

Annual 2020 Offsite Sulfolane Plume Monitoring Report

City of North Pole and Surrounding
Area

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March 30, 2022

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
bgs	below ground surface
FHRA	Flint Hills Resources Alaska
Integral	Integral Consulting Inc.
SGS	SGS North America, Inc.
Williams	Williams Alaska Petroleum, Inc.
WTZ	Water Table Zone

EXECUTIVE SUMMARY

On behalf of Williams Alaska Petroleum (Williams), Integral Consulting Inc. has prepared this Offsite Sulfolane Plume Monitoring Report (2020 Report) for the former Flint Hills Resources Alaska North Pole Refinery, located on H and H Lane in North Pole, Alaska (Site). This 2020 Report was prepared to document the 2020 annual monitoring of sulfolane in groundwater located downgradient of the Site, which was conducted as described in the scope of work (Duncan 2020) approved by the Alaska Department of Environmental Conservation (ADEC) on August 3, 2020 (Mulder 2020). The final work plan, Offsite Sulfolane Plume Monitoring Plan (2020 Plan), was submitted to ADEC on August 19, 2020. The 2020 Plan included the sampling of 48 monitoring wells and 127 private wells (including conditional locations).

While not all of the proposed wells in the 2020 Plan were sampled due to access constraints and overall reduced schedule of the sampling, an evaluation of available data has shown that overall, the observed 2020 concentrations of sulfolane are consistent with previous groundwater trends and show a stable plume footprint.

1 INTRODUCTION

On behalf of Williams Alaska Petroleum, Inc. (Williams), Integral Consulting Inc. (Integral), has prepared this Offsite Sulfolane Plume Monitoring Report (2020 Report) for groundwater downgradient of the former Flint Hills Resources Alaska (FHRA) North Pole Refinery, which is located on H and H Lane in North Pole, Alaska (Site; Figure 1).

This report satisfies annual reporting requirements for the Alternative Water Solutions Program outlined in the 2020 Offsite Sulfolane Plume Monitoring Plan (2020 Plan) and provides the proposed sampling for 2022. The 2020 Plan, dated August 19, 2020, included sampling of 48 monitoring wells and 127 private wells, including conditional wells.¹ Due to the timing of the 2020 Plan implementation by Williams, offsite sampling for sulfolane was already underway as part of the prior offsite sulfolane monitoring program implemented by FHRA. To present a comprehensive review of all data, all sulfolane samples collected in 2020 are included in this report. Deviations, if any, from the 2020 Plan are discussed in detail in Section 2.

The locations of monitoring wells and private wells sampled as part of the 2020 Plan monitoring program are presented on Figures 2 and 3. A list of monitoring well and private well locations is included as Table 1. The objective of the groundwater monitoring described in this report is to monitor and track sulfolane plume stability and plume migration, if any.

Field activities to implement the 2020 Plan prepared by Williams were completed by Shannon & Wilson in November 2020, by qualified persons as defined by 18 Alaska Administrative Code (AAC) 75.990. All work was conducted in accordance with 2020 Plan except where noted, and samples were collected and analyzed in accordance with 18 AAC 75.355(a).

¹ An error on Table 1 of the 2020 Plan listed private well locations PW-512 and PW-974 twice. The 2020 Plan included 127 distinct private well locations including conditional location PW-0242.

2 CURRENT GROUNDWATER MONITORING PROGRAM AND METHODS

The 2020 Plan was developed in accordance with the description of the scope of work presented by Williams in correspondence dated July 27, 2020 (Duncan 2020) and approved by the Alaska Department of Environmental Conservation (ADEC) on August 3, 2020 (Mulder 2020). Activities proposed in this plan and completed as part of this reporting cycle include sampling of monitoring wells, sampling of private wells, surveying of monitoring wells, and maintenance activities.

Groundwater monitoring locations are shown on Figures 2 and 3, and historical groundwater monitoring data are included in Appendix A.

