Juniper Ridge Landfill
Phase II Expansion
Project Overview Meetings

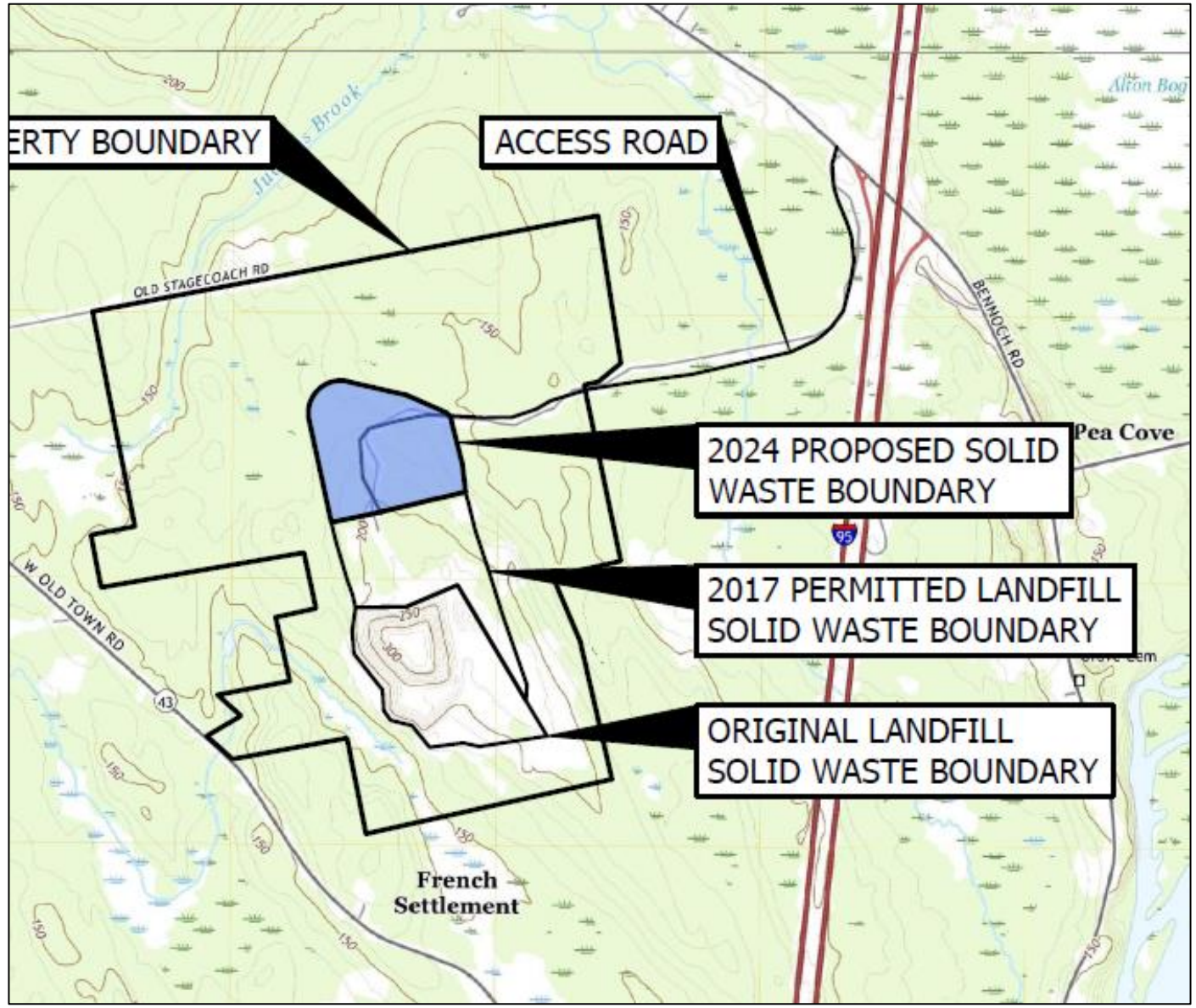
Meeting #3

Geology, Hydrogeology, Water Quality,
Leachate Management, PFAS Treatment

December 4, 2024

Project Overview Meeting Schedule

Nov. 7 6 P.M.	City of Old Town	Town Hall	Project History, Overview, and Permitting Requirements
Nov. 21 6 P.M.	Town of Alton	Town Hall	Visual, Traffic, Natural Resources, Odor
Dec. 4 6 P.M.	City of Old Town	Town Hall	Geology, Hydrogeology, Water Quality, Leachate Management, and PFAS treatment
Dec. 17 6 P.M.	City of Old Town	Town Hall	Phase II Expansion Design, Operations, Noise, and Seagulls


ERTY BOUNDARY
ACCESS ROAD
2024 PROPOSED SOLID WASTE BOUNDARY
2017 PERMITTED LANDFILL SOLID WASTE BOUNDARY
ORIGINAL LANDFILL SOLID WASTE BOUNDARY
OLD STAGECOACH RD
W OLD TOWN RD
BENNOCH RD
Pea Cove
French Settlement
Alton Bog
95
A3

Geology

Goals for site selection

- Deep, dense, fine-grained soils ✓

- Competent bedrock with an interconnected network of fractures that can be used JUST IN CASE ✓

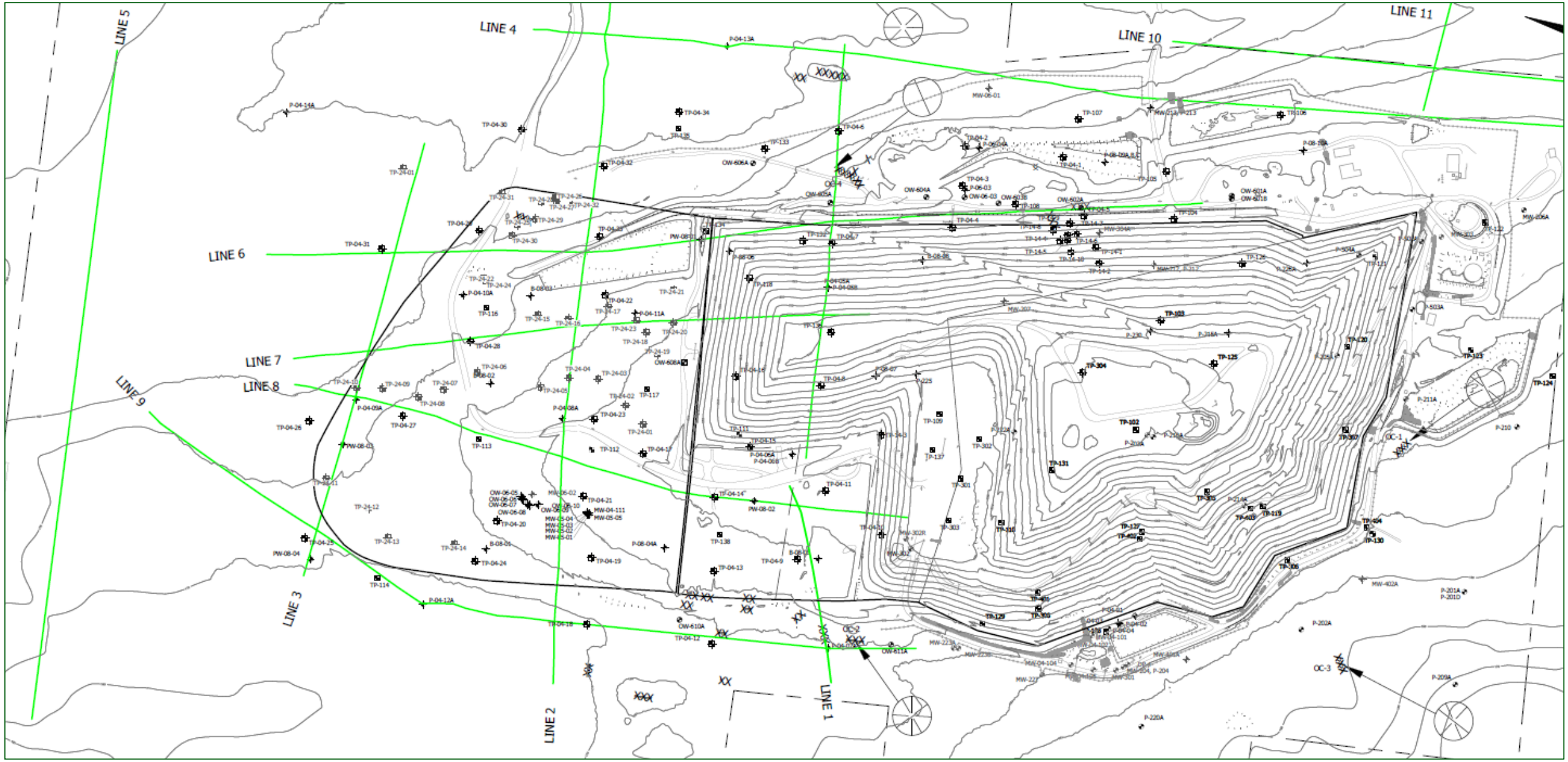
Project Site – Drumlin


French
Settlement
Pushaw

Explorations began in 1989

- Installation of over:
  - 100 borings
  - 150 test pits
  - Geophysical surveys
    (~ 34,000 lineal feet or 6.5 miles)
- Photolineament mapping
- Bedrock outcrop mapping
- Lots of in-situ and lab testing of soils

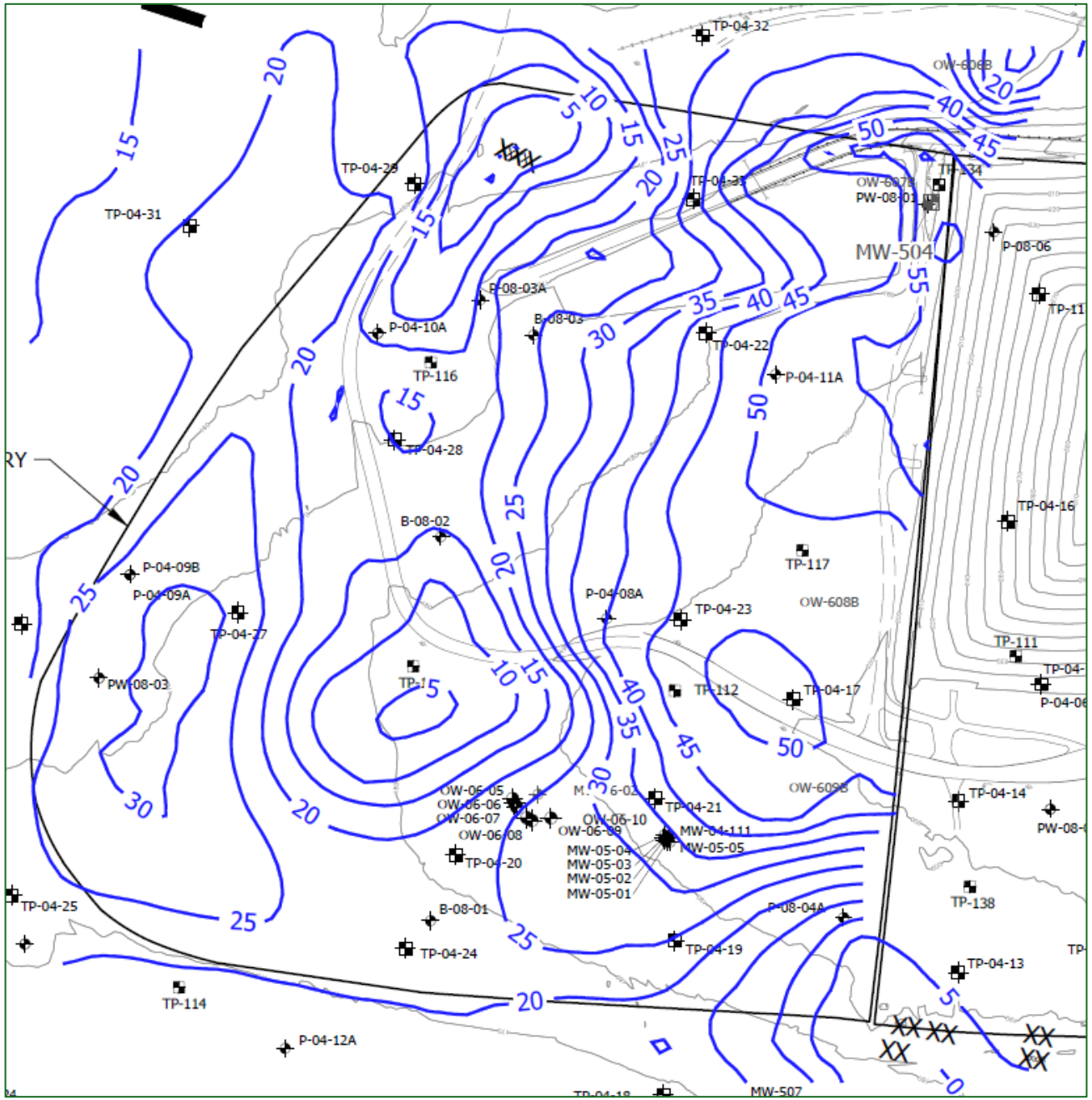
Map of Explorations



Dense Basal Till

- Dense because it was compacted by the glacier
- Basal means scraped across the rocks by a glacier
- Till is a mix of clay, boulders, and everything in between

