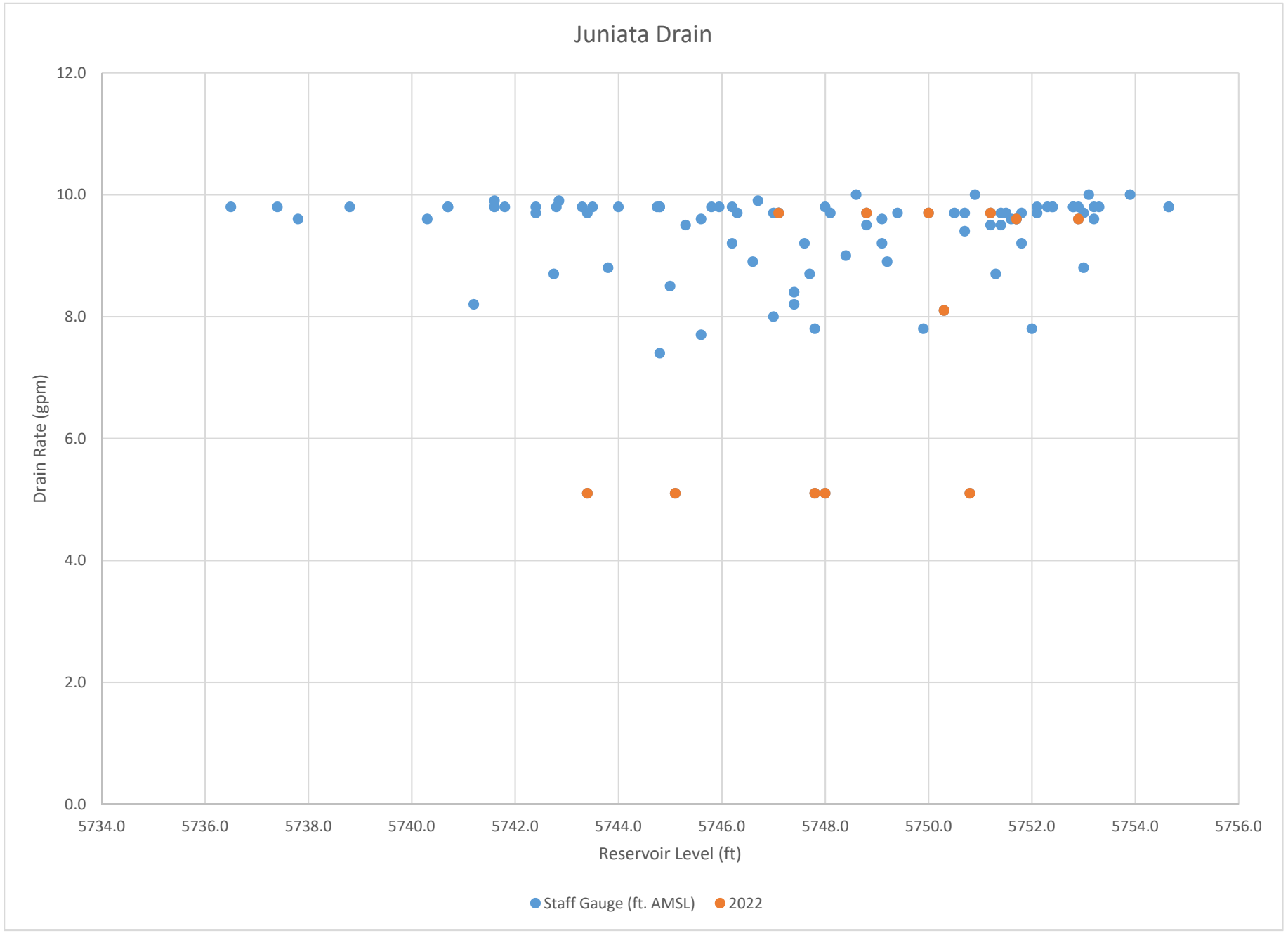
DATE OF OBSERVATION _____

OBSERVER _____ SHEET _____ OF _____

RESERVOIR LEVEL _____

PIEZ & TUBE I.D.	LOCATION		EL. OF PIEZ. TIP	EL.–TOP CASING TUBE	DIST. TOP CASING TO WATER	EL. WATER IN PIEZ	CHANGE IN W.L. EL.
	STATION	OFFSET					
P–1		12' D/S	5669.05	5759.20			
P–2		12' D/S	5659.21	5759.29			
P–3		12' D/S	5664.51	5759.62			
P–4		12' D/S	5685.62	5758.87			
P–5A	3+20	198'D/S	5654.81	5685.51			
P–5B			5661.70	5685.51			
P–6A	7+32	216'D/S	5636.27	5676.51			
P–6B			5656.50	5676.51			
P–7A	10+33	186'D/S	5641.94	5693.03			
P–7B			5654.03	5693.03			
P–7C			5676.66	5693.03			

NOTES:


Juniata Drain
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Drain Rate (gpm)
5734.0
5736.0
5738.0
5740.0
5742.0
5744.0
5746.0
5748.0
5750.0
5752.0
5754.0
5756.0
Reservoir Level (ft)
Staff Gauge (ft. AMSL)
2022