2.1 PLUME MONITORING—MONITORING WELL SAMPLING

The objective of annual groundwater monitoring at and near the Site is to monitor sulfolane concentrations present within the aquifer system. As part of the 2020 Plan field activities, groundwater elevation readings were collected from each monitoring well prior to sampling. Groundwater samples were then collected from a total of 47 monitoring wells. One monitoring well proposed in the 2020 Plan, MW-332-110, was damaged and inaccessible. A list of the wells sampled is included as Table 1 and presented on Figure 2.

2.2 PLUME MONITORING PLAN—PRIVATE WELL SAMPLING

In addition to sample collection from monitoring wells, private well sampling was also completed in November 2020 as part of the 2020 Plan. Also, because FHRA had initiated sampling in accordance with the now revised Long-Term Monitoring Plan (2017 Plan, Arcadis, 2017, and subsequent revisions in 2018 and 2019), a total of 152 private well locations were sampled for sulfolane in 2020, 82 of which were included in the 2020 Plan. Forty-two of the proposed 2020 Plan locations were not sampled due to limited access associated with the sampling schedule (time of year, resident declined, no response, etc.). The wells not sampled include:

- PW-0242
- PW-0245
- PW-0262
- PW-0266
- PW-0267
- PW-0268
- PW-0272
- PW-0273
- PW-0274
- PW-0276
- PW-0280
- PW-0281
- PW-0282
- PW-0283
- PW-0287
- PW-0288
- PW-0289
- PW-0290
- PW-0366
- PW-0367
- PW-0369
- PW-0537
- PW-0546
- PW-0591
- PW-0611
- PW-0614
- PW-0624
- PW-0627
- PW-0628
- PW-0649
- PW-0867
- PW-0907
- PW-0936
- PW-0978
- PW-1093
- PW-1118
- PW-1230
- PW-1450
- PW-1458
- PW-1608
- PW-1921
- PW-2205

A list of the private wells sampled in 2020 is included as Table 1, and locations are presented on Figure 3.

2.3 MONITORING WELL MAINTENANCE ACTIVITIES

Offsite monitoring wells were resurveyed in December 2020 by Design Alaska, Inc., a licensed surveyor, to determine if the monitoring wells had been affected by permafrost freezing and thawing (Appendix B). The information from this survey was used to determine groundwater flow direction, as described in Section 3.1.

Additionally, minor maintenance activities were performed as needed during this reporting period.

3 GROUNDWATER SAMPLING RESULTS

A summary of the 2020 groundwater monitoring results is provided in the sections below.

3.1 GROUNDWATER ELEVATION

Prior to sampling, a synoptic water level event was completed at all sampled monitoring wells. A licensed surveyor was also present onsite to collect elevation data for the monitoring wells that were suspected to have been affected by permafrost melt and freezing patterns. These revised survey results were used to determine groundwater elevation and flow direction.

The monitoring wells are divided into four depth zones: the Water Table Zone (WTZ); Zone 1, consisting of wells screened at depths between 10 and 55 ft below ground surface (bgs); Zone 2, consisting of wells screened at depths between 55 and 90 ft bgs; and Zone 3, consisting of wells screened at depths between 90 and 150 ft bgs.

In all zones, groundwater flow was to the northwest, as presented in Figures 4 through 7. A summary of synoptic gauging results is included as Appendix C, and the surveyor report is included as Appendix B.

3.2 MONITORING WELL SAMPLING

On November 22–26, 2020, qualified persons as defined by 18 AAC 75.990 mobilized to the offsite monitoring wells to collect groundwater samples for sulfolane analysis. Field parameters were collected at the time of sampling, including temperature, dissolved oxygen, conductivity, pH, oxidation reduction potential, and water clarity. A summary of field parameters and monitoring well sampling logs completed by Shannon & Wilson are included in Appendix D.

Samples were sent to SGS North America, Inc. (SGS), for sulfolane analysis. SGS is a certified laboratory that has historically been used as part of annual monitoring of sulfolane concentrations in this area. One duplicate sample (Sample ID MW-250A-10) was submitted and analyzed for quality assurance purposes. The parent sample and duplicate had consistent concentrations, indicating that sampling methods and the analytical laboratory analysis generate reproducible data of acceptable data quality. Monitoring well results provided by SGS were determined to be usable and to meet the data objectives of sampling.