Soil thickness map



Competent, somewhat metamorphosed rock

PHOTOGRAPHS OF CORE ROCK TYPES

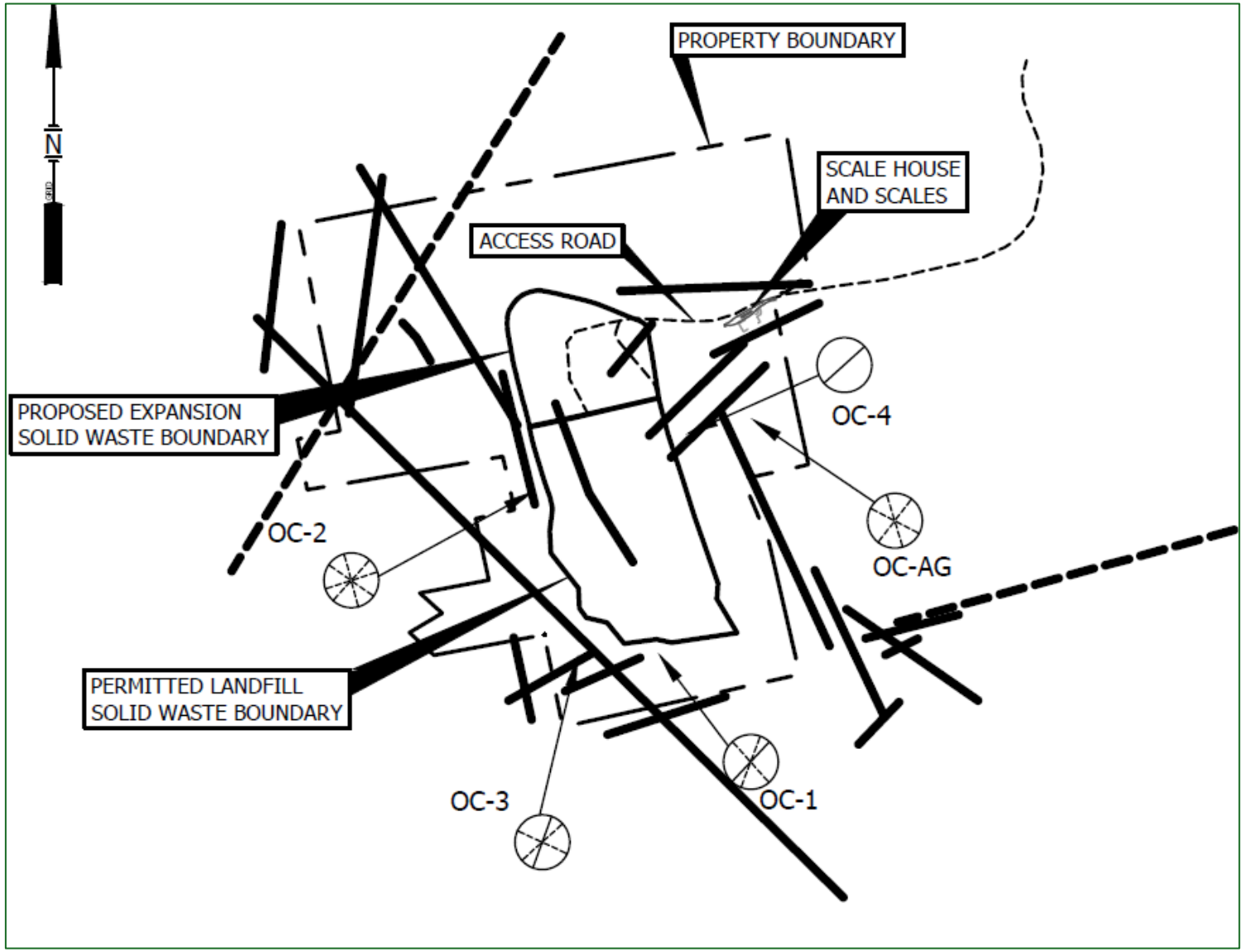
METASILTSTONE

METAGRAYWACKE

PHYLLITE

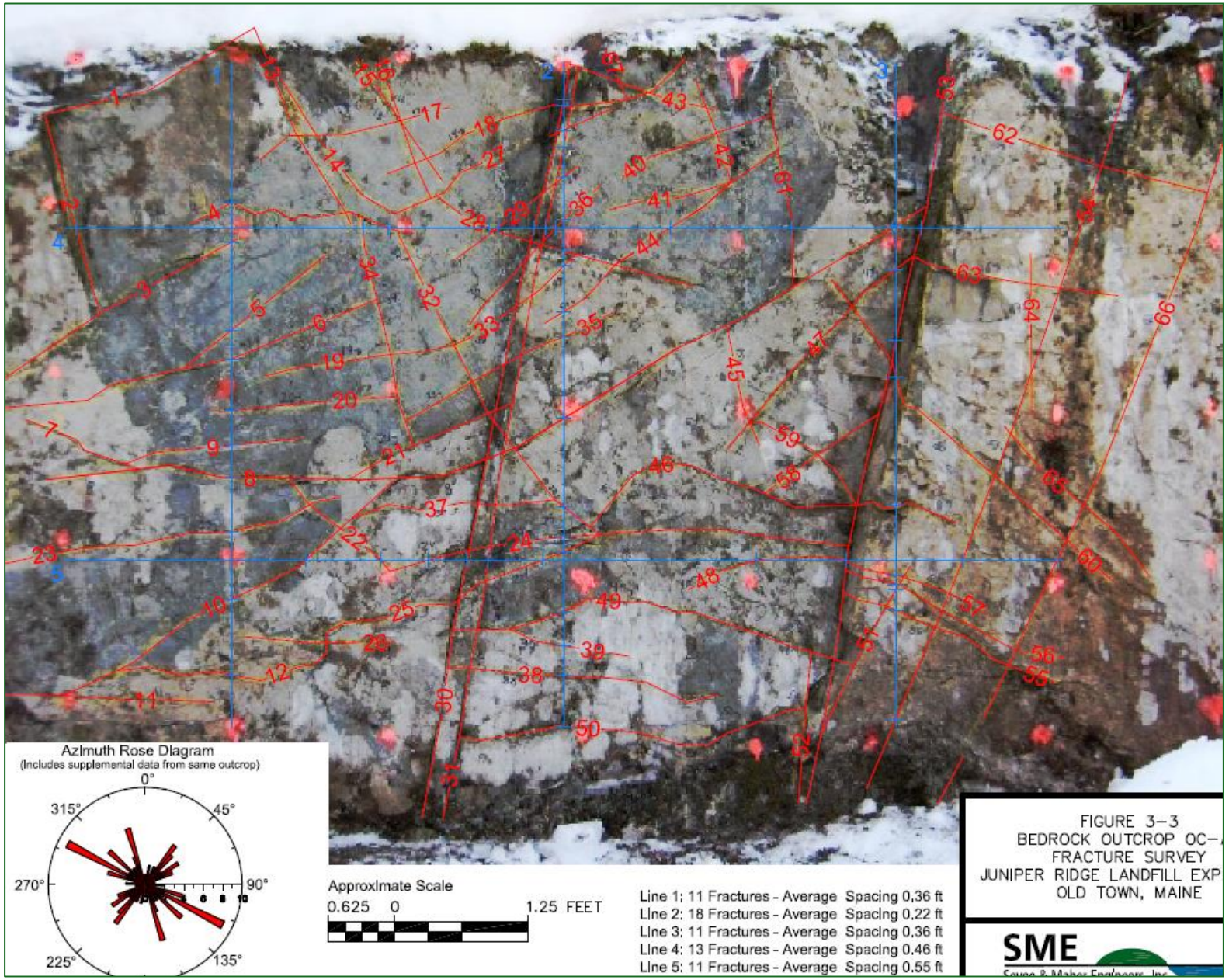
Bedrock

- Overview of fractures

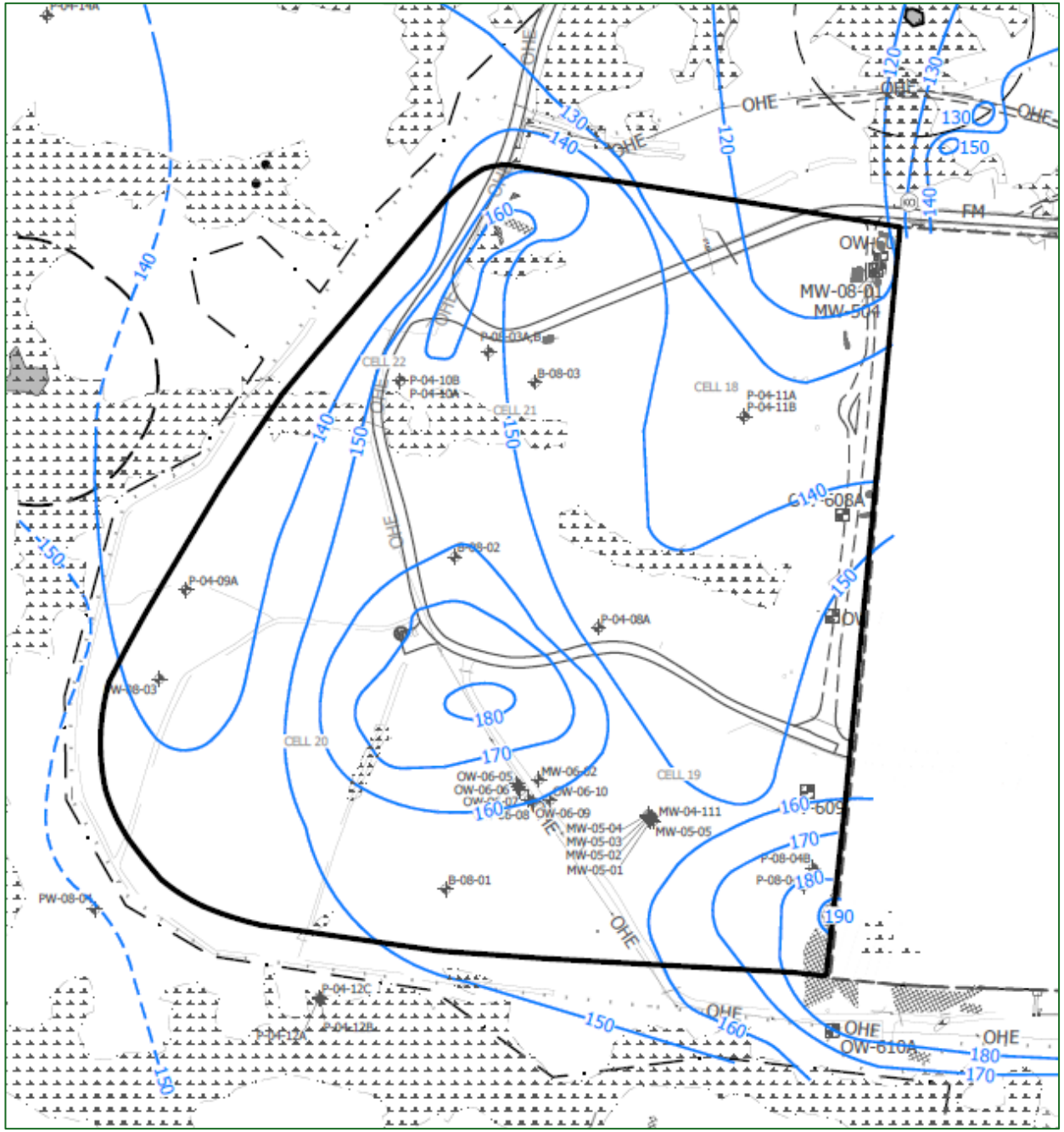


Bedrock Fractures

- Large bedrock outcrop (about 7’x11’ shown)
- Lines are the fractures we found:
  - Interconnected network
  - Uniformly fractured
- Bedrock could be pumped JUST IN CASE – (verified by pumping tests)



Bedrock surface map



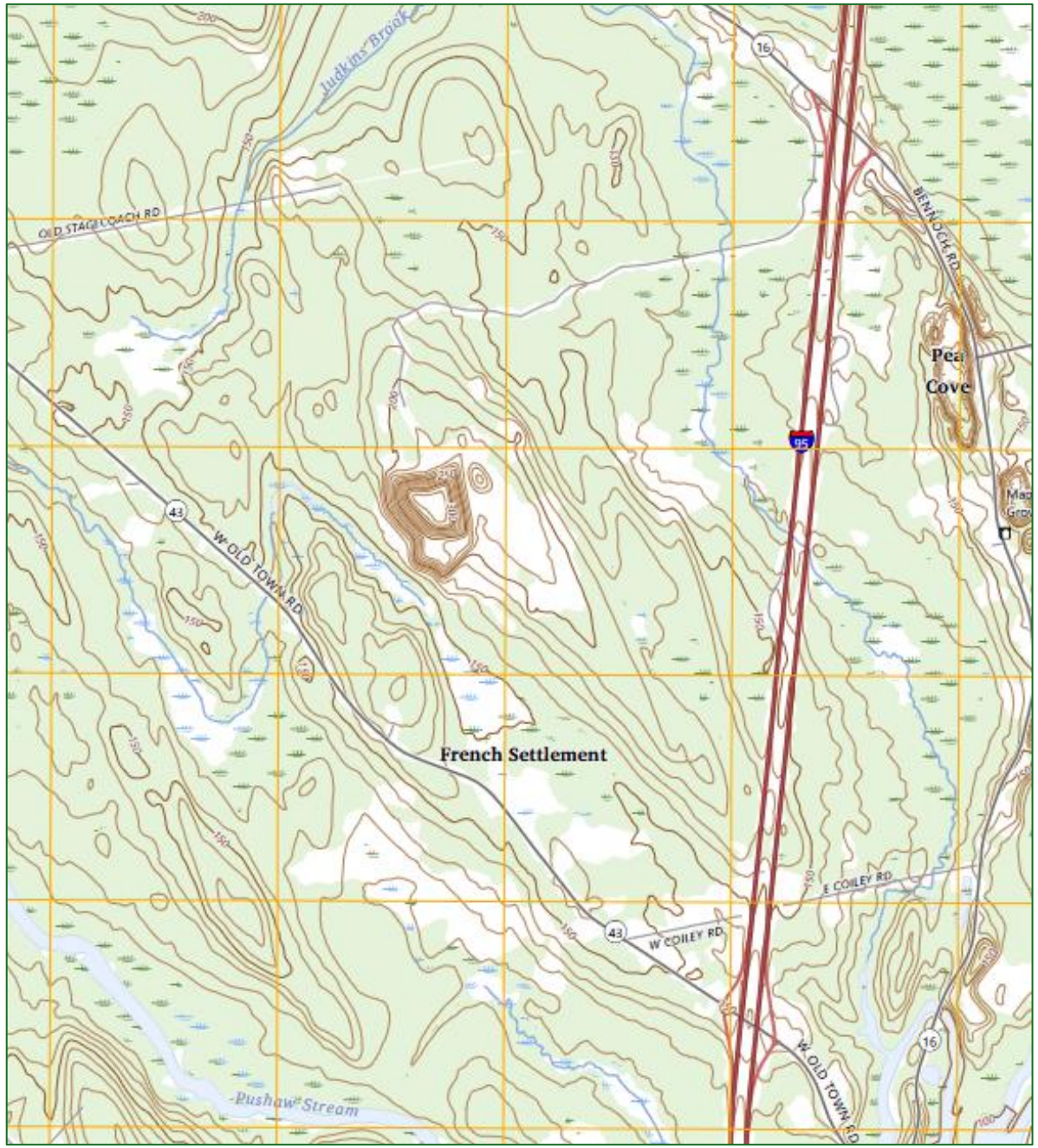
Hydrogeology

Goals for site hydrogeological characteristics

- Low permeability soils ✓
- Hydraulically isolated ✓
- Upward gradients ✓
- Protective of downgradient users ✓

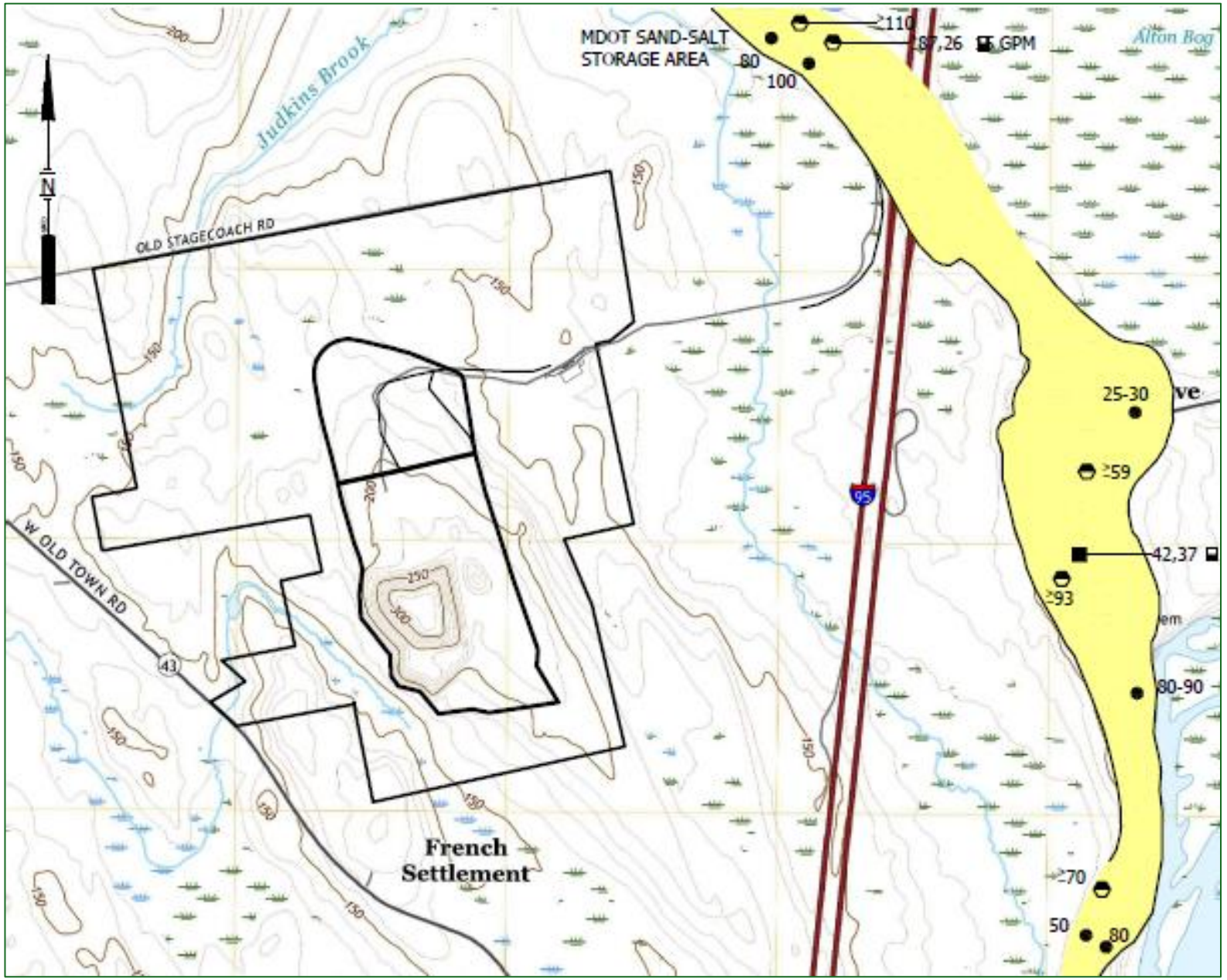
Groundwater Movement

- Water flows downhill, even underground
- From the drumlin to surrounding surface waters



Sand and Gravel Aquifer

- 300’ required for Solid Waste Rules
- Sand and gravel aquifer is >1 mile away



Continued Site Investigations

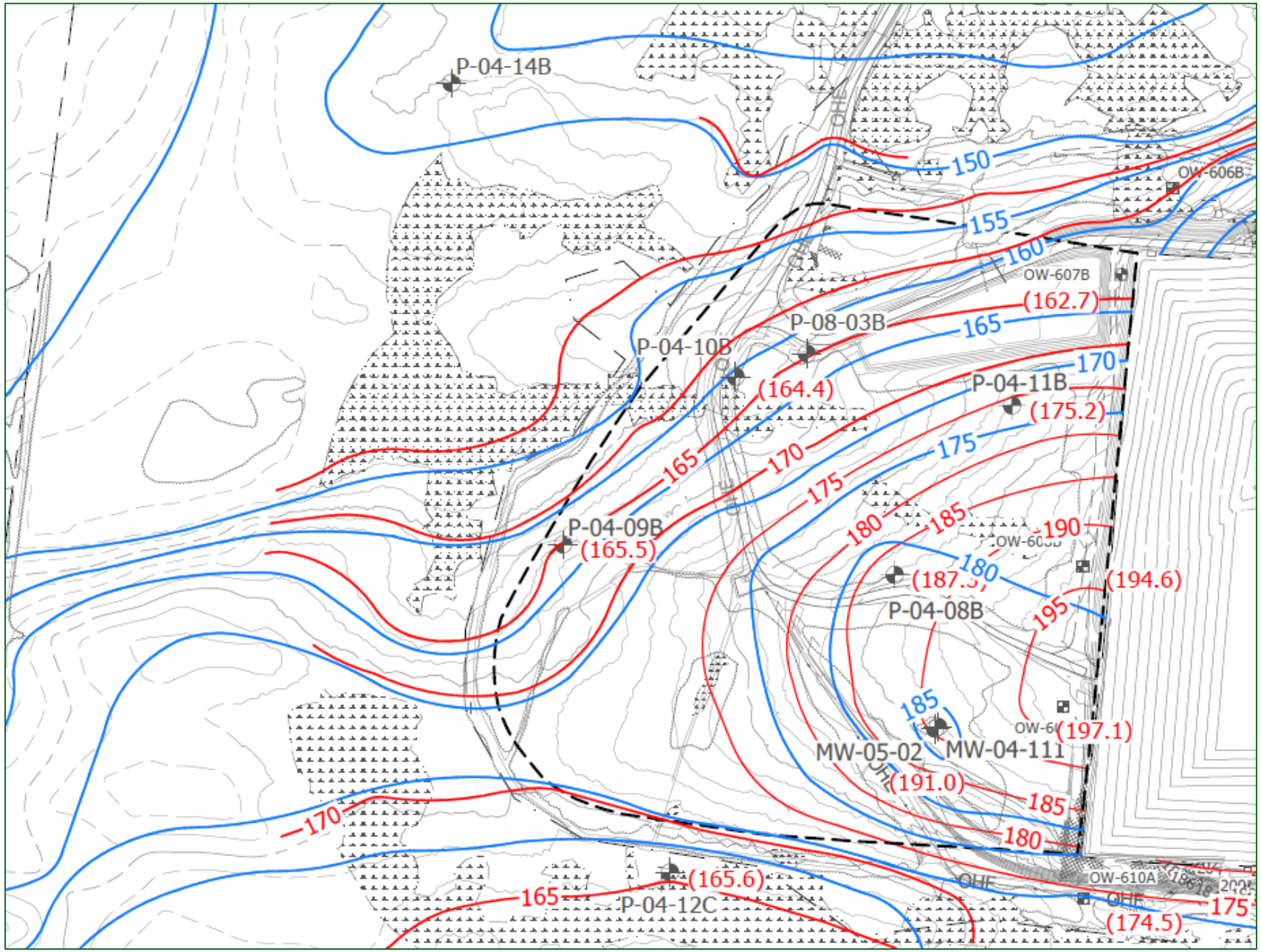
- Water levels
- In-situ hydraulic conductivity testing
- Hundreds of hours of pumping tests

Water levels in till

- Groundwater velocity:

➢ 1’-2’ per year horizontally

➢ 0.04’- 0.37’ per year vertically (1/2” to 4.5” per year)

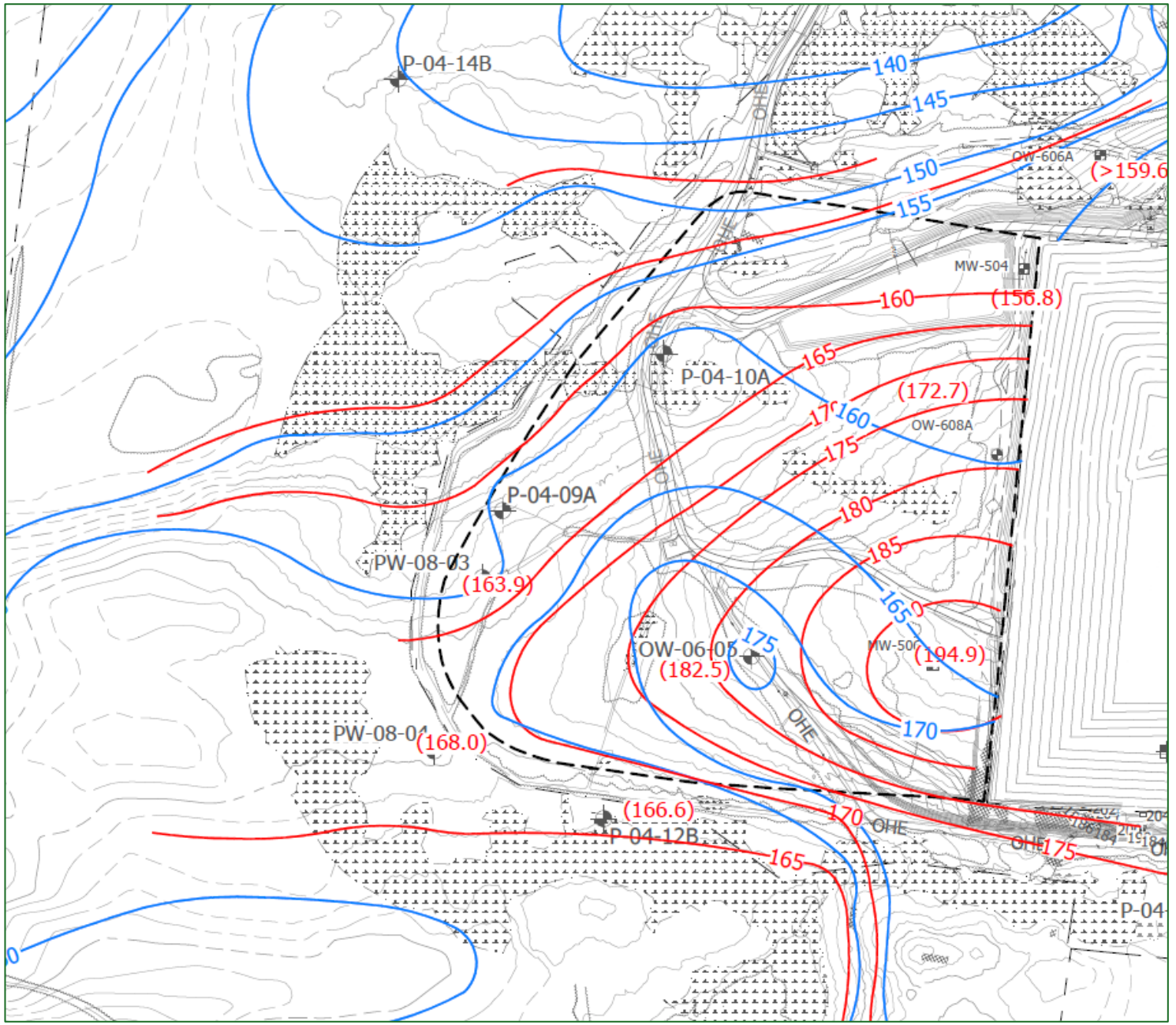


Water levels in bedrock

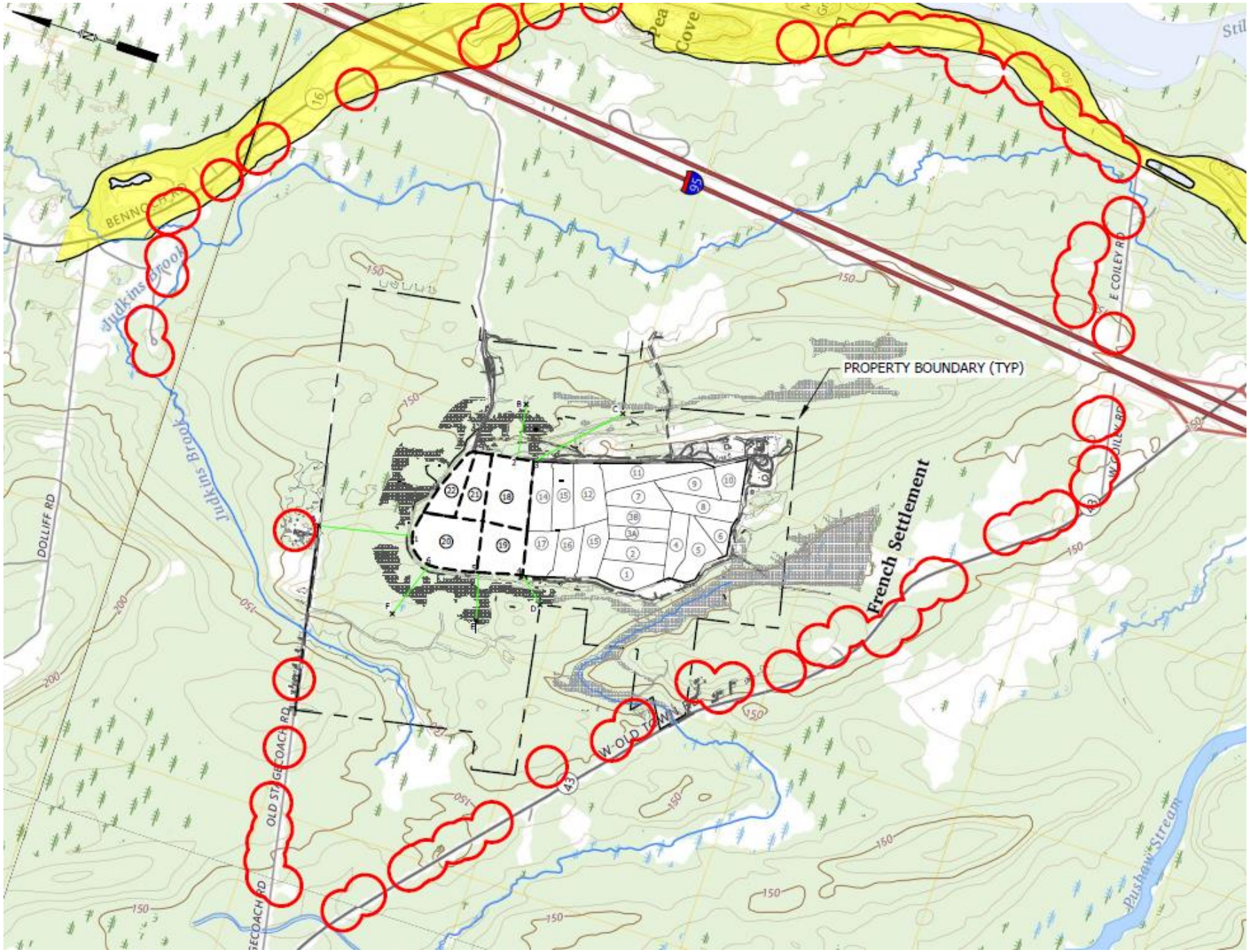
- Groundwater velocity:

➢ 2’-6’ per day horizontally

➢ (or 700’-2200’ per year)

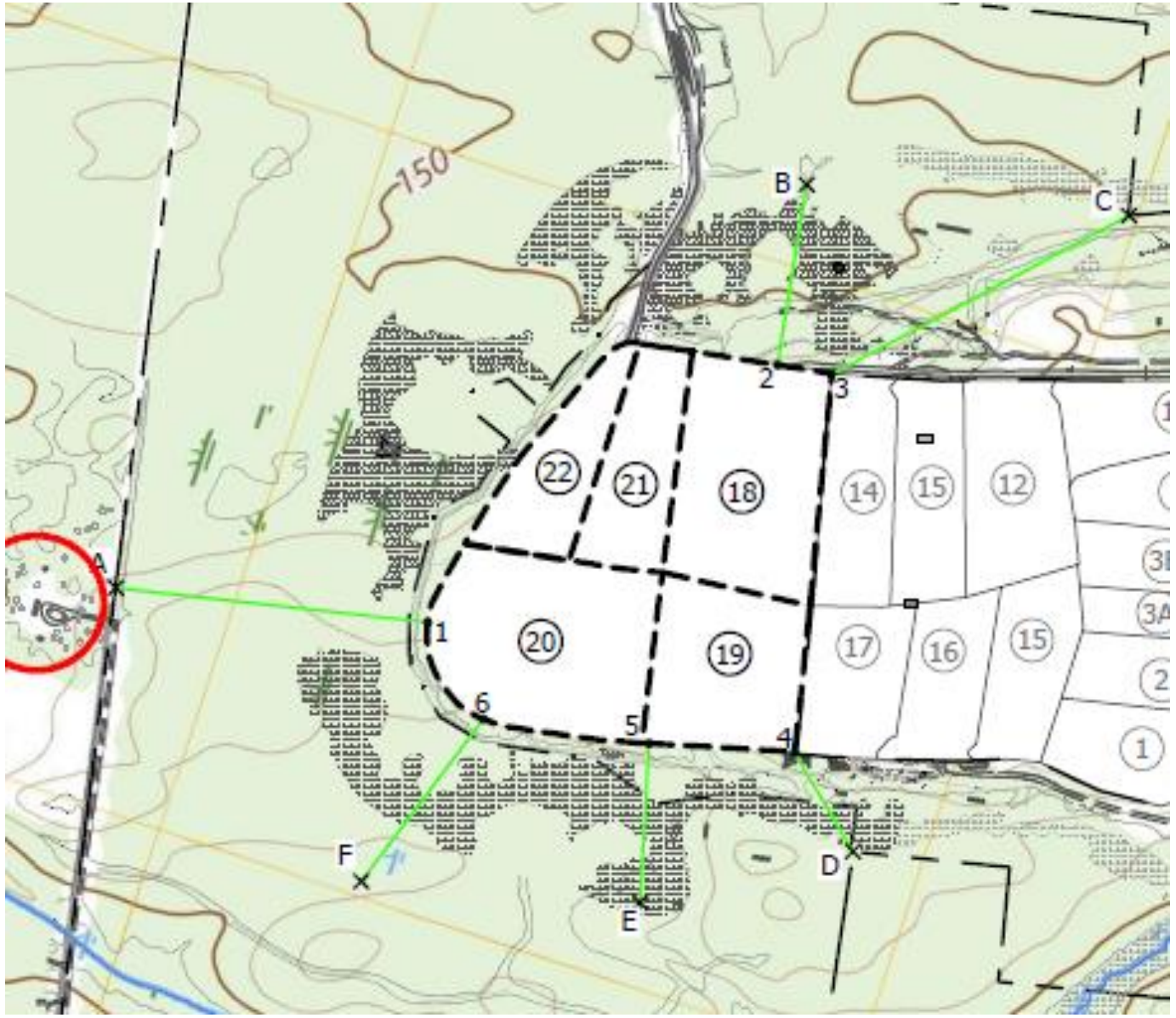


Area needed to recharge a domestic well is equivalent to about a 300’ radius around each well



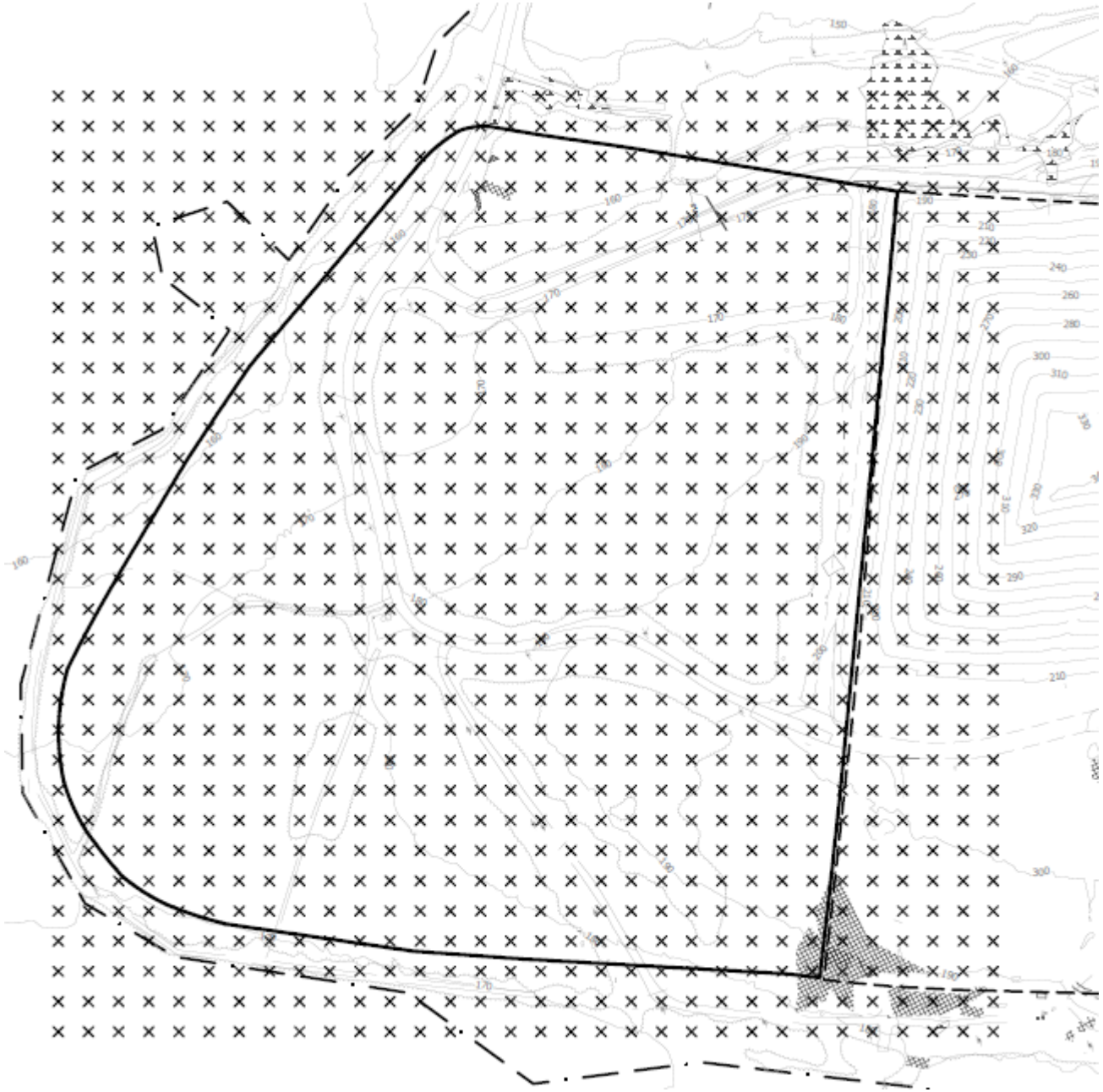
Sensitive Receptors

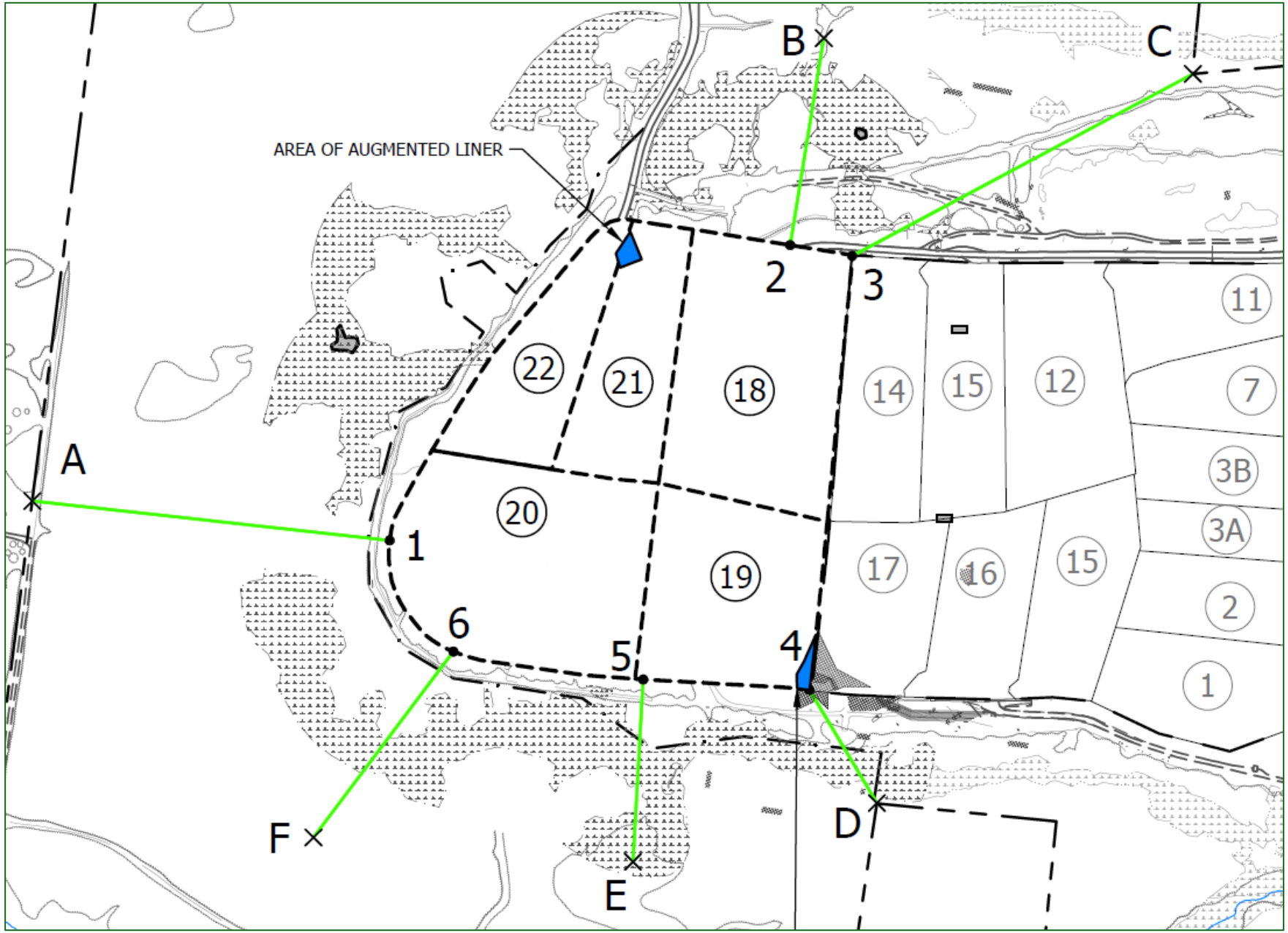
A	Closest Property Line - N	1403'
B	Tributary to Judkins Brook - E	817'
C	Closest Property Line - E	1507'
D	Closest Property Line - W	513'
E	Tributary to Pushaw Stream - W	712'
F	Tributary to Judkins Brook - NW	907'



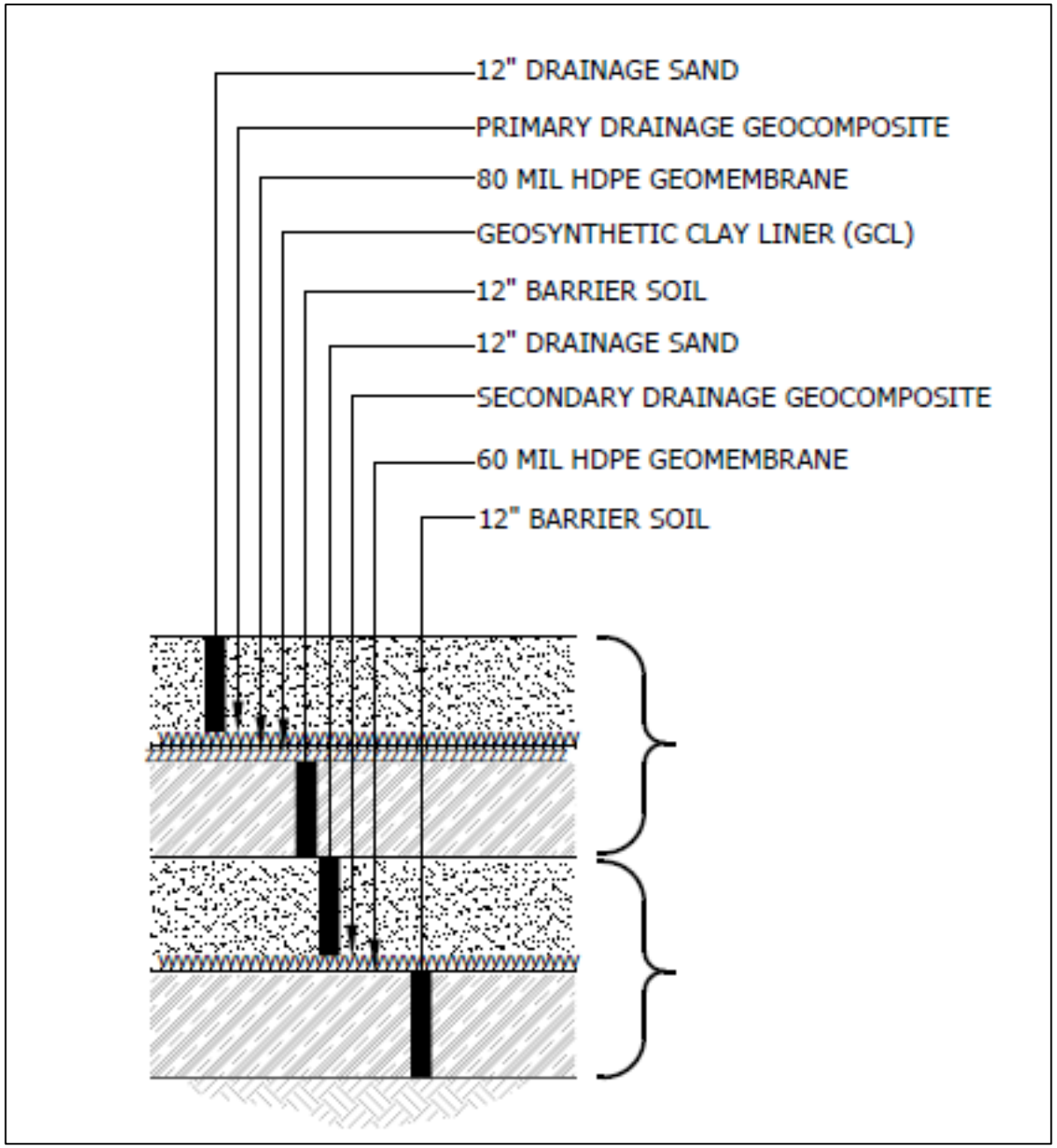
6-year Travel Time

- Rules require looking at a 6-year travel time JUST IN CASE
- Used a grid to evaluate travel time
- Found one spot – SW corner