Sulfolane was reported in monitoring wells at concentrations ranging between not detected and 97.5 µg/L or parts per billion (ppb) (collected from MW-153A-15). In 2020, 25 wells reported no detections of sulfolane (53.2% of the total) and 8 wells reported concentrations of sulfolane below 20 ppb (17% of the total). Fifteen of the 47 monitoring wells sampled had detections of sulfolane that ranged between 20 µg/L and 100 µg/L, with only 5 wells over 50 ppb. Historically

sulfolane concentrations exceeded 100 µg/L at 35 wells in 20 locations (multiple wells at one location screened in different zones, signified by letter designation).

A summary of monitoring well analytical results is presented in Table 2, and laboratory analytical data packages are included in Appendix E. Monitoring well results are presented on Figure 8.

3.3 PRIVATE WELL SAMPLING

Samples were collected from a total of 152 residential properties between January and December 2020 for sulfolane analysis.

Samples were sent to SGS for sulfolane analysis. A total of 91 duplicate samples were submitted and analyzed for quality assurance purposes. The parent samples and duplicates had consistent concentrations, suggesting that data quality was not impacted as a result of sampling. Results provided by SGS were determined usable to meet the objectives of sampling.

Sulfolane was reported in private wells at concentrations ranging between not detected and 98.2 µg/L (PW-0561). A majority of the private wells sampled in 2020 reported no detections of sulfolane (89 private wells, approximately 58.6% of sampled private wells), and 35 private wells reported concentrations below 20 ppb (approximately 23% of sampled private wells). Twenty eight of the 152 private wells sampled in 2020 had detections of sulfolane that ranged between 20 µg/L and 100 µg/L, representing approximately 18.4% of the total private wells sampled.

A summary of private well analytical results is presented in Table 3, and laboratory analytical data packages are included in Appendix E. A summary of the residential well network, 2020 sampling dates, and justification for missed sample locations, as applicable, as well as field sampling forms for all residential wells, are included in Appendix F. Private well sampling results are presented on Figure 9.

4 CONCLUSIONS AND RECOMMENDATIONS

The objectives of the 2020 Plan have been met and demonstrate the following:

- Groundwater gradient and flow direction are consistent with historical trends (see Figures 4 through 7). Thus, the proposed well network is appropriate for analysis.
- Evaluation of 2020 data as depicted on Figures 8 and 9 have shown that the overall plume footprint is stable.
- No additional monitoring locations are required to meet the objectives of the 2020 Plan.

5 REFERENCES

Arcadis. 2017. Offsite Groundwater Sulfolane Plume Monitoring Plan. Arcadis, U.S., Inc, Seattle Washington, June 2017.

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Duncan, T. 2020. Response to State of Alaska’s Requested Long-Term Offsite Monitoring of the Sulfolane Plume in North Pole, Alaska. Shook, Hardy, and Bacon. July.

Mulder, S. 2020. Long-Term Offsite Monitoring of the Sulfolane Plume in North Pole North Pole Refinery Litigation (Flint Hills) Case No. 4FA-14-01544 CI – Consolidated, AGO No. AN2014100495. Alaska Department of Law. August 3.

Integral. 2020. 2020 Offsite Sulfolane Plume Monitoring Plan, City of North Pole and Surrounding Area, Integral Consulting Inc, Cherry Hill, New Jersey, August 2020.