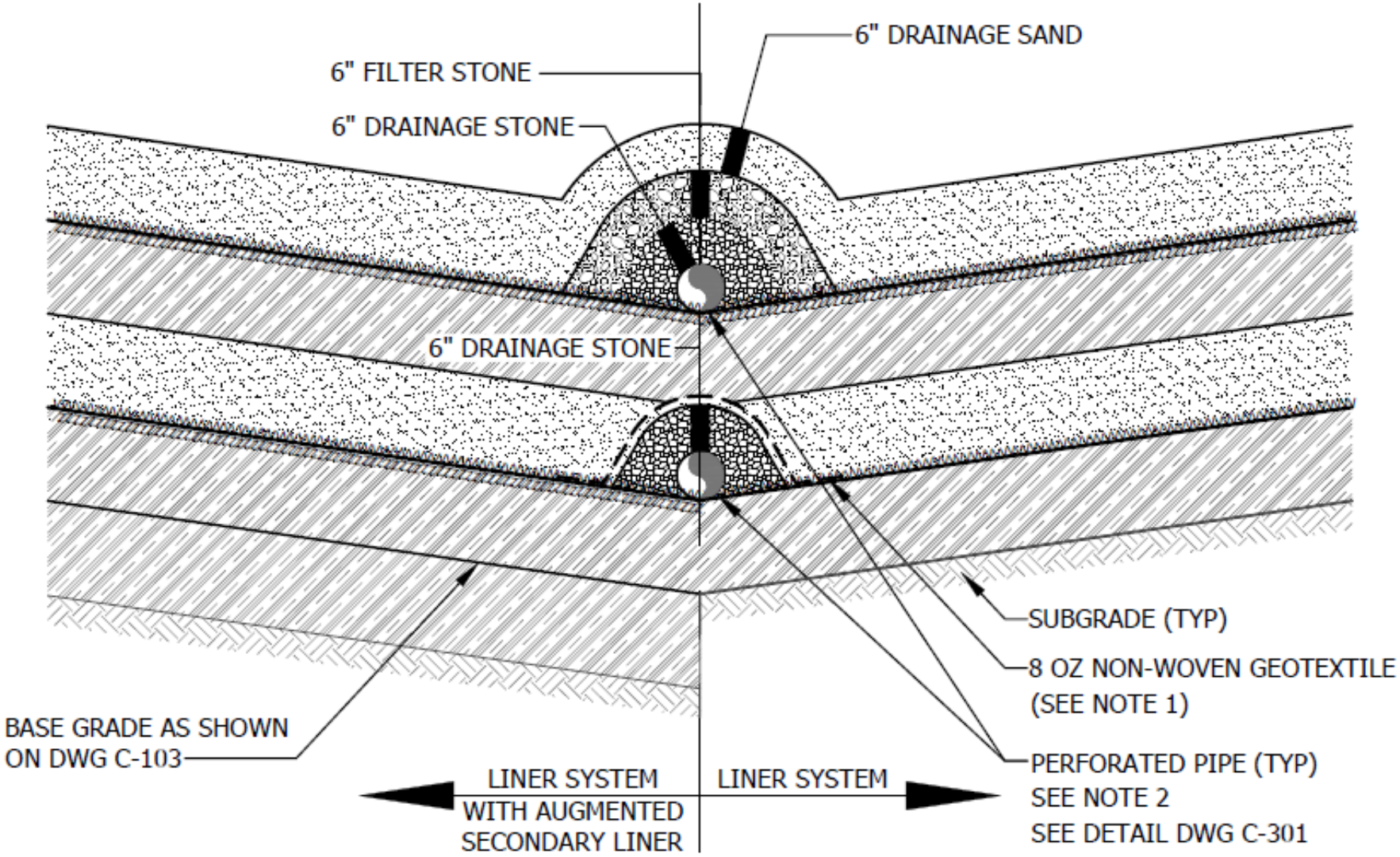



AREA OF AUGMENTED LINER
A
B
C
D
E
F
1
2
3
4
5
6
22
21
18
20
19
14
15
12
11
7
3B
3A
2
1
17
16
15

Expansion's 4-foot thick Dual- Liner System



Augmented Liner



Hydrogeologic Summary -

- Site is hydraulically isolated ✓
- Water moves ***very slowly*** downward in the soils ✓
- Can meet the six-year travel time to sensitive receptors ✓
- Add augmented liner over bedrock outcrops ✓
- Uniformly fractured rock could be pumped if there were a problem - JUST IN CASE ✓

Water Quality

Water Quality Monitoring Goals

- Continual monitoring
  - Some locations for 35 years ✓
- Frequent monitoring
  - Most locations monitored 3 times per year
  - UD, LD, LC monitored monthly ✓
- High quality testing
  - Labs are certified by the state ✓

- Good coverage around landfill
  - 50 groundwater wells
  - 4 pore water locations
  - 4 surface water locations
  - 2 stormwater locations
  - 15 underdrains
  - 5 leak detection locations
  - 1 leachate tank

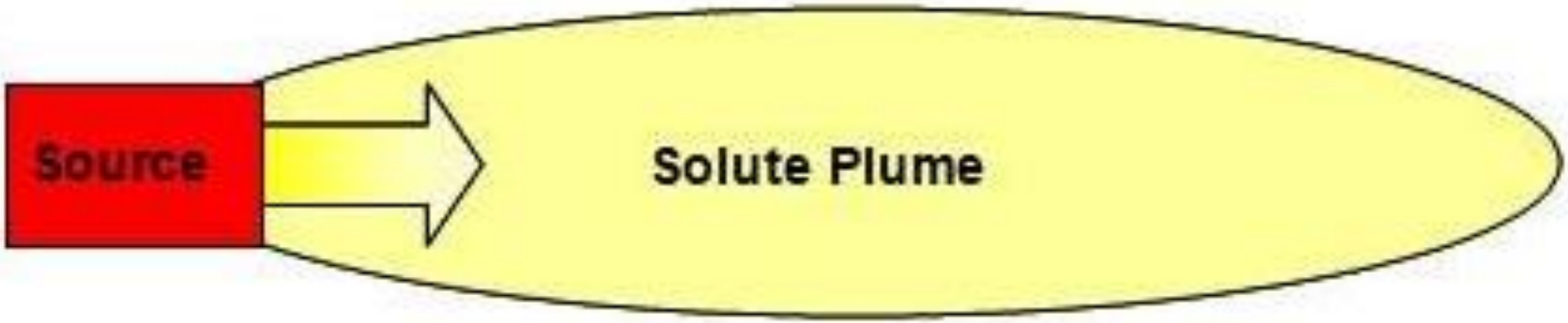
  = 81 total test locations ✓

Water Quality Outcomes

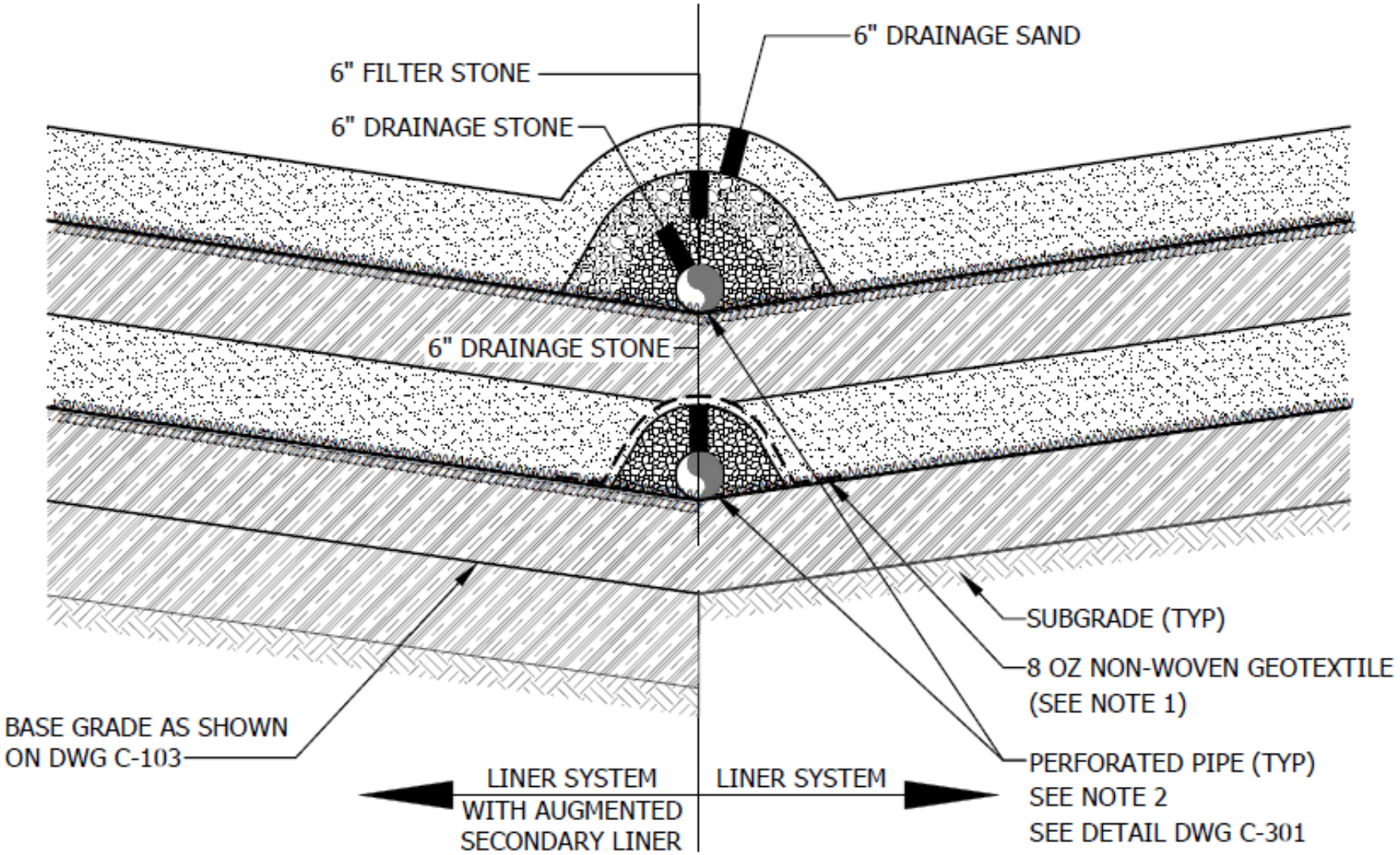
- No effect from landfill leachate ✓
  - 121-acre landfill, in use for 28 years– no effect
  - This is due to the design, construction, and management

- The only effects are due to:
  - Ground disturbance during construction
  - Road salt
  - Typical at any developed location ✓

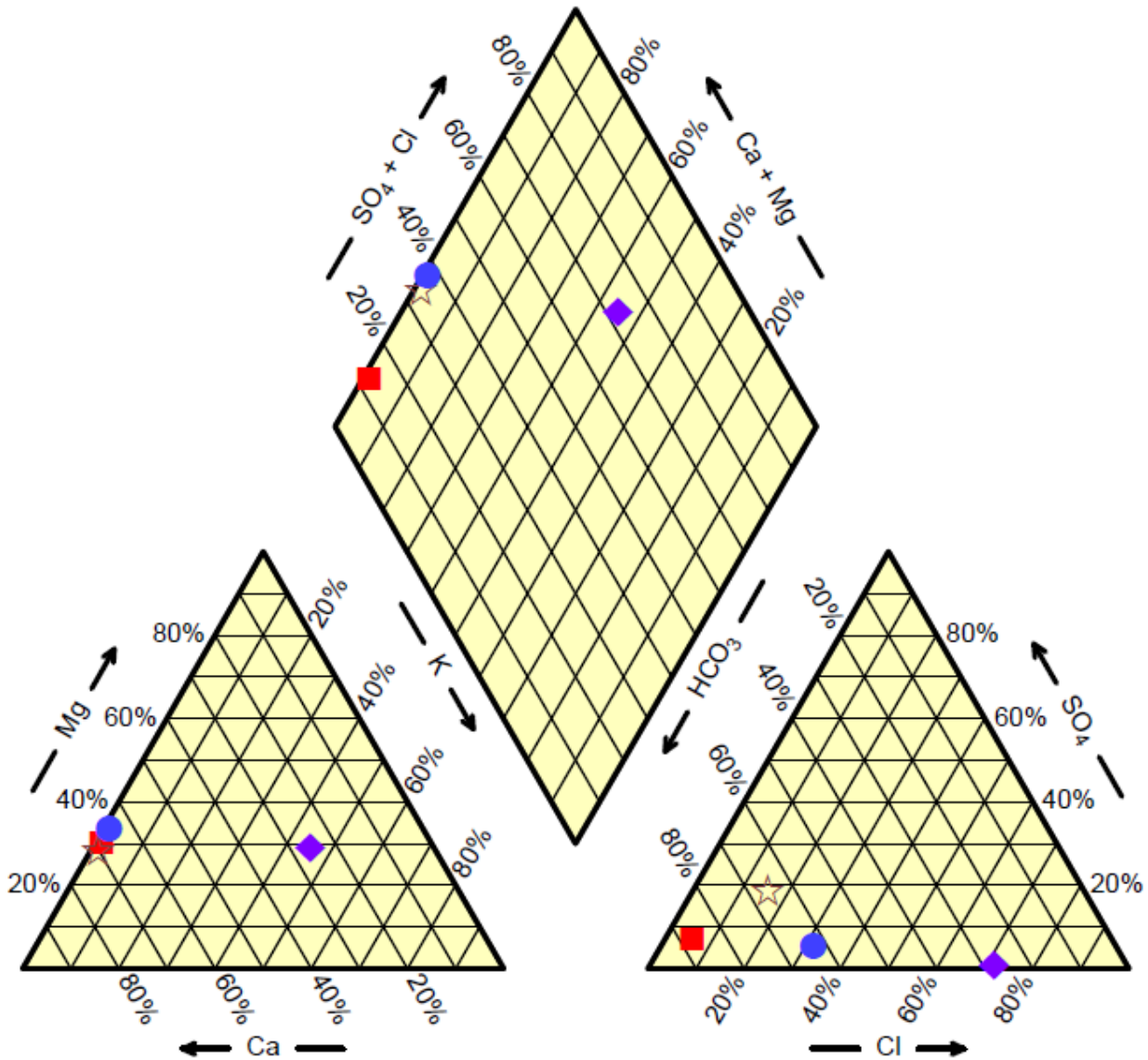
The source is diluted by rainfall and mixing with groundwater



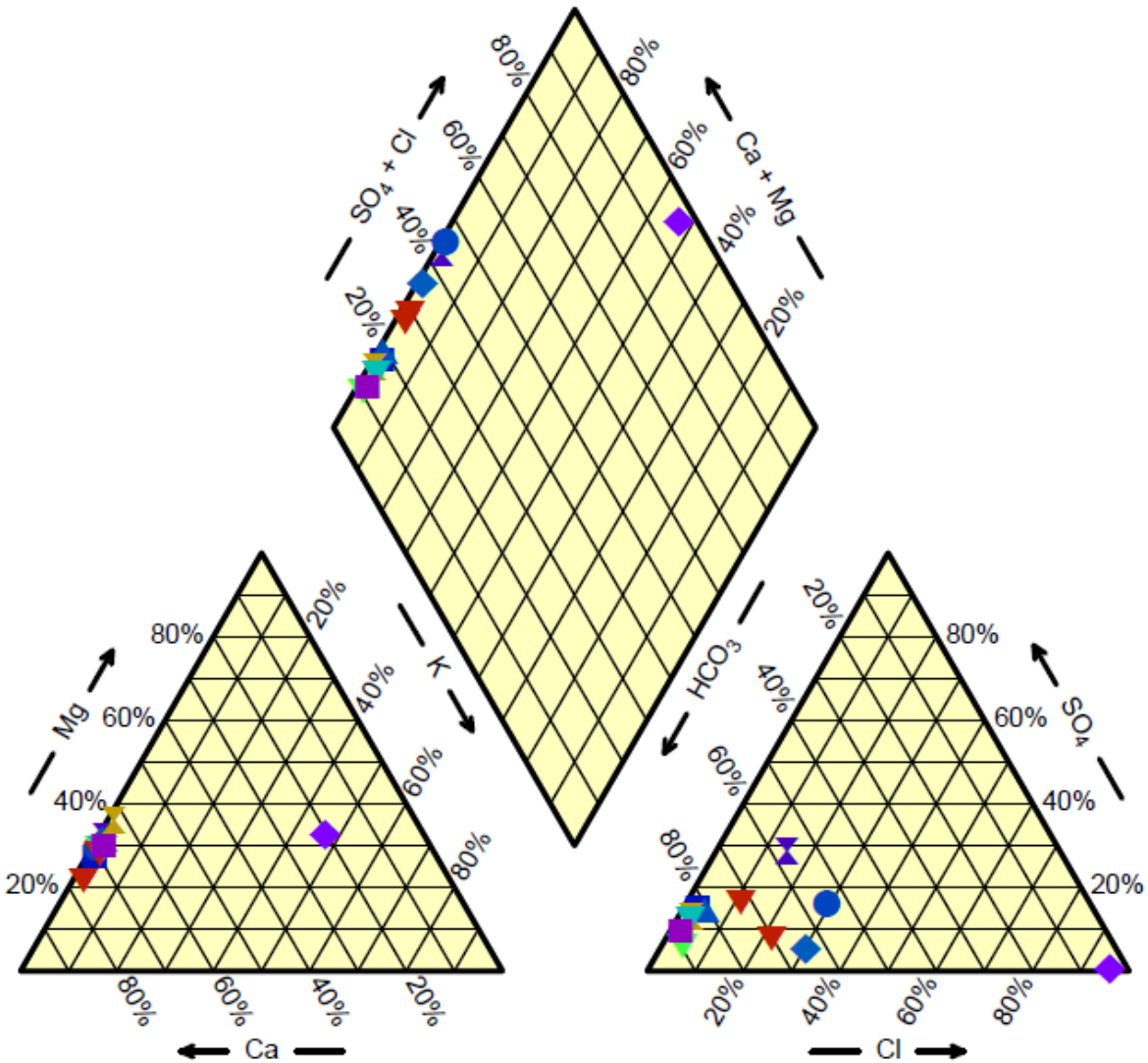
But, this landfill has a robust liner that prevents leaks