Figures

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Figure 1. Site Location

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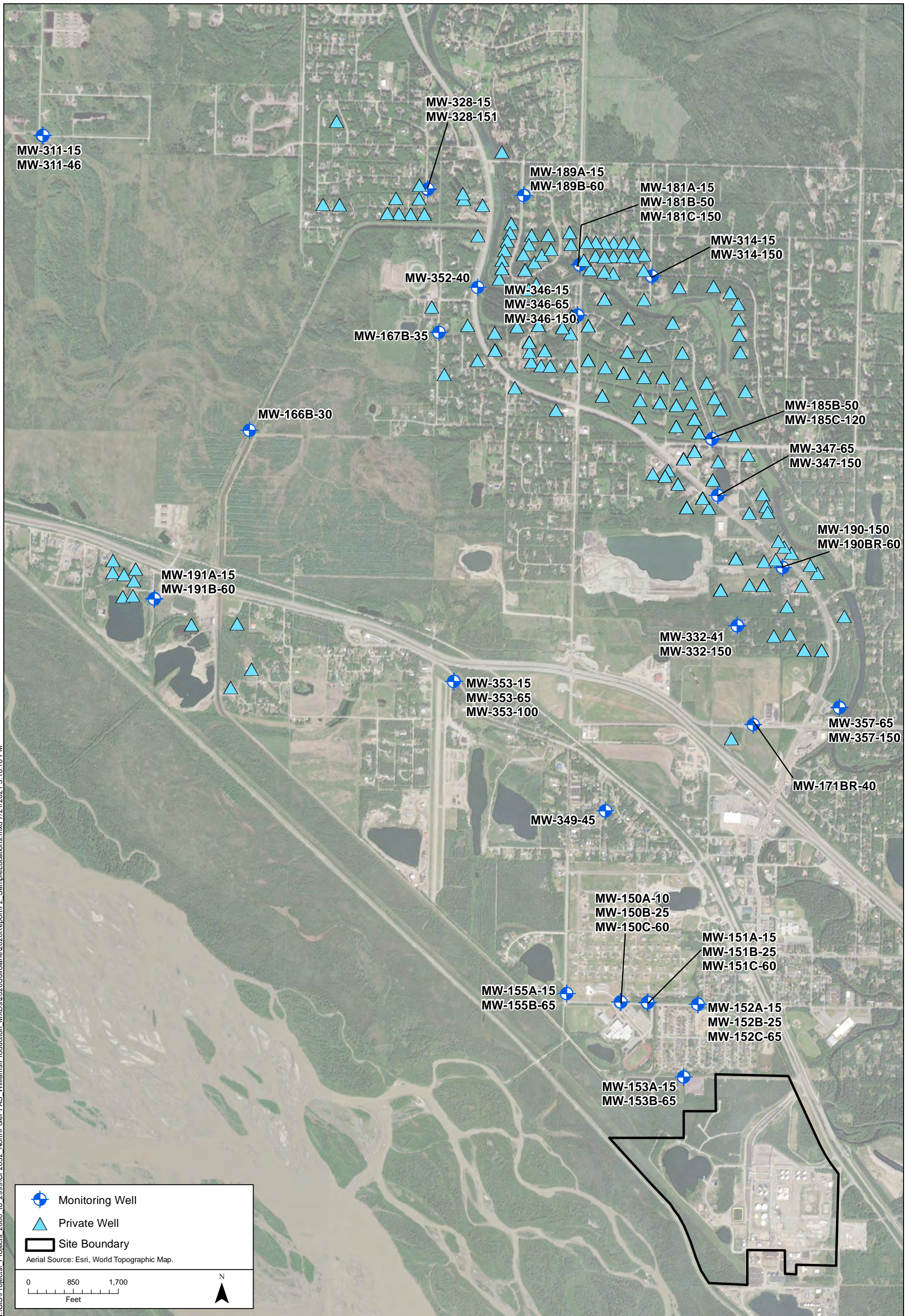


Figure 2.
Monitoring and Private Well Sample Locations

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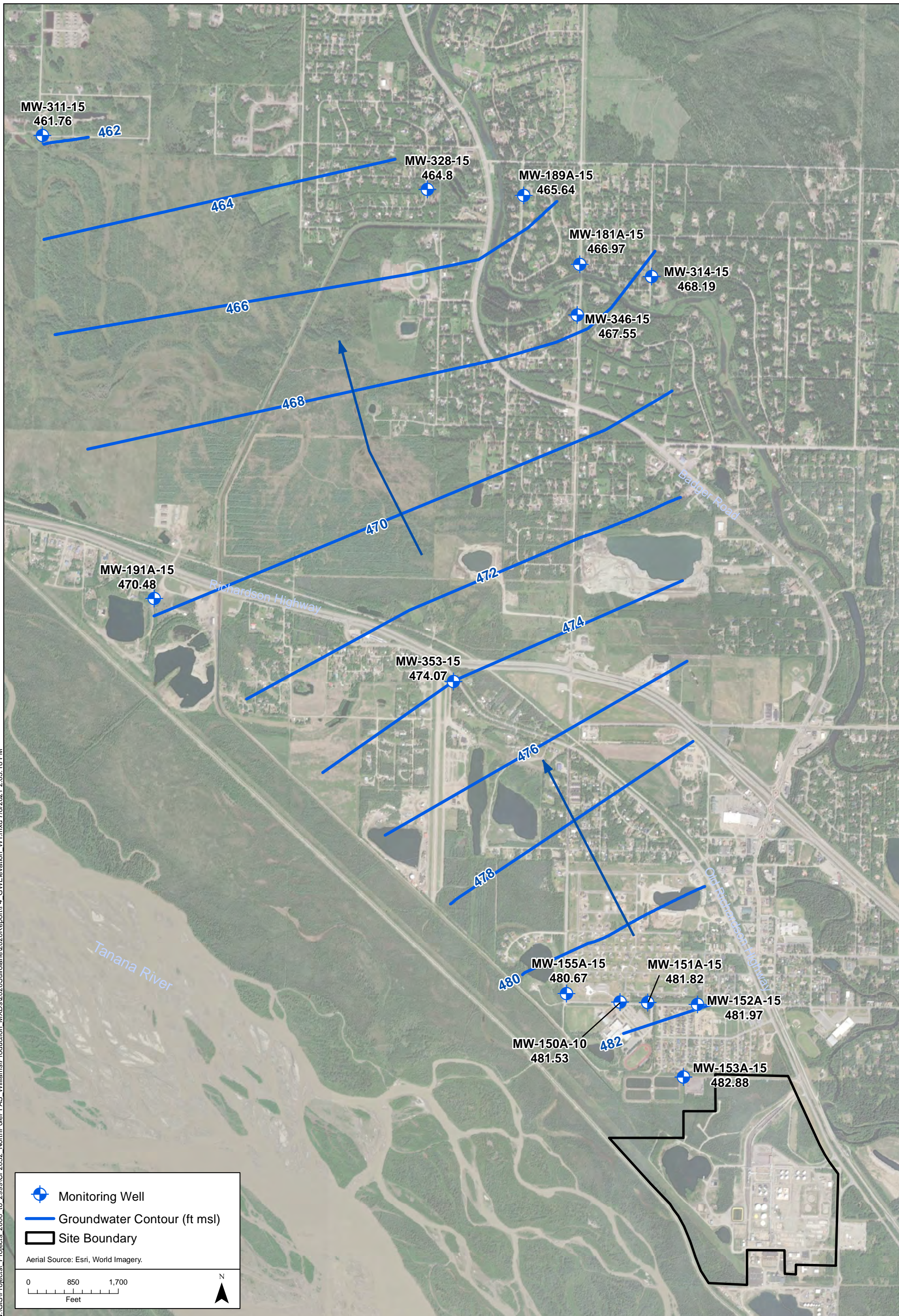


Figure 4.
Groundwater Contour Map (Offsite Wells)
Water Table Zone

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Figure 5.
Groundwater Contour Map (Offsite Wells)
Zone 1 (10-55 ft)


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Figure 6.
Groundwater Contour Map (Offsite Wells)
Zone 2 (55-90 ft)
December 2020

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 Monitoring Well

 Groundwater Contour (ft msl)

 Site Boundary

Aerial Source: Esri, World Imagery.