Piper Diagram - July 2023 Upgradient Groundwater



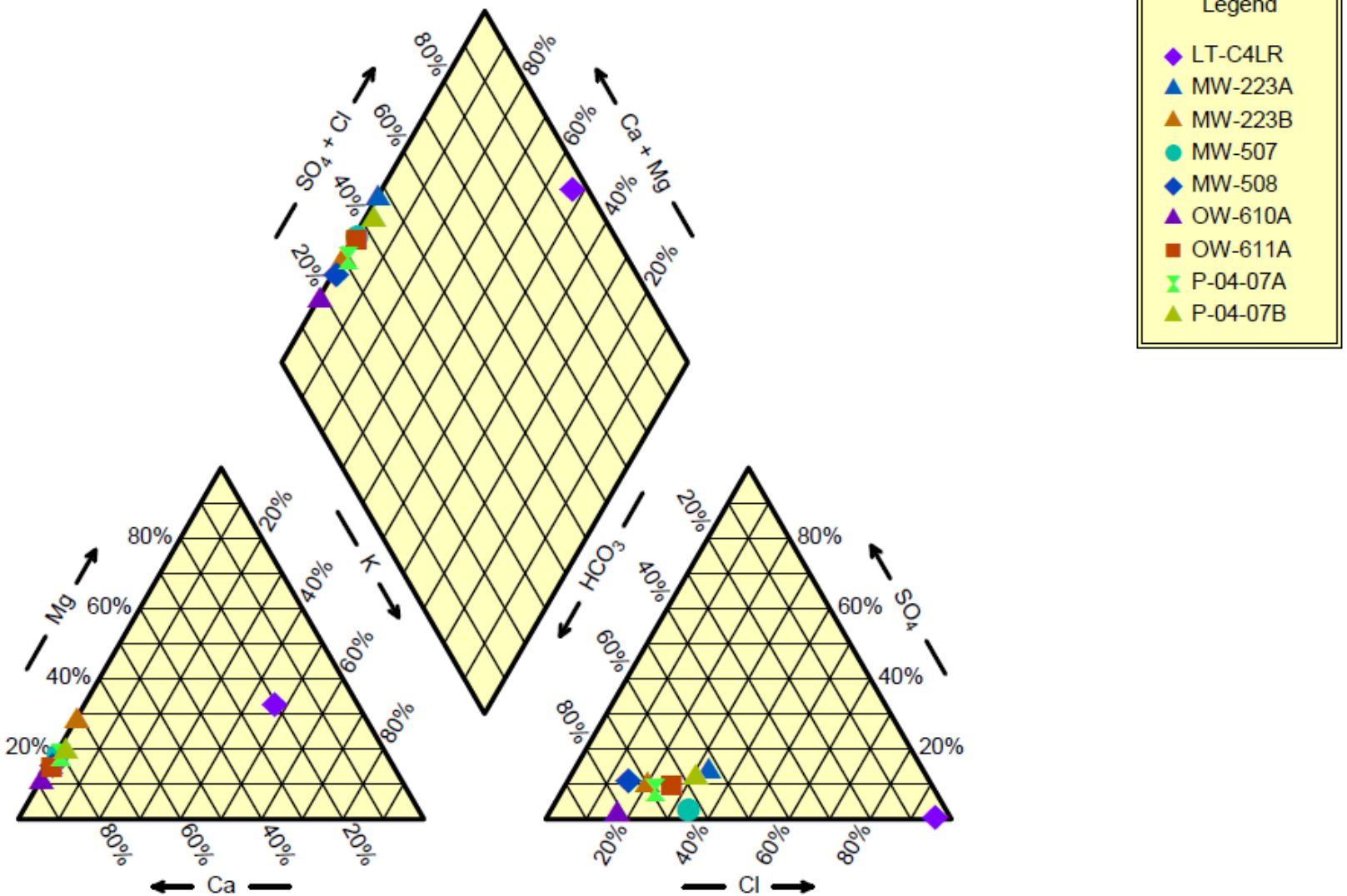
Piper Diagram - Southwest (Cells 1-10)



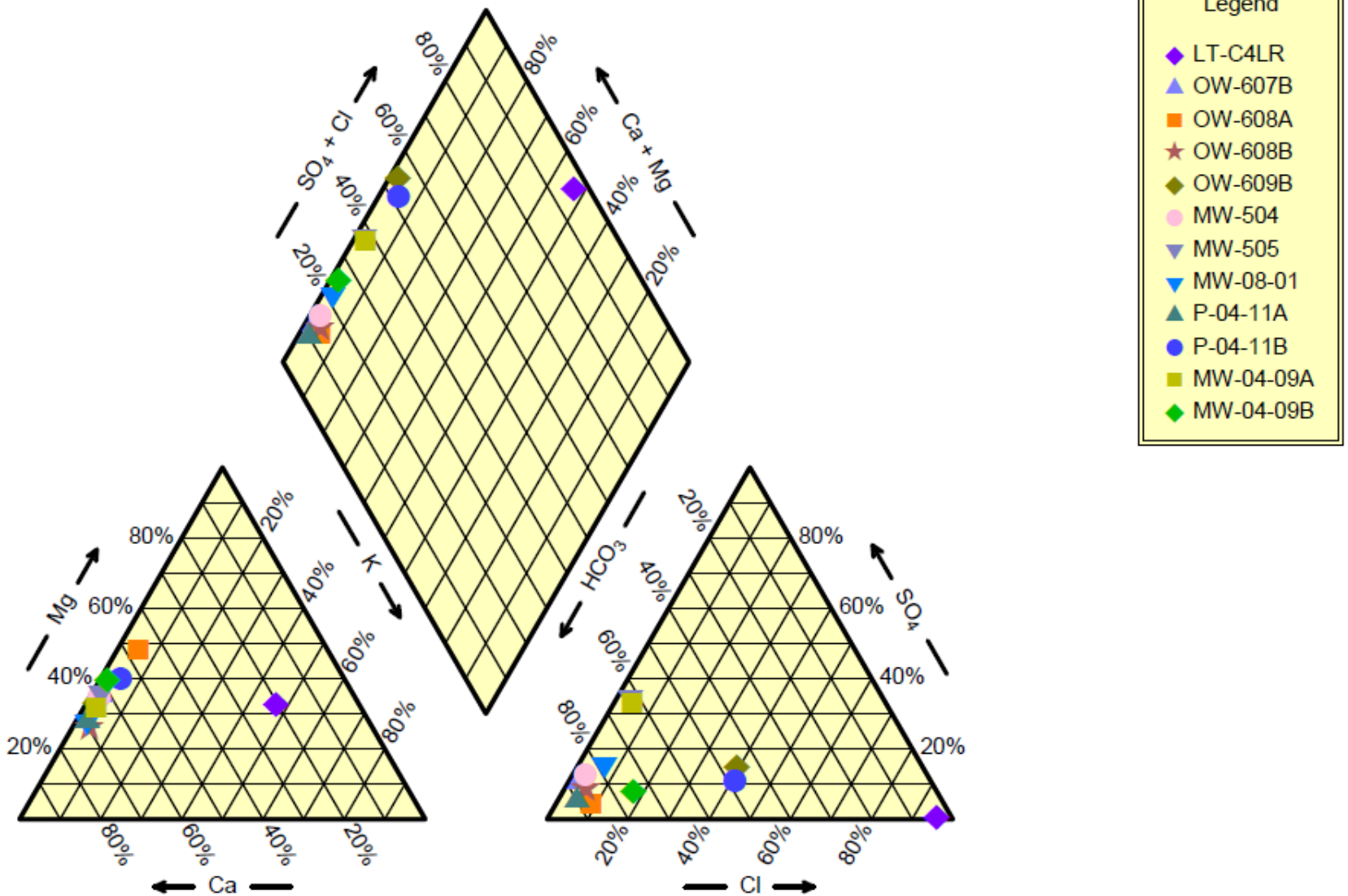
Legend

- LT-C4LR
- MW04-109R
- MW09-901
- MW-227
- MW-301
- MW-401A
- MW-401B
- MW-402A
- MW-402B
- P-04-02R
- P-04-04
- MW-04-102

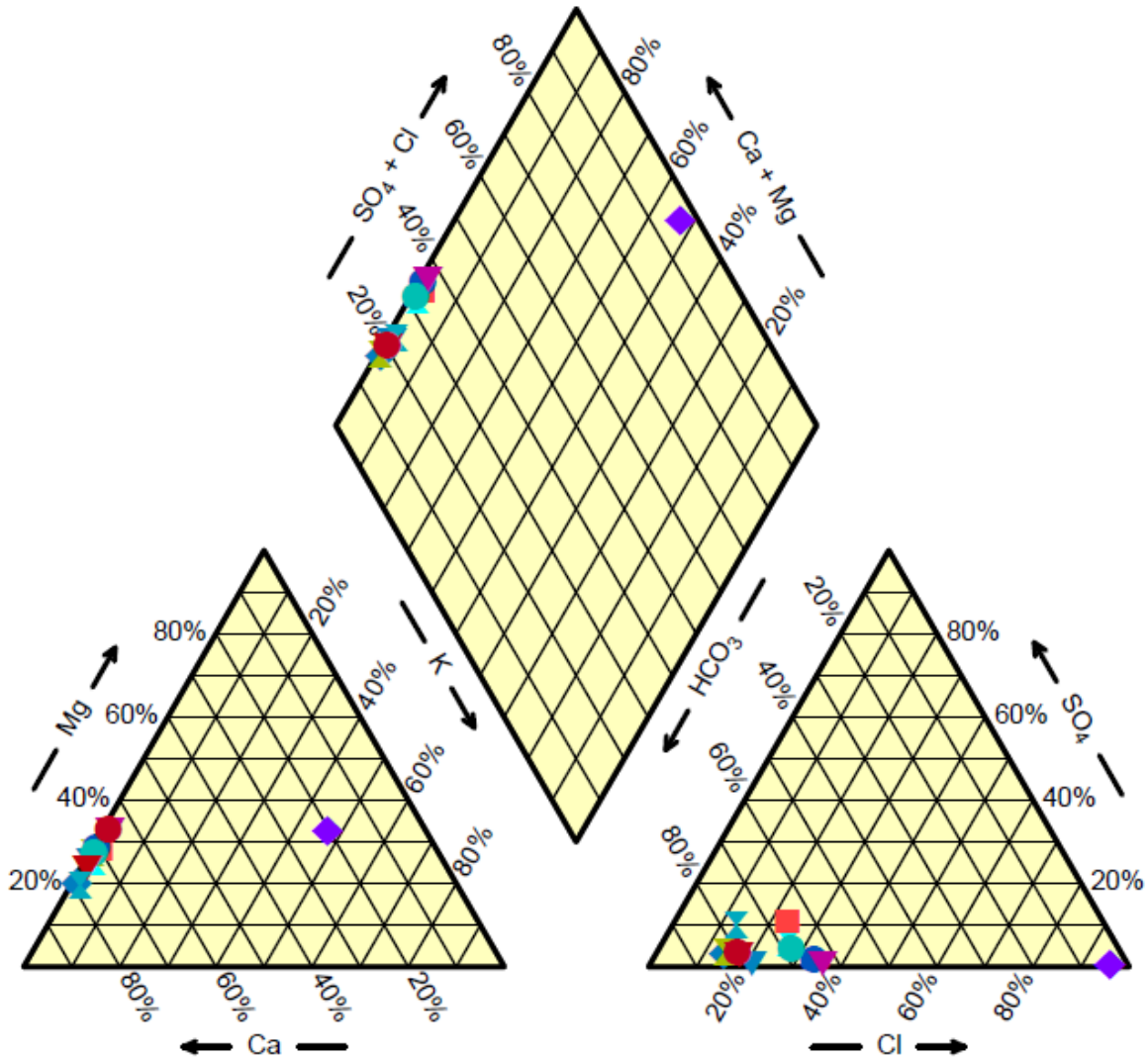
Piper Diagram - West



Piper Diagram - North (in Phase II Expansion)



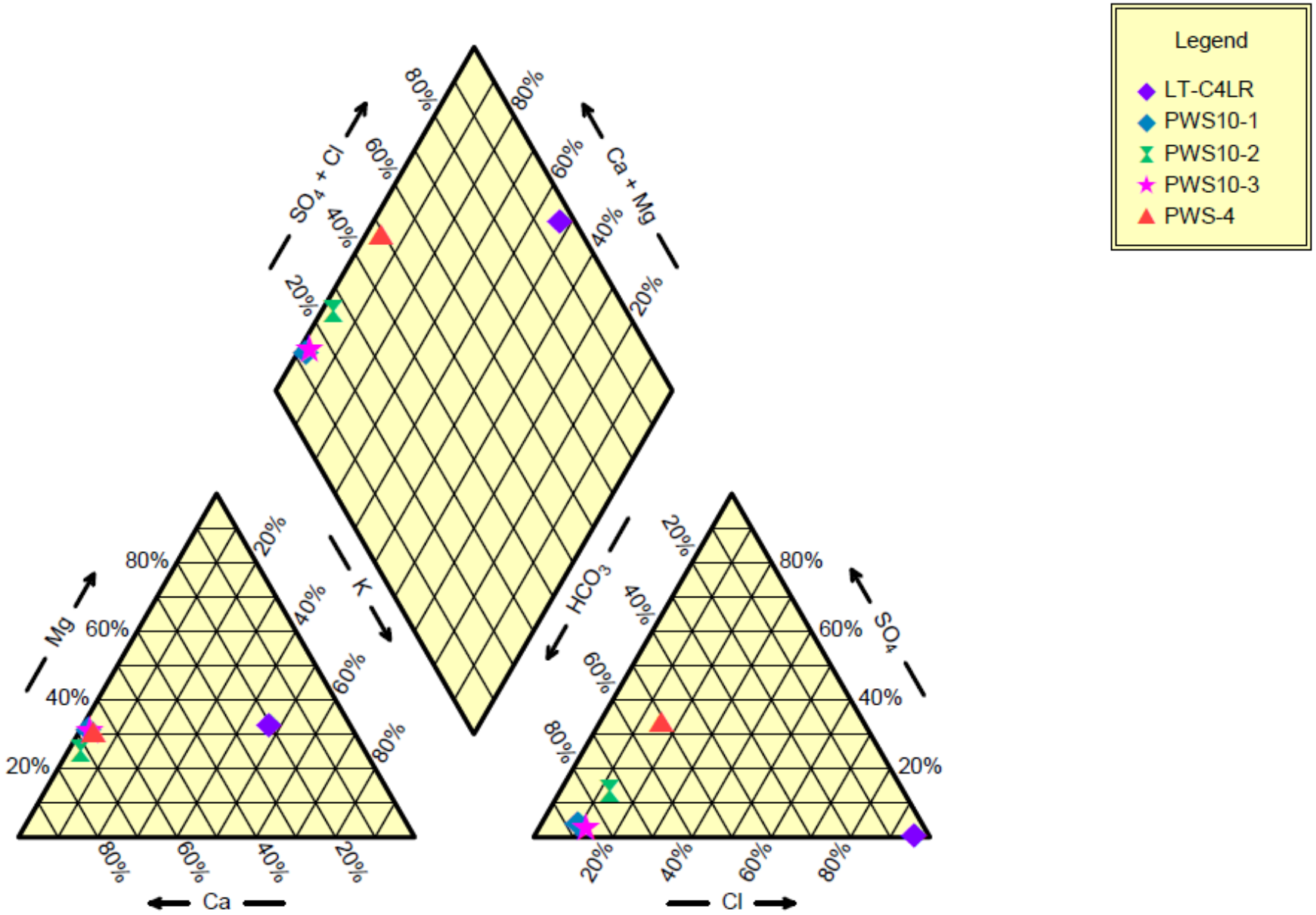
Piper Diagram - East (Phase I Expansion)