0 850 1,700
Feet

N

Figure 7.
Groundwater Contour Map (Offsite Wells)
Zone 3 (90-150 ft)
December 2020

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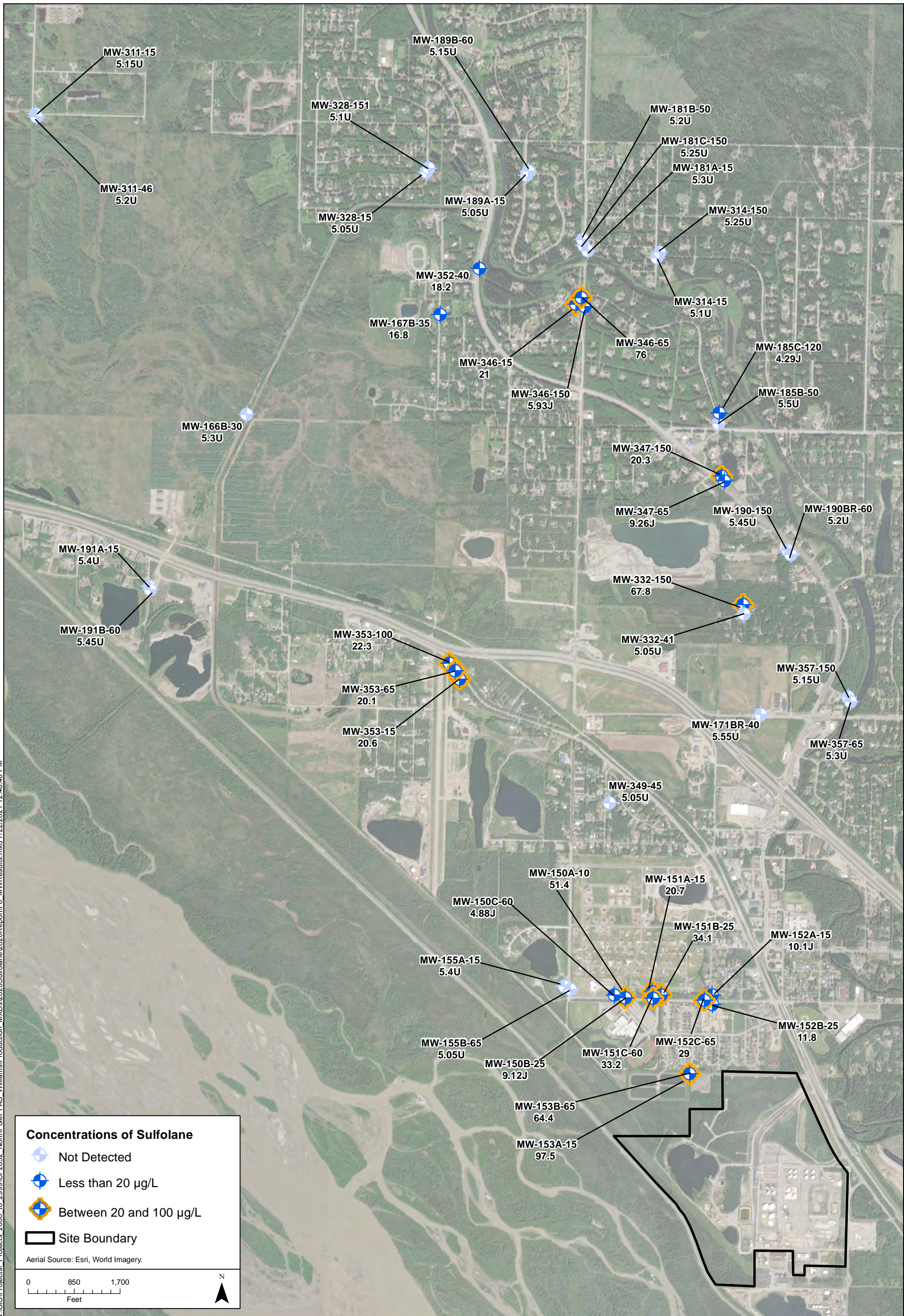


Figure 8.
2020 Monitoring Well Sulfolane Results

Notes:
Some monitoring well locations are approximate to increase visibility of sample results.

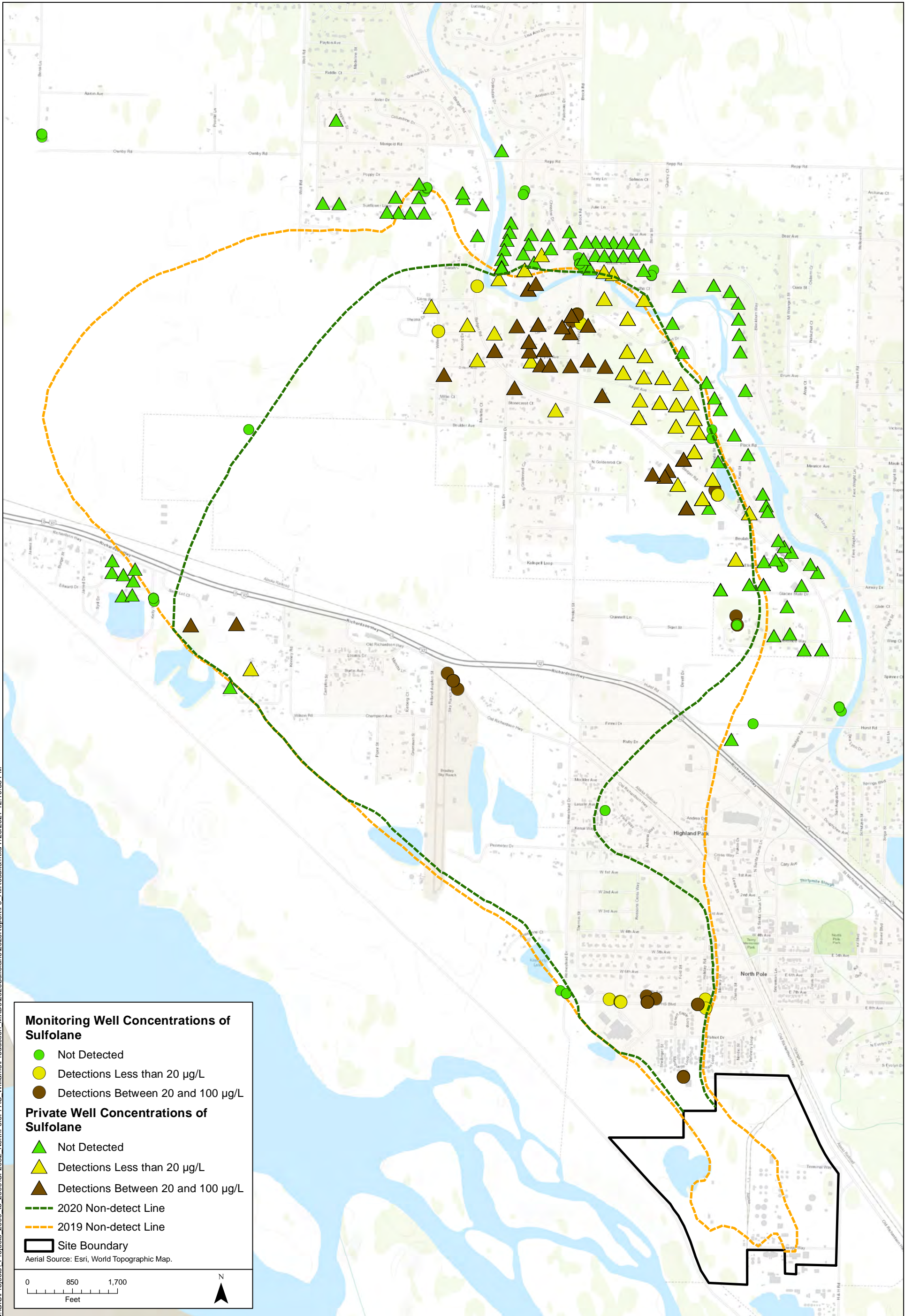


Figure 9.
2020 Offsite Groundwater Sampling and Private Well Sulfolane Results

Notes:
Some monitoring well locations are approximate to increase visibility of sample results.