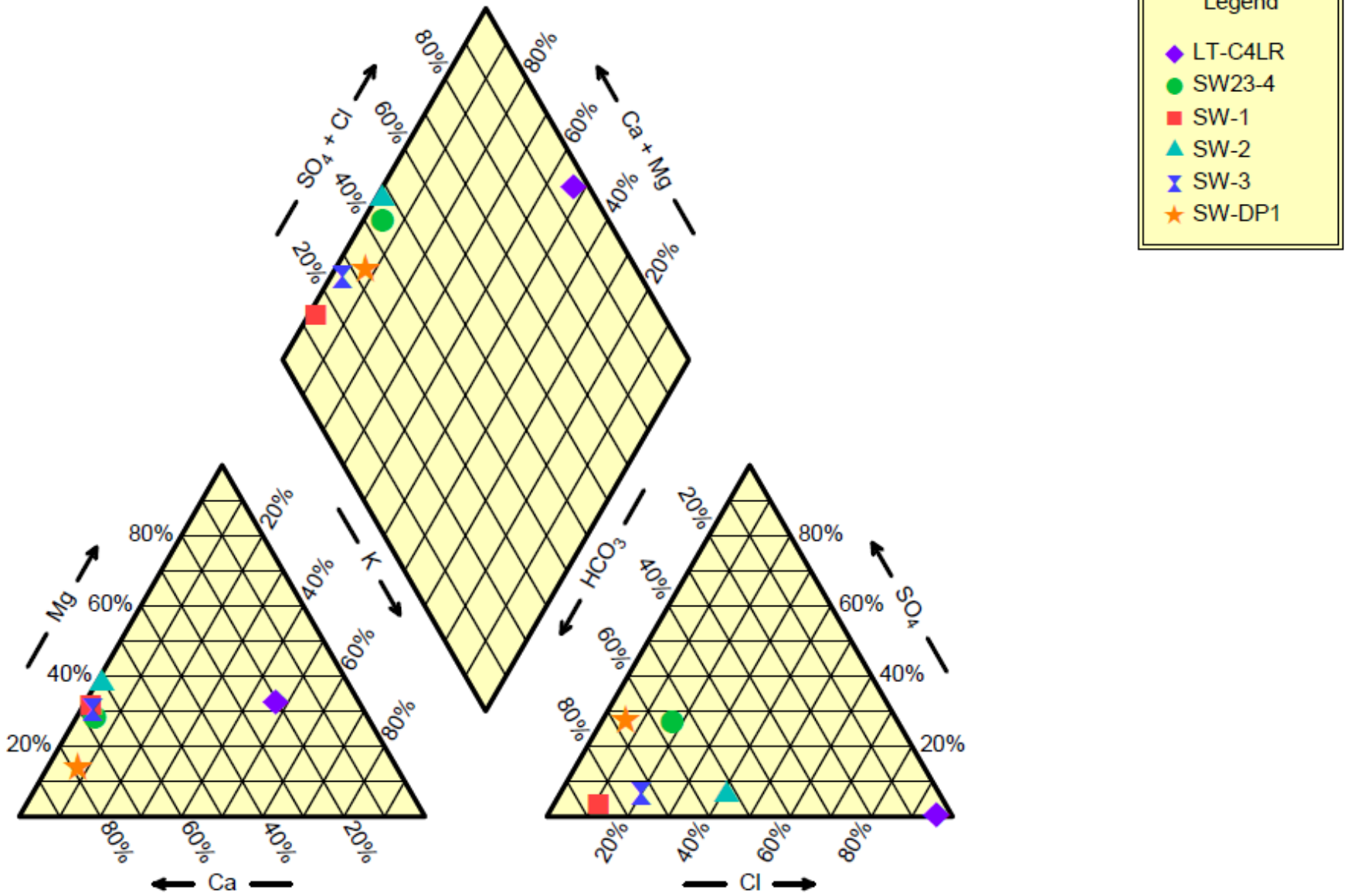
Legend

- LT-C4LR
- OW-606B
- MW-503
- MW-502
- OW-602A
- OW-604A
- OW-605A
- OW-606A
- MW-501
- OW-601A
- OW-601B
- MW06-01

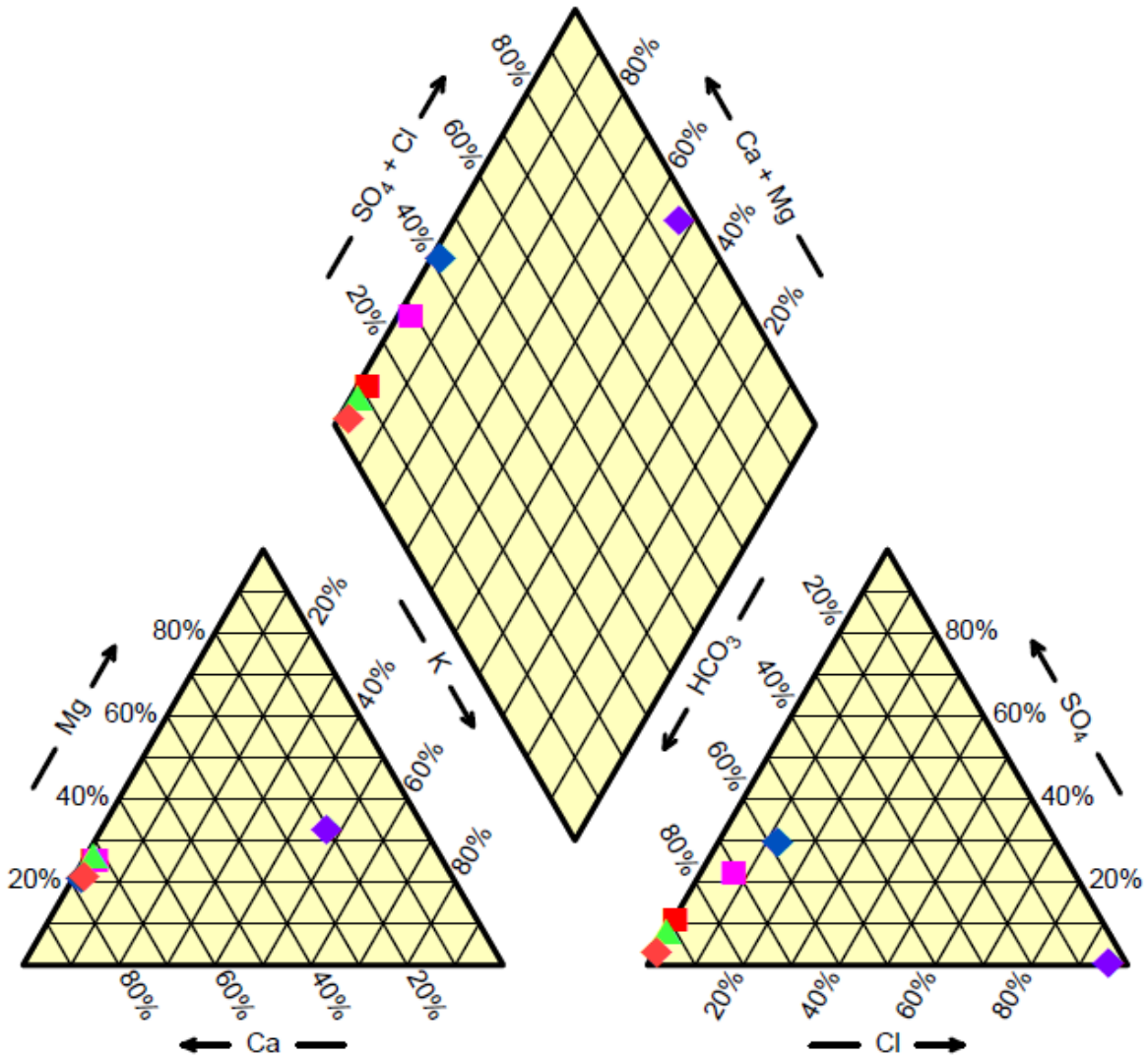
Piper Diagram - Oct 2024 Pore Water



Piper Diagram - Oct. 2024 Surface Water



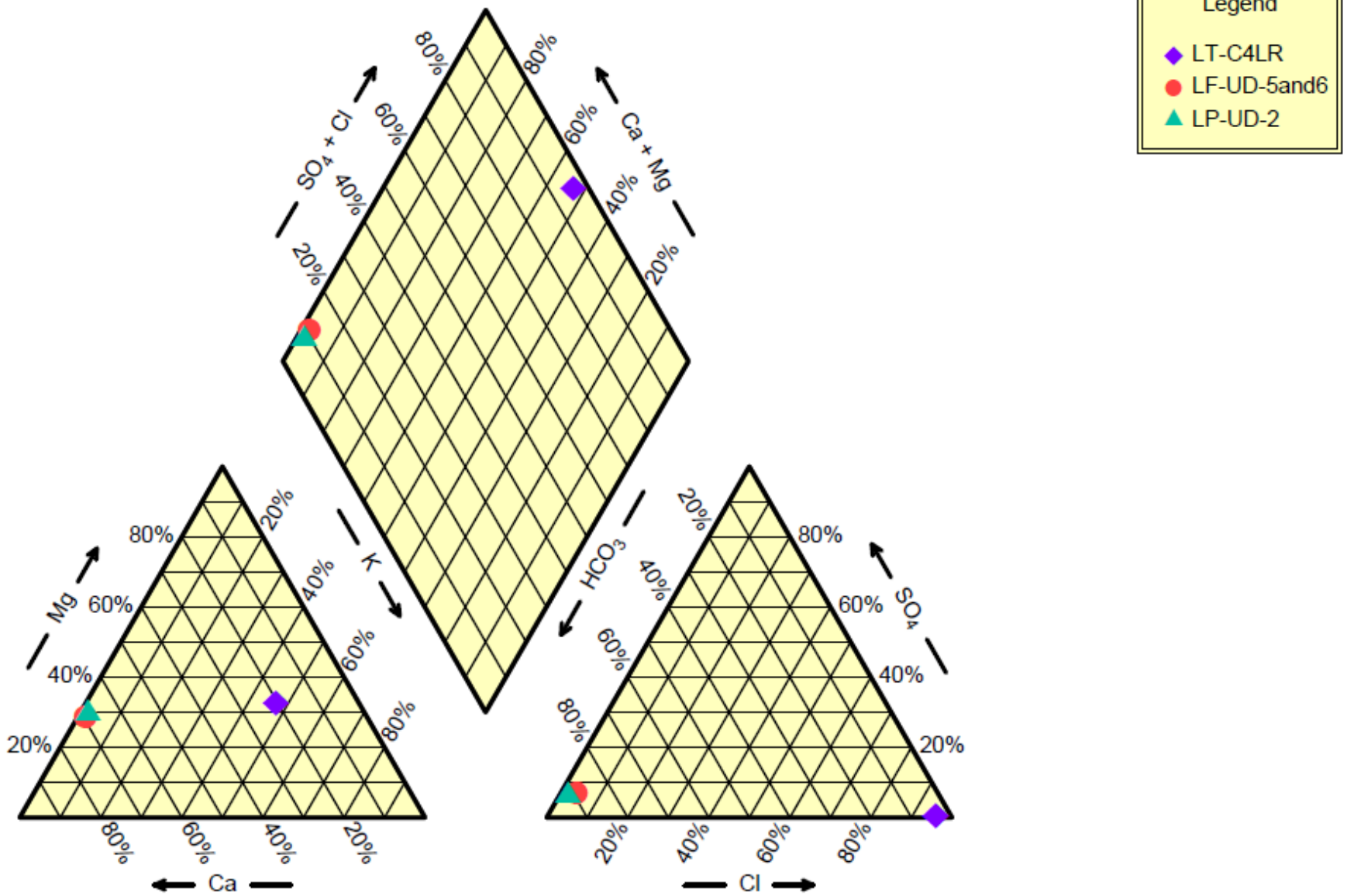
Piper Diagram - July 2024 Leak Detection



Legend

- LT-C4LR
- LF-LD-11
- LF-LD-12
- LF-LD-13
- LF-LD-14
- LF-LD-15

Piper Diagram - July 2024 Underdrain



Water Quality Summarized -

- The leachate has a characteristically unique signature
- Groundwater and surface water have a different unique signature ✓
- Leachate is not getting into the water ✓
- Monitoring will continue on the same schedule ✓
- All together, there will be 3 more total wells, 2 more pore water locations, 2 more surface water locations, 3 more underdrains, and 3 more leak detection locations = 94 total locations ✓

Current Water Quality

From the MEDEP Public Benefit Determination approval:

"Based on the Department's most recent review of JRL's annual monitoring report, the Department concluded that "[g]roundwater, surface water, porewater, underdrain and leak detection monitoring results continue to show **minimal evidence of impact** from landfill leachate." Further, the Department noted that groundwater monitoring locations that exhibit low concentrations of certain landfill indicator parameters (i.e., chloride) appear to be **affected by site-related maintenance and construction activities** rather than leachate from the landfill."*

* From the review of the 2022 Annual Report by the MEDEP hydrogeologist, dated 9/8/23.

Current Water Quality

Continuing from the review of the 2022 Annual Report by the MEDEP hydrogeologist, dated 9/8/23:

"Areas with monitoring locations exhibiting somewhat elevated indicator parameters and/or identified increasing concentration **trends in groundwater appear to be affected by site related activities such as site maintenance and construction rather than leachate generated from the landfill."**

Water Quality Outcomes

- No effect from landfill leachate ✓
  - 121-acre landfill, in use for 28 years– no effect
  - This is due to the design, construction, and management

- The only effects are due to:
  - Ground disturbance during construction
  - Road salt
  - Typical at any developed location ✓

Leachate Management

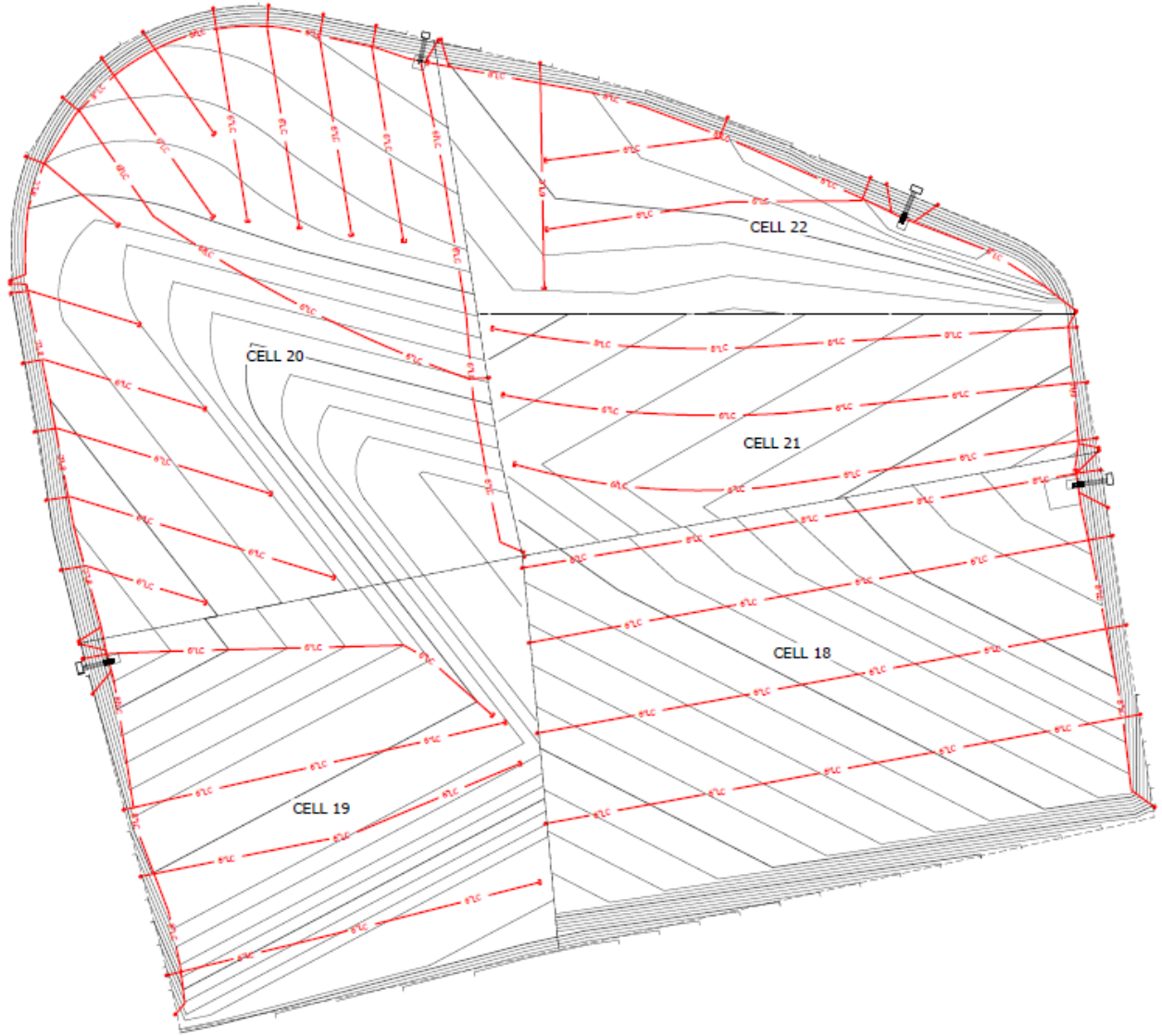
Leachate Management Goals

- Containment ✓
  - Liner
  - Dual-walled force main
  - Leachate tank
  - Trucking to treatment plant
- Collection ✓
  - Sand and pipes
  - Drainage geocomposite
  - Sumps

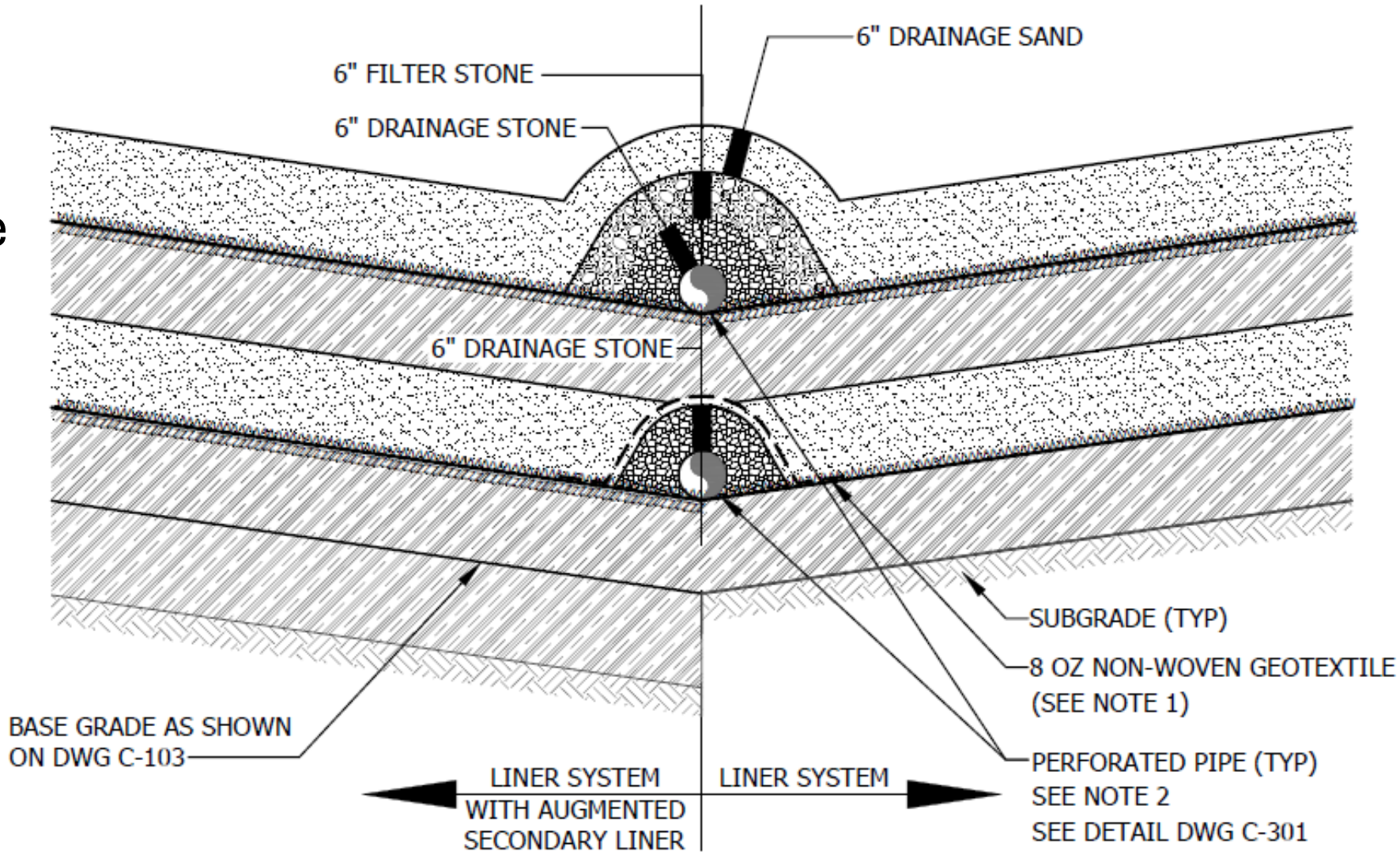
- Transport ✓
  - Pipes
  - Pump station
  - Dual-walled force main
  - Trucking to treatment plant
- Treatment ✓
  - Licensed wastewater treatment plant
  - PFAS treatment – coming soon

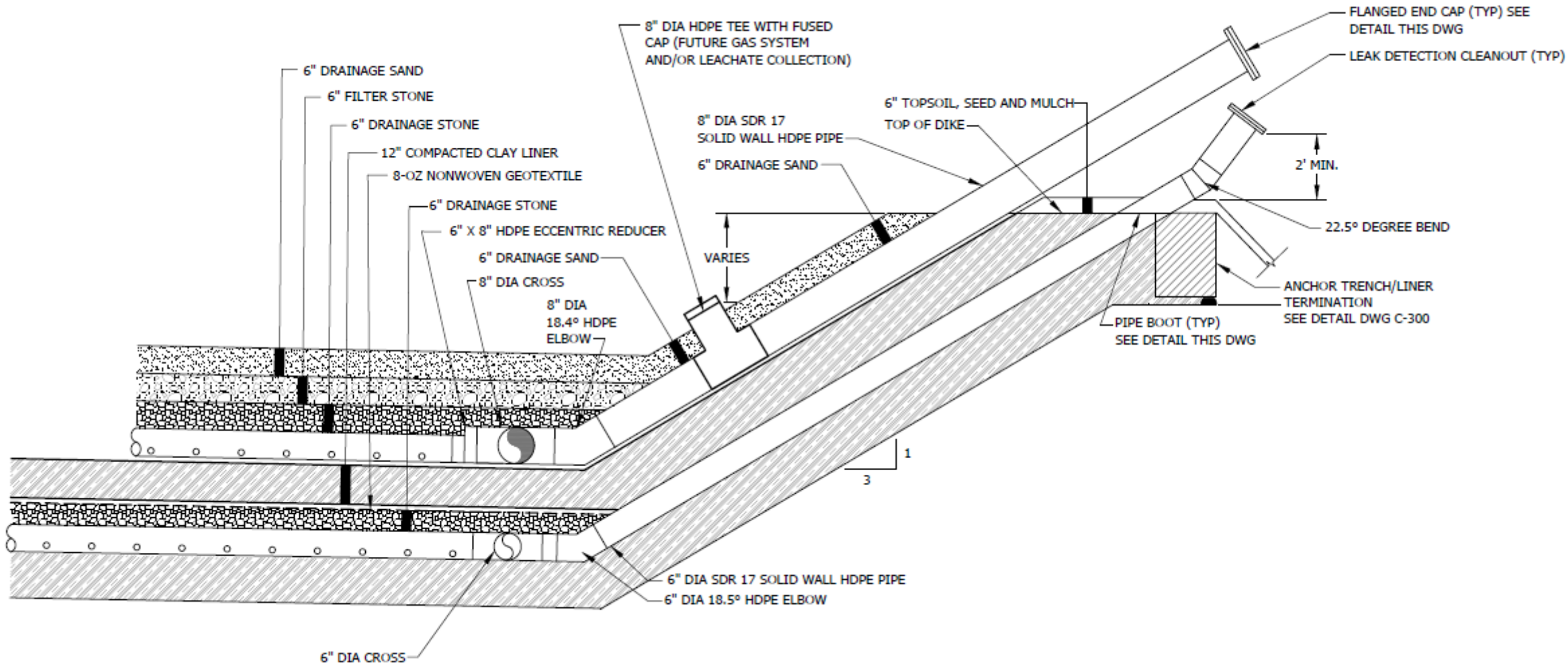
Leak Detection piping in the cells

Leachate Collection piping in the cells



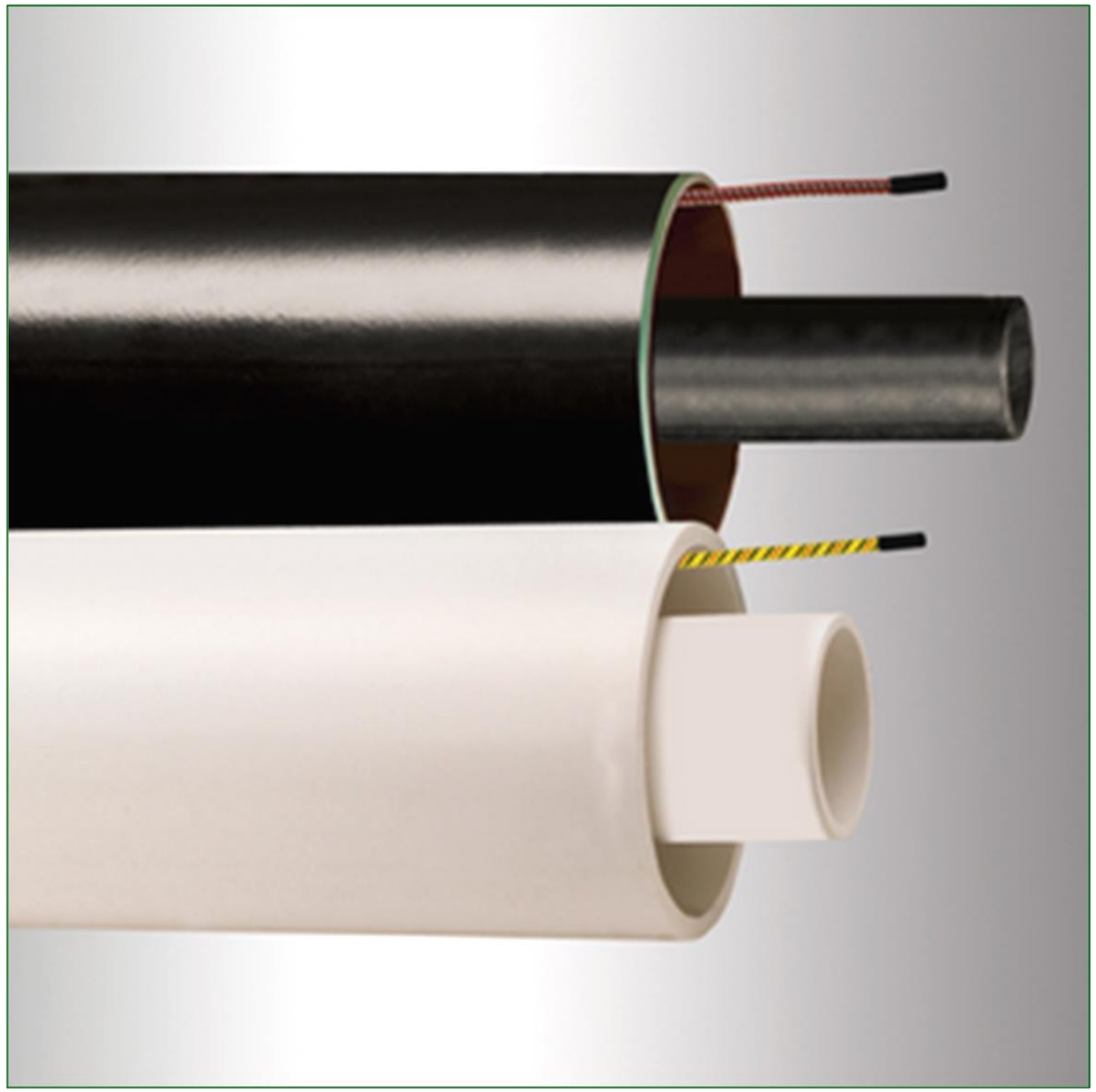
- Drainage geocomposite net
- Sand
- Pipes with stone




6" DRAINAGE SAND
6" FILTER STONE
6" DRAINAGE STONE
12" COMPACTED CLAY LINER
8-OZ NONWOVEN GEOTEXTILE
6" DRAINAGE STONE
6" X 8" HDPE ECCENTRIC REDUCER
6" DRAINAGE SAND
8" DIA CROSS
8" DIA
18.4° HDPE
ELBOW
8" DIA HDPE TEE WITH FUSED
CAP (FUTURE GAS SYSTEM
AND/OR LEACHATE COLLECTION)
8" DIA SDR 17
SOLID WALL HDPE PIPE
6" DRAINAGE SAND
VARIES
6" TOPSOIL, SEED AND MULCH
TOP OF DIKE
FLANGED END CAP (TYP) SEE
DETAIL THIS DWG
LEAK DETECTION CLEANOUT (TYP)
2' MIN.
22.5° DEGREE BEND
ANCHOR TRENCH/LINER
TERMINATION
SEE DETAIL DWG C-300
PIPE BOOT (TYP)
SEE DETAIL THIS DWG
1
3
6" DIA SDR 17 SOLID WALL HDPE PIPE
6" DIA 18.5° HDPE ELBOW
6" DIA CROSS


ON
OFF
[No Title]
12

- Dual-Wall Force Main from Pump Stations to Leachate Tank



Leachate is:

- Contained✓
- Collected
- Transported ✓
- Treated ✓

PFAS Treatment

NEWSVT Landfill

Leachate PFA Treatment

casella

ESTABLISHED 1975

RECYCLING • SOLUTIONS • ORGANICS • COLLECTION • ENERGY • LANDFILLS

Technology Chosen

Foam Fractionation (FF)

- FF is an absorptive bubble separation technique
- This technology historically has been utilised for proteins, enzymes and surfactant type compounds
- Evaluation will occur in close coordination with vendor selected to assure best possible results

Photos courtesy of EPOC Environmental

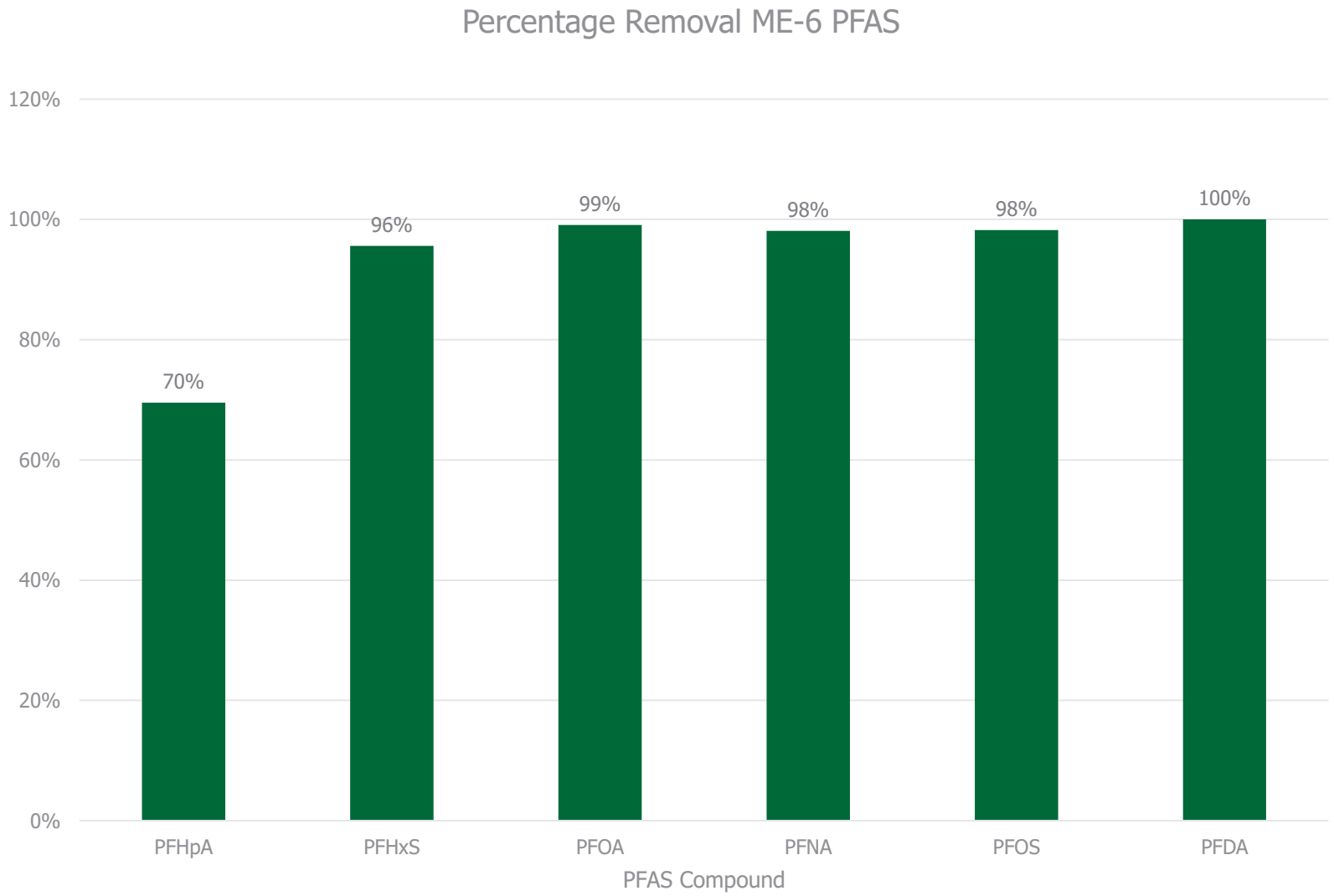
Technology Chosen

Current Testing @ NEWSVT

Test Results (Average) with FF*

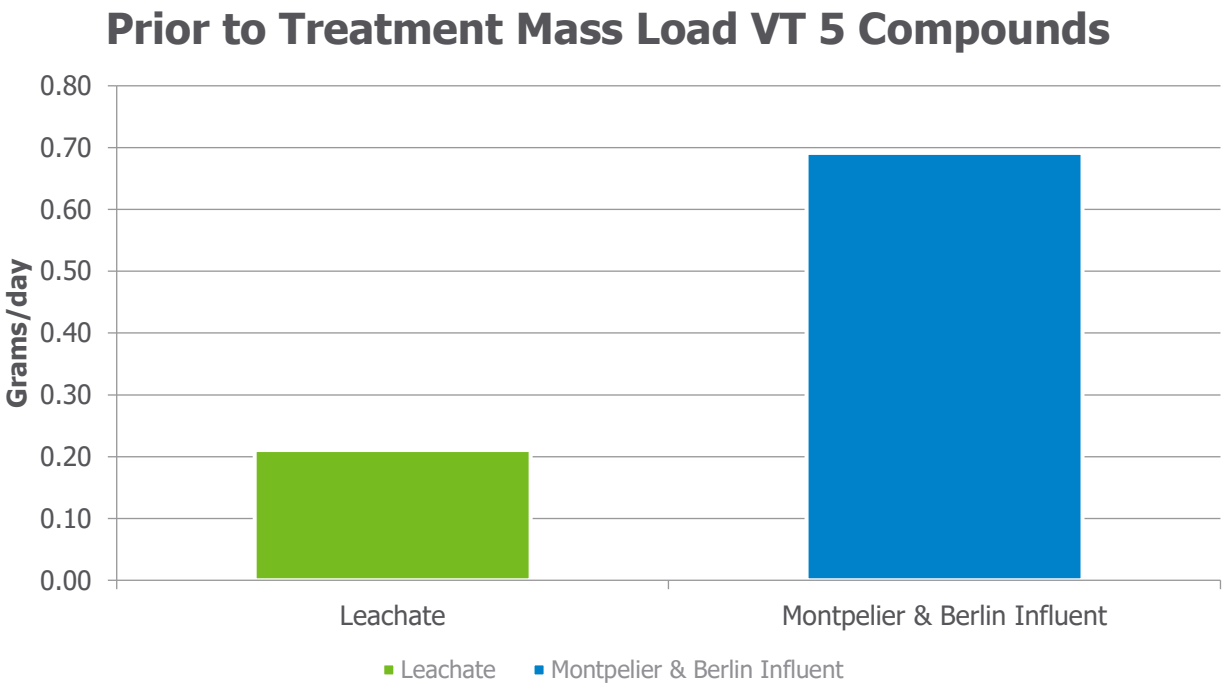
1.	PFOA	99% removal
2.	PFOS	98% removal
3.	PFNA	98% removal
4.	PFHxS	96% removal
5.	PFHpA	66% removal
6.	PFDA	99+% removal

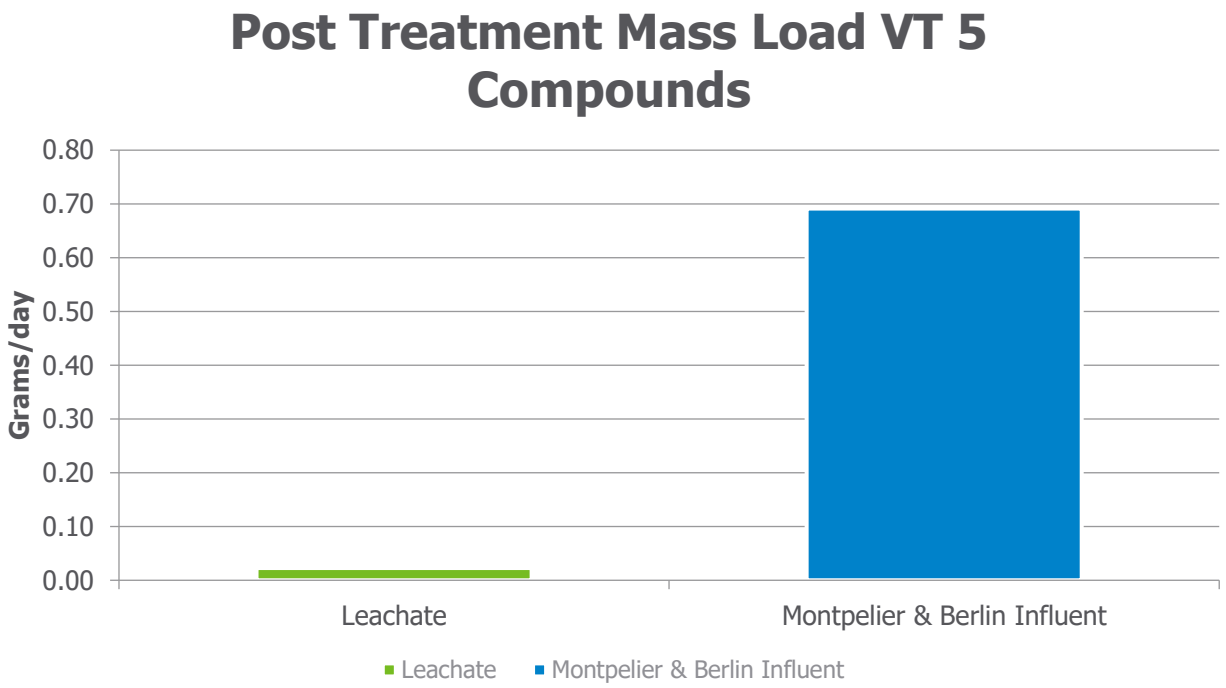
*Removal based on laboratory reporting limits



Treatment Effectiveness

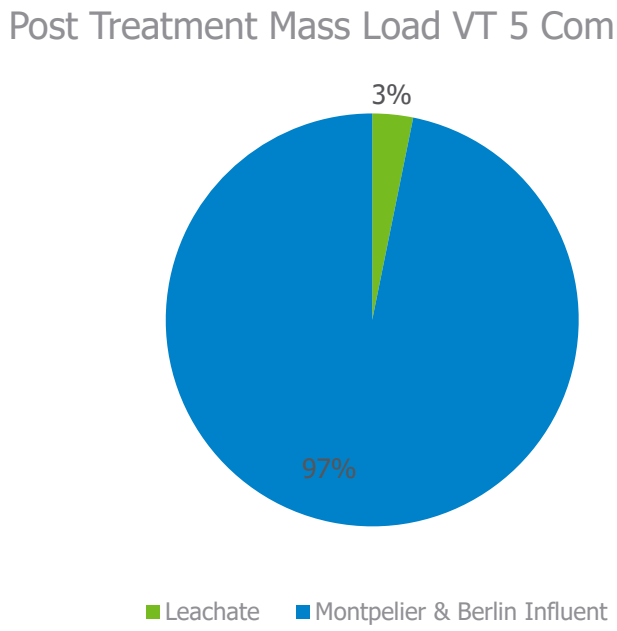
Our contribution to Montpelier PFAS inputs

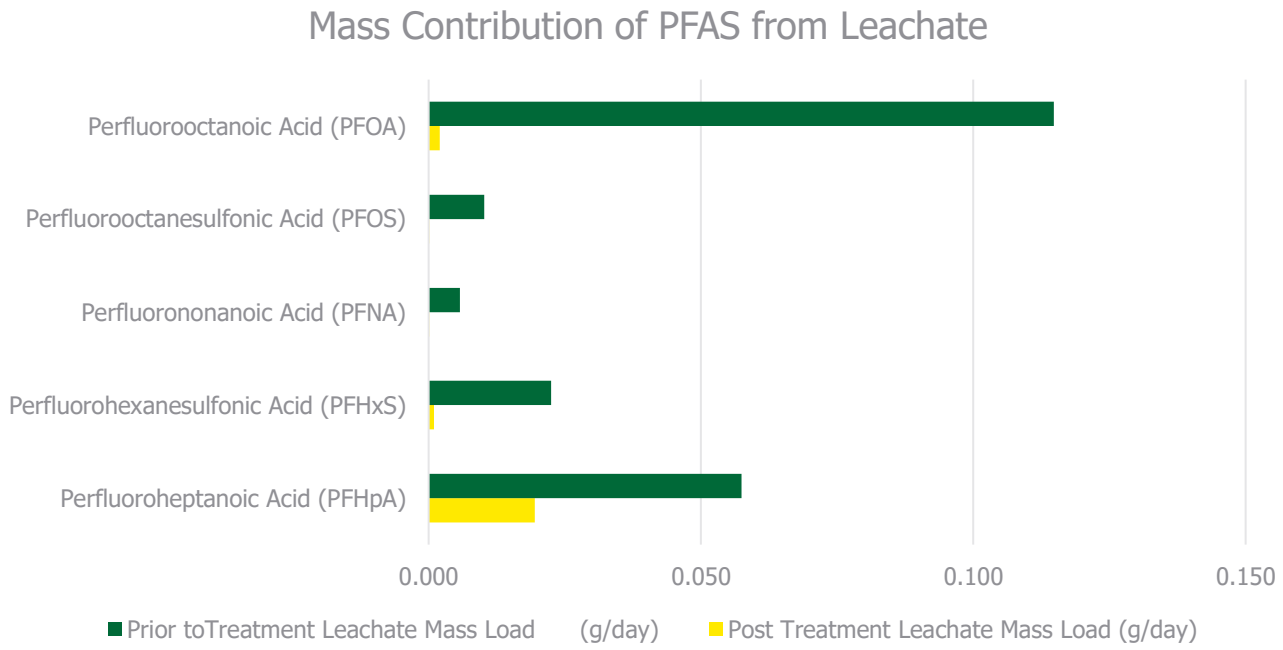




Treatment Effectiveness

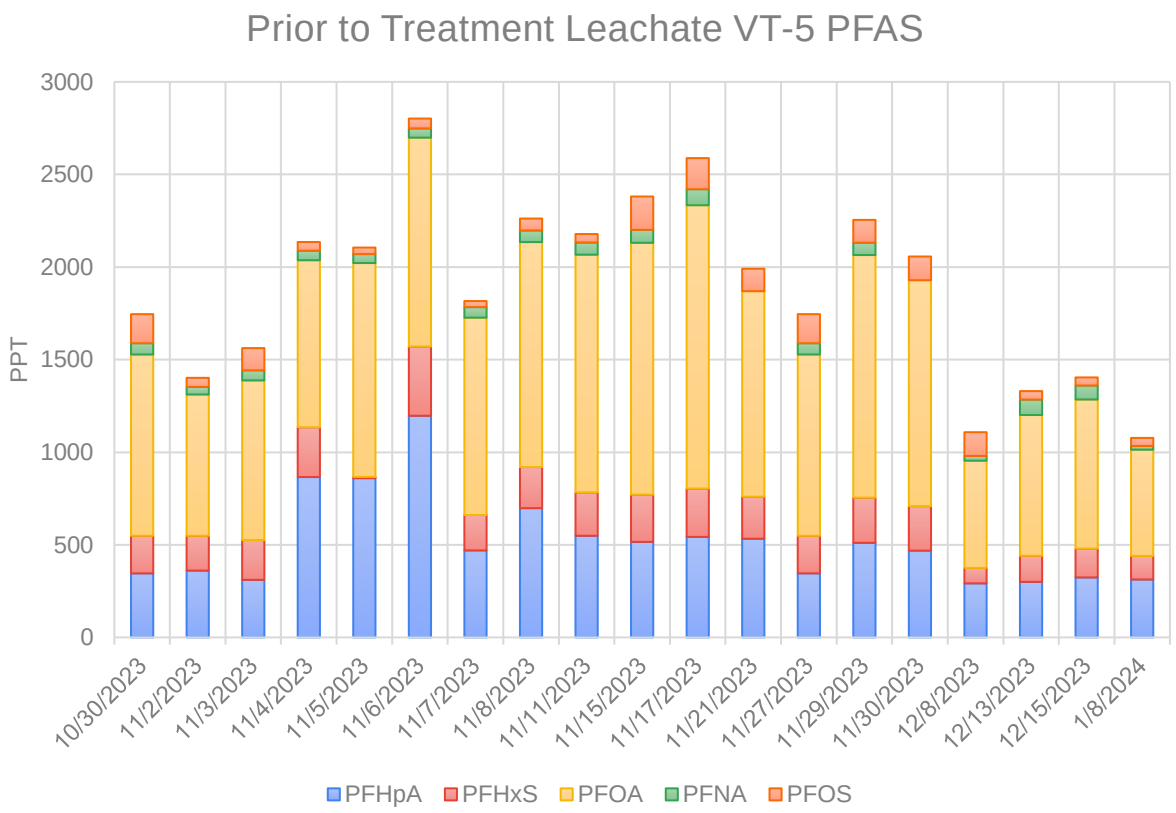
Our contribution to Montpelier VT 5 PFAS inputs

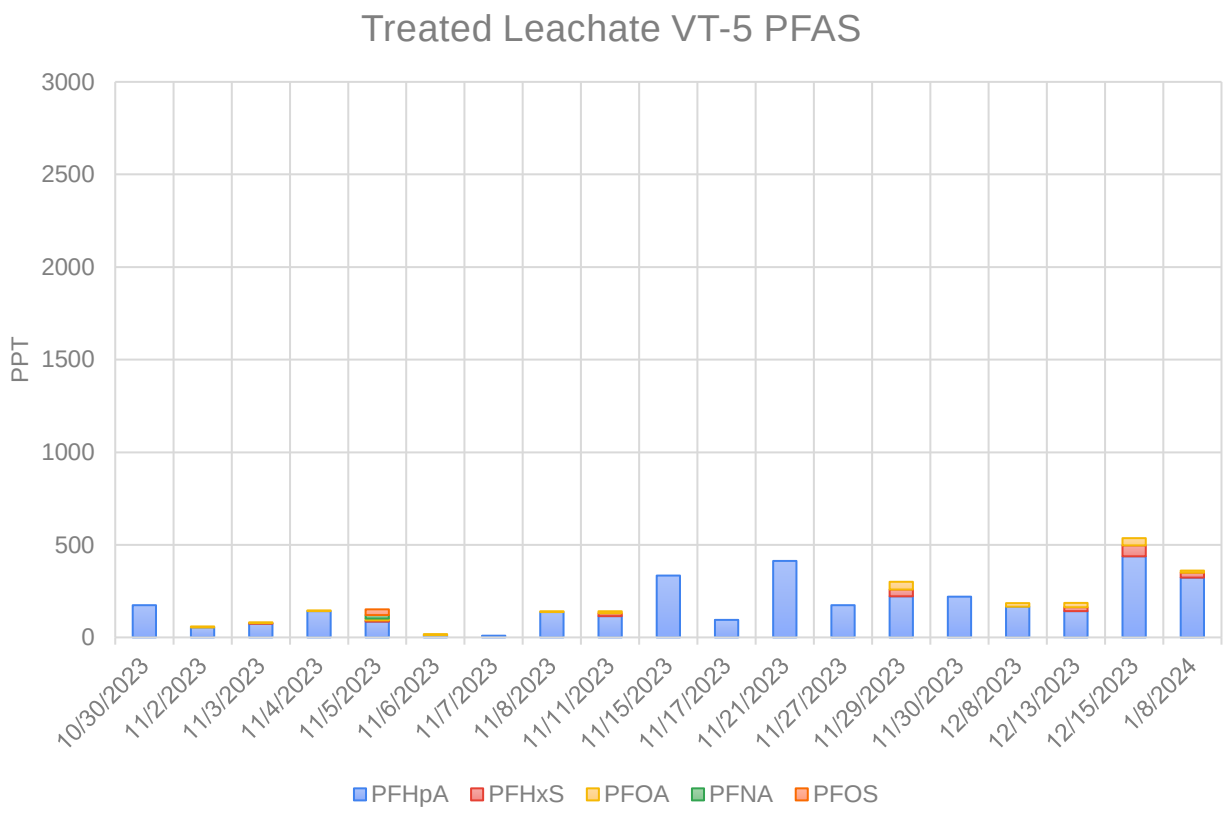




Treatment Effectiveness

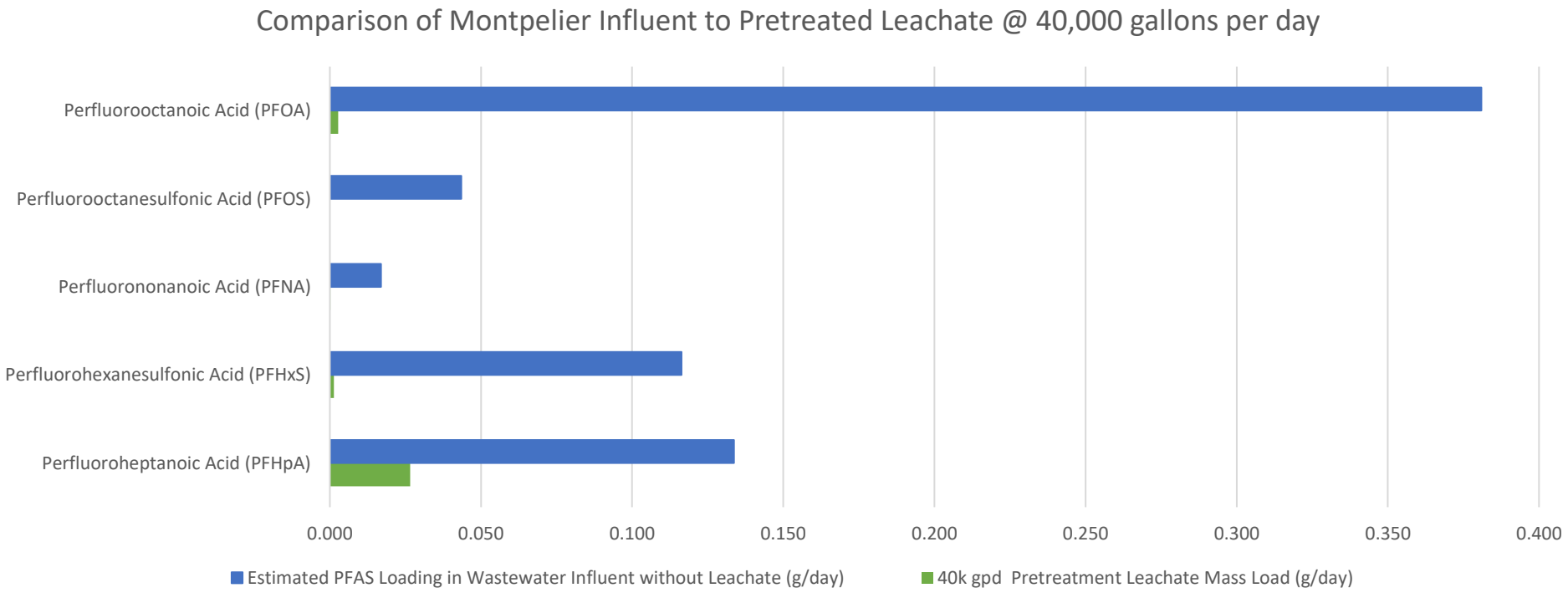
Results of Treatment Shakedown





Treatment Effectiveness

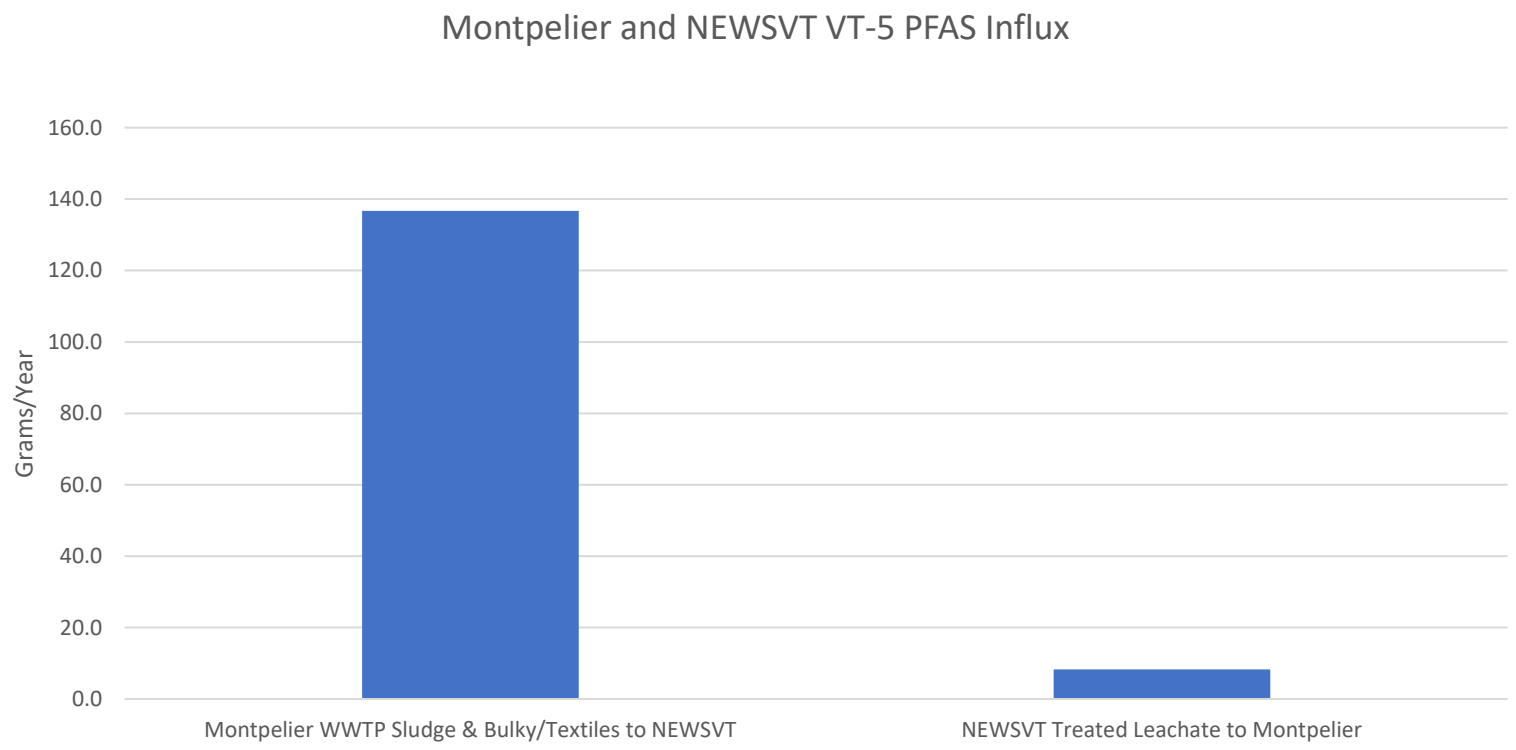
Results of Treatment Shakedown



Montpelier Influx

We are Helping Montpelier with PFAs Containing Waste

- MSW is not included, likely has appreciable amounts as well



Thank You!

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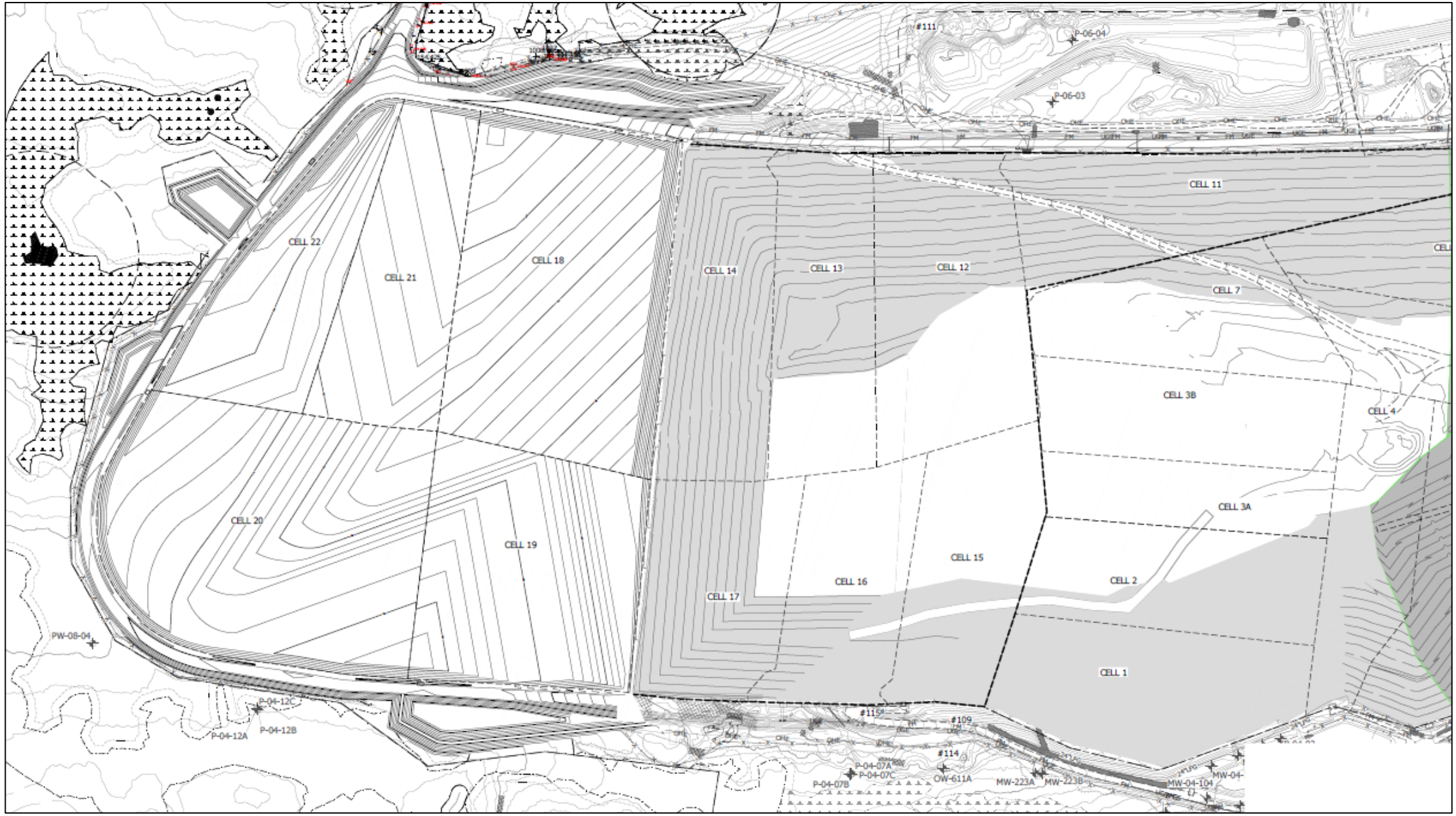
Project Overview Meeting Schedule

Nov. 7 6 P.M.	City of Old Town	Town Hall	Project History, Overview, and Permitting Requirements
Nov. 21 6 P.M.	Town of Alton	Town Hall	Visual, Traffic, Natural Resources, Odor
Dec. 4 6 P.M.	City of Old Town	Town Hall	Geology, Hydrogeology, Water Quality, Leachate Management, and PFAS treatment
Dec. 17 6 P.M.	City of Old Town	Town Hall	Phase II Expansion Design, Operations, Noise, and Seagulls

Questions?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P-06-04
P-06-03
CELL 11
CELL 22
CELL 21
CELL 18
CELL 14
CELL 13
CELL 12
CELL 7
CELL 3B
CELL 4
CELL 3A
CELL 20
CELL 19
CELL 15
CELL 16
CELL 17
CELL 2
CELL 1
PW-08-04
P-04-12C
P-04-12A
P-04-12B
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#109
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OW-611A
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MW-223B
MW-04-104
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CELL 22
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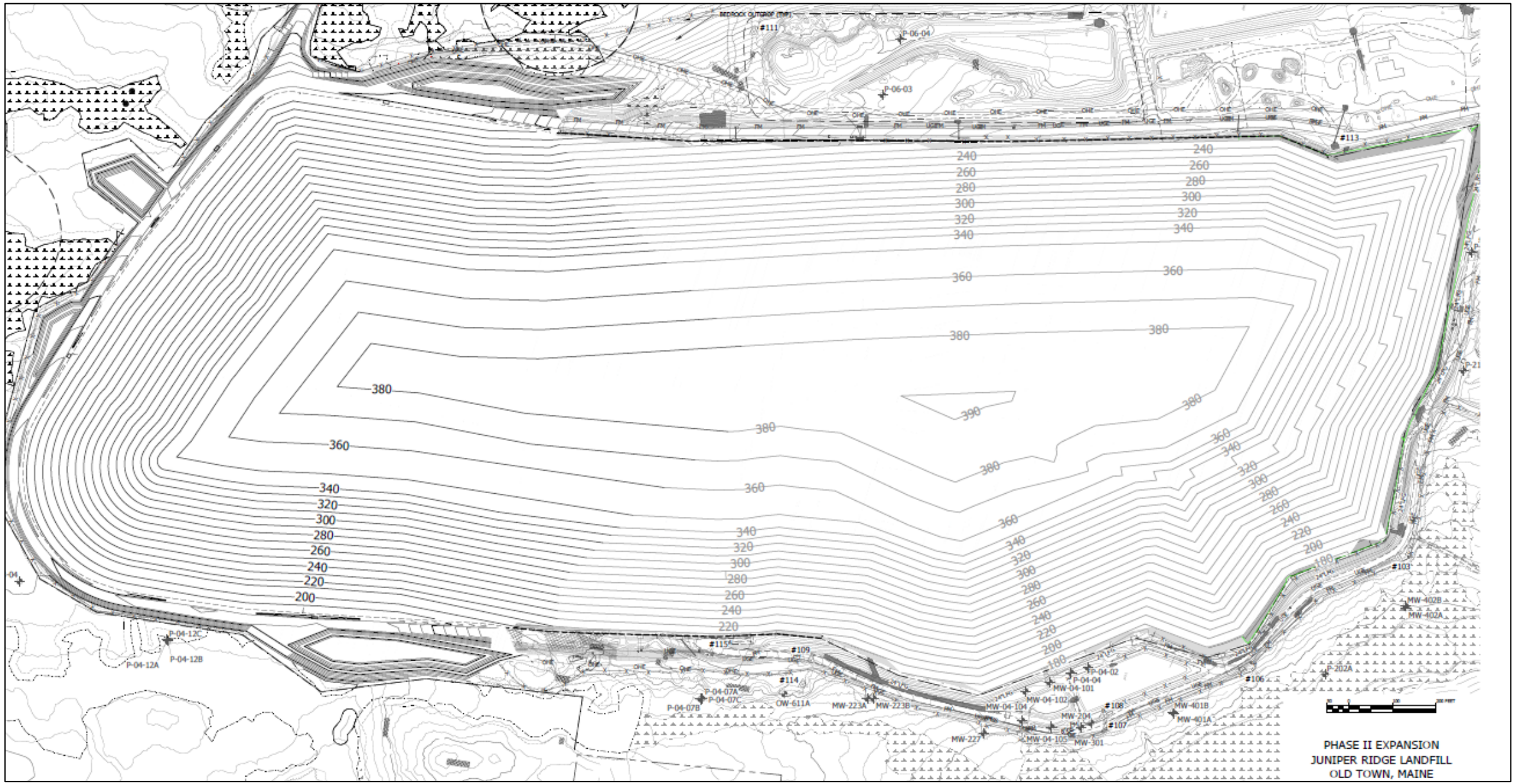
PHASE II EXPANSION
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE