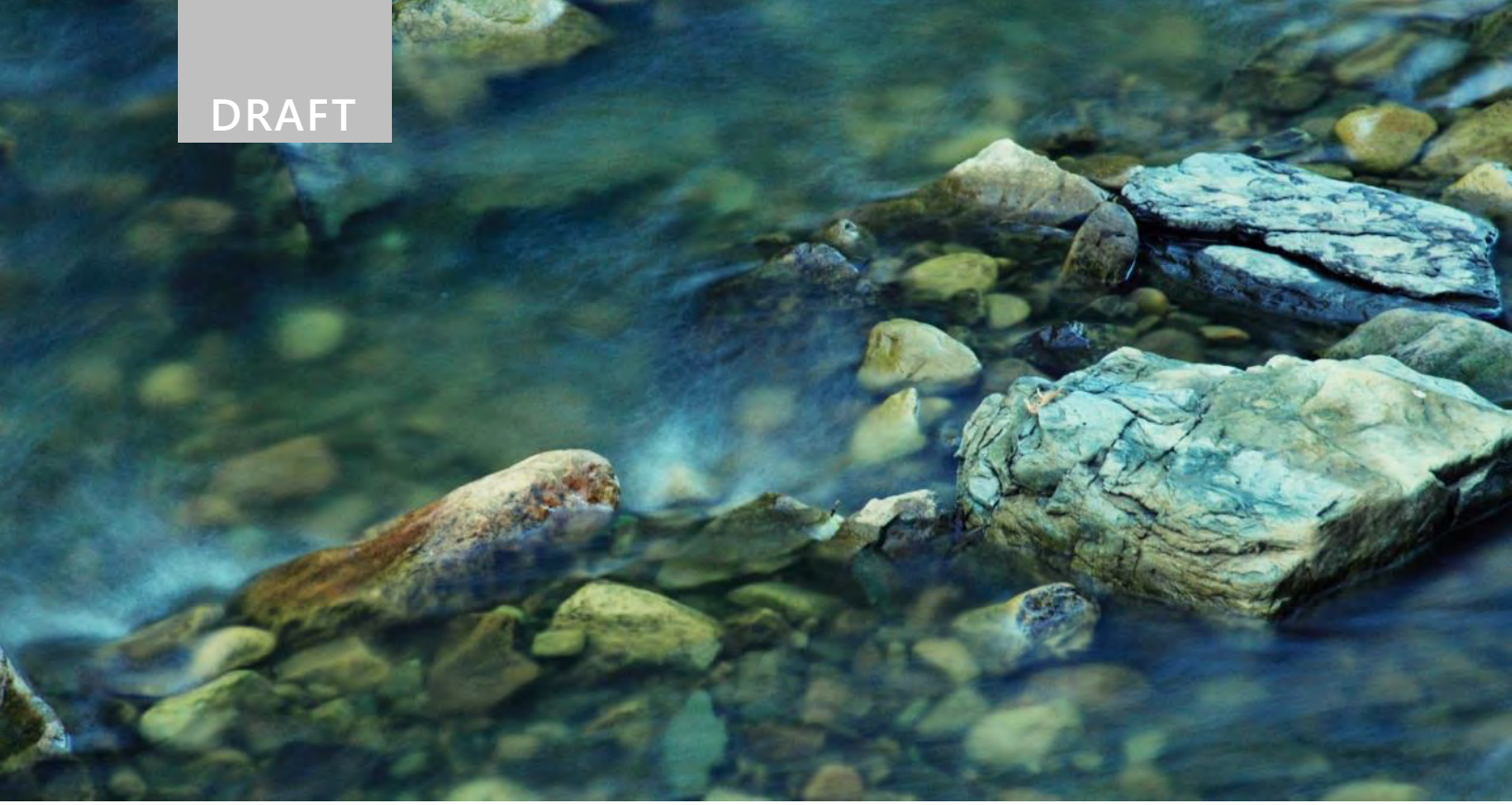

August 21, 2019
Yakima Valley Dairies | SDWA-10-2013-0080

ANCHOR QEA

2018 Annual Report

Prepared for Cow Palace, LLC
George DeRuyter & Son Dairy, LLC; D&A Dairy, LLC; George & Margaret, LLC
Liberty Dairy, LLC; H&S Bosma Dairy

DRAFT

August 21, 2019
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2018 Annual Report

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George DeRuyter & Son Dairy, LLC; D&A Dairy, LLC;
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Prepared by
Anchor QEA, LLC
1119 Pacific Avenue, Suite 1600
Tacoma, Washington 98042
In association with Agrimanagement, Inc.

Project Number: 190996-02.01
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ABBREVIATIONS

AFMP	application field management plan
AOC	Administrative Order on Consent
bgs	below ground surface
CDMA	code division multiple access
DAF	dissolved-air flotation
DAFR	dairy application field report
Dairies	Yakima Valley Dairies
EPA	U.S. Environmental Protection Agency
GCL	geosynthetic clay liner
HASP	health and safety plan
HDPE	high-density polyethylene
IWMP	irrigation water management plan
MCL	maximum contaminant level
MDL	method detection level
mg/L	milligrams per liter
mg N/kg	milligrams of nitrate per kilogram
NDN	nitrification/denitrification
NE Catch Basin	Cow Palace Northeast Catch Basin
NW Catch Basin	Cow Palace Northwest Catch Basin
O&M	operations and maintenance
ppm	parts per million
QAPP	quality assurance project plan
RO	reverse osmosis
SOW	Statement of Work
SWCB	George DeRuyter & Son Dairy Stormwater Catch Basin
TKN	total Kjeldahl nitrogen
VWC	volumetric water content
WET	Water & Environmental Technologies
Yakima Valley Dairies	1) Cow Palace, LLC; 2) D&A Dairy, LLC (also known as D and A Dairy, L.L.C.), George DeRuyter & Son Dairy, LLC, and George & Margaret, LLC; and 3) Liberty Dairy, LLC, and its associated dairy facility H&S Bosma Dairy

Executive Summary

In 2018, 1) Cow Palace, LLC; 2) George DeRuyter & Son Dairy, LLC, D&A Dairy, LLC (also known as D and A Dairy, L.L.C.), and George & Margaret, LLC; and 3) Liberty Dairy, LLC, and its associated dairy facility H&S Bosma Dairy (collectively referred to as the Yakima Valley Dairies [Dairies]) continued performing activities consistent with Administrative Order on Consent (AOC) Docket No. SDWA-10-2013-0080 (EPA 2013) requirements.

The Dairies continued to fund the maintenance of reverse osmosis systems at residences within the 1-mile downgradient boundary of the Dairies.

Lagoon lining and construction activities in 2018 resulted in the completion of one lagoon lining project each at Liberty/H&S Bosma Dairies and George DeRuyter & Son/D&A Dairies, one lagoon abandonment project being completed at Cow Palace, and four lagoon abandonment projects being initiated at Liberty/H&S Bosma Dairies.

During 2018, Liberty Dairy spent significant time and resources collaborating with a third party to design a vermiculture treatment system for enhancing nutrient recovery from liquid manures. Construction of the system was not implemented due to the high combined costs (costs to the Dairy included capital costs, operating costs, and additional intellectual property fees) associated with this proprietary treatment system.

At George DeRuyter & Son Dairy, upgrades were initiated to the Dairy's manure digester and dissolved-air flotation (DAF) unit. The upgrades (to be completed in 2019) will produce cleaned biogas destined for off-site production of low-carbon vehicle fuels. In addition, George DeRuyter & Son Dairy designed and initiated the construction of a lagoon-based nitrification/denitrification system for reducing the nitrogen content of its liquid manure.

Groundwater monitoring activities continued, including the completion and submittal of quarterly groundwater monitoring data reports. In 2018, nitrate concentrations in all northern wells and upgradient wells continued to remain below the nitrate maximum contaminant level (MCL) of 10 milligrams per liter (mg/L). Groundwater concentration plots for nitrate are included in Figures 12 through 16 of this report. Detected phosphorus concentrations were below 0.10 mg/L in all wells.

The Dairies continued pre-plant and post-harvest soil and manure sampling, including the completion and submittal of dairy application field reports as required by the AOC. Fall nitrate concentrations in application fields at Cow Palace and Liberty/H&S Bosma Dairies continued to remain below 45 parts per million (ppm) at the 2-foot depth interval. Nitrate concentrations in application fields at George DeRuyter & Son/D&A Dairies were below 45 ppm except for three fields. One of these fields that previously exceeded the 45-ppm goal (GDS-SU08) continued to show a

downward trend. Monitoring and nutrient controls will continue at the other two fields (GDS-SU06 and GDS-SU07) to facilitate meeting the 45-ppm goal, as discussed in Section 5.5.1.

The Dairies continued to monitor soil moisture levels in the application fields at each Dairy. The current program includes 83 active sensors, with 2 to 3 sensors per field. Problems with individual sensor performance (e.g., electronics problems, sensor fouling or damage caused by animals and harvest operations) were minimized through biweekly sensor maintenance. Out of a total of 12,676 valid moisture measurements during the 2018 irrigation season, there were 69 exceedances (i.e., 99.46% of sensor readings were compliant with irrigation control expectations). Irrigation monitoring is continuing during 2019.

The Dairies continued to implement controls and monitoring for their off-site shipments of manure. In areas where groundwater nitrate levels are known by the Dairies to exceed the MCL (10 mg nitrate-N/L), those controls include the collection of soil testing data are collected prior to shipment of manure or compost to that off-site application field. There was one instance during 2018 where these procedures were not followed correctly, and corrective actions were implemented.

1 Introduction

This annual report was prepared by: 1) Cow Palace, LLC; 2) George DeRuyter & Son Dairy, LLC, D&A Dairy, LLC (also known as D and A Dairy, L.L.C.), and George & Margaret, LLC; and 3) Liberty Dairy, LLC, and its associated dairy facility H&S Bosma Dairy (collectively referred to as the Yakima Valley Dairies [Dairies]). Dairy locations are shown in Figure 1.

This report outlines activities undertaken by the Dairies pursuant to Administrative Order on Consent (AOC) Docket No. SDWA-10-2013-0080 (EPA 2013) and Statement of Work (SOW) during the calendar year 2018, which covers the period from January 1 to December 31, 2018. This report includes the information required by Section III.K.2 of the SOW.

The goal of the work conducted in accordance with the AOC is to achieve drinking water quality that meets the U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL) for nitrate of 10 milligrams per liter (mg/L) in the drinking water aquifer beneath and downgradient of the Dairies. The objectives of the work conducted in accordance with the SOW are as follows:

1. Expeditiously provide a permanent, safe alternative drinking water supply to residents using private drinking water wells that exceed the MCL for nitrate (nitrate as nitrogen, or N03-N) and are on or within 1 mile downgradient of the Dairies.
2. Take specific actions to further control potential sources of nitrogen at the Dairies.
3. Establish a network of monitoring wells to measure the effectiveness of the nitrogen source reduction actions on water quality in the shallow alluvial aquifer that serves as an underground source of drinking water.
4. Ensure effective nutrient management at the Dairies to reduce the introduction of nitrate to an underground source of drinking water.

In 2018, EPA and the Dairies corresponded via face-to-face meetings, document submittals, and EPA comment letters regarding a number of actions pursuant to the AOC. EPA comment letters are listed by date in Appendix A and are noted (as applicable) throughout this report.

2 Alternative Drinking Water Supply

2.1 Initial Evaluation and Treatment System Installations

In 2013, the Dairies consultant, Inland Earth Sciences (IES), conducted testing of groundwater at residences located downgradient of the Dairies. Groundwater testing was performed at 141 locations where access was obtained from the property owners (Figure 2). At 75 of these locations, groundwater nitrate concentrations were below the MCL.

At the remaining locations, the Dairies offered to fund the installation and maintenance of reverse osmosis (RO) treatment systems or to provide bottled water. A total of 36 residents accepted the offer for a new RO system, and 9 residents were supplied with bottled water. In addition, the Dairies also committed to maintain RO systems at an additional 15 residences where RO systems had been previously installed by the residences.

2.2 Ongoing Treatment System Maintenance

Maintenance information for the RO systems is summarized in Table 1. In 2018, the Dairies continued to fund the maintenance of 51 RO systems at residences within the 1-mile downgradient boundary of the Dairies and to supply bottled water to nine other residents. During 2018, this work was implemented by Independent Water Service, Inc.

3 Actions to Further Control Potential Sources of Nitrogen

This section describes the status of actions taken to control potential sources of nitrogen from the Dairies, apart from the management of application fields. Application field management is discussed in Section 5.

3.1 Solid Separators

In 2013, a review was conducted of the solid separator areas at each Dairy. Results indicated solid separator areas at each Dairy were found to be in compliance with the requirements of the SOW, as described in the *2013 Annual Report* (IES 2016a).

In 2018, the solids separation systems at each Dairy included the following:

- Slope screen separator and centrifuge system at Cow Palace
- Centrifuge system at Liberty/H&S Bosma Dairies (the centrifuge system was rebuilt by the supplier as part of periodic required maintenance)
- Dissolved-air flotation (DAF) system at George DeRuyter & Son/D&A Dairies (an overhaul of the DAF system was initiated during 2018 in parallel with upgrades to the Dairies' manure digester)

In 2018, Liberty Dairy invested significant time and resources to help design a pilot test of a vermiculture treatment system for enhancing recovery of nutrients and nutrient solids from liquid manures. This design effort is described in Section 3.7. The system was ultimately not implemented due to the high combined costs (costs to the Dairy included capital costs, operating costs, and additional intellectual property fees) of this proprietary treatment system.

Also in 2018, George DeRuyter & Son Dairy was awarded a grant providing partial funding for repair and upgrades to its manure digester and for construction and testing of a full-scale manure treatment system using nitrification/denitrification (NDN) technology. That technology uses the activity of two different types of microorganisms to convert nitrogen in the manure to inert nitrogen gas, reducing the final concentration of nitrogen content in the treated manure. This NDN system was designed for installation in Lagoon No. 1, and construction was initiated. This work is described more fully in Section 3.8. The system was operational as of July 30, 2019.

3.2 Backflow Prevention

The presence of backflow prevention devices at each Dairy was confirmed, as described in Dairy-specific memoranda that were submitted to EPA on April 18, 2013 (ARCADIS 2013a, 2013b, 2013c). The Dairies' backflow prevention devices are detailed as follows:

- Liberty Dairy and H&S Bosma Dairy had pre-existing backflow preventers on its three production wells.
- Cow Palace also had existing backflow preventers on its four production wells.

- George DeRuyter & Son Dairy and D&A Dairy had a total of three production wells. Two of the three wells had previously installed backflow preventers. The third was installed in 2014.

In 2018, the backflow prevention devices remained operational.

3.3 Cow Pens

In 2018, the Dairies continued implementing cow pen management actions at each Dairy to prevent liquid ponding and infiltration. Pens were graded to ensure liquid generated in the pens was conveyed to each Dairy's lagoon system. Low spots occurring over time as a result of cow traffic were regraded and filled to prevent ponding. Cow pens were scraped on a weekly basis to remove accumulated manure and bedding material from the areas. Additionally, feed-mixing areas are located on asphalt or concrete surfaces, and Dairies with free stalls (Liberty/H&S Bosma Dairies and George DeRuyter & Son/D&A Dairies) are equipped with concrete flush lanes.

3.4 Roof Runoff

Roof runoff is currently conveyed to the Dairies' lagoon systems. Roof runoff in animal operation areas is conveyed to the cow pens and feed lanes either by gutter or direct runoff from the roof surface. From the cow pens and feed lanes, the roof runoff is directed to the lagoon system. Roof runoff in feed-mixing areas is conveyed to the drains associated with the silage piles. Roof runoff controls are described in the *2013 Annual Report* (IES 2016a).

3.5 Elimination of Furrow Irrigation

Under the SOW, the Dairies were required to eliminate use of furrow irrigation. Furrow irrigation has been shown to result in a higher incidence of water and nutrient transport below the root zone in comparison to modern irrigation methods (e.g., center-pivot, linear, wheel-line, or fixed-set irrigation).

Figure 3 shows for each application field the dates by which furrow irrigation was eliminated. In all but three cases, the Dairies had already modernized their irrigation methods ahead of this AOC requirement:

- One field (CP-SU06) at Cow Palace was converted from furrow irrigation to wheel-line irrigation in 2014 shortly after it was acquired by the Dairy.
- Two fields (GDS-SU12 and GDS-SU13) were converted from furrow irrigation in 2014.

No Dairies utilized furrow irrigation during 2018.

3.6 Lagoon Upgrades at Cow Palace

The status of the Cow Palace lagoon program is summarized in Figure 4.

Cow Palace elected to line its manure storage lagoons with a double-membrane liner system. That system includes two high-density polyethylene (HDPE) liners separated by a drainage layer. The drainage layer can be produced using a layer of geocomposite material (used for the Northwest Catch Basin [NW Catch Basin] lined in 2016) or by using a lower membrane liner with a dimpled surface that allows drainage between the liners without the need for a geocomposite (this system was used on Consolidated Lagoon No. 2). A leak detection system is included between the liners to detect and remove accumulations of leachate associated with leaks in the upper liner should they occur. Monitoring of leachate production from this system is used to determine when repairs of the upper liner are required.

Cow Palace is also upgrading its lagoon network to expand storage capacity in some lagoons (e.g., the consolidation and expansion of Lagoon Nos. 2 and 3 in 2017) and eliminate other unneeded lagoons. To date this has resulted in abandonment of one of the Cow Palace lagoons (the Northeast Catch Basin [NE Catch Basin]).

Design and construction activities conducted in 2018 included the development of the lining design for Lagoon No. 1 (to be lined in 2019) and the design and implementation of the abandonment of the NE Catch Basin (substantially completed in 2018). Lagoon O&M activities were performed for the other existing lined lagoons. These activities are described in more detail in Sections 3.6.1 and 3.6.2.

3.6.1 Lining Design for Cow Palace Lagoon No. 1

Pre-design investigations were conducted in early 2018 for Lagoon No. 1, including surveys and soil testing. Soil borings were advanced at the north, east, and south sides of Lagoon No. 1 by Water & Environmental Technologies (WET). As reported in WET's geotechnical investigation report, the lithology of the pre-existing lagoon embankment consisted of inconsistent layers of sand, clayey sand, silty sand, silty gravel, and silt (WET 2018). Lithology below the bottom of the pre-existing lagoon consisted of intermittent layers of silty sand, silty gravel, and sandy gravel.

In March 2018, Cow Palace submitted 90% lagoon lining design documents for Lagoon No. 1. EPA approved the 90% design as the 100% design. This approval was documented in EPA Letter 167.

Cow Palace subsequently requested that the schedule for its lagoon programs be adjusted to expedite the lining of the NE Catch Basin and defer the lining of Lagoon No. 1. This requested change was approved by EPA in EPA Letter 169.

3.6.2 Cow Palace Northeast Catch Basin Abandonment

Cow Palace submitted a letter request to EPA on June 27, 2018, to line the NE Catch Basin during 2018 (Cow Palace 2018). EPA approved the request in EPA Letter 169. Cow Palace subsequently proposed the abandonment of the NE Catch Basin instead of lining it. EPA approved the request in

EPA Letter 176. Anchor QEA, LLC, submitted the final *Cow Palace Dairy NE Catch Basin Abandonment Plan* on September 11, 2018 (Anchor QEA 2018a).

Removal of organic solids from the NE Catch Basin was performed consistent with the abandonment procedures beginning in July 2018. Soil confirmation testing was conducted on October 30, 2018. Results showed that the bottom and three sides complied with the removal goal (45 milligrams of nitrate per kilogram [mg N/kg; measured as the sum of ammonia-N and nitrate-N]), but residual nitrate was present in soils along the north side of the lagoon. These soils were over-excavated, and an additional round of compliance monitoring was performed on November 26, 2018. That round of testing documented the removal of all soils exceeding the EPA inorganic nitrogen removal goal. These compliance monitoring data are included in Appendix B.

Final abandonment of the NE Catch Basin required procurement and placement of clean backfill, installation of a concrete sump, and completion of piping modifications. A request to extend completion of the abandonment to February 2019 was requested by Cow Palace and approved by EPA in December 2018 (EPA Letter 188). Final abandonment activities were completed in early 2019 as documented in the associated completion report (Anchor QEA 2019a).

3.6.3 Operations and Maintenance of Existing Lined Lagoons

Cow Palace staff continued with the O&M of its lagoon system. O&M activities for existing lined lagoons included the following:

- **NW Catch Basin:** The NW Catch Basin was lined in 2016. Lagoon inspections were completed in accordance with the O&M plan for this lagoon during 2018. No leachate production was noted during 2018. No significant maintenance or repair activities were required.
- **Consolidated Lagoon No. 2:** This lagoon was expanded (including consolidation with former Lagoon No. 3) and lined in 2017. Lagoon inspections were completed in accordance with the O&M plan for this lagoon during 2018. No leachate production was noted during 2018. No significant maintenance or repair activities were required.
- **Lagoon No. 4:** This lagoon was previously shown to comply with applicable Natural Resource Conservation Service design requirements for waste storage lagoons. It has a clay-amended soil liner. Lagoon inspections were completed during 2018. No significant maintenance or repair activities were required.

3.6.4 Schedule for Future Lagoon Upgrades

In December 2018, Cow Palace notified EPA of the lagoons to be lined in 2019. Cow Palace proposed to line Lagoon No. 1 and the Safety Debris Catch Basin in 2019. This lagoon schedule was approved by EPA in EPA Letter 187.

Following the planned work in 2019, two Cow Palace lagoons (Settling Basins A and B) remain to be lined or abandoned. This work is scheduled to be performed in 2020.

3.7 Lagoon Upgrades at Liberty/H&S Bosma Dairies

The status of the Liberty/H&S Bosma Dairies lagoon program is summarized in Figure 4.

Liberty/H&S Bosma Dairies have elected to line their manure storage lagoons with a hybrid double-liner system. That system includes an HDPE liner placed over the top of a geosynthetic clay liner (GCL). In this system, each liner protects and reinforces the other. The upper HPDE liner protects the lower GCL from drying out or being eroded by lagoon maintenance activities. The GCL helps add durability to the lining system in that the GCL can self-seal from small punctures. In this application, the GCL also has a long operational life. Leak detection surveys for the upper liner are performed using a combination of visual and electronic leak detection surveys in alternating years.

Liberty/H&S Bosma Dairies are also upgrading their lagoon network to expand storage capacity in some lagoons, consolidate smaller lagoons, and eliminate other unneeded lagoons. To date, this has triggered the consolidation of three Liberty Dairy lagoons in 2017 (now called Consolidated Lagoon No. 15) and the abandonment of four H&S Bosma Dairy lagoons beginning in 2018.

Design and construction activities conducted in 2018 included the following:

- Design of lining systems for Lagoon No. 6 and Consolidated Lagoon No. 10 (including former Lagoon Nos. 10, 11, and 13)
- Removal of manure from Lagoon No. 10 and completion of initial grading activities
- Design and construction of lining systems for the Liberty Dairy Red Water Pond
- Design of a vermiculture treatment system for liquid manures, which was to be installed within the Red Water Pond (following lagoon lining); this vermiculture treatment system was ultimately not implemented due to the high costs of the system to Liberty Dairy
- Design and initiation of abandonment activities for H&S Bosma Dairy Lagoon Nos. 8, 9, 19, and 20

These activities are described in more detail in Sections 3.7.1, 3.7.2, and 3.7.3.

3.7.1 Lining Design for H&S Bosma Dairy Lagoon No. 6 and Consolidated Lagoon No. 10

In January 2018, pre-design testing activities were conducted at H&S Bosma Dairy per the EPA-approved *Lagoon Pre-Design Data Collection Quality Assurance Project Plan (QAPP), Liberty and H&S Bosma Dairies*

(Anchor QEA 2017a) in support of the consolidation and lining of Lagoon Nos. 10, 11, and 13 and the lining of Lagoon No. 6. Soil observations from this pre-design testing included the following:

- **Lagoon No. 6:** Soil borings were advanced on each of the four sides of Lagoon No. 6 to a depth at least 5 feet below the bottom of the lagoon. The borings ranged from 16.5 to 21.5 feet in depth. Lithology of the depth range approximating the sidewall of the lagoon (approximately 0 to 10 feet below ground surface [bgs]) is generally a soft, dry, powdery, non-plastic sandy silt with trace gravel. Lithology below the bottom of the lagoon consisted of inconsistent layers of dry, soft, non-plastic sandy silt; dry, loose gravelly sand; and dry silty sand.
- **Consolidated Lagoon No. 10:** Two soil borings were advanced on the east and south side of Consolidated Lagoon No. 10 to a depth at least 5 feet below the bottom of the lagoon. The borings ranged from 15.2 to 16.5 feet in depth. Lithology of the depth range approximating the sidewall of the lagoon (approximately 0 to 10 feet bgs) consisted of gravelly sand in the first 3 to 4 feet in depth, changing to a firm, dry, non-plastic sandy silt extending to the bottom of the lagoon. Lithology below the bottom of the lagoon consisted of a dry gravelly sand with less silt.

The 100% lagoon lining design documents for Liberty/H&S Bosma Dairies were submitted to EPA on July 4, 2018. This included submittal of two versions of the documents. The first version addressed comments received from EPA (EPA Letter 171) on the 90% design documents. The second version included a modified design as proposed to EPA in Anchor QEA's letters dated June 21 and June 27, 2018 (Anchor QEA 2018b, 2018c). The principal modification was to use periodic visual and electronic leak detection surveys rather than an installed under-pond electronic leak detection system. This change was made considering the high costs and uncertain lifespan of the under-pond leak detection system.

Construction on Lagoon No. 10 was initiated with the removal of manure, consolidation of the three lagoons, and completion of most of the rough grading. The Dairies subsequently requested that the abandonment of two lagoons (Lagoon Nos. 19 and 20) and the lining of the Red Water Pond be expedited to 2018 and the Lining of Lagoon No. 6 and Consolidated Lagoon No. 10 be deferred until 2019. This was principally to support a proposed vermiculture treatment pilot, as described in Section 3.7.2. This request was ultimately granted by EPA in EPA Letter 185.

Lagoon No. 10 remained free of manure throughout the winter of 2018/2019, consistent with the Dairy's proposal to EPA. Lagoon No. 6 was returned to service pending future lining scheduled for 2019.

3.7.2 Lining of the Liberty Dairy Red Water Pond

Over the summer of 2018, Liberty Dairy and Anchor QEA worked extensively with Organix, Inc. (a composting and nutrient management firm), and BioFiltro, Inc. (a water treatment company), on the design of an innovative vermiculture treatment system for liquid manure.

A similar vermiculture system is in operation at the Royal Dairy in Royal City, Washington. It uses a proprietary biological trickling filter to capture solids and remove nutrients from the manure. Earthworms in the filter bed prevent manure solids accumulations from fouling the filter performance and convert them into a marketable product (earthworm castings).

For application at Liberty Dairy, the BioFiltro design as applied at Royal City design required two modifications. First, the system was modified to allow placement in a lined lagoon system rather than in large and costly concrete vaults. Second, a blending and recirculation system was added to that the system could operate without extensive filter bed maintenance at the expected influent total suspended solids concentrations. Liberty Dairy, Anchor QEA, and BioFiltro developed a design addressing these two changes.

A proposal for lining of the Red Water Pond and using it for the vermiculture treatment pilot was submitted to EPA on September 18, 2018 (Anchor QEA 2018d). In September 2018, pre-design testing activities were conducted at Liberty Dairy per the EPA-approved *Lagoon Pre-Design Data Collection QAPP, Liberty and H&S Bosma Dairies* (Anchor QEA 2017a) in support of the lining of the Red Water Pond. Because the Red Water Pond was empty and accessible at the time of pre-design testing, samples of soil were collected from the interior sites and bottom of the pond. Results were used to inform the design process. The design process also considered the results of four soil borings that had been placed on each of the four sides of Consolidated Lagoon No. 15, which is located approximately 100 feet to the southwest of the Red Water Pond. The borings ranged from 15.5 to 21.5 feet in depth. Lithology of the depth range approximating the sidewall of the lagoon (approximately 0 to 10 feet bgs) generally consisted of a dry, powdery, non-plastic silt. Lithology below the bottom of the lagoon consisted of a dry, loose silty gravel containing approximately 20% to 30% non-plastic silt. At deeper depths ranging from 17.5 to 19.5 feet bgs, a dry, very stiff, highly plastic sandy clay was encountered. In the boring log for nearby monitoring well YVD-08, this same clay unit was observed from 16 to 26 feet bgs.

Final Red Water Pond design documents were submitted to EPA on November 19, 2018 (Anchor QEA 2018e).

Initial construction work began in August 2018 at the Red Water Pond with manure removal and initial grading. The work was completed in early December. Final liner quality control testing, using ASTM International Method D-7002, was conducted on December 13 and 14, 2018. Following successful quality control testing, the lagoon was returned to service.

Ultimately the pilot vermiculture treatment system was not implemented due to the excessive combined costs (out-of-pocket costs to the Dairy included capital costs, operating costs, and additional intellectual property fees) of the proprietary treatment system. The final estimated capacity and performance of the treatment system were not sufficient to justify the level of

investment required by the Dairy. The Red Water Pond remains in service for manure and irrigation water blending prior to field applications.

3.7.3 Design and Initial Abandonment of H&S Bosma Dairy Lagoon Nos. 8, 9, 19, and 20

An abandonment plan for Lagoon Nos. 8, 9, 19, and 20 was submitted to EPA in July 2018 along with design documents for lining of Lagoon No. 6 and Consolidated Lagoon No. 10 (Anchor QEA 2018f, 2018g).

Work on the abandonment of Lagoon Nos. 8, 9, 19, and 20 began in November 2018 with solids removal. Initial soil confirmation sampling was conducted in early December 2018. Results showed that removal of manure and reworked lagoon bottom soils had not been completed, and additional soil removal would be required. A request to extend completion of the abandonments to early 2019 was submitted by Liberty/H&S Bosma Dairies and approved by EPA on December 27, 2018 (EPA Letter 188).

Following several delays caused by severe winter weather and associated extension requests, the abandonments of Lagoon Nos. 8, 9, 19, and 20 were ultimately completed in early 2019. An average of between 3 and 4 feet of soils was removed from the bottom and sidewalls of each of the lagoons. Compliance monitoring demonstrated that Lagoon Nos. 9 and 20 met the nitrogen removal goal (45 ppm nitrogen, measured as the sum of nitrate-N and ammonia-N) in all sidewall and bottom samples. At Lagoon No. 8, one sidewall required 1 foot of further excavation. At Lagoon No. 19, two sidewalls required further excavation (1 foot and 3 feet, respectively) to meet the nitrogen goal. The removals are described in the draft *H&S Bosma Dairy Lagoon Nos. 8, 9, 19, and 20 Lagoon Abandonment Completion Report* submitted to EPA on July 3, 2019 (Anchor QEA 2019b). Compliance monitoring data from the lagoon abandonments are also included in Appendix B.

3.7.4 Operations and Maintenance Activities for Existing Lined Lagoons

The operations, maintenance, and monitoring plan for Consolidated Lagoon No. 15 requires that Liberty Dairy perform routine inspections of the lagoon on a weekly basis (Anchor QEA 2017b). The routine inspections include visual inspections of the following:

- The liner for evidence of slumps of bulges
- Damage to the liner (e.g., holes, tears, or damaged seams)
- The perimeter of the lagoon, looking specifically for signs of access from animals or workers, damage to fencing/barrier, presence of trees or vegetation, wind damage, or rodent activity
- The embankments, looking for signs of erosion
- The protective fence or barrier and signage
- Inlet and outlet piping to check for obstructions or damage

- Accumulation of solids in the lagoon
- The agitation equipment to ensure that it is properly secured with the tethered lines and positioned away from the side slopes and bottom of the lagoon
- Gas venting piping to check for obstructions or damage

Records of the weekly inspections conducted in 2018 are included in Appendix B.

In addition, an electronic leak detection survey was performed during Summer 2018. That testing event was performed using the under-pond leak detection system that had been installed in 2017. No leaks or other anomalies were detected. The survey results are included in Appendix B.

3.8 George DeRuyter & Son/D&A Dairies

The status of the George DeRuyter & Son/D&A Dairies lagoon program is summarized in Figure 4.

George DeRuyter & Son/D&A Dairies have elected to line their manure storage lagoons with the same double-liner system used at the Liberty/H&S Bosma Dairies. That system includes an HDPE liner placed over the top of a GCL. Leak detection surveys for the upper liner are performed using a combination of visual and electronic leak detection surveys in alternating years.

George DeRuyter & Son/D&A Dairies are also upgrading their lagoon network to optimize the storage capacity of their lagoon system, with expansions and consolidations where appropriate. They have also upgraded an existing manure digestor and DAF unit and are implementing a treatment pilot using NDN technology to reduce nitrogen concentrations in their liquid manure.

Design and construction activities conducted in 2018 included the following:

- Design of lining systems for D&A Dairy Lagoon Nos. 1 and 2 (to be lined in 2020)
- Design and construction of lining systems for the George DeRuyter & Son Dairy Stormwater Catch Basin (SWCB) (completed in 2018)
- Design and initial construction of upgrades to the George DeRuyter & Son Dairy manure digestor (to be completed in 2019)
- Design and initial construction of upgrades to the George DeRuyter & Son Dairy DAF unit (completed in 2019)
- Design and initial construction of an in-lagoon NDN pilot treatment system (completed in 2019)

These activities are described in more detail in Sections 3.8.1, 3.8.2, 3.8.3, 3.8.4, and 3.8.5.

3.8.1 Design of Lining Systems for D&A Dairy Lagoon Nos. 1 and 2

In January 2018, pre-design testing activities were conducted at George DeRuyter & Son/D&A Dairies per the EPA-approved *Lagoon Pre-Design Data Collection QAPP, George DeRuyter & Son and D&A Dairies* (Anchor QEA 2017c) in support of the lining of the SWCB and D&A Dairy Lagoon Nos. 1 and 2.

Soil borings were advanced on each of the four sides of Lagoon Nos. 1 and 2 to a depth at least 5 feet below the bottom of the lagoons. The borings ranged from 21.5 to 25.0 feet in depth. Lithology of the depth range approximating the sidewall of the lagoons (approximately 0 to 10 feet bgs) generally consisted of a dry, powdery, non-plastic sandy silt with trace gravel. Lithology below the bottom of the lagoons consisted of dry, non-plastic silt to sandy silt with occasional intermittent thin silty sand and sand layers.

A 90% design was submitted to EPA for the three lagoons utilizing the hybrid double-liner design and including an under-pond leak detection system (Anchor QEA 2018h). As D&A Lagoon Nos. 1 and 2 are geographically constrained, the lining design contained few significant modifications to the lagoon shapes and sizes. EPA provided conditional approval of this design in in EPA Letter 172. Permits for lagoon construction were also obtained from Yakima County.

Two versions of the 100% design submittal were provided to EPA on July 19, 2018. The first version (Anchor QEA 2018i) addressed comments received from EPA (EPA Letter 178) on the 90% design documents. The second version (Anchor QEA 2018j) was consistent with the modifications to the design and schedule as proposed to EPA in Anchor QEA's letters dated June 21 and June 27, 2018 (Anchor QEA 2018b, 2018c). The principal design modification was to remove the under-pond leak detection system. The proposed schedule change was to defer the lining of Lagoon Nos. 1 and 2 until 2020. This change was associated with the proposed NDN pilot testing project proposal described in Section 3.8.5.

EPA ultimately approved the modified 100% design in EPA Letter 182. EPA also approved the proposed schedule change contingent on the successful completion and operation of the NDN system. Those approvals are contained in EPA Letter 195 and subsequent extension approvals (EPA Letters 195, 200 and 209).

Lining of D&A Lagoon Nos. 1 and 2 is currently scheduled for completion in 2020. The remaining lagoons will be lined during 2021 and 2022.

3.8.2 Expansion and Lining of the George DeRuyter & Son Dairy Stormwater Catch Basin

The SWCB was located in the silage area, south of the main George DeRuyter & Son Dairy lagoon network. While it was small (approximately 0.84 million gallons) and historically not used for manure storage, the Dairy elected to expand and line the lagoon to improve the Dairy's manure storage capacity. The revised lagoon as constructed has an operating capacity of 4.42 million gallons.

Pre-design testing was performed consistent with the EPA-approved *Lagoon Pre-Design Data Collection QAPP, George DeRuyter & Son and D&A Dairies* (Anchor QEA 2017c). Soil borings were advanced on each of the four sides of the Stormwater Catch Basin to a depth at least 5 feet below the bottom of the

basin. The borings ranged from 10.0 to 16.3 feet in depth. Lithology of the depth range approximating the sidewall of the basin (approximately 0 to 10 feet bgs) ranged from silt, sandy silt, and gravelly sand on the north, south, and west sides of the basin to silty gravel and sandy gravel on the east side. Lithology below the bottom of the basin consisted of gravelly sand with trace silt and occasional thin sand and silty sand layers. The gravelly sand was composed of approximately 65% to 75% fine- to medium-grained sand with approximately 25% to 35% fine- to coarse-grained angular gravel.

The lining design for the SWCB was developed in parallel with that for D&A Dairy Lagoon Nos. 1 and 2. This included completion of pre-design testing in January 2018, submittal of a 90% design (Anchor QEA 2018h), procurement of Yakima County permits, and submittal of two versions of the 100% design (Anchor QEA 2018i, 2018j). The first version addressed comments received from EPA (EPA Letter 172) on the 90% design documents. The second version was consistent with the modifications to the design as proposed to EPA in Anchor QEA's letters dated June 21 and June 27, 2018 (Anchor QEA 2018b, 2018c). EPA approved the modified design in September 2018 (EPA Letter 182).

Construction work began on October 23, 2018, at the SWCB. The activities conducted to expand and line the SWCB included initial preparation, excavation, and grading; subgrade preparation; anchor trench excavation; inlet and outlet piping installation; liner system installation; and leak detection testing.

Lagoon lining work for the SWCB was completed in early December 2018. Following final liner quality control testing using ASTM International Method D-7002 on December 11 and 12, 2018, the lagoon was returned to service.

3.8.3 Upgrades to Manure Digester for Biogas Production

George DeRuyter & Son Dairy has operated a large (over 3 million gallons) three-lane manure digester since 2006. The digester was initially operated to produce biogas, which was in turn used to produce electrical power for sale. However, changes to the pricing structure for that power made it uneconomical to operate the electrical production machinery, and the biogas was flared.

Because of subsequent problems with the digester, including damage to the roof in one of the three lanes, the digester was offline for much of 2018. This resulted in poor solids recovery in the separator screens and the DAF unit, because the DAF unit does not operate well on undigested manure.

During 2017 and 2018, the Dairies worked with Regenis, an experienced digester company, and Promus Energy LLC, a sustainable biofuels marketing company, to develop a biogas production agreement. Under that agreement, the digester was to be repaired and upgraded (along with the DAF unit) and returned to biogas production. Instead of producing electricity, the gas was to be cleaned (principally for the removal of sulfur) and then injected into natural gas supply lines. This process would produce biofuels for cars, trucks, and buses in various markets.

Along with the biogas proposal, the Dairy, Promus Energy, and Regenis developed a proposed NDN treatment system pilot to be installed downstream of the digester and DAF unit. That pilot proposal was successful in procuring a grant from the Washington State Conservation Commission.

As communicated to EPA in letters and meetings, the implementation of the digester project and NDN treatment pilot required large capital investments by George DeRuyter & Son Dairy. The work also required all of the Dairy's manure storage lagoons to be online to facilitate manure management during the complex project. Following extensive discussion and submittal of project information, EPA approved the NDN pilot study and the changes to the lagoon lining schedule.

Digester repairs were initiated in mid-2018 by George DeRuyter & Son Dairy and were substantively complete by May 2019. The repairs included the following:

- Removing damaged roofing panels
- Removing accumulated manures
- Inspecting and replacing other digester components
- Installing and grouting the new roof panels
- Applying a corrosion-resistant sealant to the interior of the three digester bays
- Installing new operational control equipment
- Upgrading the flare- and gas-handling equipment
- Procuring a new digester heater
- Procuring gas cleaning equipment and associated permits
- Coordinating with Yakima County to procure a natural gas line extension to George DeRuyter & Son Dairy

As of May 2019, the digester was returned to biogas production with the production of between 300 and 400 cubic feet per minute of gas containing over 65% methane. An operator from Regenis operates the digester and associated equipment, including the digester, screens, and DAF unit.

As of August 2019, work remaining to be completed prior to marketing the biogas includes the construction of the gas line extension, the installation of the gas cleaning equipment, and the installation of the new digester heater.

3.8.4 Upgrades to Dissolved-Air Flotation Unit

While the digester was offline, the DAF unit was not functioning properly and its use was discontinued. In parallel with the digester repairs and upgrades, the DAF unit was overhauled. This included cleaning and inspections, followed by procurement and installation of replacement parts. Normal DAF unit operations resumed by May 2019.

3.8.5 Design and Installation of Pilot NDN Treatment System

The NDN treatment system pilot was initially proposed to EPA in a letter dated June 2018. The NDN pilot had been developed by George DeRuyter & Son Dairy in coordination with Regenis, Promus Energy, and DVO, Inc. The project was partially supported by a grant from the Washington State Conservation Commission.

The NDN system is being pilot-tested in George DeRuyter & Son Dairy Lagoon No. 1. The NDN functions using two biological treatment steps, each separated from each other in different lagoon compartments. In the first step, ammonia and organic nitrogen in the manure are converted to nitrate. In the second step, the nitrate is destroyed by conversion to inert nitrogen gas. The manure is recirculated through the treatment system compartments multiple times as needed to obtain the desired nitrogen removal efficiency.

EPA approved the NDN treatment pilot in in EPA Letter 195, including a provision establishing a 40% nitrogen removal efficiency. Anchor QEA developed a QAPP to be used to document compliance with this requirement during the first 6 months of NDN operation (Anchor QEA 2018k).

While the estimated completion date for NDN construction and startup was December 31, 2018, digester and DAF repairs took longer to complete than expected. EPA granted extension requests to support completion of the digester and NDN projects (EPA Letters 195, 200, and 209).

Anchor QEA began baseline testing of the DAF effluent in May 2019. Construction of the NDN system was completed in July 2019. Lagoon No. 1 was then filled with manure pre-treated by the digester, screens, and DAF. Treatment operations began on July 30, 2019. The 6-month operational testing period will extend through the end of January 2020, with testing as defined in the NDN QAPP (Anchor QEA 2018k).

3.8.6 Operations and Maintenance Activities for Existing Lined Lagoons

The operations, maintenance, and monitoring plan for Consolidated D&A Diary Lagoon No. 3 requires that the Dairy perform routine inspections of the lagoon on a weekly basis (Anchor QEA 2017d). The routine inspections include visual inspections of the following:

- The liner for evidence of slumps of bulges
- Damage to the liner (e.g., holes, tears, or damaged seams)
- The perimeter of the lagoon, looking specifically for signs of access from animals or workers, damage to fencing/barrier, presence of trees or vegetation, wind damage, or rodent activity
- The embankments, looking for signs of erosion
- The protective fence or barrier and signage
- Inlet and outlet piping to check for obstructions or damage
- Accumulation of solids in the lagoon

- The agitation equipment to ensure that it is properly secured with the tethered lines and positioned away from the side slopes and bottom of the lagoon
- Gas venting piping to check for obstructions or damage

Records of the weekly inspections conducted in 2018 are included in Appendix B.

In addition, an electronic leak detection survey was performed during Summer 2018. That testing event was performed using the under-pond leak detection system that had been installed in 2017. No leaks or other anomalies were detected. The survey results are included in Appendix B.

4 Groundwater Monitoring Network

Groundwater monitoring activities continued throughout 2018. The monitoring well network at the Dairies (Figure 1 and Table 1) consists of 26 monitoring wells screened in the surficial aquifer. Most of the wells (23 wells) are screened across the shallow water table. The remaining wells (3 wells) are deeper wells that are paired with water table wells.

Figures 5 and 6 summarize potential on-site sources of nitrogen at the Dairies and identify key transport mechanisms and exposure pathways. The monitoring well network serves as a tool to evaluate how the aquifer is responding to actions taken to control these potential sources and transport pathways. The groundwater monitoring data are used by EPA to supplement and verify existing information at the Dairies.

A list of the wells in the network and well construction data are shown in Table 2. Seven of the wells were installed by EPA in 2012 (EPA wells; identified as DC-01, DC-03, DC-04, DC-05, DC-07, DC-09, and DC-14). The remaining 19 wells were installed by the Dairies in 2013 (AOC wells; identified as YVD-02, YVD-03, YVD-04, YVD-05, YVD-06, YVD-07, YVD-08, YVD-09, YVD-10, YVD-11, YVD-12, YVD-13, YVD-14R, YVD-15, YVD-16, YVD-17, YVD-18, DC-03D, and DC-05D), except for well YVD-14R, which is a replacement for well YVD-14, originally installed in 2013.

Sixteen of the wells are monitored quarterly and 10 of the wells are monitored annually to assess nitrate concentrations and groundwater chemistry in the surficial aquifer. All wells are gauged on a quarterly basis to verify groundwater flow direction and to measure horizontal and vertical hydraulic gradients.

4.1 Groundwater Monitoring Quality Assurance Project Plan

The goal of monitoring was to establish a baseline of groundwater quality information at the Dairies to evaluate whether actions taken to reduce nitrogen loading were effective over time.

The first *Groundwater Monitoring QAPP* (ARCADIS 2013d) was submitted to EPA on June 21, 2013. The QAPP defined and described the processes and methods to perform the monitoring well installation and groundwater monitoring required under Section III.E of the SOW. The QAPP was also developed to document the type, quantity, and quality of data needed to meet project objectives and support key decisions. Since 2013, the *Groundwater Monitoring QAPP* has undergone revisions to reflect changes to the project team, sampling chain-of-custody requirements, field quality control sample protocols, laboratory quality control procedures, and other various document syntax and formatting clarifications; this is further described in previous annual reports (IES 2016a, 2016b, 2017; Anchor QEA 2018l).

In February 2018, an updated *Groundwater Monitoring QAPP* (Anchor QEA 2018m) was submitted to EPA and was conditionally approved by EPA in a letter dated February 28, 2018 (EPA Letter 164). The

2018 *Groundwater Monitoring QAPP* incorporated the following changes that were initiated in the First Quarter 2018 groundwater monitoring event:

- Change in analytical laboratory used to Cascade Analytical, Inc.
- Change in references to laboratory methods used where those methods are equivalent
- Reduction in sampling frequency as follows:
  - The following 10 wells that have consistently had groundwater nitrate concentrations below the MCL of 10 mg/L since Third Quarter 2016 will be sampled once per year in the Second Quarter:
    - DC-01
    - DC-07
    - DC-09
    - YVD-02
    - YVD-03
    - YVD-04
    - YVD-05
    - YVD-06
    - YVD-07
    - YVD-17
  - The following 16 wells will be sampled quarterly:
    - DC03
    - DC-03D
    - DC-04
    - DC-05
    - DC-05D
    - DC-14
    - YVD-08
    - YVD-09
    - YVD-10
    - YVD-11
    - YVD-12
    - YVD-13
    - YVD-14R
    - YVD-15
    - YVD-16
    - YVD-18

4.2 Well Installation and Maintenance

In 2018, no groundwater monitoring well installations or replacements were required.

4.2.1 Dedicated Bladder Pumps

In 2018, the dedicated bladder pumps installed in each well during 2017 remained operational with one reportable issue. In Second Quarter 2018, the dedicated bladder pump in well YVD-02 was not operational. The dedicated bladder pump was removed from the well, and YVD-02 was sampled with a QED Sample Pro® portable micropurge bladder pump. The dedicated bladder pump was repaired and reinstalled in YVD-02 in Third Quarter 2018.

4.2.2 Monitoring Well Pressure Transducers

In 2013, pressure transducers were installed in six monitoring wells (DC-03, DC-05, DC-05D, YVD-03, YVD-08, and YVD-11) to obtain groundwater elevation data from the surficial aquifer in 15-minute intervals. Five of the transducers are installed in wells screened in the shallow surficial aquifer; one transducer is installed in a well screened in a deeper zone of the surficial aquifer (DC-05D). The data obtained from the pressure transducer network have been effective in analyzing short-term, long-term, and seasonal trends in groundwater elevations in the shallow aquifer and trends in vertical hydraulic gradients at the DC-05/DC-05D shallow-deep well pair. In 2018, the pressure transducers installed in each well remained operational with no reportable issues. Pressure transducer data are summarized in the figures contained in the quarterly groundwater reports (Anchor QEA 2018n, 2018o, 2018p, 2019b). Hydrographs developed from corresponding hand gauging data are also provided in the appendices to those reports.

4.3 Quarterly Groundwater Monitoring Data Reports

Per Section III.E.1 of the SOW, the Dairies must monitor the groundwater wells installed at the Dairies on a quarterly basis. Per Section III.E.3 of the SOW, the Dairies must submit to EPA quarterly groundwater monitoring results in quarterly groundwater monitoring data reports.

In 2018, quarterly groundwater monitoring events were conducted as follows:

- First Quarter 2018 – Conducted from March 18 to March 19, 2018
- Second Quarter 2018 – Conducted from June 3 to June 12, 2018
- Third Quarter 2018 – Conducted from September 8 to September 9, 2018
- Fourth Quarter 2018 – Conducted from December 9 to December 11, 2018

2018 quarterly groundwater monitoring data reports were submitted to EPA as follows:

- *First Quarter 2018 Groundwater Monitoring Data Report* (Anchor QEA 2018n) – Submitted May 21, 2018
- *Second Quarter 2018 Groundwater Monitoring Data Report* (Anchor QEA 2018o) – Submitted August 10, 2018
- Third Quarter 2018 Groundwater Monitoring Data Report (Anchor QEA 2018p) – Submitted November 9, 2018

- *Fourth Quarter 2018 Groundwater Monitoring Data Report* (Anchor QEA 2019c) – Submitted February 11, 2019

The 2018 quarterly groundwater monitoring data reports are included in Appendix C (note that the *Fourth Quarter 2018 Groundwater Monitoring Data Report* [Anchor QEA 2019b] was submitted in early 2019 in accordance with AOC schedule requirements). Current and historical data are presented in the tables and figures of the quarterly reports and are also summarized in Section 4.4.

4.4 Summary of Findings

Data collected during quarterly groundwater monitoring in 2018 indicate that nitrate concentrations, hydraulic gradients, and groundwater chemistry in the shallow aquifer have generally remained stable and are consistent with results from previous years of the groundwater monitoring program. Historical groundwater chemistry data are presented in Table 3. Annual groundwater chemistry data for each well in 2018 are depicted in Figure 7 (nitrate concentrations), Figure 8 (nutrient concentrations), Figure 9 (anion concentrations), Figure 10 (metal concentrations), and Figure 11 (alkalinity [bicarbonate and carbonate] concentrations). A summary of groundwater elevations in the surficial aquifer through 2018 is included in Table 4.

Time-series trend plots of nitrate concentrations in groundwater from the beginning of monitoring in 2013 through Fourth Quarter 2018 are presented in Figures 12 through 16.

The results of the 2018 monitoring include the following:

- Nitrate concentrations in all northern wells and upgradient wells have remained below the nitrate MCL since Third Quarter 2016 and Second Quarter 2015, respectively.
- Nitrate concentrations have been consistently below the nitrate MCL in downgradient wells DC-07 and YVD-17 since the beginning of the monitoring program.
- Nitrate concentrations in the east downgradient wells, west downgradient wells, and central wells are summarized in Figures 12, 13, and 14, respectively. As of 2018, most of the nitrate trends appear to be either stable or decreasing. However, the specific trend conclusions for each well vary somewhat depending on the trend analysis methods and data sets (e.g., 2 years or 5 years of data) used. A definitive trend analysis method has not been approved by EPA for the project at this time and is therefore not presented.
- Detections of nitrite, ammonia, and total Kjeldahl nitrogen (TKN) are summarized as follows:
  - There have been no nitrite detections above the method detection level (MDL) of 0.05 mg/L since First Quarter 2017.
  - There have been three ammonia detections above the MDL of 0.07 mg/L since First Quarter 2017. In reviewing the ammonia detections, EPA commented on the draft version of this Annual Report (EPA Letter 202) that ammonia detections could be indicative of recent nitrogen sources at the Dairies. However, the results were very low

in concentration, and their sporadic occurrence makes this conclusion premature. Anchor QEA has incorporated additional quality assurance testing and data validation activities in 2019 groundwater monitoring activities to assess the performance of the lab and analytical method near the ammonia reporting limit where these three detections were noted. The three ammonia detections observed in 2018 are summarized as follows:

    - **Well DC-05:** Ammonia was detected at a concentration of 0.10 mg/L in one sample during the First Quarter 2018 monitoring event. But ammonia was not detected in a field duplicate sample analyzed from the same sampling event. Ammonia was not detected in the three other monitoring events in 2018, nor during previous events in 2016 or 2017. Nor was TKN detected in any events for this well during 2018 (TKN measurements measure both organic nitrogen and ammonia nitrogen).
    - **Well YVD-14R:** Ammonia was detected at a concentration of 0.17 mg/L in well YVD-14R during First Quarter 2018. It was not detected in that well any of the other monitoring events during 2018, nor was TKN detected in that well during any of the 2018 sampling events.
    - **Well DC-03:** Ammonia was detected during Second Quarter 2018 at a concentration of 1.22 mg/L in well DC-03. During the other three quarters, ammonia was not detected. TKN was not detected in well DC-03 during any of the 2018 monitoring events.
  - There have been no TKN detections above the MDL of 0.5 mg/L since First Quarter 2016 except for one estimated concentration of 0.6 mg/L in a duplicate sample from well YVD-11 in Second Quarter 2018.
- All detected phosphorus concentrations have been below 0.10 mg/L since First Quarter 2017. Historical phosphorous concentrations in the central, northern, and downgradient wells are not significantly different than concentrations in the upgradient wells.

The number of wells located on or downgradient of the Dairies with nitrate concentrations above the MCL (10 mg/L) has fluctuated since 2013, ranging from 13 in Second Quarter 2014 to 16 in First Quarter 2014, as shown in Figure 17. There have consistently been 15 downgradient wells with nitrate concentrations above the MCL since Fourth Quarter 2016.

Groundwater in the surficial aquifer flows in a northeast to southwest direction with little seasonal change in hydraulic gradient. In 2018, the average hydraulic gradient across the site was 0.024 foot per foot, with an average of 0.047 foot per foot in the topographically higher area upgradient of the Dairies, 0.011 foot per foot in the central area of the site, and 0.0045 foot per foot in the topographically lower area downgradient of the Dairies. Vertical gradients as measured at the three shallow/deep well pairs (DC-03/DC-03D, DC-05/DC-05D, and YVD-13/YVD-18) are generally

consistent, with upward vertical gradients for three of the four quarters in 2018 at well pairs DC-03/DC-03D and YVD-13/YVD-18 and downward vertical gradients for all four quarters at well pair DC-05/DC-05D. However, during First Quarter 2018, all well pairs had downward vertical gradients.

Groundwater in the surficial aquifer in the location of the Dairies is mainly calcium-bicarbonate type (approximately 75% of the wells), with calcium-sulfate water present in a few wells (approximately 25%). Groundwater in one well, YVD-09, is consistently "no dominant type." This is consistent with analysis of groundwater quality from previous years of the groundwater monitoring program.

5 Actions to Ensure Effective Nutrient Management

Each Dairy conducts soil and manure testing consistent with an EPA-approved application field management plan (AFMP). The goal of that testing, which is conducted in spring and fall, is to document that the soil nitrate level has been reduced to below 45 parts per million (ppm) at the 2-foot depth by balancing manure applications with crop nutrient needs. Each Dairy has also submitted an irrigation water management plan (IWMP) to EPA and has installed flow meters and moisture sensors with the goal of controlling irrigation water applications and minimizing water movement below the root zone.

In 2018, the Dairies operated under respective AFMPs (ARCADIS 2013e, 2013f, 2013g), which were approved by EPA on November 18, 2013. Additionally, the Dairies operated under an updated *Dairy Facility AFMP* (Anchor QEA 2018q), which combined the existing Dairy-specific AFMPs into a single consolidated AFMP and included changes to the AFMP following the assumption of responsibility of implementation of the AFMP by Anchor QEA as of August 15, 2016. The Dairies also operated under respective IWMPs (ARCADIS 2014a, 2014b, 2014c), which were approved by EPA on August 15, 2014. Each Dairy submitted the following documents related to nutrient management in 2018:

- Updated *Dairy Facility AFMP* (Anchor QEA 2018q) – Submitted May 15, 2018
- 2018 Spring Pre-Plant Dairy Application Field Reports (DAFRs; Anchor QEA 2018r, 2018s, 2018t) – Submitted August 3, 2018

The 2018 Fall Post-Harvest DAFR Memorandum for Cow Palace Dairy, George DeRuyter & Son/D&A Dairies, and Liberty/H&S Bosma Dairies (Anchor QEA 2019d), which combines the existing Dairy-specific DAFRs into a single consolidated DAFR memorandum, was submitted in early 2019 per the AOC. These documents remain under review by EPA.

5.1 Use of Agronomic Rates for Nutrient Applications

The use of an agronomic rate to guide nutrient applications continues to be the primary management tool for achieving the goal of reducing nitrates at the 2-foot depth for each application field. To calculate an agronomic rate, dairy nutrient sources are evaluated (through sampling and analysis procedures described in the updated *Dairy Facility AFMP* [Anchor QEA 2018q]) for total nitrogen, which principally includes ammonium nitrogen, nitrate nitrogen, and organic nitrogen. Other potential sources of nutrients, such as organic matter, irrigation water, crop residue, and past manure applications, are established through sampling and calculation and accounted for in the calculation of an agronomic rate.

Following application, only a portion of the nitrogen measured in the dairy nutrient sources is available to the crop during the growing season. Available nitrogen is calculated using the nutrient source parameters. Residual soil nitrogen is measured by soil sampling and is a critical component of

an agronomic rate. Due to variation in crop physiology and rooting depth, not all of the measured residual nitrogen within the soil will be available to the growing crop over the season. Therefore, some of the nitrogen is considered to be "positionally unavailable" or "not accessible."

As the crop develops, in-season adjustments are sometimes made using tissue samples (petioles) or soil samples. These samples can be taken to assess if current nutrient availability will be sufficient to meet crop needs to finish out the crop. If it is determined that additional nitrogen will be required to meet crop demand, then the initial agronomic rate is adjusted. An agronomic rate should not be considered to be an absolute maximum or minimum, as in-season dynamics can change. However, if applications are made outside of these parameters, then documentation of the reasons for the change in rate are required.

Application field management summary and recommendation calculations for each Dairy are provided in Tables 5, 6, and 7. Manure nutrient contents measured for various liquid and solid manure sources for pre-plant and post-harvest are summarized for each Dairy in Tables 8a to 8d (Cow Palace), Tables 9a to 9d (Liberty/H&S Bosma Dairies), and Tables 10a to 10d (George DeRuyter & Son/D&A Dairies). Other nutrient management activities and results are further described for each Dairy in Sections 5.3, 5.4, and 5.5.

5.2 Irrigation Water Management

As described in the IWMPs, at each Dairy, a system of data loggers and moisture sensors was installed within each field help guide irrigation water applications with the goal of reducing the potential for the movement of water below the crop root zone.

Table 11 summarizes the network of 83 irrigation sensor clusters (each cluster includes three sensors at different depths) installed at the dairy application fields. Each field has two or three sensor clusters. However, some fields have been consolidated (i.e., operated as a single unit with one crop and one irrigation system) by the Diaries since that time, meaning that individual fields are serviced by as many as six irrigation sensor clusters.

5.2.1 Sensor Installation and Maintenance

The maximum amount of water that is held in soil against the pull of gravity is referred to as the "field capacity" (NRCS 2017). The results of the field capacity testing and soil moisture monitoring station installation is described in the field capacity soil testing reports for irrigation water management (IES 2015a, 2015b, 2015c).

Agrimanagement, Inc., completed testing in September and October 2014 to establish field capacities of application field soils. Pessl iMetos data loggers with Decagon moisture sensors were installed during November 2014. Separate sensors were installed at 1 foot bgs, 2 feet bgs, and 3 feet

bgs. The moisture sensors measure the volumetric water content (VWC; water volume divided by soil volume). As shown on the example provided in Figure 18, the VWC at 1 foot bgs is generally more variable during precipitation or irrigation compared to the VWC at 2 feet and 3 feet bgs. The VWC at 2 feet and 3 feet bgs is more gradual in response to the rainfall or irrigation event.

Data are collected from the moisture sensors on an hourly basis and transmitted up to four times per day via cell modem to a web application. These data are evaluated once per week, and field-specific recommendations are provided. In the event field capacity is exceeded at the 3-foot depth, the web application sends a text notification to the professional irrigation consultant (Agrimanagement) and to farm managers to notify them that field capacity has been exceeded.

Throughout 2018, Agrimanagement continued to work with the manufacturer and the Dairy managers to complete upgrades to the remaining transducers and logger components. These upgrades were necessary because T-Mobile discontinued cell service to the original cell modems installed in the region. This resulted in transitioning from traditional cell modem functionality to code division multiple access (CDMA) from a different carrier. Key benefits of CDMA include two-way communications and greater transmission bandwidth. These features benefit the Dairies by supporting a more consistent, unabated performance by the moisture sensor data loggers.

In 2018, moisture sensor stations continued to be updated with new motherboards equipped with CDMA technology. These necessary maintenance periods briefly interrupted data collection while the data loggers were being upgraded (Appendix D). These updates, coupled with interruptions caused by field activities and clogged rain gauges from nutrient applications, weed seeds, dirt, and avian and insect debris, resulted in somewhat poor data logger and sensor performance again in 2018. However, data and visual inspection were generally adequate to effectively assess field moisture levels and guide irrigation water applications.

Biweekly maintenance was performed on each sensor station. Table 11 summarizes the operational performance of each sensor cluster, indicating when the cluster was providing data over the course of the 6-month irrigation period. Over the course of 2018, sensor operation produced 12,767 daily readings, with sensor clusters online an average of 85.4% of the time. Sensor downtime, when encountered, was caused mainly by rodent interference/damage and damage during harvest operations.

5.2.2 Irrigation Monitoring Results

During 2018, the irrigation season extended from mid-April through mid-October. The weather experienced during the 2018 irrigation season was a little cooler than average to start the season in April. Cool conditions persisted through early June, when the weather returned to more typical summer temperatures. Late summer weather was hot, and above-average temperatures continued

through mid-October. Annual precipitation was down significantly from 2017 (6.9 inches) at 4.15 inches for the year. With warm weather extending into the fall and wind being a little more common, season-long evapotranspiration totals were above average for 2018.

Table 11 provides a concise summary of all instances when an exceedance of field capacity was noted at the 3-foot level in a field during that period, summarized as follows:

- There were a total of 69 exceedances out of a total of 12,767 sensor operational days. This represents an irrigation control compliance record of 99.46%.
- None of the field capacity exceedances were noted simultaneously in more than one sensor in a given field, indicating that the areas of field capacity exceedances were localized.

The 2018 moisture sensor data are described in individual weekly reports, which include the current soil moisture status and recommendations for the week ahead. These reports are included in Appendix D. Individual season summary site reports for each field are included in Appendix E.[1,2,3]

5.3 Cow Palace Application Fields

In 2018, pre-plant and post-harvest soil sampling was conducted by Agrimanagement at the seven application fields associated with Cow Palace from May 10 to May 18, 2018 (pre-plant), and from September 25 to October 11, 2018 (post-harvest). Liquid and solid manure samples were collected on April 18, 2018 (pre-plant), and on August 28, 2018 (post-harvest). Complete results from these activities are described in the following reports submitted to EPA in 2018 and early 2019:

- *2018 Spring Pre-Plant Sampling DAFR, Cow Palace Dairy* (Anchor QEA 2018r)
- 2018 Fall Post-Harvest Sampling DAFR Memorandum for Cow Palace Dairy, George DeRuyter & Son/D&A Dairies, and Liberty/H&S Bosma Dairies (Anchor QEA 2019d)

A summary of 2018 pre-plant and post-harvest data is provided in Table 12. For the entirety of the 2018 season, nitrate concentrations in all application fields associated with Cow Palace were below 45 ppm at the 2-foot depth.

5.3.1 Soil Nitrate Level Summary

In 2018, based on soil sampling results collected, nitrate concentrations at the 2-foot depth interval were all below 45 ppm for both the pre-plant and post-harvest samplings, and they are continuing

[1] In the line graph of each application field season report, the line between the green shading and the blue shading is field capacity at the third foot (or the green is the favorable zone, red is below favorable, and blue is above favorable).
[2] In the bar graph of each application field season report, the blue data bars represent precipitation. Overlapping data bars may appear darker (blue versus dark blue). To clarify, all blue bars represent precipitation.
[3] Certain application field season reports include notes regarding sensor performance during the season.

to decrease in all seven application fields from season to season (Figure 19, Table 13, and Appendix F). Average spring and fall nitrate concentrations are summarized as follows:

- From Spring 2017 to Spring 2018, the average first-foot nitrate concentration decreased by 42%, and the average second-foot nitrate concentration decreased by 40%.
- From Fall 2017 to Fall 2018, the average first-foot nitrate concentration decreased by 20%, the average second-foot nitrate concentration decreased by 53%, and the average third-foot nitrate concentration decreased by 52%.

Average post-harvest soil nitrate concentrations measured in the seven application fields associated with Cow Palace have consistently decreased since 2013 (Figure 20). From Fall 2013 to Fall 2018, nitrate concentrations have decreased by 73% in the first foot, 90% in the second foot, and 88% in the third foot. As discussed in Section 5.1, residual soil nitrogen measured in each field is an important element in the development of the agronomic rate for that field. The 2018 season was the third full year where the nitrate concentrations were consecutively below 45 ppm at the 2-foot depth interval.

5.3.2 Application Field Management

In 2018, in addition to agronomic rate, the following management tools and strategies were used toward achieving soil nitrate concentrations below 45 ppm at the 2-foot depth interval in application fields associated with Cow Palace:

- Improved application timing to better coincide with crop nutrient uptake
- In-season tissue and soil sampling to evaluate crop nutrient uptake progress

In 2018, two fields of alfalfa were rotated to Italian rye grass as the alfalfa stand had started to decline. Overall, manure applications were well controlled, and as discussed in Section 5.3.1, soil nitrate concentrations have continued to decrease. All field manure applications for 2018 were within or below the acceptable recommendation ranges. With soil residual nitrogen levels continuing to decrease, it may become necessary to adjust application rates upward to help ensure crop needs are not being neglected.

5.3.3 Field Moisture Management

In 2018, as discussed in Section 5.2, moisture sensor stations were upgraded in response to changes in the available cell service. At Cow Palace, 16 of 17 stations have been upgraded. Moisture levels exceeded field capacity at the 3-foot depth a total of six times, which is minimal when considered over the entire 2018 season. Exceedances occurred in fields CP-SU04A, CP-SU04B, and CP-SU06, and once observed, water application to these fields was adjusted by turning the water off or by lengthening the time between planned applications until moisture levels decreased below field

capacity. In fields where field capacity was exceeded, nitrate concentrations at the 2-foot depth were all below 9.5 ppm during pre-plant and post-harvest sampling throughout 2018.

5.4 Liberty/H&S Bosma Dairies Application Fields

In 2018, pre-plant and post-harvest soil sampling was conducted by Agrimanagement at the 13 application fields associated with Liberty/H&S Bosma Dairies from April 26 to June 4, 2018 (pre-plant), and from September 25 to November 2, 2018 (post-harvest). Liquid and solid manure samples were collected on April 18, 2018 (pre-plant), and on August 28, 2018 (post-harvest). Complete results from these activities are described in the following reports submitted to EPA in 2018 and early 2019:

- *2018 Spring Pre-Plant Sampling DAFR, Liberty/H&S Bosma Dairies* (Anchor QEA 2018s)
- 2018 Fall Post-Harvest Sampling DAFR Memorandum for Cow Palace Dairy, George DeRuyter & Son/D&A Dairies, and Liberty/H&S Bosma Dairies (Anchor QEA 2019d)

A summary of 2018 pre-plant and post-harvest data is provided in Table 14. For the entirety of the 2018 season, nitrate concentrations in all application fields associated with Liberty/H&S Bosma Dairies were below 45 ppm at the 2-foot depth.

5.4.1 Soil Nitrate Level Summary

In 2018, based on soil sampling results collected, nitrate concentrations at the 2-foot depth interval were below 45 ppm for both the pre-plant and post-harvest samplings, and they are continuing to decrease in all 13 application fields from season to season (Figure 21, Table 15, and Appendix G). Average spring and fall nitrate concentrations are summarized as follows:

- From Spring 2017 to Spring 2018, the average first-foot nitrate concentration decreased by 40%, and the average second-foot nitrate concentration decreased by 23%.
- From Fall 2017 to Fall 2018, the average first-foot nitrate concentration decreased by 8%, the average second-foot nitrate concentration decreased by 1%, and the average third-foot nitrate concentration increased by 17%.

Average post-harvest soil nitrate concentrations measured in the 13 application fields associated with Liberty/H&S Bosma Dairies have consistently decreased since 2013 (Figure 22). From Fall 2013 to Fall 2018, nitrate concentrations have decreased by 77% in the first foot, 78% in the second foot, and 67% in the third foot. As discussed in Section 5.1, residual soil nitrogen measured in each field is an important element in the development of the agronomic rate for that field. The 2018 season was the second full year where the nitrate concentrations were consistently below 45 ppm at the 2-foot depth interval.

5.4.2 Application Field Management

In 2018, in addition to agronomic rate, the following management tools and strategies were used toward achieving soil nitrate concentrations below 45 ppm at the 2-foot depth interval in application fields associated with Liberty/H&S Bosma Dairies:

- Improved application timing to better coincide with crop nutrient uptake
- In-season tissue and soil sampling to evaluate crop nutrient uptake progress
- Rotation changes to provide application flexibility as well as increased nutrient uptake

In 2018, several fields with triticale were allowed to grow into the soft dough stage, which resulted in higher yields and nutrient uptake. Overall, manure applications were well controlled, and soil sample concentrations for nitrate have continued to decrease or be maintained. All field manure applications for 2018 were within the acceptable recommendation ranges except fields SU04 (Fall 2017), SU07 (Spring 2018) and SU08N (Spring 2018), which were slightly higher. With soil residual nitrate levels continuing to decrease in some fields, it may become necessary to adjust the application rates upward to help ensure crop needs are not being neglected.

5.4.3 Field Moisture Management

In 2018, as discussed in Section 5.2, moisture sensor stations were upgraded in response to changes in the available cell service. At Liberty/H&S Bosma Dairies, 35 of 36 stations have been upgraded. Moisture levels exceeded field capacity at the 3-foot depth in fields LD-SU08N, LD-SU10, LD-SU14, and LD-SU17. Many of these exceedances were found to be calibration or sensor issues. Once confirmed field capacity exceedances were observed, water application to these fields was adjusted by turning the water off or by lengthening the time between planned applications until moisture levels decreased below field capacity. In fields where field capacity was exceeded, nitrate concentrations at the 2-foot depth were below 16 ppm in all except SU08N (35 ppm) during pre-plant and post-harvest sampling throughout 2018.

5.5 George DeRuyter & Son/D&A Dairies Application Fields

In 2018, pre-plant and post-harvest soil sampling was conducted by Agrimanagement at the 14 application fields associated with George DeRuyter & Son/D&A Dairies, from May 9 to May 24, 2018 (pre-plant), and from September 28 to October 22, 2018 (post-harvest). Liquid and solid manure samples were collected on April 18, 2018 (pre-plant), and on August 28, 2018 (post-harvest). Complete results from these activities are described in the following reports submitted to EPA in 2018 and early 2019:

- *2018 Spring Pre-Plant Sampling DAFR, George DeRuyter & Son/D&A Dairies* (Anchor QEA 2018t)

- 2018 Fall Post-Harvest Sampling DAFR Memorandum for Cow Palace Dairy, George DeRuyter & Son/D&A Dairies, and Liberty/H&S Bosma Dairies (Anchor QEA 2019d)

A summary of 2018 pre-plant and post-harvest data is provided in Table 16. By the end of 2018, nitrate concentrations in 11 of 14 application fields associated with George DeRuyter & Son/D&A Dairies were below 45 ppm at the 2-foot depth.[4]

5.5.1 Soil Nitrate Level Summary

In 2018, based on soil sampling results collected, nitrate concentrations at the 2-foot depth interval were below 45 ppm for both the pre-plant and post-harvest samplings on all fields except GDS-SU06, GDS-SU07, and GDS-SU08.

Residual nitrate concentrations at the 2-foot depth, expressed as the area-weighted averages for the 14 application fields, decreased from season to season (Figure 23, Table 17, and Appendix H). Average spring and fall nitrate concentrations are summarized as follows:

- From Spring 2017 to Spring 2018, the average first-foot nitrate concentration decreased by 46%, and the average second-foot nitrate concentration decreased by 32%.
- From Fall 2017 to Fall 2018, while the average first-foot nitrate concentration increased by 38%, the average second-foot nitrate concentration decreased by 2%, and the average third-foot nitrate concentration decreased by 9%.

From Fall 2013 to Fall 2018, nitrate concentrations have decreased by 68% in the top foot, 73% in the second foot, and 61% in the third foot.

Trends for the three fields that did not meet the 45-ppm nitrate goal (Figure 24) are described as follows:

- **Fields GDS-SU06 and GDS-SU07:** These two fields previously met the 45-ppm goal between Spring 2017 and Spring 2018. Manure applications were made to each field following the Spring 2018 pre-plant sampling. The applications to GDS-SU07 exceeded the recommended application rate. Results for Fall 2018 showed that both fields exceeded the 45-ppm goal at that time, indicating that not all of the applied nitrogen was taken up by the summer crops during the growing season.
- **Field GDS-SU08:** This field has not previously met the 45-ppm goal in 2017 or in preceding years. Nitrate levels have continued to decrease year over year, including 2018.

All three of these fields are subject to ongoing nutrient management and monitoring activities under the AOC and under parallel Washington State permit requirements.

[4] Two of these fields are subfields of a single field (GDS-SU06 and GDS-SU07 are a single circle divided into two halves).

5.5.2 Application Field Management

In 2018, in addition to agronomic rate, the following management tools and strategies were used toward achieving soil nitrate concentrations below 45 ppm at the 2-foot depth interval in application fields associated with George DeRuyter & Son/D&A Dairies:

- Improved application timing to better coincide with crop nutrient uptake
- In-season tissue and soil sampling to evaluate crop nutrient uptake progress
- Rotation changes to provide application flexibility

Overall, manure applications were well controlled, and soil sample concentrations for nitrate have continued to decrease in all fields, except SU06 and SU07. All field manure applications for 2018 were within the acceptable recommendation ranges except fields SU02 (Fall 2017), SU04 (Fall 2017), SU11 (Fall 2017), and SU14 (Fall 2017), which were slightly higher.

5.5.3 Field Moisture Management

In 2018, as discussed in Section 5.2, moisture sensors stations were upgraded in response to changes in the available cell service. At George DeRuyter & Son/D&A Dairies, 30 of 30 stations have been upgraded. Moisture levels exceeded field capacity at the 3-foot depth in fields SU01, SU02, SU03, SU08, SU10, SU11, SU13, and SU14. Nearly all of the exceedances occurred in fields with wheel-lines and solid sets. Exceedances were mostly a result of applying a longer set than needed. However, most exceeding events were situations where field capacity was only slightly exceeded. Once these exceedances were observed, water application to these fields was adjusted by turning the water off or by lengthening the time between planned applications until moisture levels decreased below field capacity. In fields where field capacity was exceeded, nitrate concentrations at the 2-foot depth were below 24 ppm in all except SU08 (64 ppm) during pre-plant and post-harvest sampling throughout 2018.

5.6 Off-Site Transfers

Under Section III.F.7 of the SOW, the Dairies must endeavor to avoid transporting manure to locations where the nitrate concentrations in groundwater is known by the Dairies to currently exceed 10 mg/L. Application of manure on fields in such areas is allowed only if post-harvest soil sampling data indicate nitrate concentrations at the 2-foot depth are below the 45-ppm target.

The Dairies have access to current groundwater quality in areas within and within 1 mile downgradient of the Dairies. This knowledge is available near the existing AOC groundwater monitoring network and near the residential wells that were sampled in 2013 as described in Section 2 (Figure 4).

In 2018, a portion of the manure and composted manure from each Dairy was transferred off site for use as a nutrient supplement. Prior to transferring manure to off-site application fields within the 1-mile downgradient boundary of the Dairies, nutrient data were collected from these fields to

monitor nutrient levels, therein minimizing the risk of nitrogen over-application in a manner that could potentially contribute to groundwater nitrate contamination. Compost from the Dairies was primarily transferred outside of the 1-mile downgradient boundary of the Dairies.

5.6.1 Off-Site Liquid Manure Transfers

In 2018, the Dairies applied liquid manure to off-site application fields to support crop production at the respective locations. Off-site applications of liquid manure totaled 22,984,060 gallons. These details are described in Tables 18, 19, and 20; locations are shown in Figure 25; and soil sample results are provided in Appendices I, J, and K.

The Dairies are continuing to optimize off-site tracking and nutrient monitoring with the goal of providing consistent collection of post-harvest soil samples from the 2-foot depth and avoiding over-application of liquid manure, which could potentially contribute to areas of existing groundwater nitrate contamination.

In 2018, off-site nutrient monitoring activities were conducted for all off-site liquid manure transfers, regardless of groundwater quality in the vicinity, as follows:

- For Cow Palace, nutrient monitoring data were collected from 18 of 18 fields receiving liquid manure transfers from the Dairy. Each field receiving liquid manure applications exhibited nitrate concentrations at the 2-foot depth below the 45-ppm target.
- For Liberty/H&S Bosma Dairies, nutrient monitoring data were collected from 10 of 11 fields receiving liquid manure transfers from the Dairies. Each field receiving liquid manure applications exhibited nitrate concentrations at the 2-foot depth below the 45-ppm target. Nutrient monitoring data were not collected for one off-site liquid manure transfer because the manure was collected, transported, and applied by the receiving party (i.e., the collection, transportation and application were not conducted by Liberty/H&S Bosma Dairies).
- For George DeRuyter & Son/D&A Dairies, nutrient monitoring data were collected from 15 of 15 fields receiving liquid manure transfers from the Dairies.
  - Twelve of the 15 fields receiving liquid manure applications exhibited nitrate concentrations at the 2-foot depth below the 45-ppm target.
  - In three fields (fields D5, D6 and D8; Table 20 and Figure 25), the contractor applied nutrients to the fields prior to receiving soil sampling results, and the 2-foot nitrate concentrations exceeded 45 ppm.
    - One of these fields (D5) was located in an area where some of the nearby residential wells exceeded the nitrate MCL and some did not.
    - The other two fields (D6 and D8) were located in areas where the closest groundwater data available to the Dairies did not exceed the nitrate MCL.

- The application process was reviewed with the contractor, potential impacts from the over-application at field D5 were discussed, and remedial actions were immediately implemented. In 2018, winter cover crops were planted in the affected fields to increase nutrient extraction rates and minimize potential nutrient flux toward groundwater. Additionally, during the 2019 grow season, crop tissue monitoring will take place to help improve management decisions for effective nutrient uptake.
- George DeRuyter & Son/D&A Dairies has met with their staff and the manure hauling contractor to review procedures and the requirements of the AOC to prevent recurrence and ensure compliance with off-site transfer procedures.

5.6.2 Off-Site Solid Manure Transfers

In 2018, off-site solid manure transfers included sales to agricultural users, as well as transfers to off-site compost manufacturers. Off-site transfers of solid manure totaled 8,884 tons (including both manure solids and unfinished compost). These details are described in Tables 21, 22, and 23; locations are shown in Figure 26. In 2018, off-site nutrient monitoring activities were conducted for off-site solid manure transfers as follows:

- For Cow Palace, off-site solid manure transfers were to locations outside the 1-mile downgradient boundary; therefore, nutrient monitoring activities were not required under the AOC.
- For Liberty/H&S Bosma Dairies, no off-site solid manure transfers were conducted.
- For George DeRuyter & Son/D&A Dairies, no off-site solid manure transfers were conducted.

5.6.3 Compost Production

The Dairies use much of their solid manure to produce organic compost. The compost is produced through windrow composting performed by the Dairies, as well as by third parties using on-site and off-site composting areas. The produced compost is a commercial product that is either used by the Dairies or sold as a soil amendment for horticultural use (i.e., landscaping, nurseries, and tree production) or agricultural use (including organic farming and other agricultural crop production) as a soil amendment.

During compost production, nitrogen in raw manure is transformed into more complex and stable humus-like organic matter, and odors, pathogens, weeds, and other unwanted materials that may be present in raw manure are greatly reduced or destroyed (DeLuca and DeLuca 1997; Rynk 1992). Moisture levels in raw manure are reduced during composting by approximately 50%, and approximately 30% to 60% of the readily available nitrogen volatizes (DeLuca and DeLuca 1997). Compared to the application of raw manure and inorganic fertilizers, the application of composted manure results in reduced risks of nitrogen leaching to infiltrating water. Although site-specific

reasons vary, generally the primary reasons for this are as follows: 1) the reduction in total nitrogen content during composting; 2) conversion of the nitrogen to more complex and stable forms that are released in the subsurface at a slower and a more consistent rate; and 3) increase in the humus and organic matter content of the soil of the application field, improving both the ability of the soils to sequester nitrogen and regulate moisture content.

Most of the compost produced from solid manure generated by the Dairies is used in areas beyond the 1-mile downgradient boundary. Approximately 61,899 tons of finished compost produced from manure solids generated by the Dairies was sold for off-site use (this represents about 123,798 tons of wet manure solids prior to moisture and solids losses occurring during the compost process). Of this quantity, about 5,000 tons (approximately 8%) was used within the 1-mile downgradient boundary. The majority (approximately 92%) was used outside of the 1-mile downgradient boundary, and approximately 60% was used outside of Yakima County.

During 2018, finished compost was shipped by the Dairies to one property located within the 1-mile downgradient boundary. Transfer quantity and location details are described in Table 24 and Figure 27. The Dairies are unaware of any data indicating this shipment was to a location where nitrate concentrations in groundwater exceeded 10 mg/L.

The most developed markets for organic compost produced from the Dairies' manure solids currently include horticulture/landscape uses, production of organic root crops (typically not grown in the Sunnyside/Yakima area), organic fruit-tree growing (principally apples), and organic viticulture. Organic compost is relatively expensive in comparison to the cost of traditional chemical fertilizers and some other compost products that are higher in nitrogen levels (e.g., composted chicken manure). However, markets for organic compost continue to emerge as both organic and traditional growers gain experience with compost application and as the benefits of the compost amendment to crop production and soil conservation are documented in the agricultural community.

6 Other Plans

6.1 Quality Assurance Project Plans

Per Section III.A of the SOW, the Dairies must submit to EPA a QAPP prior to commencing any monitoring, sampling, field measurements, or laboratory sample analyses.

Each QAPP is prepared in accordance with *Guidance for QAPPs* (EPA 2001) and *EPA Requirements for QAPPs* (EPA 2002), as well as applicable amendments. The project data quality objectives are developed for use in the QAPP in accordance with *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA 2006).

In 2018, the following activities were performed regarding QAPPs:

- An updated *Groundwater Monitoring QAPP* (Anchor QEA 2018m) was conditionally approved by EPA (EPA Letter 164), as further discussed in Section 4.1.
- A revised draft of the George DeRuyter & Son/D&A Dairies *NDN QAPP* (Anchor QEA 2018k) was submitted to EPA per EPA Letter 183, as further discussed in Section 3.8.5.

6.2 Health and Safety Plan

Per Section III.B of the SOW, the Dairies must submit to EPA a health and safety plan (HASP) at least 14 days in advance of initial field work for each task.

Each HASP is compliant with the Occupational Safety and Health Act and its implementing regulations. The HASP will be updated periodically, as applicable, to address changes in work or field activities. The current HASP (Anchor QEA 2016) was submitted to EPA on September 13, 2016.

In 2018, there were no changes to the current HASP, and no loss time injuries or recordable incidents occurred.

6.3 Public Involvement

Per Section III.C of the SOW, the Dairies must notify EPA of their interest in participating in the public involvement process within 30 days of the effective date of the AOC. On April 18, 2013, the Dairies notified EPA of their interest in participating in the public involvement process (ARCADIS 2013h).

In 2018, no public involvement activities were performed.

7 References

Anchor QEA (Anchor QEA, LLC), 2016. *Health and Safety Plan, Yakima Valley Dairies*. Prepared for the U.S. Environmental Protection Agency, Region 10. September 2016.

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8 Certifications

Cow Palace Certification

I certify under the penalty of law that this document and attachments were prepared by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel gathered and evaluated the information submitted. Based on my inquiry of any and persons directly responsible for gathering and analyzing the information obtained, I certify that the information contained in or accompanying this submittal is to the best of my knowledge and belief, true, accurate, and complete. As to those identified portion(s) of this submittal for which I cannot personally verify the accuracy, I certify that this submittal and attachments were prepared in accordance with procedures designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those directly responsible for gathering the information, or the immediate supervisor of such person(s), the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Cow Palace, LLC

Signature	
Name	Adam Dolsen
Title	Member
Date	8-20-19

George DeRuyter & Son Dairy, D&A Dairy, and George & Margaret Certification

I certify under the penalty of law that this document and attachments were prepared by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel gathered and evaluated the information submitted. Based on my inquiry of any and persons directly responsible for gathering and analyzing the information obtained, I certify that the information contained in or accompanying this submittal is to the best of my knowledge and belief, true, accurate, and complete. As to those identified portion(s) of this submittal for which I cannot personally verify the accuracy, I certify that this submittal and attachments were prepared in accordance with procedures designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those directly responsible for gathering the information, or the immediate supervisor of such person(s), the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

George DeRuyter & Son Dairy, LLC, D&A Dairy, LLC (also known as D and A Dairy, L.L.C.), and George & Margaret, LLC

Signature	Dan DeRuyter
Name	Dan DeRuyter
Title	Member
Date	8/20/19

Liberty Dairy Certification

I certify under the penalty of law that this document and attachments were prepared by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel gathered and evaluated the information submitted. Based on my inquiry of any and persons directly responsible for gathering and analyzing the information obtained, I certify that the information contained in or accompanying this submittal is to the best of my knowledge and belief, true, accurate, and complete. As to those identified portion(s) of this submittal for which I cannot personally verify the accuracy, I certify that this submittal and attachments were prepared in accordance with procedures designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those directly responsible for gathering the information, or the immediate supervisor of such person(s), the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Liberty Dairy, LLC (and its associated dairy facility H&S Bosma Dairy)

Signature	Henry W B
Name	Henry Bosma
Title	Partner
Date	8-20-19

Tables

Table 1

Reverse Osmosis Unit Maintenance Summary, 2013 to 2018

	Number of Residences
Residence Survey	
Residences identified as being located within the area of interest[a]	223
RO Unit Survey	
Residence was offered reverse osmosis treatment system, at no charge to the resident[b]	67
Residence accepted the offer of a reverse osmosis unit	36
Residence already had reverse osmosis unit installed	50
Residence accepted the offer of maintenance of an existing reverse osmosis unit	15
Nitrate Sampling and Assessment	
Residence assessed for nitrate concentration in drinking water, either by Hach test strip or lab analysis	141
Residence drinking water sample nitrate concentration was less than the nitrate MCL, either by Hach test strip or lab analysis	75
Residence drinking water sample nitrate concentration exceeded the nitrate MCL based on laboratory analysis	66
Sampling and Assessments Unavailable	
Residence refusal, no response or vacant[c]	31
Maintenance post-2013 RO System Survey	
Residence RO systems maintained, 2016	36
Residence RO systems maintained, 2017	51[d]
Residence RO systems maintained, 2018	51[e]

Notes:

Data compiled from 2013, 2016, and 2017 Annual Reports (IES 2016a; Anchor QEA 2017e and 2018e)

a. RW-1007 and RW-1205 are duplicates in the source spreadsheet; these were originally listed as separate RW numbers but are the same residence.

b. RW-1055A and RW-1055 are separate houses that share a well (Table 8 in IES 2016a)

c. Four lots did not have homes onsite; one parcel "did not exist."

d. Maintennace activities during 2017 included 66 home site visits.

e. Maintenance activities were funded in conjuctiuon with work performed in parallel agreements with CARE for additional areas outside the 1-mile perimeter.

MCL: maximum contaminant level

RO: reverse osmosis

Table 2
Groundwater Monitoring Well Construction Data

Well ID	Coordinates[1]		Ground Surface Elevation[2] (feet NAVD88)	Surface Completion	Well Depth (feet bgs)	Casing and Screen Material	Screen Slot Size (inches)	Screen Length (feet)	Depth to Top of Screen (feet bgs)	Depth to Bottom of Screen (feet bgs)	Elevation of Top of Screen (feet NAVD88)	Elevation of Base of Screen (feet NAVD88)	Depth to Top of Filter Pack (feet bgs)	Depth to Bottom of Filter Pack (feet bgs)
	Latitude	Longitude												
Monitoring Wells														
DC-01	46.41879473	-120.13818510	1,199.64	Flush	160.0	Schedule 40 PVC	0.020	20.0	140.0	160.0	1,059.6	1,039.6	136.0	160.0
DC-03	46.38628888	-120.14614525	911.04	Flush	85.0	Schedule 40 PVC	0.020	20.0	62.5	82.5	848.5	828.5	58.5	85.0
DC-03D	46.38622013	-120.14605399	908.83	Stick-up	116.1	Schedule 40 PVC	0.020	9.5	106.1	115.6	802.7	793.2	100.0	116.5
DC-04	46.38244597	-120.13112916	877.62	Flush	51.0	Schedule 40 PVC	0.020	20.0	29.5	49.5	848.1	828.1	24.5	51.0
DC-05	46.38235835	-120.12023653	912.35	Flush	86.0	Schedule 40 PVC	0.020	20.0	63.5	83.5	848.9	828.9	59.5	86.0
DC-05D	46.38251688	-120.12020991	913.55	Stick-up	126.8	Schedule 40 PVC	0.020	9.5	116.8	126.3	796.8	787.3	114.0	128.0
DC-07	46.38961248	-120.14167140	889.78	Flush	61.0	Schedule 40 PVC	0.020	20.0	38.5	58.5	851.3	831.3	34.5	61.0
DC-09	46.40422954	-120.12085803	1,048.97	Flush	196.0	Schedule 40 PVC	0.020	20.0	173.5	193.5	875.5	855.5	169.5	196.0
DC-14	46.40424001	-120.13968549	1,036.92	Flush	151.0	Schedule 40 PVC	0.020	20.0	128.5	148.5	908.4	888.4	124.5	151.0
YVD-02	46.42260142	-120.11369707	1,285.81	Stick-up	35.0	Schedule 40 PVC	0.020	19.5	15.0	34.5	1,270.8	1,251.3	13.0	36.0
YVD-03	46.41422690	-120.13963782	1,118.15	Stick-up	200.1	Schedule 40 PVC	0.020	19.5	180.1	199.6	938.1	918.6	176.0	202.0
YVD-04	46.40806206	-120.15622396	1,116.06	Stick-up	245.2	Schedule 40 PVC	0.020	19.5	225.2	244.7	890.9	871.4	220.0	248.0
YVD-05	46.40445691	-120.14279042	1,052.26	Flush	182.2	Schedule 40 PVC	0.020	19.5	162.2	181.7	890.1	870.6	156.0	208.0
YVD-06	46.40767071	-120.13719080	1,053.88	Flush	169.0	Schedule 40 PVC	0.020	19.5	149.0	168.5	904.9	885.4	144.0	170.0
YVD-07	46.40443244	-120.12520522	1,070.59	Stick-up	168.3	Schedule 40 PVC	0.020	19.5	148.3	167.8	922.3	902.8	145.0	169.0
YVD-08	46.39691976	-120.15277093	1,011.92	Stick-up	182.5	Schedule 40 PVC	0.020	19.5	162.5	182.0	849.4	829.9	155.0	188.0
YVD-09	46.39683198	-120.14407816	964.28	Stick-up	122.3	Schedule 40 PVC	0.020	19.5	102.3	121.8	862.0	842.5	9.5	128.0
YVD-10	46.39697787	-120.13616530	955.45	Stick-up	103.1	Schedule 40 PVC	0.020	19.5	83.1	102.6	872.4	852.9	76.0	103.5
YVD-11	46.39344626	-120.12362653	965.51	Stick-up	116.9	Schedule 40 PVC	0.020	19.5	96.9	116.4	868.6	849.1	94.0	117.3
YVD-12	46.38972988	-120.16699550	959.51	Stick-up	151.4	Schedule 40 PVC	0.020	19.5	131.4	150.9	828.1	808.6	127.0	154.0
YVD-13	46.38970847	-120.15167317	963.07	Stick-up	141.0	Schedule 40 PVC	0.020	19.5	121.0	140.5	842.1	822.6	117.0	148.0
YVD-14R	46.389532	-120.145124	918.80	Stick-up	93.0	Schedule 40 PVC	0.020	20.0	72.0	92.0	846.8	826.8	69.0	93.0
YVD-15	46.38980233	-120.13715271	938.08	Stick-up	105.1	Schedule 40 PVC	0.020	19.5	85.1	104.6	853.0	833.5	81.0	128.0
YVD-16	46.38958628	-120.11478279	972.99	Stick-up	122.1	Schedule 40 PVC	0.020	19.5	102.1	121.6	870.9	851.4	100.5	127.0
YVD-17	46.38076091	-120.14206677	864.28	Stick-up	47.7	Schedule 40 PVC	0.020	19.5	27.7	47.2	836.6	817.1	25.0	58.0
YVD-18	46.38975797	-120.15167075	963.42	Stick-up	179.9	Schedule 40 PVC	0.020	9.5	169.9	179.4	793.5	784.0	166.0	181.5
Decommissioned Wells														
YVD-14	46.38953605	-120.14506741	917.64	Stick-up	91.0	Schedule 40 PVC	0.020	19.5	71.0	90.5	846.6	827.1	66.0	98.0

Notes:

1. Latitude and longitude in decimal degrees based on World Geodetic Survey 1984.

2. Vertical elevation based on NAVD88.

bgs: below ground surface

NAVD88: North American Vertical Datum of 1988

PVC: polyvinyl chloride

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-01	DC-01-130104	01/04/2013	N	EPA01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-01	DC-01-130924	09/24/2013	N	SWI0178	**88.9**	-	-	**32.5**	-	-	**6.10**	-	-	**43.0**	-	-	**44**	-	-	0.5	U	-
DC-01	DC-01-131211	12/11/2013	N	SWL0063	**91.4**	-	-	**32.6**	-	-	**5.94**	-	-	**41.9**	-	-	**47.8**	-	-	5	U	-
DC-01	DC-01-140318	03/18/2014	N	SXC0095	**90.5**	-	-	**31.4**	-	-	**5.93**	-	-	**40.2**	-	-	**48.2**	-	-	5	U	-
DC-01	DC-01-140602	06/02/2014	N	SXF0017	**88.6**	-	-	**31.9**	-	-	**6.74**	-	-	**41.8**	-	-	**41.4**	-	-	2	U	-
DC-01	DC-01-140923	09/23/2014	N	SXI0158	**89.4**	-	-	**31.2**	-	-	**6.02**	-	-	**44.3**	J+	MSD	**41.8**	-	-	5	U	-
DC-01	DC-01-141216	12/16/2014	N	SXL0121	**92.8**	-	-	**34.0**	-	-	**6.18**	-	-	**43.1**	-	-	**85.7**	-	-	5	U	-
DC-01	DC-01-150316	03/16/2015	N	5904471	**91.0**	-	-	**32.0**	-	-	**6.50**	-	-	**44.0**	-	-	**44**	-	-	5	U	-
DC-01	DC-01-150616	06/16/2015	N	59010751	**91.0**	J+	MSD	**33.0**	J+	MSD	**6.20**	J+	MSD	**42.0**	J+	MSD	**42**	-	-	5	U	-
DC-01	DC-01-150923	09/23/2015	N	59020281	**83.0**	-	-	**32.0**	-	-	**6.00**	-	-	**43.0**	-	-	**37**	-	-	5	U	-
DC-01	YVD-D1-150923	09/23/2015	FD	59020281	**85.0**	-	-	**33.0**	-	-	**6.10**	-	-	**43.0**	-	-	**43**	-	-	0.5	U	-
DC-01	DC-01-151214	12/14/2015	N	59025431	**97.0**	-	-	**34.0**	-	-	**6.80**	-	-	**48.0**	-	-	**38**	-	-	5	U	-
DC-01	DC-01-160308	03/08/2016	N	59029711	**83.0**	-	-	**30.0**	-	-	**6.20**	-	-	**42.0**	-	-	**40**	-	-	5	U	-
DC-01	DC-01-160620	6/20/2016	N	59037101	**83.0**	-	-	**31.0**	-	-	**6.50**	-	-	**46.0**	-	-	**40**	-	-	5	U	-
DC-01	DC-01-160928	9/28/2016	N	K1611629	**80.6**	-	-	**28.5**	-	-	**5.76**	-	-	**41.6**	-	-	**34.0**	-	-	**0.25**	-	-
DC-01	DC-01-161212	12/12/2016	N	K1615045	**81.1**	-	-	**27.9**	-	-	**5.52**	-	-	**40.4**	-	-	**31.9**	-	-	**0.39**	-	-
DC-01	YVD-030817-18	3/8/2017	N	K1702324	**80.8**	-	-	**27**	-	-	**5.13**	-	-	**37.4**	-	-	**32.6**	-	-	**0.39**	-	-
DC-01	YVD-060417-03	6/4/2017	N	K1705702	**83.4**	-	-	**26.2**	-	-	**5.22**	-	-	**37.4**	-	-	**32.9**	-	-	**0.4**	-	-
DC-01	YVD-060417-05	6/4/2017	FD	K1705702	**83.0**	-	-	**25.7**	-	-	**5.08**	-	-	**36.9**	-	-	**33.2**	-	-	**0.38**	-	-
DC-01	YVD-092517-13	9/25/2017	N	K1710333	**78.9**	-	-	**26.1**	-	-	**5.31**	-	-	**39.1**	-	-	**33.2**	-	-	**0.37**	-	-
DC-01	YVD-120617-31	12/6/2017	N	K1713157	**83.7**	-	-	**28.1**	-	-	**5.56**	-	-	**40.6**	-	-	**33.2**	-	-	**0.37**	-	-
DC-01	YVD-060418-19	6/4/2018	N	874662	**80.5**	-	-	**28.75**	-	-	**5.80**	-	-	**42.4**	-	-	**34.6**	-	-	**0.36**	-	-
DC-03	DC-03-130102	01/02/2013	N	EPA01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-03	DC-03-130918	09/18/2013	N	SWI0138	**284**	-	-	**73.7**	-	-	**2.73**	-	-	**173**	-	-	**176**	-	-	5	U	-
DC-03	DC-03-131212	12/12/2013	N	SWL0078	**280**	-	-	**75.0**	-	-	**3.29**	-	-	**172**	-	-	**172**	-	-	5	U	-
DC-03	YVD-D3-131212	12/12/2013	FD	SWL0078	**292**	-	-	**77.3**	-	-	**3.53**	-	-	**181**	-	-	**142**	-	-	5	U	-
DC-03	DC-03-140319	03/19/2014	N	SXC0107	**261**	-	-	**66.8**	-	-	**2.91**	-	-	**165**	-	-	**159**	J	FDP	5	U	-
DC-03	YVD-D3-140319	03/19/2014	FD	SXC0107	**261**	-	-	**66.7**	-	-	**2.81**	-	-	**166**	-	-	**128**	J	FDP	5	U	-
DC-03	DC-03-140604	06/04/2014	N	SXF0025	**259**	-	-	**67.7**	-	-	**3.11**	-	-	**177**	-	-	**201**	-	-	10	U	-
DC-03	DC-03-140924	09/24/2014	N	SXI0173	**291**	-	-	**77.1**	-	-	**3.28**	-	-	**178**	-	-	**147**	-	-	5	U	-
DC-03	DC-03-141217	12/17/2014	N	SXL0144	**274**	-	-	**74.9**	-	-	**3.76**	-	-	**185**	-	-	**157**	-	-	10	U	-
DC-03	YVD-D4-141217	12/17/2014	FD	SXL0144	**271**	-	-	**72.6**	-	-	**3.19**	-	-	**180**	-	-	**182**	-	-	5	U	-
DC-03	DC-03-150318	03/18/2015	N	5904651	**260**	-	-	**73.0**	-	-	**3.30**	J-	MSD	**180**	-	-	**160**	-	-	5	U	-
DC-03	YVD-D4-150318	03/18/2015	FD	5904651	**270**	-	-	**74.0**	-	-	**3.60**	J-	MSD	**180**	-	-	**150**	-	-	2.5	U	-
DC-03	DC-03-150617	06/17/2015	N	59011021	**290**	-	-	**78.0**	J	RPD	**3.60**	J	RPD	**190**	J	RPD	**170**	-	-	5	U	-
DC-03	YVD-D4-150617	06/17/2015	FD	59011021	**290**	-	-	**77.0**	J	RPD	**3.60**	J	RPD	**190**	J	RPD	**180**	-	-	5	U	-
DC-03	DC-03-150925	09/25/2015	N	59020431	**270**	-	-	**73.0**	-	-	**3.30**	-	-	**180**	-	-	**140**	-	-	10	U	-
DC-03	YVD-D4-150925	09/25/2015	FD	59020431	**260**	-	-	**69.0**	-	-	**3.20**	-	-	**180**	-	-	**140**	-	-	0.5	U	-
DC-03	DC-03-151216	12/16/2015	N	59025501	**260**	-	-	**75.0**	-	-	**3.50**	-	-	**160**	-	-	**170**	-	-	5	U	-
DC-03	YVD-D4-151216	12/16/2015	FD	59025501	**250**	-	-	**75.0**	-	-	**3.50**	-	-	**160**	-	-	**160**	-	-	2.5	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-01	DC-01-130104	01/04/2013	N	EPA01	**9.8**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-01	DC-01-130924	09/24/2013	N	SWI0178	**11.1**	-	-	0.2	U	-	**223**	-	-	-	-	-	0.1	U	-	0.25	U	-
DC-01	DC-01-131211	12/11/2013	N	SWL0063	**11.5**	-	-	2	U	-	**280**	J-	MSD	-	-	-	0.02	R	MSD	0.2	U	-
DC-01	DC-01-140318	03/18/2014	N	SXC0095	**11.2**	-	-	2	U	-	**250**	J-	MSD	-	-	-	**0.101**	-	-	**0.304**	-	-
DC-01	DC-01-140602	06/02/2014	N	SXF0017	**9.76**	-	-	0.8	U	-	**224**	J-	MSD	-	-	-	0.1	U	-	**0.45**	-	-
DC-01	DC-01-140923	09/23/2014	N	SXI0158	**9**	-	-	2	U	-	**216**	-	-	-	-	-	0.1	R	MSD	0.25	U	-
DC-01	DC-01-141216	12/16/2014	N	SXL0121	**18.9**	-	-	2	U	-	**463**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
DC-01	DC-01-150316	03/16/2015	N	5904471	**11**	-	-	2	U	-	**220**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
DC-01	DC-01-150616	06/16/2015	N	59010751	**9.5**	-	-	2	U	-	**200**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	MSD
DC-01	DC-01-150923	09/23/2015	N	59020281	**8.6**	-	-	2	U	-	**200**	-	-	-	-	-	**0.13**	-	-	0.25	R	MSD
DC-01	YVD-D1-150923	09/23/2015	FD	59020281	**10**	-	-	0.2	U	-	**210**	-	-	-	-	-	0.1	U	-	0.25	R	MSD
DC-01	DC-01-151214	12/14/2015	N	59025431	**8.8**	-	-	2	U	-	**220**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD
DC-01	DC-01-160308	03/08/2016	N	59029711	**8.6**	-	-	2	U	-	**210**	J+	MSD	-	-	-	0.11	R	FBK, FDP	0.25	R	MSD
DC-01	DC-01-160620	6/20/2016	N	59037101	**9.2**	-	-	2	U	-	**220**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	MSD
DC-01	DC-01-160928	9/28/2016	N	K1611629	**9.15**	-	-	0.10	U	-	**193**	-	-	-	-	-	0.050	U	MBK	0.5	U	-
DC-01	DC-01-161212	12/12/2016	N	K1615045	**8.89**	J	HTQ	0.10	UJ	HTQ	**191**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-01	YVD-030817-18	3/8/2017	N	K1702324	**9.0**	-	-	0.10	U	-	**175**	-	-	-	-	-	1	U	-	0.5	U	-
DC-01	YVD-060417-03	6/4/2017	N	K1705702	**8.2**	-	-	0.10	U	-	**203**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-01	YVD-060417-05	6/4/2017	FD	K1705702	**8.2**	-	-	0.10	U	-	**203**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-01	YVD-092517-13	9/25/2017	N	K1710333	**8.41**	-	-	0.10	U	-	**194**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-01	YVD-120617-31	12/6/2017	N	K1713157	**8.81**	-	-	0.10	U	-	**182**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-01	YVD-060418-19	6/4/2018	N	874662	**8.60**	-	-	0.05	U	-	**171**	-	-	0.07	U	FBK	-	-	-	0.5	UJ	MSD
DC-03	DC-03-130102	01/02/2013	N	EPA01	**190**	-	-	-	-	-	-	-	-	-	-	-	0.1	U	-	-	-	-
DC-03	DC-03-130918	09/18/2013	N	SWI0138	**166**	-	-	2	U	-	**176**	-	-	-	-	-	0.1	U	-	0.25	U	-
DC-03	DC-03-131212	12/12/2013	N	SWL0078	**174**	-	-	2	U	-	**176**	-	-	-	-	-	0.02	U	-	0.2	U	-
DC-03	YVD-D3-131212	12/12/2013	FD	SWL0078	**182**	-	-	2	U	-	**160**	-	-	-	-	-	0.02	U	-	0.8311	U	ERL
DC-03	DC-03-140319	03/19/2014	N	SXC0107	**195**	-	-	2	U	-	**189**	J	FDP	-	-	-	0.1	U	-	**0.938**	J-	MSD
DC-03	YVD-D3-140319	03/19/2014	FD	SXC0107	**164**	-	-	2	U	-	**150**	J	FDP	-	-	-	0.1	U	-	**0.718**	J-	MSD
DC-03	DC-03-140604	06/04/2014	N	SXF0025	**234**	-	-	4	U	-	**214**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
DC-03	DC-03-140924	09/24/2014	N	SXI0173	**170**	-	-	2	U	-	**166**	-	-	-	-	-	0.1	U	-	**2.27**	J+	MSD
DC-03	DC-03-141217	12/17/2014	N	SXL0144	**193**	-	-	4	U	-	**182**	-	-	-	-	-	**0.18**	J+	FBK, MBK	0.25	R	MSD
DC-03	YVD-D4-141217	12/17/2014	FD	SXL0144	**156**	-	-	10	U	-	**211**	-	-	-	-	-	0.1	U	-	0.25	R	MSD
DC-03	DC-03-150318	03/18/2015	N	5904651	**180**	-	-	2	U	-	**160**	-	-	-	-	-	0.1	U	-	**0.45**	J-	MSD
DC-03	YVD-D4-150318	03/18/2015	FD	5904651	**180**	-	-	1	U	-	**160**	-	-	-	-	-	**0.12**	-	-	**0.53**	J-	MSD
DC-03	DC-03-150617	06/17/2015	N	59011021	**180**	J-	MSD, FD	2	U	-	**170**	-	-	-	-	-	0.1	U	-	0.25	R	MSD
DC-03	YVD-D4-150617	06/17/2015	FD	59011021	**10**	J-	MSD, FD	2	U	-	**180**	-	-	-	-	-	0.1	U	-	0.25	R	MSD
DC-03	DC-03-150925	09/25/2015	N	59020431	**180**	-	-	4	U	-	**150**	-	-	-	-	-	**0.1**	-	-	0.25	U	-
DC-03	YVD-D4-150925	09/25/2015	FD	59020431	**180**	-	-	4	U	-	**160**	-	-	-	-	-	**0.2**	-	-	0.25	U	-
DC-03	DC-03-151216	12/16/2015	N	59025501	**200**	-	-	2	U	-	**130**	-	-	-	-	-	**0.18**	J-	MSD	0.25	R	MSD
DC-03	YVD-D4-151216	12/16/2015	FD	59025501	**170**	-	-	1	U	-	**130**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-01	DC-01-130104	01/04/2013	N	EPA01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-01	DC-01-130924	09/24/2013	N	SWI0178	-	-	-	-	-	-	**0.123**	-	-	-	-	-	**110**	-	-	**110**	-	-
DC-01	DC-01-131211	12/11/2013	N	SWL0063	-	-	-	-	-	-	-	-	-	**0.186**	-	-	**159**	-	-	**160**	-	-
DC-01	DC-01-140318	03/18/2014	N	SXC0095	**0.079**	-	-	-	-	-	-	-	-	-	-	-	**159**	-	-	**160**	-	-
DC-01	DC-01-140602	06/02/2014	N	SXF0017	**0.81**	-	-	-	-	-	-	-	-	-	-	-	**164**	-	-	**165**	-	-
DC-01	DC-01-140923	09/23/2014	N	SXI0158	**0.12**	-	-	-	-	-	-	-	-	-	-	-	**154**	-	-	**155**	-	-
DC-01	DC-01-141216	12/16/2014	N	SXL0121	0.1	U	-	-	-	-	-	-	-	-	-	-	**140**	-	-	**140**	-	-
DC-01	DC-01-150316	03/16/2015	N	5904471	0.25	UJ	MSD	-	-	-	-	-	-	-	-	-	**150**	-	-	**150**	-	-
DC-01	DC-01-150616	06/16/2015	N	59010751	0.25	U	-	-	-	-	-	-	-	-	-	-	**150**	-	-	**150**	-	-
DC-01	DC-01-150923	09/23/2015	N	59020281	0.25	U	-	-	-	-	-	-	-	-	-	-	**150**	-	-	**150**	-	-
DC-01	YVD-D1-150923	09/23/2015	FD	59020281	0.25	U	-	-	-	-	-	-	-	-	-	-	**160**	-	-	**160**	-	-
DC-01	DC-01-151214	12/14/2015	N	59025431	**0.3**	J	FDP	-	-	-	-	-	-	-	-	-	**170**	J	FDP	**170**	J	FDP
DC-01	DC-01-160308	03/08/2016	N	59029711	**0.26**	-	-	-	-	-	-	-	-	-	-	-	**150**	-	-	**150**	-	-
DC-01	DC-01-160620	6/20/2016	N	59037101	0.25	U	-	-	-	-	-	-	-	-	-	-	**150**	-	-	**150**	-	-
DC-01	DC-01-160928	9/28/2016	N	K1611629	-	-	-	**0.009**	J	-	-	-	-	-	-	-	**147**	-	-	**147**	-	-
DC-01	DC-01-161212	12/12/2016	N	K1615045	-	-	-	**0.040**	-	-	-	-	-	-	-	-	**144**	-	-	**144**	-	-
DC-01	YVD-030817-18	3/8/2017	N	K1702324	-	-	-	**0.008**	J	-	-	-	-	-	-	-	**148**	-	-	**148**	-	-
DC-01	YVD-060417-03	6/4/2017	N	K1705702	-	-	-	**0.010**	J	-	-	-	-	-	-	-	**147**	-	-	**147**	-	-
DC-01	YVD-060417-05	6/4/2017	FD	K1705702	-	-	-	**0.010**	J	-	-	-	-	-	-	-	**147**	-	-	**147**	-	-
DC-01	YVD-092517-13	9/25/2017	N	K1710333	-	-	-	0.010	U	-	-	-	-	-	-	-	**148**	-	-	**148**	-	-
DC-01	YVD-120617-31	12/6/2017	N	K1713157	-	-	-	**0.010**	-	-	-	-	-	-	-	-	**146**	-	-	**146**	-	-
DC-01	YVD-060418-19	6/4/2018	N	874662	-	-	-	-	-	-	-	-	-	0.07	U	-	**141**	-	-	**141**	-	-
DC-03	DC-03-130102	01/02/2013	N	EPA01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-03	DC-03-130918	09/18/2013	N	SWI0138	-	-	-	-	-	-	0.1	U	-	-	-	-	**435**	-	-	**435**	-	-
DC-03	DC-03-131212	12/12/2013	N	SWL0078	-	-	-	-	-	-	-	-	-	**0.221**	-	-	**474**	-	-	**475**	-	-
DC-03	YVD-D3-131212	12/12/2013	FD	SWL0078	-	-	-	-	-	-	-	-	-	**0.244**	-	-	**459**	-	-	**460**	-	-
DC-03	DC-03-140319	03/19/2014	N	SXC0107	**0.057**	-	-	-	-	-	-	-	-	-	-	-	**459**	-	-	**460**	-	-
DC-03	YVD-D3-140319	03/19/2014	FD	SXC0107	**0.062**	-	-	-	-	-	-	-	-	-	-	-	**469**	-	-	**470**	-	-
DC-03	DC-03-140604	06/04/2014	N	SXF0025	**0.12**	-	-	-	-	-	-	-	-	-	-	-	**425**	-	-	**425**	-	-
DC-03	DC-03-140924	09/24/2014	N	SXI0173	**0.073**	J+	FBK	-	-	-	-	-	-	-	-	-	**409**	-	-	**410**	-	-
DC-03	DC-03-141217	12/17/2014	N	SXL0144	0.1	UJ	MSD	-	-	-	-	-	-	-	-	-	**429**	-	-	**430**	-	-
DC-03	YVD-D4-141217	12/17/2014	FD	SXL0144	**0.13**	J-	MSD	-	-	-	-	-	-	-	-	-	**423**	-	-	**425**	-	-
DC-03	DC-03-150318	03/18/2015	N	5904651	0.25	U	-	-	-	-	-	-	-	-	-	-	**420**	-	-	**420**	-	-
DC-03	YVD-D4-150318	03/18/2015	FD	5904651	0.25	U	-	-	-	-	-	-	-	-	-	-	**410**	-	-	**410**	-	-
DC-03	DC-03-150617	06/17/2015	N	59011021	0.25	U	-	-	-	-	-	-	-	-	-	-	**460**	-	-	**460**	-	-
DC-03	YVD-D4-150617	06/17/2015	FD	59011021	0.25	U	-	-	-	-	-	-	-	-	-	-	**450**	-	-	**450**	-	-
DC-03	DC-03-150925	09/25/2015	N	59020431	0.25	U	-	-	-	-	-	-	-	-	-	-	**390**	-	-	**390**	-	-
DC-03	YVD-D4-150925	09/25/2015	FD	59020431	0.25	U	-	-	-	-	-	-	-	-	-	-	**460**	-	-	**460**	-	-
DC-03	DC-03-151216	12/16/2015	N	59025501	0.25	UJ	MSD	-	-	-	-	-	-	-	-	-	**400**	-	-	**400**	-	-
DC-03	YVD-D4-151216	12/16/2015	FD	59025501	0.25	UJ	MSD	-	-	-	-	-	-	-	-	-	**380**	-	-	**380**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-03	DC-03-160310	03/10/2016	N	59029941	**270**	-	-	**72.0**	-	-	**3.10**	-	-	**180**	-	-	**150**	-	-	5	U	-
DC-03	YVD-D4-160310	03/10/2016	FD	59029941	**270**	-	-	**72.0**	-	-	**3.00**	-	-	**180**	-	-	**160**	-	-	5	U	-
DC-03	DC-03-160623	6/23/2016	N	59037371	**270**	-	-	**73.0**	-	-	**3.50**	-	-	**190**	-	-	**150**	-	-	5	U	-
DC-03	YVD-D4-160623	6/23/2016	FD	59037371	**250**	-	-	**71.0**	-	-	**3.30**	-	-	**180**	-	-	**160**	-	-	2.5	U	-
DC-03	DC-03-160927	9/27/2016	N	K1611565	**265**	-	-	**72.4**	-	-	**2.85**	-	-	**182**	-	-	**136**	-	-	**0.2**	J	-
DC-03	DC-03-D2-160927	9/27/2016	FD	K1611565	**262**	-	-	**71.9**	-	-	**2.87**	-	-	**183**	-	-	**137**	-	-	**0.19**	J	-
DC-03	DC-03-161212	12/12/2016	N	K1615029	**254**	-	-	**65.7**	-	-	**3.05**	-	-	**167**	-	-	**131**	-	-	**0.24**	-	-
DC-03	YVD-030817-13	3/8/2017	N	K1702324	**267**	-	-	**66**	-	-	**2.58**	-	-	**159**	-	-	**150**	-	-	**0.22**	-	-
DC-03	YVD-060517-02	6/5/2017	N	K1705702	**271**	-	-	**61.6**	-	-	**2.49**	-	-	**157**	-	-	**152**	-	-	**0.24**	-	-
DC-03	YVD-060517-04	6/5/2017	FD	K1705702	**269**	-	-	**70.6**	-	-	**2.49**	-	-	**158**	-	-	**152**	-	-	**0.28**	-	-
DC-03	YVD-092617-22	9/26/2017	N	K1710333	**279**	-	-	**68.9**	-	-	**2.92**	-	-	**159**	-	-	**154**	-	-	**0.24**	-	-
DC-03	YVD-120417-10	12/4/2017	N	K1713026	**274**	-	-	**69.4**	-	-	**2.76**	-	-	**161**	-	-	**161**	-	-	**0.24**	-	-
DC-03	YVD-031818-04	3/18/2018	N	870610	**280**	-	-	**67.00**	-	-	**3.01**	-	-	**180**	-	-	**156**	-	-	**0.19**	-	-
DC-03	YVD-060418-22	6/4/2018	N	874860	**266**	-	-	**67.00**	-	-	**3.34**	-	-	**174**	-	-	**152**	-	-	**0.19**	-	-
DC-03	YVD-090918-17	9/9/2018	N	880601	**267**	-	-	**65.50**	-	-	**2.82**	-	-	**160**	-	-	**133**	-	-	**0.20**	-	-
DC-03	YVD-121018-03	12/10/2018	N	884857	**263**	-	-	**65.50**	J	MSD	**3.24**	-	-	**170**	-	-	**142**	-	-	0.20	U	FBK
DC-03D	DC-03D-130918	09/18/2013	N	SWI0138	**198**	-	-	**44.0**	-	-	**2.71**	-	-	**62.1**	-	-	**56**	-	-	5	U	-
DC-03D	DC-03D-131212	12/12/2013	N	SWL0073	**194**	-	-	**43.3**	-	-	**2.67**	-	-	**59.7**	-	-	**67.9**	-	-	5	U	-
DC-03D	DC-03D-140319	03/19/2014	N	SXC0107	**200**	-	-	**43.9**	-	-	**2.67**	-	-	**57.5**	-	-	**65.9**	-	-	5	U	-
DC-03D	DC-03D-140603	06/03/2014	N	SXF0017	**179**	-	-	**40.9**	-	-	**2.66**	-	-	**59.0**	-	-	**65.5**	-	-	2	U	-
DC-03D	DC-03D-140923	09/23/2014	N	SXI0173	**216**	-	-	**46.6**	-	-	**3.40**	-	-	**67.8**	-	-	**59.5**	-	-	2.5	U	-
DC-03D	DC-03D-141217	12/17/2014	N	SXL0121	**203**	-	-	**46.8**	-	-	**2.92**	-	-	**60.7**	-	-	**62.8**	-	-	2.5	U	-
DC-03D	DC-03D-150317	03/17/2015	N	5904651	**210**	-	-	**48.0**	-	-	**3.00**	J-	MSD	**68.0**	-	-	**63**	-	-	2.5	U	-
DC-03D	DC-03D-150617	06/17/2015	N	59011021	**210**	-	-	**48.0**	J	RPD	**3.20**	J	RPD	**68.0**	J	RPD	**71**	-	-	2.5	U	-
DC-03D	DC-03D-150925	09/25/2015	N	59020431	**200**	-	-	**47.0**	-	-	**3.00**	-	-	**65.0**	-	-	**58**	-	-	10	U	-
DC-03D	DC-03D-151216	12/16/2015	N	59025501	**210**	-	-	**50.0**	-	-	**3.20**	-	-	**69.0**	-	-	**70**	-	-	2.5	U	-
DC-03D	DC-03D-160310	03/10/2016	N	59029941	**200**	-	-	**47.0**	-	-	**3.00**	-	-	**68.0**	-	-	**65**	-	-	2.5	U	-
DC-03D	DC-03D-160623	6/23/2016	N	59037371	**200**	-	-	**47.0**	-	-	**3.00**	-	-	**70.0**	-	-	**65**	-	-	5	U	-
DC-03D	DC-03D-160927	9/27/2016	N	K1611565	**188**	-	-	**47.1**	-	-	**2.73**	-	-	**63.0**	-	-	**58.7**	-	-	**0.1**	J	-
DC-03D	DC-03D-161212	12/12/2016	N	K1615029	**200**	-	-	**44.8**	-	-	**2.98**	-	-	**65.0**	-	-	**57.8**	-	-	**0.12**	J	-
DC-03D	YVD-030817-14	3/8/2017	N	K1702324	**196**	-	-	**43.4**	-	-	**2.75**	-	-	**61.3**	-	-	**59.5**	-	-	**0.16**	J	-
DC-03D	YVD-030817-16	3/8/2017	FD	K1702324	**194**	-	-	**42.7**	-	-	**2.69**	-	-	**60.2**	-	-	**59.1**	-	-	**0.17**	J	-
DC-03D	YVD-060517-09	6/5/2017	N	K1705702	**203**	-	-	**41.3**	-	-	**2.66**	-	-	**59.7**	-	-	**58.7**	-	-	**0.13**	J	-
DC-03D	YVD-092617-24	9/26/2017	N	K1710333	**194**	-	-	**44.2**	-	-	**3.16**	-	-	**67.1**	-	-	**60.1**	-	-	**0.12**	J	-
DC-03D	YVD-120417-08	12/4/2017	N	K1713026	**195**	-	-	**41.5**	-	-	**2.64**	-	-	**60.9**	-	-	**57.9**	-	-	**0.17**	J	-
DC-03D	YVD-031818-02	3/18/2018	N	870610	**199**	-	-	**42.65**	-	-	**3.02**	-	-	**70.0**	-	-	**66.1**	-	-	0.1	U	-
DC-03D	YVD-060418-24	6/4/2018	N	874860	**187**	-	-	**42.85**	-	-	**3.24**	-	-	**67.0**	-	-	**64.7**	-	-	**0.10**	-	-
DC-03D	YVD-090918-15	9/9/2018	N	880601	**200**	-	-	**42.90**	-	-	**3.01**	-	-	**68.0**	-	-	**69.5**	-	-	**0.10**	-	-
DC-03D	YVD-121018-05	12/10/2018	N	884857	**191**	-	-	**42.50**	J	MSD	**3.18**	-	-	**67.0**	-	-	**62.1**	-	-	0.10	U	FBK

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-03	DC-03-160310	03/10/2016	N	59029941	**180**	-	-	2	U	-	**170**	J	DUP	-	-	-	0.1	U	-	**0.94**	J-	FDP, MSD
DC-03	YVD-D4-160310	03/10/2016	FD	59029941	**190**	-	-	2	U	-	**180**	J	DUP	-	-	-	0.1	U	-	0.25	UJ	FDP, MSD
DC-03	DC-03-160623	6/23/2016	N	59037371	**180**	-	-	2	U	-	**160**	-	-	-	-	-	**0.12**	J-	MSD	0.25	U	-
DC-03	YVD-D4-160623	6/23/2016	FD	59037371	**170**	-	-	1	U	-	**160**	-	-	-	-	-	**0.11**	J-	MSD	0.25	U	-
DC-03	DC-03-160927	9/27/2016	N	K1611565	**163**	-	-	0.10	U	-	**139**	-	-	-	-	-	0.050	U	MBK	0.5	R	MSD
DC-03	DC-03-D2-160927	9/27/2016	FD	K1611565	**163**	-	-	0.10	U	-	**138**	-	-	-	-	-	0.050	U	MBK	0.5	R	MSD
DC-03	DC-03-161212	12/12/2016	N	K1615029	**168**	J	HTQ	0.10	U	-	**112**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-03	YVD-030817-13	3/8/2017	N	K1702324	**179**	-	-	**0.12**	-	-	**104**	-	-	-	-	-	1	U	-	0.5	U	-
DC-03	YVD-060517-02	6/5/2017	N	K1705702	**181**	-	-	0.10	U	-	**147**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-03	YVD-060517-04	6/5/2017	FD	K1705702	**182**	-	-	0.10	U	-	**122**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-03	YVD-092617-22	9/26/2017	N	K1710333	**192**	-	-	0.10	U	-	**115**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-03	YVD-120417-10	12/4/2017	N	K1713026	**207**	-	-	0.10	U	-	**108**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-03	YVD-031818-04	3/18/2018	N	870610	**192**	-	-	0.05	U	-	**111**	-	-	0.07	U	-	-	-	-	0.5	U	-
DC-03	YVD-060418-22	6/4/2018	N	874860	**184**	-	-	0.05	U	-	**108**	-	-	**1.22**	-	-	-	-	-	0.5	UJ	MSD
DC-03	YVD-090918-17	9/9/2018	N	880601	**157**	-	-	0.05	U	-	**136**	-	-	0.07	U	-	-	-	-	0.5	R	MSD
DC-03	YVD-121018-03	12/10/2018	N	884857	**180**	-	-	0.05	U	-	**134**	-	-	0.07	U	-	-	-	-	0.5	U	-
DC-03D	DC-03D-130918	09/18/2013	N	SWI0138	**46.4**	-	-	2	U	-	**101**	-	-	-	-	-	0.1	U	-	**0.255**	-	-
DC-03D	DC-03D-131212	12/12/2013	N	SWL0073	**38.9**	-	-	2	U	-	**99.1**	-	-	-	-	-	0.02	UJ	MSD	0.2	UJ	MSD
DC-03D	DC-03D-140319	03/19/2014	N	SXC0107	**42.5**	-	-	2	U	-	**106**	-	-	-	-	-	**0.127**	-	-	**0.427**	J-	MSD
DC-03D	DC-03D-140603	06/03/2014	N	SXF0017	**42**	-	-	0.8	U	-	**103**	J-	MSD	-	-	-	0.1	U	-	**0.468**	-	-
DC-03D	DC-03D-140923	09/23/2014	N	SXI0173	**38**	-	-	1	U	-	**89.4**	-	-	-	-	-	0.1	U	-	0.25	U	-
DC-03D	DC-03D-141217	12/17/2014	N	SXL0121	**38.6**	-	-	1	U	-	**92.2**	-	-	-	-	-	0.1	U	-	**0.282**	J-	MSD
DC-03D	DC-03D-150317	03/17/2015	N	5904651	**37**	-	-	1	U	-	**87**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
DC-03D	DC-03D-150617	06/17/2015	N	59011021	**42**	J-	MSD	1	U	-	**93**	-	-	-	-	-	0.1	U	-	0.25	R	MSD
DC-03D	DC-03D-150925	09/25/2015	N	59020431	**33**	-	-	4	U	-	**86**	-	-	-	-	-	0.1	U	-	0.25	U	-
DC-03D	DC-03D-151216	12/16/2015	N	59025501	**36**	-	-	1	U	-	**94**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD
DC-03D	DC-03D-160310	03/10/2016	N	59029941	**37**	-	-	1	U	-	**90**	J	DUP	-	-	-	0.1	U	-	0.25	UJ	FDP, MSD
DC-03D	DC-03D-160623	6/23/2016	N	59037371	**36**	-	-	2	U	-	**89**	-	-	-	-	-	**0.11**	J-	MSD	0.25	U	-
DC-03D	DC-03D-160927	9/27/2016	N	K1611565	**32.8**	-	-	0.10	U	-	**90.9**	-	-	-	-	-	0.050	U	MBK	0.5	R	MSD
DC-03D	DC-03D-161212	12/12/2016	N	K1615029	**33.8**	J	HTQ	0.10	U	-	**90.7**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-03D	YVD-030817-14	3/8/2017	N	K1702324	**32.9**	-	-	**0.05**	J	-	**80.8**	-	-	-	-	-	1	U	-	0.5	U	-
DC-03D	YVD-030817-16	3/8/2017	FD	K1702324	**32.8**	-	-	**0.04**	J	-	**79.6**	-	-	-	-	-	1	U	-	0.5	U	-
DC-03D	YVD-060517-09	6/5/2017	N	K1705702	**31.9**	-	-	0.10	U	-	**91.6**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-03D	YVD-092617-24	9/26/2017	N	K1710333	**33.2**	-	-	0.10	U	-	**101**	-	-	-	-	-	0.050	U	-	0.5	R	MSD
DC-03D	YVD-120417-08	12/4/2017	N	K1713026	**33.6**	-	-	0.10	U	-	**86.7**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-03D	YVD-031818-02	3/18/2018	N	870610	**32.6**	-	-	0.05	U	-	**86.1**	-	-	0.07	U	-	-	-	-	0.5	U	-
DC-03D	YVD-060418-24	6/4/2018	N	874860	**31.0**	-	-	0.05	U	-	**82.1**	-	-	0.07	U	-	-	-	-	0.5	UJ	MSD
DC-03D	YVD-090918-15	9/9/2018	N	880601	**32.9**	-	-	0.05	U	-	**88.6**	-	-	0.07	U	-	-	-	-	0.5	R	MSD
DC-03D	YVD-121018-05	12/10/2018	N	884857	**34.8**	-	-	0.05	U	-	**83.0**	-	-	0.07	U	-	-	-	-	0.5	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-03	DC-03-160310	03/10/2016	N	59029941	0.25	U	-	-	-	-	-	-	-	-	-	-	**460**	-	-	**460**	-	-
DC-03	YVD-D4-160310	03/10/2016	FD	59029941	0.25	U	-	-	-	-	-	-	-	-	-	-	**480**	-	-	**480**	-	-
DC-03	DC-03-160623	6/23/2016	N	59037371	0.25	U	-	-	-	-	-	-	-	-	-	-	**420**	-	-	**420**	-	-
DC-03	YVD-D4-160623	6/23/2016	FD	59037371	0.25	U	-	-	-	-	-	-	-	-	-	-	**410**	-	-	**410**	-	-
DC-03	DC-03-160927	9/27/2016	N	K1611565	-	-	-	**0.006**	J	-	-	-	-	-	-	-	**425**	-	-	**425**	-	-
DC-03	DC-03-D2-160927	9/27/2016	FD	K1611565	-	-	-	0.010	U	-	-	-	-	-	-	-	**427**	-	-	**427**	-	-
DC-03	DC-03-161212	12/12/2016	N	K1615029	-	-	-	**0.199**	-	-	-	-	-	-	-	-	**371**	-	-	**371**	-	-
DC-03	YVD-030817-13	3/8/2017	N	K1702324	-	-	-	**0.006**	J	-	-	-	-	-	-	-	**381**	-	-	**381**	-	-
DC-03	YVD-060517-02	6/5/2017	N	K1705702	-	-	-	**0.022**	-	-	-	-	-	-	-	-	**358**	-	-	**358**	-	-
DC-03	YVD-060517-04	6/5/2017	FD	K1705702	-	-	-	**0.019**	-	-	-	-	-	-	-	-	**360**	-	-	**360**	-	-
DC-03	YVD-092617-22	9/26/2017	N	K1710333	-	-	-	**0.010**	J	-	-	-	-	-	-	-	**329**	-	-	**329**	-	-
DC-03	YVD-120417-10	12/4/2017	N	K1713026	-	-	-	0.017	U	MBK	-	-	-	-	-	-	**333**	-	-	**333**	-	-
DC-03	YVD-031818-04	3/18/2018	N	870610	-	-	-	-	-	-	-	-	-	0.07	U	-	**374**	-	-	**374**	-	-
DC-03	YVD-060418-22	6/4/2018	N	874860	-	-	-	-	-	-	-	-	-	0.07	U	-	**358**	-	-	**358**	-	-
DC-03	YVD-090918-17	9/9/2018	N	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	**460**	-	-	**460**	-	-
DC-03	YVD-121018-03	12/10/2018	N	884857	-	-	-	-	-	-	-	-	-	0.07	U	-	**415**	-	-	**415**	-	-
DC-03D	DC-03D-130918	09/18/2013	N	SWI0138	-	-	-	-	-	-	0.1	U	-	-	-	-	**509**	-	-	**510**	-	-
DC-03D	DC-03D-131212	12/12/2013	N	SWL0073	-	-	-	-	-	-	-	-	-	0.06	U	-	**559**	-	-	**560**	-	-
DC-03D	DC-03D-140319	03/19/2014	N	SXC0107	0.05	U	-	-	-	-	-	-	-	-	-	-	**564**	-	-	**565**	-	-
DC-03D	DC-03D-140603	06/03/2014	N	SXF0017	**0.074**	J+	FBK	-	-	-	-	-	-	-	-	-	**542**	-	-	**543**	-	-
DC-03D	DC-03D-140923	09/23/2014	N	SXI0173	**0.098**	-	-	-	-	-	-	-	-	-	-	-	**514**	-	-	**515**	-	-
DC-03D	DC-03D-141217	12/17/2014	N	SXL0121	0.1	U	-	-	-	-	-	-	-	-	-	-	**514**	-	-	**515**	-	-
DC-03D	DC-03D-150317	03/17/2015	N	5904651	0.25	U	-	-	-	-	-	-	-	-	-	-	**530**	-	-	**530**	-	-
DC-03D	DC-03D-150617	06/17/2015	N	59011021	0.25	U	-	-	-	-	-	-	-	-	-	-	**530**	-	-	**530**	-	-
DC-03D	DC-03D-150925	09/25/2015	N	59020431	0.25	U	-	-	-	-	-	-	-	-	-	-	**610**	-	-	**610**	-	-
DC-03D	DC-03D-151216	12/16/2015	N	59025501	0.25	UJ	MSD	-	-	-	-	-	-	-	-	-	**590**	-	-	**590**	-	-
DC-03D	DC-03D-160310	03/10/2016	N	59029941	0.25	U	-	-	-	-	-	-	-	-	-	-	**580**	-	-	**580**	-	-
DC-03D	DC-03D-160623	6/23/2016	N	59037371	0.25	U	-	-	-	-	-	-	-	-	-	-	**530**	-	-	**530**	-	-
DC-03D	DC-03D-160927	9/27/2016	N	K1611565	-	-	-	**0.006**	J	-	-	-	-	-	-	-	**546**	-	-	**546**	-	-
DC-03D	DC-03D-161212	12/12/2016	N	K1615029	-	-	-	**0.085**	-	-	-	-	-	-	-	-	**544**	-	-	**544**	-	-
DC-03D	YVD-030817-14	3/8/2017	N	K1702324	-	-	-	**0.008**	J	-	-	-	-	-	-	-	**537**	-	-	**537**	-	-
DC-03D	YVD-030817-16	3/8/2017	FD	K1702324	-	-	-	**0.008**	J	-	-	-	-	-	-	-	**555**	-	-	**555**	-	-
DC-03D	YVD-060517-09	6/5/2017	N	K1705702	-	-	-	**0.006**	J	-	-	-	-	-	-	-	**533**	-	-	**533**	-	-
DC-03D	YVD-092617-24	9/26/2017	N	K1710333	-	-	-	**0.011**	-	-	-	-	-	-	-	-	**537**	-	-	**537**	-	-
DC-03D	YVD-120417-08	12/4/2017	N	K1713026	-	-	-	0.011	U	MBK	-	-	-	-	-	-	**525**	-	-	**525**	-	-
DC-03D	YVD-031818-02	3/18/2018	N	870610	-	-	-	-	-	-	-	-	-	0.07	U	-	**529**	-	-	**529**	-	-
DC-03D	YVD-060418-24	6/4/2018	N	874860	-	-	-	-	-	-	-	-	-	0.07	U	-	**533**	-	-	**533**	-	-
DC-03D	YVD-090918-15	9/9/2018	N	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	**541**	-	-	**541**	-	-
DC-03D	YVD-121018-05	12/10/2018	N	884857	-	-	-	-	-	-	-	-	-	0.07	U	-	**543**	-	-	**543**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-04	DC-04-130103	01/03/2013	N	EPA01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-04	DC-04-130920	09/20/2013	N	SWI0142	**141**	-	-	**25.5**	-	-	**3.45**	-	-	**32.1**	-	-	**39.4**	-	-	5	U	-
DC-04	DC-04-130924	09/24/2013	N	SWI0175	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-04	DC-04-131212	12/12/2013	N	SWL0073	**148**	-	-	**28.4**	-	-	**3.51**	-	-	**31.7**	-	-	**41.1**	-	-	5	U	-
DC-04	DC-04-140318	03/18/2014	N	SXC0107	**153**	-	-	**28.0**	-	-	**3.58**	-	-	**30.4**	-	-	**42**	-	-	5	U	-
DC-04	DC-04-140603	06/03/2014	N	SXF0017	**134**	-	-	**28.9**	-	-	**3.65**	-	-	**32.3**	-	-	**36.2**	-	-	2	U	-
DC-04	DC-04-140923	09/23/2014	N	SXI0173	**174**	-	-	**34.2**	-	-	**4.51**	-	-	**35.5**	-	-	**39.7**	-	-	2.5	U	-
DC-04	DC-04-141217	12/17/2014	N	SXL0121	**182**	-	-	**35.7**	-	-	**4.34**	-	-	**34.9**	-	-	**42.7**	-	-	2.5	U	-
DC-04	DC-04-150317	03/17/2015	N	5904651	**180**	-	-	**34.0**	-	-	**3.90**	J-	MSD	**36.0**	-	-	**41**	-	-	2.5	U	-
DC-04	DC-04-150617	06/17/2015	N	59010961	**180**	-	-	**34.0**	-	-	**4.10**	J+	MSD	**36.0**	J+	MSD	**46**	-	-	5	U	-
DC-04	DC-04-150924	09/24/2015	N	59020391	**160**	-	-	**36.0**	-	-	**3.90**	-	-	**33.0**	-	-	**48**	-	-	2.5	U	-
DC-04	YVD-D3-150924	09/24/2015	FD	59020391	**170**	-	-	**37.0**	-	-	**4.10**	-	-	**35.0**	-	-	**53**	-	-	2.5	U	-
DC-04	DC-04-151215	12/15/2015	N	59025431	**180**	-	-	**36.0**	-	-	**4.20**	-	-	**36.0**	-	-	**46**	-	-	2.5	U	-
DC-04	DC-04-160309	03/09/2016	N	59029711	**190**	-	-	**36.0**	-	-	**4.00**	-	-	**36.0**	-	-	**53**	-	-	2.5	U	-
DC-04	DC-04-160621	6/21/2016	N	59037271	**200**	-	-	**40.0**	-	-	**4.40**	-	-	**39.0**	-	-	**50**	-	-	2.5	U	-
DC-04	DC-04-160926	9/26/2016	N	K1611506	**194**	-	-	**40.6**	-	-	**4.50**	-	-	**38.2**	-	-	**43.4**	-	-	**0.12**	J	-
DC-04	DC-04-161216	12/12/2016	N	K1615174	**214**	-	-	**39.7**	-	-	**4.11**	-	-	**36.9**	-	-	**44.7**	-	-	**0.15**	J	-
DC-04	YVD-031017-31	3/10/2017	N	K1702448	**219**	-	-	**36.3**	-	-	**3.75**	-	-	**32.4**	-	-	**43.1**	-	-	**0.16**	J	-
DC-04	YVD-031017-33	3/10/2017	FD	K1702448	**219**	-	-	**36.3**	-	-	**3.74**	-	-	**32.3**	-	-	**43.2**	-	-	**0.16**	J	-
DC-04	YVD-060617-26	6/6/2017	N	K1705833	**202**	-	-	**37.0**	-	-	**3.96**	-	-	**34.7**	-	-	**38.6**	-	-	**0.13**	J	-
DC-04	YVD-092517-06	9/25/2017	N	K1710274	**192**	-	-	**37**	-	-	**4.06**	-	-	**35.9**	-	-	**35.2**	-	-	**0.14**	J	-
DC-04	YVD-120517-24	12/5/2017	N	K1713091	**188**	-	-	**32.7**	-	-	**3.62**	-	-	**32.7**	-	-	**34.3**	-	-	**0.12**	J	-
DC-04	YVD-031818-07	3/18/2018	N	870610	**182**	-	-	**32.10**	-	-	**4.02**	-	-	**35.6**	-	-	**34.5**	-	-	0.1	U	-
DC-04	YVD-060418-18	6/4/2018	N	874662	**182**	-	-	**33.55**	-	-	**4.18**	-	-	**34.4**	-	-	**35.4**	-	-	**0.10**	-	-
DC-04	YVD-090918-18	9/9/2018	N	880601	**176**	-	-	**30.40**	-	-	**3.98**	-	-	**32.8**	-	-	**32.4**	-	-	**0.12**	-	-
DC-04	YVD-121118-18	12/11/2018	N	884939	**166**	-	-	**29.40**	-	-	**4.08**	-	-	**32.0**	-	-	**30.4**	-	-	**0.11**	-	-
DC-05	DC-05-130104	01/04/2013	N	EPA01	-		-	-		-	-		-	-		-	-		-	-		-
DC-05	DC-05-130920	09/20/2013	N	SWI0142	**129**		-	**48.5**		-	**2.88**		-	**64.2**		-	**36.7**		-	5	U	-
DC-05	DC-05-130924	09/24/2013	N	SWI0175	-		-	-		-	-		-	-		-	-		-	-		-
DC-05	DC-05-131212	12/12/2013	N	SWL0073	**130**	-	-	**50.2**	-	-	**3.92**	-	-	**64.2**	-	-	**35.9**	-	-	5	U	-
DC-05	DC-05-140318	03/18/2014	N	SXC0107	**133**	-	-	**49.7**	-	-	**2.90**	-	-	**59.4**	-	-	**33**	-	-	5	U	-
DC-05	DC-05-140603	06/03/2014	N	SXF0017	**118**	-	-	**46.7**	-	-	**3.25**	-	-	**61.3**	-	-	**31.6**	-	-	2	U	-
DC-05	DC-05-140923	09/23/2014	N	SXI0173	**140**	-	-	**53.5**	-	-	**3.86**	-	-	**71.0**	-	-	**35**	-	-	2.5	U	-
DC-05	DC-05-141217	12/17/2014	N	SXL0121	**147**	-	-	**58.9**	-	-	**3.41**	-	-	**59.0**	-	-	**34.4**	-	-	2.5	U	-
DC-05	DC-05-150317	03/17/2015	N	5904541	**150**	-	-	**58.0**	-	-	**3.00**	-	-	**61.0**	-	-	**36**	-	-	**2**	-	-
DC-05	DC-05-150616	06/16/2015	N	59010961	**140**	-	-	**57.0**	-	-	**3.00**	J+	MSD	**64.0**	J+	MSD	**35**	-	-	2	U	-
DC-05	YVD-D2-150616	06/16/2015	FD	59010961	**140**	-	-	**56.0**	-	-	**3.30**	J+	MSD	**64.0**	J+	MSD	**35**	-	-	5	U	-
DC-05	DC-05-150923	09/23/2015	N	59020391	**130**	-	-	**57.0**	-	-	**3.10**	-	-	**56.0**	-	-	**33**	-	-	2	U	-
DC-05	DC-05-151215	12/15/2015	N	59025431	**140**	-	-	**55.0**	-	-	**2.90**	-	-	**51.0**	-	-	**29**	-	-	2	U	-
DC-05	DC-05-160309	03/09/2016	N	59029711	**140**	-	-	**54.0**	-	-	**2.90**	-	-	**53.0**	-	-	**35**	-	-	2	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-04	DC-04-130103	01/03/2013	N	EPA01	**26**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-04	DC-04-130920	09/20/2013	N	SWI0142	-	-	-	-	-	-	**93.6**	-	-	-	-	-	0.1	U	-	**3.03**	-	-
DC-04	DC-04-130924	09/24/2013	N	SWI0175	**31.7**	-	-	2	U	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-04	DC-04-131212	12/12/2013	N	SWL0073	**36.7**	-	-	2	U	-	**110**	-	-	-	-	-	0.02	UJ	MSD	0.2	UJ	MSD
DC-04	DC-04-140318	03/18/2014	N	SXC0107	**37.3**	-	-	2	U	-	**107**	-	-	-	-	-	0.1	U	-	**0.707**	J-	MSD
DC-04	DC-04-140603	06/03/2014	N	SXF0017	**36.4**	-	-	0.8	U	-	**104**	J-	MSD	-	-	-	0.1	U	-	**0.645**	-	-
DC-04	DC-04-140923	09/23/2014	N	SXI0173	**37.8**	-	-	1	U	-	**108**	-	-	-	-	-	0.1	U	-	**0.524**	J+	MSD
DC-04	DC-04-141217	12/17/2014	N	SXL0121	**40.8**	-	-	1	U	-	**120**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
DC-04	DC-04-150317	03/17/2015	N	5904651	**39**	-	-	1	U	-	**110**	-	-	-	-	-	0.1	U	-	**0.33**	J-	MSD
DC-04	DC-04-150617	06/17/2015	N	59010961	**42**	-	-	2	U	-	**110**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
DC-04	DC-04-150924	09/24/2015	N	59020391	**48**	J+	MSD	1	U	-	**140**	J-	MSD	-	-	-	0.1	UJ	MSD	**0.25**	J-	MSD
DC-04	YVD-D3-150924	09/24/2015	FD	59020391	**53**	J+	MSD	1	U	-	**150**	J-	MSD	-	-	-	0.1	UJ	MSD	0.25	UJ	MSD
DC-04	DC-04-151215	12/15/2015	N	59025431	**48**	-	-	1	U	-	**130**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD
DC-04	DC-04-160309	03/09/2016	N	59029711	**53**	-	-	1	U	-	**150**	J+	MSD	-	-	-	0.1	UJ	FDP	0.25	R	MSD
DC-04	DC-04-160621	6/21/2016	N	59037271	**50**	-	-	1	U	-	**150**	-	-	-	-	-	0.1	UJ	MSD	0.25	R	MSD
DC-04	DC-04-160926	9/26/2016	N	K1611506	**44.1**	-	-	0.10	U	-	**142**	-	-	-	-	-	0.050	U	MBK	0.5	R	MSD
DC-04	DC-04-161216	12/12/2016	N	K1615174	**45.2**	-	-	0.10	U	-	**155**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-04	YVD-031017-31	3/10/2017	N	K1702448	**46.0**	-	-	0.10	U	-	**153**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-04	YVD-031017-33	3/10/2017	FD	K1702448	**45.7**	-	-	0.10	U	-	**152**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-04	YVD-060617-26	6/6/2017	N	K1705833	**38.4**	-	-	0.10	U	-	**129**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-04	YVD-092517-06	9/25/2017	N	K1710274	**33.7**	-	-	0.10	U	-	**140**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-04	YVD-120517-24	12/5/2017	N	K1713091	**33.8**	J	HTQ	0.10	U	-	**121**	-	-	-	-	-	0.050	U	-	0.5	UJ	MSD
DC-04	YVD-031818-07	3/18/2018	N	870610	**32.9**	-	-	0.05	U	-	**115**	-	-	0.07	U	-	-	-	-	0.5	U	-
DC-04	YVD-060418-18	6/4/2018	N	874662	**33.0**	-	-	0.05	U	-	**119**	-	-	0.07	U	FBK	-	-	-	0.5	UJ	MSD
DC-04	YVD-090918-18	9/9/2018	N	880601	**30.4**	-	-	0.05	U	-	**109**	-	-	0.07	U	-	-	-	-	0.5	R	MSD
DC-04	YVD-121118-18	12/11/2018	N	884939	**29.4**	-	-	0.05	U	-	**102**	-	-	0.07	U	-	-	-	-	0.5	U	-
DC-05	DC-05-130104	01/04/2013	N	EPA01	**32**		-	-		-	-		-	-	-	-	-		-	-		-
DC-05	DC-05-130920	09/20/2013	N	SWI0142	-		-	-		-	**154**		-	-	-	-	**0.255**		-	0.25	U	-
DC-05	DC-05-130924	09/24/2013	N	SWI0175	**33.6**		-	2	U	-	-		-	-	-	-	-		-	-		-
DC-05	DC-05-131212	12/12/2013	N	SWL0073	**42.6**	-	-	2	U	-	**178**	-	-	-	-	-	0.02	UJ	MSD	0.2	UJ	MSD
DC-05	DC-05-140318	03/18/2014	N	SXC0107	**33.1**	-	-	2	U	-	**150**	-	-	-	-	-	**0.131**	-	-	**0.558**	J-	MSD
DC-05	DC-05-140603	06/03/2014	N	SXF0017	**32.6**	-	-	0.8	U	-	**128**	J-	MSD	-	-	-	0.1	U	-	**0.581**	-	-
DC-05	DC-05-140923	09/23/2014	N	SXI0173	**35.8**	-	-	1	U	-	**122**	-	-	-	-	-	0.1	U	-	**0.998**	J+	MSD
DC-05	DC-05-141217	12/17/2014	N	SXL0121	**33.4**	-	-	1	U	-	**141**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
DC-05	DC-05-150317	03/17/2015	N	5904541	**38**	J-	MSD	0.8	U	-	**140**	J-	MSD	-	-	-	0.1	U	-	**0.27**	J-	MSD
DC-05	DC-05-150616	06/16/2015	N	59010961	**37**	-	-	0.8	U	-	**120**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
DC-05	YVD-D2-150616	06/16/2015	FD	59010961	**41**	-	-	2	U	-	**110**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
DC-05	DC-05-150923	09/23/2015	N	59020391	**38**	J+	MSD	0.8	U	-	**110**	J-	MSD	-	-	-	0.1	UJ	MSD	0.25	UJ	MSD
DC-05	DC-05-151215	12/15/2015	N	59025431	**38**	-	-	0.8	U	-	**120**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD
DC-05	DC-05-160309	03/09/2016	N	59029711	**43**	-	-	0.8	U	-	**140**	J+	MSD	-	-	-	0.1	UJ	FDP	0.25	R	MSD

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-04	DC-04-130103	01/03/2013	N	EPA01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-04	DC-04-130920	09/20/2013	N	SWI0142	-	-	-	-	-	-	0.1	U	-	-	-	-	**305**	-	-	**305**	-	-
DC-04	DC-04-130924	09/24/2013	N	SWI0175	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-04	DC-04-131212	12/12/2013	N	SWL0073	-	-	-	-	-	-	-	-	-	**0.104**	-	-	**315**	-	-	**315**	-	-
DC-04	DC-04-140318	03/18/2014	N	SXC0107	**0.13**	-	-	-	-	-	-	-	-	-	-	-	**325**	-	-	**325**	-	-
DC-04	DC-04-140603	06/03/2014	N	SXF0017	**0.24**	J+	FBK	-	-	-	-	-	-	-	-	-	**310**	-	-	**310**	-	-
DC-04	DC-04-140923	09/23/2014	N	SXI0173	**0.29**	-	-	-	-	-	-	-	-	-	-	-	**317**	-	-	**320**	-	-
DC-04	DC-04-141217	12/17/2014	N	SXL0121	**0.17**	-	-	-	-	-	-	-	-	-	-	-	**329**	-	-	**330**	-	-
DC-04	DC-04-150317	03/17/2015	N	5904651	0.25	U	-	-	-	-	-	-	-	-	-	-	**340**	-	-	**340**	-	-
DC-04	DC-04-150617	06/17/2015	N	59010961	0.25	U	-	-	-	-	-	-	-	-	-	-	**330**	-	-	**330**	-	-
DC-04	DC-04-150924	09/24/2015	N	59020391	0.25	U	-	-	-	-	-	-	-	-	-	-	**400**	-	-	**400**	-	-
DC-04	YVD-D3-150924	09/24/2015	FD	59020391	0.25	U	-	-	-	-	-	-	-	-	-	-	**380**	-	-	**380**	-	-
DC-04	DC-04-151215	12/15/2015	N	59025431	0.25	UJ	FDP	-	-	-	-	-	-	-	-	-	**400**	J	FDP	**400**	J	FDP
DC-04	DC-04-160309	03/09/2016	N	59029711	0.25	U	-	-	-	-	-	-	-	-	-	-	**390**	-	-	**390**	-	-
DC-04	DC-04-160621	6/21/2016	N	59037271	0.25	U	-	-	-	-	-	-	-	-	-	-	**360**	-	-	**360**	-	-
DC-04	DC-04-160926	9/26/2016	N	K1611506	-	-	-	**0.137**	-	-	-	-	-	-	-	-	**374**	-	-	**374**	-	-
DC-04	DC-04-161216	12/12/2016	N	K1615174	-	-	-	**0.052**	-	-	-	-	-	-	-	-	**384**	-	-	**384**	-	-
DC-04	YVD-031017-31	3/10/2017	N	K1702448	-	-	-	**0.035**	J	FDP	-	-	-	-	-	-	**375**	-	-	**375**	-	-
DC-04	YVD-031017-33	3/10/2017	FD	K1702448	-	-	-	**0.053**	J	FDP	-	-	-	-	-	-	**383**	-	-	**383**	-	-
DC-04	YVD-060617-26	6/6/2017	N	K1705833	-	-	-	**0.085**	-	-	-	-	-	-	-	-	**390**	-	-	**390**	-	-
DC-04	YVD-092517-06	9/25/2017	N	K1710274	-	-	-	**0.044**	-	-	-	-	-	-	-	-	**391**	-	-	**391**	-	-
DC-04	YVD-120517-24	12/5/2017	N	K1713091	-	-	-	**0.037**	-	-	-	-	-	-	-	-	**388**	-	-	**388**	-	-
DC-04	YVD-031818-07	3/18/2018	N	870610	-	-	-	-	-	-	-	-	-	0.07	U	-	**377**	-	-	**377**	-	-
DC-04	YVD-060418-18	6/4/2018	N	874662	-	-	-	-	-	-	-	-	-	0.07	U	-	**380**	-	-	**380**	-	-
DC-04	YVD-090918-18	9/9/2018	N	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	**371**	-	-	**371**	-	-
DC-04	YVD-121118-18	12/11/2018	N	884939	-	-	-	-	-	-	-	-	-	0.07	U	-	**376**	-	-	**376**	-	-
DC-05	DC-05-130104	01/04/2013	N	EPA01	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-		-
DC-05	DC-05-130920	09/20/2013	N	SWI0142	-	-	-	-	-	-	0.1	U	-	-	-	-	**414**		-	**415**		-
DC-05	DC-05-130924	09/24/2013	N	SWI0175	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-		-
DC-05	DC-05-131212	12/12/2013	N	SWL0073	-	-	-	-	-	-	-	-	-	**0.723**	-	-	**424**	-	-	**425**	-	-
DC-05	DC-05-140318	03/18/2014	N	SXC0107	**0.06**	-	-	-	-	-	-	-	-	-	-	-	**404**	-	-	**405**	-	-
DC-05	DC-05-140603	06/03/2014	N	SXF0017	**0.28**	J+	FBK	-	-	-	-	-	-	-	-	-	**412**	-	-	**413**	-	-
DC-05	DC-05-140923	09/23/2014	N	SXI0173	**0.16**	-	-	-	-	-	-	-	-	-	-	-	**408**	-	-	**410**	-	-
DC-05	DC-05-141217	12/17/2014	N	SXL0121	**0.13**	-	-	-	-	-	-	-	-	-	-	-	**414**	-	-	**415**	-	-
DC-05	DC-05-150317	03/17/2015	N	5904541	0.25	U	-	-	-	-	-	-	-	-	-	-	**430**	-	-	**430**	-	-
DC-05	DC-05-150616	06/16/2015	N	59010961	0.25	U	-	-	-	-	-	-	-	-	-	-	**410**	-	-	**410**	-	-
DC-05	YVD-D2-150616	06/16/2015	FD	59010961	0.25	U	-	-	-	-	-	-	-	-	-	-	**410**	-	-	**410**	-	-
DC-05	DC-05-150923	09/23/2015	N	59020391	0.25	U	-	-	-	-	-	-	-	-	-	-	**440**	-	-	**440**	-	-
DC-05	DC-05-151215	12/15/2015	N	59025431	0.25	UJ	FDP	-	-	-	-	-	-	-	-	-	**440**	J	FDP	**440**	J	FDP
DC-05	DC-05-160309	03/09/2016	N	59029711	0.25	U	-	-	-	-	-	-	-	-	-	-	**410**	-	-	**410**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-05	DC-05-160621	6/21/2016	N	59037151	**130**	-	-	**54.0**	-	-	**2.80**	-	-	**53.0**	-	-	**34**	-	-	2	U	-
DC-05	DC-05-160926	9/26/2016	N	K1611506	**119**	-	-	**49.7**	-	-	**2.89**	-	-	**54.9**	-	-	**26.5**	-	-	**0.15**	J	-
DC-05	DC-05-D1-160926	9/26/2016	FD	K1611506	**124**	-	-	**52.5**	-	-	**3.06**	-	-	**58.1**	-	-	**26.6**	-	-	**0.16**	J	-
DC-05	DC-05-161216	12/16/2016	N	K1615174	**129**	-	-	**45.4**	-	-	**2.60**	-	-	**47.9**	-	-	**28.6**	-	-	**0.19**	J	-
DC-05	YVD-D5-161216	12/16/2016	FD	K1615174	**128**	-	-	**48.0**	-	-	**2.65**	-	-	**49.6**	-	-	**28.9**	-	-	**0.19**	J	-
DC-05	YVD-030717-09	3/7/2017	N	K1702324	**117**	-	-	**43.5**	-	-	**2.61**	-	-	**58.3**	-	-	**28.5**	-	-	**0.2**	J	-
DC-05	YVD-060717-30	6/7/2017	N	K1705833	**122**	-	-	**47.1**	-	-	**2.82**	-	-	**63.9**	-	-	**26.8**	-	-	**0.16**	J	-
DC-05	YVD-060717-32	6/7/2017	FD	K1705833	**122**	-	-	**45.8**	-	-	**2.77**	-	-	**62.6**	-	-	**26.3**	-	-	**0.16**	J	-
DC-05	YVD-092517-04	9/25/2017	N	K1710274	**126**	-	-	**49.7**	-	-	**2.99**	-	-	**62.0**	-	-	**28.1**	-	-	**0.19**	J	-
DC-05	YVD-120517-16	12/5/2017	N	K1713091	**119**	-	-	**42.5**	-	-	**2.52**	-	-	**59.1**	-	-	**31.9**	-	-	**0.18**	J	-
DC-05	YVD-120517-18	12/5/2017	FD	K1713091	**120**	-	-	**43.1**	-	-	**2.53**	-	-	**60.0**	-	-	**31.3**	-	-	**0.19**	J	-
DC-05	YVD-031818-03	3/18/2018	N	870610	**116**	-	-	**42.35**	-	-	**2.94**	-	-	**75.0**	-	-	**33.0**	-	-	0.14	U	-
DC-05	YVD-031818-05	3/18/2018	FD	870610	**116**	-	-	**42.85**	-	-	**2.94**	-	-	**75.0**	-	-	**33.1**	-	-	**0.14**	-	-
DC-05	YVD-060318-02	6/3/2018	FD	874568	**118**	-	-	**43.50**	-	-	**3.02**	-	-	**72.0**	-	-	**32.2**	-	-	**0.15**	-	-
DC-05	YVD-090918-03	9/9/2018	N	880601	**122**	-	-	**42.55**	-	-	**2.91**	-	-	**65.5**	-	-	**31.4**	-	-	**0.18**	-	-
DC-05	YVD-121118-16	12/11/2018	N	884939	**120**	-	-	**43.40**	-	-	**3.05**	-	-	**68.1**	-	-	**33.7**	-	-	**0.16**	-	-
DC-05D	DC-05D-130920	09/20/2013	N	SWI0142	**86.7**	-	-	**30.3**	-	-	**3.67**	-	-	**40.5**	-	-	**43.6**	-	-	5	U	-
DC-05D	DC-05D-130924	09/24/2013	N	SWI0178	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-05D	DC-05D-131211	12/11/2013	N	SWL0073	**81.8**	-	-	**28.8**	-	-	**3.52**	-	-	**37.5**	-	-	**32.3**	-	-	5	U	-
DC-05D	DC-05D-140318	03/18/2014	N	SXC0095	**86.2**	-	-	**29.4**	-	-	**3.73**	-	-	**36.7**	-	-	**33.4**	-	-	5	U	-
DC-05D	DC-05D-140602	06/02/2014	N	SXF0017	**67.4**	-	-	**24.6**	-	-	**4.99**	-	-	**34.3**	-	-	**30.6**	-	-	2	U	-
DC-05D	DC-05D-140922	09/22/2014	N	SXI0148	**83.3**	-	-	**30.2**	-	-	**3.56**	-	-	**37.8**	-	-	**30.9**	-	-	2	U	-
DC-05D	DC-05D-141216	12/16/2014	N	SXL0121	**78.9**	-	-	**29.5**	-	-	**5.18**	-	-	**36.8**	-	-	**35.9**	-	-	5	U	-
DC-05D	DC-05D-150317	03/17/2015	N	5904541	**78.0**	-	-	**29.0**	-	-	**4.60**	-	-	**39.0**	-	-	**31**	-	-	2	U	-
DC-05D	DC-05D-150616	06/16/2015	N	59010961	**79.0**	-	-	**30.0**	-	-	**4.70**	J+	MSD	**41.0**	J+	MSD	**34**	-	-	2	U	-
DC-05D	DC-05D-150923	09/23/2015	N	59020391	**74.0**	-	-	**31.0**	-	-	**4.40**	-	-	**38.0**	-	-	**31**	-	-	2	U	-
DC-05D	YVD-D2-150923	09/23/2015	FD	59020391	**73.0**	-	-	**30.0**	-	-	**4.40**	-	-	**38.0**	-	-	**33**	-	-	0.5	U	-
DC-05D	DC-05D-151215	12/15/2015	N	59025431	**78.0**	-	-	**29.0**	-	-	**4.40**	-	-	**39.0**	-	-	**30**	-	-	2	U	-
DC-05D	DC-05D-160309	03/09/2016	N	59029711	**81.0**	-	-	**30.0**	-	-	**4.30**	-	-	**41.0**	-	-	**33**	-	-	2	U	-
DC-05D	DC-05D-160621	6/21/2016	N	59037271	**78.0**	-	-	**30.0**	-	-	**4.10**	-	-	**41.0**	-	-	**32**	-	-	2	U	-
DC-05D	DC-05D-160926	9/26/2016	N	K1611506	**81.4**	-	-	**28.4**	-	-	**3.93**	-	-	**39.4**	J	MSD	**25.6**	-	-	**0.26**	-	-
DC-05D	DC-05D-161214	12/14/2016	N	K1615126	**78.1**	-	-	**27.5**	-	-	**3.90**	-	-	**38.2**	-	-	**25.7**	-	-	**0.28**	-	-
DC-05D	YVD-030717-12	3/7/2017	N	K1702324	**76.4**	-	-	**26.5**	-	-	**3.64**	-	-	**35.6**	-	-	**26.3**	-	-	**0.32**	-	-
DC-05D	YVD-060717-34	6/7/2017	N	K1705833	**79.1**	-	-	**27.3**	-	-	**3.78**	-	-	**37.4**	-	-	**23.9**	-	-	**0.29**	-	-
DC-05D	YVD-092517-02	9/25/2017	N	K1710274	**79.2**	-	-	**28.9**	-	-	**3.91**	-	-	**38.7**	-	-	**25.2**	-	-	**0.28**	-	-
DC-05D	YVD-092517-03	9/25/2017	FD	K1710274	**80.6**	-	-	**29.1**	-	-	**4.02**	-	-	**38.9**	-	-	**24.9**	-	-	**0.27**	-	-
DC-05D	YVD-120517-20	12/5/2017	N	K1713091	**81.2**	-	-	**27.1**	-	-	**3.69**	-	-	**37.6**	-	-	**26.6**	-	-	**0.28**	-	-
DC-05D	YVD-031818-08	3/18/2018	N	870610	**82.0**	-	-	**27.50**	-	-	**3.97**	-	-	**41.2**	-	-	**27.4**	-	-	**0.25**	-	-
DC-05D	YVD-060318-03	6/3/2018	N	874568	**78.5**	-	-	**27.95**	-	-	**4.12**	-	-	**39.6**	-	-	**27.4**	-	-	**0.35**	-	-
DC-05D	YVD-060318-05	6/3/2018	FD	874568	**78.5**	-	-	**28.00**	-	-	**4.14**	-	-	**39.6**	-	-	**27.4**	-	-	**0.26**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-05	DC-05-160621	6/21/2016	N	59037151	**36**	-	-	0.8	U	-	**130**	-	-	-	-	-	0.1	UJ	-	0.25	U	-
DC-05	DC-05-160926	9/26/2016	N	K1611506	**32.1**	-	-	0.10	U	-	**114**	-	-	-	-	-	0.050	U	-	0.5	R	MSD
DC-05	DC-05-D1-160926	9/26/2016	FD	K1611506	**32.2**	-	-	0.10	U	-	**114**	-	-	-	-	-	0.050	U	MBK	0.5	R	MSD
DC-05	DC-05-161216	12/16/2016	N	K1615174	**33.7**	-	-	0.10	U	-	**108**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-05	YVD-D5-161216	12/16/2016	FD	K1615174	**33.3**	-	-	0.10	U	-	**107**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-05	YVD-030717-09	3/7/2017	N	K1702324	**32.9**	J	HTQ	0.10	U	-	**97.6**	-	-	-	-	-	1	U	-	0.5	U	-
DC-05	YVD-060717-30	6/7/2017	N	K1705833	**30.8**	-	-	0.10	U	-	**102**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-05	YVD-060717-32	6/7/2017	FD	K1705833	**30.7**	-	-	0.10	U	-	**102**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-05	YVD-092517-04	9/25/2017	N	K1710274	**30.7**	-	-	0.10	U	-	**107**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-05	YVD-120517-16	12/5/2017	N	K1713091	**34.5**	J	HTQ	0.10	U	-	**88.8**	-	-	-	-	-	0.050	U	-	0.5	UJ	MSD
DC-05	YVD-120517-18	12/5/2017	FD	K1713091	**33.9**	J	HTQ	0.10	U	-	**89.3**	-	-	-	-	-	0.050	U	-	0.5	UJ	MSD
DC-05	YVD-031818-03	3/18/2018	N	870610	**33.6**	-	-	0.05	U	-	**97.4**	-	-	**0.10**	-	-	-	-	-	0.5	U	-
DC-05	YVD-031818-05	3/18/2018	FD	870610	**33.8**	-	-	0.05	U	-	**96.7**	-	-	0.07	U	-	-	-	-	0.5	U	-
DC-05	YVD-060318-02	6/3/2018	FD	874568	**34.4**	-	-	0.05	U	-	**88.3**	-	-	0.07	U	-	-	-	-	0.5	U	-
DC-05	YVD-090918-03	9/9/2018	N	880601	**31.5**	-	-	0.05	U	-	**95.4**	-	-	0.07	U	-	-	-	-	0.5	R	MSD
DC-05	YVD-121118-16	12/11/2018	N	884939	**33.2**	-	-	0.05	U	-	**92.2**	-	-	0.07	U	-	-	-	-	0.5	U	-
DC-05D	DC-05D-130920	09/20/2013	N	SWI0142	-	-	-	-	-	-	**167**	-	-	-	-	-	0.1	U	-	**0.361**	-	-
DC-05D	DC-05D-130924	09/24/2013	N	SWI0178	**14.6**	-	-	0.2	U	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-05D	DC-05D-131211	12/11/2013	N	SWL0073	**16**	-	-	2	U	-	**145**	-	-	-	-	-	0.02	UJ	MSD	0.2	UJ	MSD
DC-05D	DC-05D-140318	03/18/2014	N	SXC0095	**12.8**	-	-	2	U	-	**137**	J-	MSD	-	-	-	**0.182**	-	-	0.25	U	-
DC-05D	DC-05D-140602	06/02/2014	N	SXF0017	**3.36**	-	-	0.8	U	-	**122**	J-	MSD	-	-	-	**0.163**	-	-	**0.591**	-	-
DC-05D	DC-05D-140922	09/22/2014	N	SXI0148	**11.7**	-	-	0.8	U	-	**127**	-	-	-	-	-	0.1	U	-	**0.424**	-	-
DC-05D	DC-05D-141216	12/16/2014	N	SXL0121	**7.9**	-	-	0.2	U	-	**140**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
DC-05D	DC-05D-150317	03/17/2015	N	5904541	**7.7**	J-	MSD	0.8	U	-	**120**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	MSD
DC-05D	DC-05D-150616	06/16/2015	N	59010961	**8.6**	-	-	0.8	U	-	**120**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
DC-05D	DC-05D-150923	09/23/2015	N	59020391	**8.9**	J+	MSD	0.8	U	-	**120**	J-	MSD	-	-	-	0.1	UJ	MSD	0.25	UJ	MSD
DC-05D	YVD-D2-150923	09/23/2015	FD	59020391	**10**	J+	MSD	0.2	U	-	**120**	J-	MSD	-	-	-	**0.16**	J	MSD	0.25	UJ	MSD
DC-05D	DC-05D-151215	12/15/2015	N	59025431	**9.9**	-	-	0.8	U	-	**120**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD
DC-05D	DC-05D-160309	03/09/2016	N	59029711	**13**	-	-	0.8	U	-	**140**	J+	MSD	-	-	-	0.1	UJ	FDP	0.25	R	MSD
DC-05D	DC-05D-160621	6/21/2016	N	59037271	**12**	-	-	0.8	U	-	**130**	-	-	-	-	-	**0.13**	J-	MSD	0.25	R	MSD
DC-05D	DC-05D-160926	9/26/2016	N	K1611506	**11.2**	-	-	0.10	U	-	**113**	-	-	-	-	-	0.050	U	-	0.5	R	MSD
DC-05D	DC-05D-161214	12/14/2016	N	K1615126	**11.2**	-	-	0.10	U	-	**114**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-05D	YVD-030717-12	3/7/2017	N	K1702324	**11.6**	J	HTQ	0.10	U	-	**105**	-	-	-	-	-	1	U	-	0.5	U	-
DC-05D	YVD-060717-34	6/7/2017	N	K1705833	**10.8**	-	-	0.10	U	-	**101**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-05D	YVD-092517-02	9/25/2017	N	K1710274	**11.1**	-	-	0.10	U	-	**118**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-05D	YVD-092517-03	9/25/2017	FD	K1710274	**11**	-	-	0.10	U	-	**115**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-05D	YVD-120517-20	12/5/2017	N	K1713091	**11.9**	J	HTQ	0.10	U	-	**112**	-	-	-	-	-	0.050	U	-	0.5	UJ	MSD
DC-05D	YVD-031818-08	3/18/2018	N	870610	**12.6**	-	-	0.05	U	-	**108**	-	-	0.07	U	-	-	-	-	0.5	U	-
DC-05D	YVD-060318-03	6/3/2018	N	874568	**12.5**	-	-	0.05	U	-	**105**	-	-	0.08	U	FBK	-	-	-	0.5	U	-
DC-05D	YVD-060318-05	6/3/2018	FD	874568	**13.4**	-	-	0.05	U	-	**105**	-	-	0.07	U	-	-	-	-	0.5	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-05	DC-05-160621	6/21/2016	N	59037151	0.25	U	-	-	-	-	-	-	-	-	-	-	**390**	-	-	**390**	-	-
DC-05	DC-05-160926	9/26/2016	N	K1611506	-	-	-	**0.031**	-	-	-	-	-	-	-	-	**346**	-	-	**346**	-	-
DC-05	DC-05-D1-160926	9/26/2016	FD	K1611506	-	-	-	**0.028**	-	-	-	-	-	-	-	-	**364**	-	-	**364**	-	-
DC-05	DC-05-161216	12/16/2016	N	K1615174	-	-	-	**0.048**	-	-	-	-	-	-	-	-	**348**	-	-	**348**	-	-
DC-05	YVD-D5-161216	12/16/2016	FD	K1615174	-	-	-	**0.04**	-	-	-	-	-	-	-	-	**340**	-	-	**340**	-	-
DC-05	YVD-030717-09	3/7/2017	N	K1702324	-	-	-	**0.026**	-	-	-	-	-	-	-	-	**367**	-	-	**367**	-	-
DC-05	YVD-060717-30	6/7/2017	N	K1705833	-	-	-	**0.059**	J	FDP	-	-	-	-	-	-	**364**	-	-	**364**	-	-
DC-05	YVD-060717-32	6/7/2017	FD	K1705833	-	-	-	**0.031**	J	FDP	-	-	-	-	-	-	**364**	-	-	**364**	-	-
DC-05	YVD-092517-04	9/25/2017	N	K1710274	-	-	-	**0.039**	-	-	-	-	-	-	-	-	**368**	-	-	**368**	-	-
DC-05	YVD-120517-16	12/5/2017	N	K1713091	-	-	-	**0.014**	-	-	-	-	-	-	-	-	**364**	-	-	**364**	-	-
DC-05	YVD-120517-18	12/5/2017	FD	K1713091	-	-	-	**0.014**	-	-	-	-	-	-	-	-	**366**	-	-	**366**	-	-
DC-05	YVD-031818-03	3/18/2018	N	870610	-	-	-	-	-	-	-	-	-	0.07	U	-	**364**	-	-	**364**	-	-
DC-05	YVD-031818-05	3/18/2018	FD	870610	-	-	-	-	-	-	-	-	-	0.07	U	-	**356**	-	-	**356**	-	-
DC-05	YVD-060318-02	6/3/2018	FD	874568	-	-	-	-	-	-	-	-	-	0.07	U	-	**368**	-	-	**368**	-	-
DC-05	YVD-090918-03	9/9/2018	N	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	**378**	-	-	**378**	-	-
DC-05	YVD-121118-16	12/11/2018	N	884939	-	-	-	-	-	-	-	-	-	0.07	U	-	**390**	-	-	**390**	-	-
DC-05D	DC-05D-130920	09/20/2013	N	SWI0142	-	-	-	-	-	-	**0.163**	-	-	-	-	-	**214**	-	-	**215**	-	-
DC-05D	DC-05D-130924	09/24/2013	N	SWI0178	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-05D	DC-05D-131211	12/11/2013	N	SWL0073	-	-	-	-	-	-	-	-	-	0.06	U	-	**209**	-	-	**210**	-	-
DC-05D	DC-05D-140318	03/18/2014	N	SXC0095	**0.072**	-	-	-	-	-	-	-	-	-	-	-	**209**	-	-	**210**	-	-
DC-05D	DC-05D-140602	06/02/2014	N	SXF0017	**0.56**	J+	FBK	-	-	-	-	-	-	-	-	-	**214**	-	-	**215**	-	-
DC-05D	DC-05D-140922	09/22/2014	N	SXI0148	**0.057**	-	-	-	-	-	-	-	-	-	-	-	**203**	-	-	**205**	-	-
DC-05D	DC-05D-141216	12/16/2014	N	SXL0121	**0.39**	-	-	-	-	-	-	-	-	-	-	-	**199**	-	-	**200**	-	-
DC-05D	DC-05D-150317	03/17/2015	N	5904541	**0.3**	-	-	-	-	-	-	-	-	-	-	-	**210**	-	-	**210**	-	-
DC-05D	DC-05D-150616	06/16/2015	N	59010961	**0.27**	-	-	-	-	-	-	-	-	-	-	-	**210**	-	-	**210**	-	-
DC-05D	DC-05D-150923	09/23/2015	N	59020391	0.25	U	-	-	-	-	-	-	-	-	-	-	**200**	-	-	**200**	-	-
DC-05D	YVD-D2-150923	09/23/2015	FD	59020391	0.25	U	-	-	-	-	-	-	-	-	-	-	**220**	-	-	**220**	-	-
DC-05D	DC-05D-151215	12/15/2015	N	59025431	0.25	UJ	FDP	-	-	-	-	-	-	-	-	-	**230**	J	FDP	**230**	J	FDP
DC-05D	DC-05D-160309	03/09/2016	N	59029711	0.25	U	-	-	-	-	-	-	-	-	-	-	**220**	-	-	**220**	-	-
DC-05D	DC-05D-160621	6/21/2016	N	59037271	0.25	U	-	-	-	-	-	-	-	-	-	-	**210**	-	-	**210**	-	-
DC-05D	DC-05D-160926	9/26/2016	N	K1611506	-	-	-	**0.014**	-	-	-	-	-	-	-	-	**209**	-	-	**209**	-	-
DC-05D	DC-05D-161214	12/14/2016	N	K1615126	-	-	-	**0.015**	-	-	-	-	-	-	-	-	**202**	-	-	**202**	-	-
DC-05D	YVD-030717-12	3/7/2017	N	K1702324	-	-	-	**0.041**	-	-	-	-	-	-	-	-	**206**	-	-	**206**	-	-
DC-05D	YVD-060717-34	6/7/2017	N	K1705833	-	-	-	**0.012**	-	-	-	-	-	-	-	-	**201**	-	-	**201**	-	-
DC-05D	YVD-092517-02	9/25/2017	N	K1710274	-	-	-	**0.024**	J	FDP	-	-	-	-	-	-	**207**	-	-	**207**	-	-
DC-05D	YVD-092517-03	9/25/2017	FD	K1710274	-	-	-	**0.008**	J	FDP	-	-	-	-	-	-	**207**	-	-	**207**	-	-
DC-05D	YVD-120517-20	12/5/2017	N	K1713091	-	-	-	**0.013**	-	-	-	-	-	-	-	-	**202**	-	-	**202**	-	-
DC-05D	YVD-031818-08	3/18/2018	N	870610	-	-	-	-	-	-	-	-	-	0.07	U	-	**198**	-	-	**198**	-	-
DC-05D	YVD-060318-03	6/3/2018	N	874568	-	-	-	-	-	-	-	-	-	0.07	U	-	**203**	-	-	**203**	-	-
DC-05D	YVD-060318-05	6/3/2018	FD	874568	-	-	-	-	-	-	-	-	-	0.07	U	-	**202**	-	-	**202**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-05D	YVD-090918-02	9/9/2018	N	880601	**79.5**	-	-	**26.75**	-	-	**4.00**	-	-	**38.0**	-	-	**26.8**	-	-	**0.25**	-	-
DC-05D	YVD-121118-14	12/11/2018	N	884939	**78.5**	-	-	**26.50**	-	-	**4.15**	-	-	**38.0**	-	-	**25.7**	-	-	**0.24**	-	-
DC-07	DC-07-130103	01/03/2013	N	EPA01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-07	DC-07-130918	09/18/2013	N	SWI0123	**122**	-	-	**18.4**	-	-	1.00	U	-	**45.7**	-	-	**30.5**	-	-	5	U	-
DC-07	YVD-D1-130918	09/18/2013	FD	SWI0123	**122**	-	-	**18.5**	-	-	1.00	U	-	**46.1**	-	-	**32.8**	-	-	5	U	-
DC-07	DC-07-131210	12/10/2013	N	SWL0055	**27.5**	-	-	**11.5**	-	-	**3.82**	-	-	**38.4**	-	-	**31**	-	-	5	U	-
DC-07	DC-07-140316	03/16/2014	N	SXC0081	**88.4**	-	-	**15.4**	-	-	**1.04**	-	-	**33.5**	-	-	**26.5**	-	-	2	U	-
DC-07	DC-07-140602	06/02/2014	N	SXF0008	**93.7**	-	-	**16.5**	-	-	1.00	U	-	**36.3**	-	-	**28.2**	-	-	2	U	-
DC-07	DC-07-140922	09/22/2014	N	SXI0148	**87.1**	-	-	**16.1**	-	-	1.00	U	-	**33.7**	-	-	**29.8**	-	-	2	U	-
DC-07	DC-07-141216	12/16/2014	N	SXL0108	**83.6**	-	-	**15.1**	-	-	1.00	U	-	**30.6**	-	-	**24.2**	-	-	2	U	-
DC-07	YVD-D2-141216	12/16/2014	FD	SXL0108	**84.2**	-	-	**15.1**	-	-	1.00	U	-	**30.8**	-	-	**25.6**	-	-	0.5	U	-
DC-07	DC-07-150317	03/17/2015	N	5904541	**94.0**	-	-	**17.0**	-	-	**1.00**	-	-	**35.0**	-	-	**29**	-	-	2	U	-
DC-07	DC-07-150617	06/17/2015	N	59011021	**97.0**	-	-	**17.0**	J	RPD	1.00	U	-	**37.0**	J	RPD	**32**	-	-	2	U	-
DC-07	DC-07-150924	09/24/2015	N	59020391	**76.0**	-	-	**15.0**	-	-	1.00	U	-	**33.0**	-	-	**30**	-	-	2	U	-
DC-07	DC-07-151215	12/15/2015	N	59025501	**87.0**	-	-	**16.0**	-	-	1.00	U	-	**34.0**	-	-	**29**	-	-	2	U	-
DC-07	DC-07-160309	03/09/2016	N	59029941	**91.0**	-	-	**17.0**	-	-	**1.10**	-	-	**36.0**	-	-	**31**	-	-	2	U	-
DC-07	DC-07-160621	6/21/2016	N	59037271	**96.0**	-	-	**18.0**	-	-	**1.20**	-	-	**38.0**	-	-	**33**	-	-	2	U	-
DC-07	DC-07-160926	9/26/2016	N	K1611565	**82.3**	-	-	**15.0**	-	-	**1.06**	-	-	**36.6**	-	-	**24.4**	-	-	0.2	U	-
DC-07	DC-07-161214	12/14/2016	N	K1615083	**77.0**	-	-	**13.1**	-	-	**1.05**	-	-	**32.0**	-	-	**19.2**	-	-	0.2	U	-
DC-07	YVD-030917-25	3/9/2017	N	K1702448	**87.9**	-	-	**14.4**	-	-	**1.03**	-	-	**32.1**	-	-	**21.4**	-	-	0.2	U	-
DC-07	YVD-060617-18	6/6/2017	N	K1705754	**82.8**	-	-	**14.3**	-	-	**1.10**	-	-	**34.6**	-	-	**24.5**	-	-	**0.11**	J	-
DC-07	YVD-092517-12	9/25/2017	N	K1710333	**86.1**	-	-	**13.9**	-	-	**1.14**	-	-	**34.5**	-	-	**25.4**	-	-	**0.09**	J	-
DC-07	YVD-120417-14	12/4/2017	N	K1713026	**80.9**	-	-	**13.3**	-	-	**1.17**	-	-	**33.0**	-	-	**25.7**	-	-	**0.18**	J	-
DC-07	YVD-060318-17	6/3/2018	N	874568	**90.5**	-	-	**15.85**	-	-	**1.52**	-	-	**37.8**	-	-	**28.5**	-	-	0.10	U	-
DC-09	DC-09-130103	01/03/2013	N	EPA01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-09	DC-09-130923	09/23/2013	N	SWI0178	**34.0**	-	-	**8.4**	-	-	**2.75**	-	-	**39.7**	-	-	-	-	-	-	-	-
DC-09	DC-09-130926	09/26/2013	N	SWI0190	-	-	-	-	-	-	-	-	-	-	-	-	**16.2**	-	-	0.5	U	-
DC-09	DC-09-131211	12/11/2013	N	SWL0063	**34.8**	-	-	**7.9**	-	-	**2.48**	-	-	**39.1**	-	-	**17.4**	-	-	0.5	U	-
DC-09	DC-09-140317	03/17/2014	N	SXC0095	**35.4**	-	-	**8.4**	-	-	**2.88**	-	-	**36.5**	-	-	**15.6**	-	-	**0.82**	-	-
DC-09	DC-09-140602	06/02/2014	N	SXF0008	**33.9**	-	-	**8.3**	-	-	**2.92**	-	-	**38.1**	-	-	**15.9**	-	-	0.5	U	-
DC-09	YVD-D3-140602	06/02/2014	FD	SXF0008	**34.2**	-	-	**8.7**	-	-	**3.08**	-	-	**37.9**	-	-	**15.8**	-	-	0.5	U	-
DC-09	DC-09-140923	09/23/2014	N	SXI0158	**32.2**	-	-	**6.8**	-	-	**1.94**	-	-	**38.9**	J+	MSD	**15.8**	-	-	0.5	U	-
DC-09	DC-09-141216	12/16/2014	N	SXL0108	**35.3**	-	-	**8.0**	-	-	**2.48**	-	-	**39.1**	-	-	**16.3**	-	-	0.5	U	-
DC-09	DC-09-150316	03/16/2015	N	5904541	**36.0**	-	-	**8.0**	-	-	**2.60**	-	-	**43.0**	-	-	**17**	-	-	**0.6**	-	-
DC-09	DC-09-150616	06/16/2015	N	59010751	**34.0**	J+	MSD	**8.1**	J+	MSD	**2.30**	J+	MSD	**38.0**	J+	MSD	**16**	-	-	0.5	U	-
DC-09	DC-09-150923	09/23/2015	N	59020281	**33.0**	-	-	**8.1**	-	-	**2.50**	-	-	**40.0**	-	-	**16**	-	-	0.5	U	-
DC-09	DC-09-151214	12/14/2015	N	59025431	**34.0**	-	-	**8.2**	-	-	**2.70**	-	-	**40.0**	-	-	**16**	-	-	0.5	U	-
DC-09	DC-09-160308	03/08/2016	N	59029711	**35.0**	-	-	**8.8**	-	-	**3.30**	-	-	**39.0**	-	-	**16**	-	-	0.5	U	-
DC-09	YVD-D2-160308	03/08/2016	FD	59029711	**34.0**	-	-	**8.6**	-	-	**3.10**	-	-	**39.0**	-	-	**16**	-	-	0.5	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-05D	YVD-090918-02	9/9/2018	N	880601	**12.2**	-	-	0.05	U	-	**107**	-	-	0.07	U	-	-	-	-	0.5	R	MSD
DC-05D	YVD-121118-14	12/11/2018	N	884939	**12.4**	-	-	0.05	U	-	**102**	-	-	0.07	U	-	-	-	-	0.5	U	-
DC-07	DC-07-130103	01/03/2013	N	EPA01	**2.8**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-07	DC-07-130918	09/18/2013	N	SWI0123	**4.3**	-	-	2	U	-	**168**	-	-	-	-	-	0.1	U	-	0.25	U	-
DC-07	YVD-D1-130918	09/18/2013	FD	SWI0123	**4.3**	-	-	2	U	-	**179**	-	-	-	-	-	0.1	U	-	0.25	U	-
DC-07	DC-07-131210	12/10/2013	N	SWL0055	**4.7**	-	-	2	U	-	**117**	-	-	-	-	-	0.02	UJ	MSD	0.4366	UJ	ERL, MSD
DC-07	DC-07-140316	03/16/2014	N	SXC0081	**4.72**	-	-	0.8	U	-	**78.9**	-	-	-	-	-	**0.116**	-	-	0.25	U	-
DC-07	DC-07-140602	06/02/2014	N	SXF0008	0.8	U	-	0.8	U	-	**105**	-	-	-	-	-	0.1	U	-	**0.34**	-	-
DC-07	DC-07-140922	09/22/2014	N	SXI0148	**4.88**	-	-	0.8	U	-	**98.2**	-	-	-	-	-	0.1	U	-	**0.487**	-	-
DC-07	DC-07-141216	12/16/2014	N	SXL0108	**2.8**	-	-	0.8	U	-	**80.4**	-	-	-	-	-	0.1	U	-	**0.261**	-	-
DC-07	YVD-D2-141216	12/16/2014	FD	SXL0108	**2.92**	-	-	0.2	U	-	**82.1**	-	-	-	-	-	0.1	U	-	**0.305**	-	-
DC-07	DC-07-150317	03/17/2015	N	5904541	**4.6**	J-	MSD	0.8	U	-	**83**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	MSD
DC-07	DC-07-150617	06/17/2015	N	59011021	**4**	J-	MSD	0.8	U	-	**93**	-	-	-	-	-	0.1	U	-	**0.28**	J-	MSD
DC-07	DC-07-150924	09/24/2015	N	59020391	**2.7**	J+	MSD	0.8	U	-	**95**	J-	MSD	-	-	-	0.1	UJ	MSD	0.25	UJ	MSD
DC-07	DC-07-151215	12/15/2015	N	59025501	**2.5**	-	-	0.8	U	-	**70**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD
DC-07	DC-07-160309	03/09/2016	N	59029941	**2.2**	-	-	0.8	U	-	**78**	J	DUP	-	-	-	0.1	U	-	0.25	R	BK, FDP, MS
DC-07	DC-07-160621	6/21/2016	N	59037271	**4.8**	-	-	0.8	U	-	**96**	-	-	-	-	-	**0.1**	J-	MSD	0.25	R	MSD
DC-07	DC-07-160926	9/26/2016	N	K1611565	**2.74**	-	-	0.10	U	-	**92.3**	-	-	-	-	-	0.050	U	-	0.5	R	MSD
DC-07	DC-07-161214	12/14/2016	N	K1615083	**1.44**	-	-	0.10	U	-	**72.4**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-07	YVD-030917-25	3/9/2017	N	K1702448	**2.58**	-	-	0.10	U	-	**59.8**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-07	YVD-060617-18	6/6/2017	N	K1705754	**2.42**	-	-	0.10	U	-	**70.4**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-07	YVD-092517-12	9/25/2017	N	K1710333	**2.34**	-	-	0.10	U	-	**94.2**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-07	YVD-120417-14	12/4/2017	N	K1713026	**2.92**	-	-	0.10	U	-	**81.9**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-07	YVD-060318-17	6/3/2018	N	874568	**6.90**	-	-	0.05	U	-	**93.4**	-	-	0.07	U	-	-	-	-	0.5	U	-
DC-09	DC-09-130103	01/03/2013	N	EPA01	**6**	-	-	-	-	-	-	-	-	-	-	-	0.1	U	-	-	-	-
DC-09	DC-09-130923	09/23/2013	N	SWI0178	-	-	-	-	-	-	-	-	-	-	-	-	0.1	U	-	**0.447**	-	-
DC-09	DC-09-130926	09/26/2013	N	SWI0190	**6.02**	-	-	0.2	U	-	**30.7**	-	-	-	-	-	-	-	-	-	-	-
DC-09	DC-09-131211	12/11/2013	N	SWL0063	**6.78**	-	-	0.2	U	-	**34.4**	J-	MSD	-	-	-	0.02	R	MSD	0.2	U	-
DC-09	DC-09-140317	03/17/2014	N	SXC0095	**5.85**	-	-	0.2	U	-	**28.8**	J-	MSD	-	-	-	0.1	U	-	**0.251**	-	-
DC-09	DC-09-140602	06/02/2014	N	SXF0008	**6.18**	-	-	0.2	U	-	**29.4**	-	-	-	-	-	**0.106**	-	-	**0.279**	-	-
DC-09	YVD-D3-140602	06/02/2014	FD	SXF0008	**5.97**	-	-	0.2	U	-	**29.1**	-	-	-	-	-	0.1	U	-	**0.359**	-	-
DC-09	DC-09-140923	09/23/2014	N	SXI0158	**6.01**	-	-	0.2	U	-	**29.6**	-	-	-	-	-	0.1	R	MSD	0.25	U	-
DC-09	DC-09-141216	12/16/2014	N	SXL0108	**5.94**	-	-	0.2	U	-	**30.2**	-	-	-	-	-	0.1	U	-	0.25	U	-
DC-09	DC-09-150316	03/16/2015	N	5904541	**5.9**	J-	MSD	0.2	U	-	**29**	J-	MSD	-	-	-	**0.15**	-	-	0.25	UJ	MSD
DC-09	DC-09-150616	06/16/2015	N	59010751	**5.8**	-	-	0.2	U	-	**28**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	MSD
DC-09	DC-09-150923	09/23/2015	N	59020281	**5.8**	-	-	0.2	U	-	**30**	-	-	-	-	-	0.1	U	-	0.25	R	MSD
DC-09	DC-09-151214	12/14/2015	N	59025431	**5.9**	-	-	0.2	U	-	**31**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD
DC-09	DC-09-160308	03/08/2016	N	59029711	**5.7**	-	-	0.2	U	-	**31**	J+	MSD	-	-	-	0.25	R	FBK, FDP	0.25	R	MSD
DC-09	YVD-D2-160308	03/08/2016	FD	59029711	**5.7**	-	-	0.2	U	-	**31**	J+	MSD	-	-	-	0.1	UJ	FDP	0.25	R	MSD

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-05D	YVD-090918-02	9/9/2018	N	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	**204**	-	-	**204**	-	-
DC-05D	YVD-121118-14	12/11/2018	N	884939	-	-	-	-	-	-	-	-	-	0.07	U	-	**204**	-	-	**204**	-	-
DC-07	DC-07-130103	01/03/2013	N	EPA01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-07	DC-07-130918	09/18/2013	N	SWI0123	-	-	-	-	-	-	0.1	U	-	-	-	-	**315**	-	-	**315**	-	-
DC-07	YVD-D1-130918	09/18/2013	FD	SWI0123	-	-	-	-	-	-	0.1	U	-	-	-	-	**295**	-	-	**295**	-	-
DC-07	DC-07-131210	12/10/2013	N	SWL0055	-	-	-	-	-	-	-	-	-	**0.0648**	-	-	**260**	-	-	**260**	-	-
DC-07	DC-07-140316	03/16/2014	N	SXC0081	**0.11**	-	-	-	-	-	-	-	-	-	-	-	**260**	-	-	**260**	-	-
DC-07	DC-07-140602	06/02/2014	N	SXF0008	**0.12**	-	-	-	-	-	-	-	-	-	-	-	**245**	-	-	**245**	-	-
DC-07	DC-07-140922	09/22/2014	N	SXI0148	**0.19**	-	-	-	-	-	-	-	-	-	-	-	**215**	-	-	**215**	-	-
DC-07	DC-07-141216	12/16/2014	N	SXL0108	0.1	U	-	-	-	-	-	-	-	-	-	-	**210**	-	-	**210**	-	-
DC-07	YVD-D2-141216	12/16/2014	FD	SXL0108	0.1	U	-	-	-	-	-	-	-	-	-	-	**210**	-	-	**210**	-	-
DC-07	DC-07-150317	03/17/2015	N	5904541	0.25	U	-	-	-	-	-	-	-	-	-	-	**240**	-	-	**240**	-	-
DC-07	DC-07-150617	06/17/2015	N	59011021	0.25	U	-	-	-	-	-	-	-	-	-	-	**230**	-	-	**230**	-	-
DC-07	DC-07-150924	09/24/2015	N	59020391	0.25	U	-	-	-	-	-	-	-	-	-	-	**240**	-	-	**240**	-	-
DC-07	DC-07-151215	12/15/2015	N	59025501	**0.41**	J-	MSD	-	-	-	-	-	-	-	-	-	**240**	-	-	**240**	-	-
DC-07	DC-07-160309	03/09/2016	N	59029941	0.25	U	-	-	-	-	-	-	-	-	-	-	**280**	-	-	**280**	-	-
DC-07	DC-07-160621	6/21/2016	N	59037271	0.25	U	-	-	-	-	-	-	-	-	-	-	**250**	-	-	**250**	-	-
DC-07	DC-07-160926	9/26/2016	N	K1611565	-	-	-	**0.057**	-	-	-	-	-	-	-	-	**204**	-	-	**204**	-	-
DC-07	DC-07-161214	12/14/2016	N	K1615083	-	-	-	**0.078**	-	-	-	-	-	-	-	-	**218**	-	-	**218**	-	-
DC-07	YVD-030917-25	3/9/2017	N	K1702448	-	-	-	**0.093**	-	-	-	-	-	-	-	-	**255**	-	-	**255**	-	-
DC-07	YVD-060617-18	6/6/2017	N	K1705754	-	-	-	**0.061**	-	-	-	-	-	-	-	-	**232**	-	-	**232**	-	-
DC-07	YVD-092517-12	9/25/2017	N	K1710333	-	-	-	**0.058**	-	-	-	-	-	-	-	-	**235**	-	-	**235**	-	-
DC-07	YVD-120417-14	12/4/2017	N	K1713026	-	-	-	**0.064**	-	-	-	-	-	-	-	-	**221**	-	-	**221**	-	-
DC-07	YVD-060318-17	6/3/2018	N	874568	-	-	-	-	-	-	-	-	-	0.07	U	-	**202**	-	-	**202**	-	-
DC-09	DC-09-130103	01/03/2013	N	EPA01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-09	DC-09-130923	09/23/2013	N	SWI0178	-	-	-	-	-	-	0.1	U	-	-	-	-	**44.7**	-	-	**45**	-	-
DC-09	DC-09-130926	09/26/2013	N	SWI0190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-09	DC-09-131211	12/11/2013	N	SWL0063	-	-	-	-	-	-	-	-	-	**0.125**	-	-	**129**	-	-	**130**	-	-
DC-09	DC-09-140317	03/17/2014	N	SXC0095	**0.18**	-	-	-	-	-	-	-	-	-	-	-	**144**	-	-	**145**	-	-
DC-09	DC-09-140602	06/02/2014	N	SXF0008	**0.22**	J	FDP	-	-	-	-	-	-	-	-	-	**129**	-	-	**130**	-	-
DC-09	YVD-D3-140602	06/02/2014	FD	SXF0008	**0.16**	J	FDP	-	-	-	-	-	-	-	-	-	**129**	-	-	**130**	-	-
DC-09	DC-09-140923	09/23/2014	N	SXI0158	0.05	U	-	-	-	-	-	-	-	-	-	-	**124**	-	-	**125**	-	-
DC-09	DC-09-141216	12/16/2014	N	SXL0108	**0.13**	-	-	-	-	-	-	-	-	-	-	-	**129**	-	-	**130**	-	-
DC-09	DC-09-150316	03/16/2015	N	5904541	0.25	U	-	-	-	-	-	-	-	-	-	-	**130**	-	-	**130**	-	-
DC-09	DC-09-150616	06/16/2015	N	59010751	0.25	U	-	-	-	-	-	-	-	-	-	-	**130**	-	-	**130**	-	-
DC-09	DC-09-150923	09/23/2015	N	59020281	0.25	U	-	-	-	-	-	-	-	-	-	-	**140**	-	-	**140**	-	-
DC-09	DC-09-151214	12/14/2015	N	59025431	**0.3**	J	FDP	-	-	-	-	-	-	-	-	-	**150**	J	FDP	**150**	J	FDP
DC-09	DC-09-160308	03/08/2016	N	59029711	0.25	U	-	-	-	-	-	-	-	-	-	-	**130**	-	-	**130**	-	-
DC-09	YVD-D2-160308	03/08/2016	FD	59029711	0.25	U	-	-	-	-	-	-	-	-	-	-	**130**	-	-	**130**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-09	DC-09-160621	6/21/2016	N	59037151	**32.0**	-	-	**7.5**	-	-	**2.20**	-	-	**41.0**	-	-	**17**	-	-	**0.51**	-	-
DC-09	DC-09-160929	9/29/2016	N	K1611704	**30.6**	-	-	**6.25**	-	-	**2.00**	-	-	**39.3**	-	-	**14.8**	-	-	**0.38**	-	-
DC-09	DC-09-D4-160929	9/29/2016	FD	K1611704	**30.4**	-	-	**6.22**	-	-	**1.98**	-	-	**38.8**	-	-	**14.9**	-	-	**0.38**	-	-
DC-09	DC-09-161215	12/15/2016	N	K1615126	**33.0**	-	-	**6.65**	-	-	**1.99**	-	-	**38.9**	-	-	**15.0**	-	-	**0.41**	-	-
DC-09	YVD-D4-161215	12/15/2016	FD	K1615126	**32.8**	-	-	**6.62**	-	-	**1.98**	-	-	**37.8**	-	-	**15.0**	-	-	**0.42**	-	-
DC-09	YVD-031317-36	3/13/2017	N	K1702489	**33.8**	-	-	**6.75**	-	-	**2.00**	-	-	**38.8**	-	-	**14.6**	-	-	**0.44**	-	-
DC-09	YVD-060717-27	6/7/2017	N	K1705833	**33.3**	-	-	**6.88**	-	-	**1.97**	-	-	**39.3**	-	-	**14.7**	-	-	**0.40**	-	-
DC-09	YVD-092617-23	9/26/2017	N	K1710333	**32.9**	-	-	**6.71**	-	-	**1.98**	-	-	**38.5**	-	-	**14.7**	-	-	**0.40**	-	-
DC-09	YVD-120417-09	12/4/2017	N	K1713026	**33.0**	-	-	**6.50**	-	-	**1.86**	-	-	**37.3**	-	-	**15.1**	-	-	**0.43**	-	-
DC-09	YVD-060418-25	6/4/2018	N	874860	**33.4**	-	-	**7.30**	-	-	**2.08**	-	-	**40.2**	-	-	**14.1**	-	-	**0.39**	-	-
DC-14	DC-14-130103	01/03/2013	N	EPA01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-14	DC-14-130917	09/17/2013	N	SWI0113	**121**	-	-	**32.3**	-	-	**5.85**	-	-	**94.9**	-	-	**80.2**	-	-	0.5	U	-
DC-14	DC-14-131211	12/11/2013	N	SWL0063	**91.2**	-	-	**23.9**	-	-	**4.71**	-	-	**94.0**	-	-	**64.4**	-	-	5	U	-
DC-14	DC-14-140318	03/18/2014	N	SXC0095	**107**	-	-	**28.4**	-	-	**5.25**	-	-	**87.0**	-	-	**71.8**	-	-	5	U	-
DC-14	DC-14-140602	06/02/2014	N	SXF0017	**95.9**	-	-	**26.3**	-	-	**5.37**	-	-	**83.2**	-	-	**56.1**	-	-	1	U	-
DC-14	DC-14-140923	09/23/2014	N	SXI0158	**106**	-	-	**27.6**	-	-	**4.95**	-	-	**88.6**	J+	MSD	**63.7**	-	-	1	U	-
DC-14	DC-14-141216	12/16/2014	N	SXL0108	**110**	-	-	**31.5**	-	-	**5.57**	-	-	**84.5**	-	-	**74.4**	-	-	1	U	-
DC-14	DC-14-150316	03/16/2015	N	5904541	**140**	-	-	**38.0**	-	-	**6.10**	-	-	**100**	-	-	**80**	-	-	1	U	-
DC-14	DC-14-150616	06/16/2015	N	59010961	**120**	-	-	**33.0**	-	-	**6.50**	J+	MSD	**85.0**	J+	MSD	**76**	-	-	1	U	-
DC-14	DC-14-150924	09/24/2015	N	59020391	**130**	-	-	**42.0**	-	-	**6.30**	-	-	**92.0**	-	-	**96**	-	-	1	U	-
DC-14	DC-14-151214	12/14/2015	N	59025351	**150**	-	-	**43.0**	-	-	**6.60**	-	-	**100**	-	-	**90**	-	-	1	U	-
DC-14	YVD-D1-151214	12/14/2015	FD	59025351	**150**	-	-	**43.0**	-	-	**6.60**	-	-	**100**	-	-	**85**	-	-	0.5	U	-
DC-14	DC-14-160309	03/09/2016	N	59029711	**130**	-	-	**38.0**	-	-	**6.60**	-	-	**95.0**	-	-	**82**	-	-	1	U	-
DC-14	DC-14-160620	6/20/2016	N	59037151	**120**	-	-	**36.0**	-	-	**6.00**	-	-	**92.0**	-	-	**75**	-	-	1	U	-
DC-14	DC-14-160929	9/29/2016	N	K1611704	**97.2**	-	-	**28.9**	-	-	**4.75**	-	-	**74.9**	-	-	**56.4**	-	-	**0.30**	-	-
DC-14	DC-14-161216	12/16/2016	N	K1615174	**93.3**	-	-	**22.3**	-	-	**4.37**	-	-	**68.8**	-	-	**53.9**	-	-	**0.36**	-	-
DC-14	YVD-031317-38	3/14/2017	N	K1702542	**91.0**	-	-	**24.4**	-	-	**4.57**	-	-	**68.4**	-	-	**49.6**	-	-	**0.34**	-	-
DC-14	YVD-060617-19	6/6/2017	N	K1705754	**97.7**	-	-	**24.4**	-	-	**4.40**	-	-	**65.2**	-	-	**49.2**	-	-	**0.34**	-	-
DC-14	YVD-092517-11	9/25/2017	N	K1710274	**98.2**	-	-	**24.5**	-	-	**4.63**	-	-	**64.3**	-	-	**43.3**	-	-	**0.34**	-	-
DC-14	YVD-120617-27	12/6/2017	N	K1713157	**100**	-	-	**23.5**	-	-	**4.49**	-	-	**60.5**	-	-	**46.4**	-	-	**0.35**	-	-
DC-14	YVD-120617-29	12/6/2017	FD	K1713157	**97.7**	-	-	**22.8**	-	-	**4.44**	-	-	**60.6**	-	-	**46.0**	-	-	**0.34**	-	-
DC-14	YVD-031918-20	3/19/2018	N	870634	**95.0**	-	-	**22.55**	-	-	**4.56**	-	-	**58.0**	-	-	**47.9**	-	-	**0.31**	-	-
DC-14	YVD-060518-28	6/5/2018	N	874860	**92.0**	-	-	**23.45**	-	-	**4.62**	-	-	**56.0**	-	-	**56.5**	-	-	**0.31**	-	-
DC-14	YVD-060518-30	6/5/2018	FD	874860	**97.5**	-	-	**24.55**	-	-	**4.78**	-	-	**57.5**	-	-	-	R	PRS	-	R	PRS
DC-14	YVD-090918-08	9/9/2018	N	880601	**104**	-	-	**25.00**	-	-	**4.80**	-	-	**54.0**	-	-	**63.5**	-	-	**0.29**	-	-
DC-14 (FD)	YVD-090918-10	9/9/2018	FD	880601	**105**	-	-	**25.05**	-	-	**4.78**	-	-	**53.5**	-	-	**70.8**	-	-	**0.29**	-	-
DC-14	YVD-121018-07	12/10/2018	N	884857	**105**	-	-	**25.70**	J	MSD	**4.92**	-	-	**55.5**	-	-	**72.8**	-	-	0.28	U	FBK
YVD-02	YVD-02-130924	09/24/2013	N	SWI0178	**20.4**	-	-	**5.9**	-	-	**3.50**	-	-	**8.6**	-	-	**3.85**	-	-	0.5	U	-
YVD-02	YVD-02-140316	03/16/2014	N	SXC0081	**90.8**	-	-	**71.7**	-	-	**12.60**	-	-	**88.6**	-	-	**3.93**	-	-	**1.02**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-09	DC-09-160621	6/21/2016	N	59037151	**5.9**	-	-	0.2	U	-	**32**	-	-	-	-	-	0.1	UJ	-	0.25	U	-
DC-09	DC-09-160929	9/29/2016	N	K1611704	**5.53**	-	-	0.10	U	-	**29.8**	-	-	-	-	-	0.050	U	MBK	0.5	U	-
DC-09	DC-09-D4-160929	9/29/2016	FD	K1611704	**5.53**	-	-	0.10	U	-	**29.6**	-	-	-	-	-	0.050	U	MBK	0.5	U	-
DC-09	DC-09-161215	12/15/2016	N	K1615126	**5.62**	-	-	0.10	U	-	**30.6**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-09	YVD-D4-161215	12/15/2016	FD	K1615126	**5.61**	-	-	0.10	U	-	**30.6**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-09	YVD-031317-36	3/13/2017	N	K1702489	**5.54**	-	-	0.10	U	-	**28.2**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-09	YVD-060717-27	6/7/2017	N	K1705833	**5.55**	-	-	0.10	U	-	**30.3**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-09	YVD-092617-23	9/26/2017	N	K1710333	**5.47**	-	-	0.10	U	-	**32.5**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-09	YVD-120417-09	12/4/2017	N	K1713026	**5.80**	-	-	0.10	U	-	**30.6**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-09	YVD-060418-25	6/4/2018	N	874860	**5.29**	-	-	0.05	U	-	**29.2**	-	-	0.07	U	-	-	-	-	0.5	UJ	MSD
DC-14	DC-14-130103	01/03/2013	N	EPA01	**26**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-14	DC-14-130917	09/17/2013	N	SWI0113	**12**	-	-	0.2	U	-	**34.2**	-	-	-	-	-	**0.115**	-	-	**0.31**	-	-
DC-14	DC-14-131211	12/11/2013	N	SWL0063	**5.8**	-	-	2	U	-	**33.9**	J-	MSD	-	-	-	0.02	R	MSD	0.2	U	-
DC-14	DC-14-140318	03/18/2014	N	SXC0095	**10.6**	-	-	2	U	-	**35.7**	J-	MSD	-	-	-	0.1	U	-	0.25	U	-
DC-14	DC-14-140602	06/02/2014	N	SXF0017	**6.46**	-	-	0.4	U	-	**24.2**	J-	MSD	-	-	-	0.1	U	-	**0.367**	-	-
DC-14	DC-14-140923	09/23/2014	N	SXI0158	**8.9**	-	-	0.4	U	-	**25.9**	-	-	-	-	-	0.1	R	MSD	**0.315**	-	-
DC-14	DC-14-141216	12/16/2014	N	SXL0108	**10.4**	-	-	0.4	U	-	**29.8**	-	-	-	-	-	0.1	U	-	0.25	U	-
DC-14	DC-14-150316	03/16/2015	N	5904541	**18**	J-	MSD	0.4	U	-	**38**	J-	MSD	-	-	-	**0.16**	-	-	0.25	UJ	MSD
DC-14	DC-14-150616	06/16/2015	N	59010961	**12**	-	-	0.4	U	-	**29**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
DC-14	DC-14-150924	09/24/2015	N	59020391	**22**	J+	MSD	0.4	U	-	**42**	J-	MSD	-	-	-	0.1	UJ	MSD	0.25	UJ	MSD
DC-14	DC-14-151214	12/14/2015	N	59025351	**21**	-	-	0.4	U	-	**39**	-	-	-	-	-	0.1	R	MSD	0.25	UJ	MSD
DC-14	YVD-D1-151214	12/14/2015	FD	59025351	**22**	-	-	0.2	U	-	**41**	-	-	-	-	-	0.1	R	MSD	0.25	UJ	MSD
DC-14	DC-14-160309	03/09/2016	N	59029711	**16**	-	-	0.4	U	-	**39**	J+	MSD	-	-	-	0.1	UJ	FDP	0.25	R	MSD
DC-14	DC-14-160620	6/20/2016	N	59037151	**16**	-	-	0.4	U	-	**38**	-	-	-	-	-	0.1	U	-	0.25	U	-
DC-14	DC-14-160929	9/29/2016	N	K1611704	**7.19**	-	-	0.10	U	-	**23.1**	-	-	-	-	-	0.050	U	MBK	0.5	U	-
DC-14	DC-14-161216	12/16/2016	N	K1615174	**4.45**	-	-	0.10	U	-	**21.9**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-14	YVD-031317-38	3/14/2017	N	K1702542	**4.34**	-	-	0.10	U	-	**20.8**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-14	YVD-060617-19	6/6/2017	N	K1705754	**3.86**	-	-	0.10	U	-	**26.9**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-14	YVD-092517-11	9/25/2017	N	K1710274	**2.41**	-	-	0.10	U	-	**23.9**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-14	YVD-120617-27	12/6/2017	N	K1713157	**2.52**	-	-	0.10	U	-	**20.3**	-	-	-	-	-	0.050	U	MBK	0.5	U	-
DC-14	YVD-120617-29	12/6/2017	FD	K1713157	**2.52**	-	-	0.10	U	-	**20.0**	-	-	-	-	-	0.050	U	-	0.5	U	-
DC-14	YVD-031918-20	3/19/2018	N	870634	**2.86**	-	-	0.05	U	-	**17.8**	-	-	0.07	U	-	-	-	-	0.5	U	-
DC-14	YVD-060518-28	6/5/2018	N	874860	**4.0**	-	-	0.05	U	-	**16.1**	-	-	0.07	U	-	-	-	-	0.5	UJ	MSD
DC-14	YVD-060518-30	6/5/2018	FD	874860	-	R	PRS	-	R	PRS	-	R	PRS	0.07	U	-	-	-	-	0.5	UJ	MBK
DC-14	YVD-090918-08	9/9/2018	N	880601	**4.08**	-	-	0.05	U	-	**16.0**	-	-	0.07	U	-	-	-	-	0.5	R	MSD
DC-14 (FD)	YVD-090918-10	9/9/2018	FD	880601	**4.00**	-	-	0.05	U	-	**15.3**	-	-	0.07	U	-	-	-	-	0.5	R	MSD
DC-14	YVD-121018-07	12/10/2018	N	884857	**4.60**	-	-	0.05	U	-	**14.9**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-02	YVD-02-130924	09/24/2013	N	SWI0178	**0.41**	-	-	0.2	U	-	**5.77**	-	-	-	-	-	**0.146**	-	-	0.25	U	-
YVD-02	YVD-02-140316	03/16/2014	N	SXC0081	0.2	U	-	0.2	U	-	**66.9**	-	-	-	-	-	0.1	U	-	0.25	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
DC-09	DC-09-160621	6/21/2016	N	59037151	0.25	U	-	-	-	-	-	-	-	-	-	-	**130**	-	-	**130**	-	-
DC-09	DC-09-160929	9/29/2016	N	K1611704	-	-	-	**0.016**	-	-	-	-	-	-	-	-	**129**	-	-	**129**	-	-
DC-09	DC-09-D4-160929	9/29/2016	FD	K1611704	-	-	-	**0.013**	-	-	-	-	-	-	-	-	**128**	-	-	**128**	-	-
DC-09	DC-09-161215	12/15/2016	N	K1615126	-	-	-	**0.009**	J	-	-	-	-	-	-	-	**127**	-	-	**127**	-	-
DC-09	YVD-D4-161215	12/15/2016	FD	K1615126	-	-	-	**0.007**	J	-	-	-	-	-	-	-	**127**	-	-	**127**	-	-
DC-09	YVD-031317-36	3/13/2017	N	K1702489	-	-	-	**0.024**	-	-	-	-	-	-	-	-	**124**	-	-	**124**	-	-
DC-09	YVD-060717-27	6/7/2017	N	K1705833	-	-	-	**0.029**	-	-	-	-	-	-	-	-	**126**	-	-	**126**	-	-
DC-09	YVD-092617-23	9/26/2017	N	K1710333	-	-	-	0.010	U	-	-	-	-	-	-	-	**132**	-	-	**132**	-	-
DC-09	YVD-120417-09	12/4/2017	N	K1713026	-	-	-	0.014	U	MBK	-	-	-	-	-	-	**129**	-	-	**129**	-	-
DC-09	YVD-060418-25	6/4/2018	N	874860	-	-	-	-	-	-	-	-	-	0.07	U	-	**127**	-	-	**127**	-	-
DC-14	DC-14-130103	01/03/2013	N	EPA01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DC-14	DC-14-130917	09/17/2013	N	SWI0113	-	-	-	-	-	-	**0.199**	-	-	-	-	-	**454**	-	-	**455**	-	-
DC-14	DC-14-131211	12/11/2013	N	SWL0063	-	-	-	-	-	-	-	-	-	**0.167**	-	-	**434**	-	-	**435**	-	-
DC-14	DC-14-140318	03/18/2014	N	SXC0095	**0.26**	-	-	-	-	-	-	-	-	-	-	-	**494**	-	-	**495**	-	-
DC-14	DC-14-140602	06/02/2014	N	SXF0017	**0.42**	J+	FBK	-	-	-	-	-	-	-	-	-	**425**	-	-	**425**	-	-
DC-14	DC-14-140923	09/23/2014	N	SXI0158	**0.3**	-	-	-	-	-	-	-	-	-	-	-	**424**	-	-	**425**	-	-
DC-14	DC-14-141216	12/16/2014	N	SXL0108	**0.14**	-	-	-	-	-	-	-	-	-	-	-	**429**	-	-	**430**	-	-
DC-14	DC-14-150316	03/16/2015	N	5904541	0.25	U	-	-	-	-	-	-	-	-	-	-	**490**	-	-	**490**	-	-
DC-14	DC-14-150616	06/16/2015	N	59010961	**0.3**	-	-	-	-	-	-	-	-	-	-	-	**430**	-	-	**430**	-	-
DC-14	DC-14-150924	09/24/2015	N	59020391	**0.31**	-	-	-	-	-	-	-	-	-	-	-	**470**	-	-	**470**	-	-
DC-14	DC-14-151214	12/14/2015	N	59025351	**0.35**	-	-	-	-	-	-	-	-	-	-	-	**550**	-	-	**550**	-	-
DC-14	YVD-D1-151214	12/14/2015	FD	59025351	**0.38**	-	-	-	-	-	-	-	-	-	-	-	**540**	-	-	**540**	-	-
DC-14	DC-14-160309	03/09/2016	N	59029711	**0.33**	-	-	-	-	-	-	-	-	-	-	-	**490**	-	-	**490**	-	-
DC-14	DC-14-160620	6/20/2016	N	59037151	0.25	U	-	-	-	-	-	-	-	-	-	-	**460**	-	-	**460**	-	-
DC-14	DC-14-160929	9/29/2016	N	K1611704	-	-	-	**0.009**	J	-	-	-	-	-	-	-	**394**	-	-	**394**	-	-
DC-14	DC-14-161216	12/16/2016	N	K1615174	-	-	-	**0.014**	-	-	-	-	-	-	-	-	**361**	-	-	**361**	-	-
DC-14	YVD-031317-38	3/14/2017	N	K1702542	-	-	-	**0.074**	-	-	-	-	-	-	-	-	**359**	-	-	**359**	-	-
DC-14	YVD-060617-19	6/6/2017	N	K1705754	-	-	-	**0.010**	J	-	-	-	-	-	-	-	**386**	-	-	**386**	-	-
DC-14	YVD-092517-11	9/25/2017	N	K1710274	-	-	-	**0.005**	J	-	-	-	-	-	-	-	**382**	-	-	**382**	-	-
DC-14	YVD-120617-27	12/6/2017	N	K1713157	-	-	-	**0.020**	-	-	-	-	-	-	-	-	**378**	-	-	**378**	-	-
DC-14	YVD-120617-29	12/6/2017	FD	K1713157	-	-	-	**0.021**	-	-	-	-	-	-	-	-	**372**	-	-	**372**	-	-
DC-14	YVD-031918-20	3/19/2018	N	870634	-	-	-	-	-	-	-	-	-	0.07	U	-	**372**	-	-	**372**	-	-
DC-14	YVD-060518-28	6/5/2018	N	874860	-	-	-	-	-	-	-	-	-	0.07	U	-	**370**	-	-	**370**	-	-
DC-14	YVD-060518-30	6/5/2018	FD	874860	-	-	-	-	-	-	-	-	-	0.07	U	-	-	R	PRS	-	R	PRS
DC-14	YVD-090918-08	9/9/2018	N	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	**368**	-	-	**368**	-	-
DC-14 (FD)	YVD-090918-10	9/9/2018	FD	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	**363**	-	-	**363**	-	-
DC-14	YVD-121018-07	12/10/2018	N	884857	-	-	-	-	-	-	-	-	-	0.07	U	-	**376**	-	-	**376**	-	-
YVD-02	YVD-02-130924	09/24/2013	N	SWI0178	-	-	-	-	-	-	**0.124**	-	-	-	-	-	**54.9**	-	-	**55**	-	-
YVD-02	YVD-02-140316	03/16/2014	N	SXC0081	**0.54**	-	-	-	-	-	-	-	-	-	-	-	**199**	-	-	**200**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-02	YVD-02-140602	06/02/2014	N	SXF0008	**62.7**	-	-	**48.7**	-	-	**8.53**	-	-	**23.0**	-	-	**2.75**	-	-	0.5	U	-
YVD-02	YVD-02-140921	09/21/2014	N	SXI0148	**29.6**	-	-	**13.7**	J	FDP	**4.53**	-	-	**11.6**	J	FDP	**2.64**	-	-	0.5	U	-
YVD-02	YVD-D1-140921	09/21/2014	FD	SXI0148	**35.8**	-	-	**18.2**	J	FDP	**5.05**	-	-	**15.7**	J	FDP	**2.2**	-	-	0.5	U	-
YVD-02	YVD-02-141215	12/15/2014	N	SXL0103	**35.7**	-	-	**17.4**	-	-	**5.35**	-	-	**16.1**	-	-	**2.9**	J+	MSD	0.5	U	-
YVD-02	YVD-02-150615	06/15/2015	N	59010751	**32.0**	J+	MSD	**16.0**	J+	MSD	**4.10**	J+	MSD	**12.0**	J+	MSD	**2.6**	-	-	0.5	U	-
YVD-02	YVD-02-150923	09/23/2015	N	59020281	**28.0**	-	-	**17.0**	-	-	**4.80**	-	-	**14.0**	-	-	**2.5**	-	-	0.5	U	-
YVD-02	YVD-02-151214	12/14/2015	N	59025351	**38.0**	-	-	**23.0**	-	-	**6.30**	-	-	**25.0**	-	-	**2.6**	-	-	0.5	U	-
YVD-02	YVD-02-160308	03/08/2016	N	59029521	**32.0**	-	-	**20.0**	-	-	**5.80**	-	-	**22.0**	-	-	**3**	-	-	**0.57**	-	-
YVD-02	YVD-02-160620	6/20/2016	N	59037101	**25.0**	-	-	**10.0**	-	-	**4.20**	-	-	**9.7**	-	-	**2.9**	-	-	0.5	U	-
YVD-02	YVD-02-160928	9/28/2016	N	K1611629	**17.2**	-	-	**4.6**	-	-	**3.41**	-	-	**5.07**	-	-	**2.79**	J	DUP	**0.16**	J	-
YVD-02	YVD-030817-15	3/8/2017	N	K1702324	**30.2**	-	-	**7.2**	-	-	**3.51**	-	-	**7.06**	-	-	**3.85**	-	-	**0.21**	-	-
YVD-02	YVD-060617-14	6/6/2017	N	K1705754	**20.9**	-	-	**4.85**	-	-	**3.00**	-	-	**5.95**	-	-	**3.03**	-	-	**0.16**	J	-
YVD-02	YVD-060617-16	6/6/2017	FD	K1705754	**20.2**	-	-	**4.74**	-	-	**3.00**	-	-	**5.91**	-	-	**2.95**	-	-	**0.15**	J	-
YVD-02	YVD-092617-20	9/26/2017	N	K1710333	**17.7**	-	-	**4.64**	-	-	**3.06**	-	-	**5.2**	-	-	**2.63**	-	-	**0.15**	J	-
YVD-02	YVD-120417-02	12/4/2017	N	K1713026	**20.0**	-	-	**7.43**	-	-	**3.18**	-	-	**9.59**	-	-	**2.37**	-	-	**0.29**	-	-
YVD-02	YVD-120417-04	12/4/2017	FD	K1713026	**19.6**	-	-	**7.74**	-	-	**3.08**	-	-	**9.58**	-	-	**2.20**	-	-	**0.31**	-	-
YVD-02	YVD-061218-32	6/12/2018	N	875438	-	R	NR	-	R	NR	-	R	NR	-	R	NR	-	R	NR	-	R	NR
YVD-03	YVD-03-130916	09/16/2013	N	SWI0113	**57.5**	-	-	**24.3**	-	-	**9.00**	-	-	**43.0**	-	-	**14**	-	-	**0.74**	-	-
YVD-03	YVD-03-131210	12/10/2013	N	SWL0063	**48.7**	-	-	**20.4**	-	-	**6.67**	-	-	**40.2**	-	-	**14.3**	-	-	1	U	-
YVD-03	YVD-03-140317	03/17/2014	N	SXC0081	**51.2**	-	-	**18.2**	-	-	**4.10**	-	-	**37.6**	-	-	**13.3**	-	-	**1.03**	-	-
YVD-03	YVD-03-140602	06/02/2014	N	SXF0008	**46.4**	-	-	**16.8**	-	-	**3.93**	-	-	**36.8**	-	-	**10.7**	-	-	0.5	U	-
YVD-03	YVD-03-140923	09/23/2014	N	SXI0158	**52.2**	-	-	**19.5**	-	-	**4.66**	J	FDP	**40.7**	J+	MSD	**11.8**	-	-	**0.62**	-	-
YVD-03	YVD-D3-140923	09/23/2014	FD	SXI0158	**45.4**	-	-	**16.2**	-	-	**3.62**	J	FDP	**38.0**	J+	MSD	**12.1**	-	-	**0.65**	-	-
YVD-03	YVD-03-141215	12/15/2014	N	SXL0108	**51.7**	-	-	**19.3**	-	-	**4.47**	-	-	**39.1**	-	-	**12.9**	-	-	**0.54**	-	-
YVD-03	YVD-03-150316	03/16/2015	N	5904541	**46.0**	-	-	**17.0**	-	-	**3.90**	-	-	**39.0**	-	-	**13**	-	-	**0.84**	-	-
YVD-03	YVD-03-150616	06/16/2015	N	59010751	**50.0**	J+	MSD	**20.0**	J+	MSD	**6.10**	J+	MSD	**37.0**	J+	MSD	**12**	-	-	**0.68**	-	-
YVD-03	YVD-03-150922	09/22/2015	N	59020141	**43.0**	-	-	**19.0**	-	-	**6.50**	-	-	**40.0**	-	-	**14**	-	-	**0.66**	-	-
YVD-03	YVD-03-151214	12/14/2015	N	59025351	**49.0**	-	-	**22.0**	-	-	**7.80**	-	-	**43.0**	-	-	**14**	-	-	**0.74**	-	-
YVD-03	YVD-03-160307	03/07/2016	N	59029521	**43.0**	-	-	**20.0**	-	-	**7.10**	-	-	**40.0**	-	-	**13**	-	-	**0.72**	-	-
YVD-03	YVD-03-160620	6/20/2016	N	59037151	**46.0**	-	-	**21.0**	-	-	**7.70**	-	-	**40.0**	-	-	**14**	-	-	**0.76**	-	-
YVD-03	YVD-03-160929	9/29/2016	N	K1611758	**43.2**	-	-	**18.3**	-	-	**6.89**	-	-	**41.4**	-	-	**11.7**	-	-	**0.61**	-	-
YVD-03	YVD-03-161213	12/13/2016	N	K1615045	**40.0**	-	-	**17.4**	-	-	**6.57**	-	-	**38.9**	-	-	**11.6**	-	-	**0.69**	-	-
YVD-03	YVD-030617-02	3/6/2017	N	K1702228	**41.6**	-	-	**17.3**	-	-	**6.53**	-	-	**38.5**	-	-	**11.4**	-	-	**0.6**	-	-
YVD-03	YVD-030617-03	3/6/2017	FD	K1702228	**41.5**	-	-	**17.3**	-	-	**6.48**	-	-	**38.4**	-	-	**11.6**	-	-	**0.65**	-	-
YVD-03	YVD-060517-13	6/5/2017	N	K1705702	**41.9**	-	-	**18.1**	-	-	**6.27**	-	-	**36.4**	-	-	**11.9**	-	-	**0.66**	-	-
YVD-03	YVD-092517-05	9/25/2017	N	K1710274	**41.6**	-	-	**18.7**	-	-	**6.85**	-	-	**40.9**	-	-	**11.6**	-	-	**0.66**	-	-
YVD-03	YVD-120517-19	12/5/2017	N	K1713091	**41.9**	-	-	**17.4**	-	-	**6.39**	-	-	**38.0**	-	-	**11.1**	-	-	**0.64**	-	-
YVD-03	YVD-060518-27	6/5/2018	N	874860	**39.0**	-	-	**17.4**	-	-	**6.70**	-	-	**39.3**	-	-	**11.3**	-	-	**0.62**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-02	YVD-02-140602	06/02/2014	N	SXF0008	0.2	U	-	0.2	U	-	**3.12**	-	-	-	-	-	0.1	U	-	**0.49**	-	-
YVD-02	YVD-02-140921	09/21/2014	N	SXI0148	0.2	U	-	0.2	U	-	**13.8**	-	-	-	-	-	0.1	U	-	**0.274**	-	-
YVD-02	YVD-D1-140921	09/21/2014	FD	SXI0148	0.2	U	-	0.2	U	-	**15.6**	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-02	YVD-02-141215	12/15/2014	N	SXL0103	**0.22**	J	DUP	0.2	U	-	**33.6**	J+	MSD, DUP	-	-	-	0.1	U	-	**0.358**	-	-
YVD-02	YVD-02-150615	06/15/2015	N	59010751	**0.23**	-	-	0.2	U	-	**3.2**	J-	MSD	-	-	-	**0.11**	-	-	0.25	UJ	MSD
YVD-02	YVD-02-150923	09/23/2015	N	59020281	0.2	U	-	0.2	U	-	**9.5**	-	-	-	-	-	0.1	U	-	**0.25**	J-	MSD
YVD-02	YVD-02-151214	12/14/2015	N	59025351	0.2	U	-	0.2	U	-	**24**	-	-	-	-	-	0.1	R	MSD	**0.76**	J-	MSD
YVD-02	YVD-02-160308	03/08/2016	N	59029521	0.2	U	-	0.2	U	-	**54**	-	-	-	-	-	0.1	UJ	RPD	**0.25**	J-	MSD
YVD-02	YVD-02-160620	6/20/2016	N	59037101	**0.31**	-	-	0.2	U	-	**8**	J-	MSD	-	-	-	0.1	U	-	**0.35**	J-	MSD
YVD-02	YVD-02-160928	9/28/2016	N	K1611629	**0.13**	-	-	0.10	U	-	**3.13**	-	-	-	-	-	0.050	U	MBK	0.5	U	-
YVD-02	YVD-030817-15	3/8/2017	N	K1702324	**5.40**	-	-	0.10	U	-	**11.7**	-	-	-	-	-	1	U	-	0.5	U	-
YVD-02	YVD-060617-14	6/6/2017	N	K1705754	**0.20**	-	-	0.10	U	-	**3.43**	J	FDP	-	-	-	0.050	U	-	0.5	U	-
YVD-02	YVD-060617-16	6/6/2017	FD	K1705754	**0.20**	-	-	0.10	U	-	**12.2**	J	FDP	-	-	-	0.050	U	-	0.5	U	-
YVD-02	YVD-092617-20	9/26/2017	N	K1710333	**0.17**	-	-	0.10	U	-	**4.79**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-02	YVD-120417-02	12/4/2017	N	K1713026	**0.22**	-	-	0.10	U	-	**16.1**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-02	YVD-120417-04	12/4/2017	FD	K1713026	**0.20**	-	-	0.10	U	-	**15.8**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-02	YVD-061218-32	6/12/2018	N	875438	-	R	NR	-	R	NR	-	R	NR	-	R	NR	-	-	-	-	R	NR
YVD-03	YVD-03-130916	09/16/2013	N	SWI0113	**4.75**	-	-	**0.49**	-	-	**70.7**	-	-	-	-	-	0.1	U	-	**0.488**	-	-
YVD-03	YVD-03-131210	12/10/2013	N	SWL0063	**5.96**	-	-	0.4	U	-	**54.8**	J-	MSD	-	-	-	0.02	R	MSD	0.2	U	-
YVD-03	YVD-03-140317	03/17/2014	N	SXC0081	**4.75**	-	-	0.2	U	-	**38**	-	-	-	-	-	**0.249**	-	-	0.25	U	-
YVD-03	YVD-03-140602	06/02/2014	N	SXF0008	**3.86**	-	-	0.2	U	-	**36**	-	-	-	-	-	0.1	U	-	**0.261**	-	-
YVD-03	YVD-03-140923	09/23/2014	N	SXI0158	**3.97**	-	-	0.2	U	-	**34.7**	-	-	-	-	-	0.1	R	MSD	0.25	U	-
YVD-03	YVD-D3-140923	09/23/2014	FD	SXI0158	**4.04**	-	-	0.2	U	-	**34.4**	-	-	-	-	-	0.1	R	MSD	0.25	U	-
YVD-03	YVD-03-141215	12/15/2014	N	SXL0108	**4.27**	-	-	0.2	U	-	**37**	-	-	-	-	-	0.1	U	-	**0.4**	-	-
YVD-03	YVD-03-150316	03/16/2015	N	5904541	**4.1**	J-	MSD	0.2	U	-	**33**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-03	YVD-03-150616	06/16/2015	N	59010751	**4**	-	-	0.2	U	-	**41**	J-	MSD	-	-	-	**0.12**	-	-	0.25	UJ	MSD
YVD-03	YVD-03-150922	09/22/2015	N	59020141	**4.9**	-	-	0.2	U	-	**51**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-03	YVD-03-151214	12/14/2015	N	59025351	**4.9**	-	-	0.2	U	-	**51**	-	-	-	-	-	0.1	R	MSD	0.25	UJ	MSD
YVD-03	YVD-03-160307	03/07/2016	N	59029521	**4.6**	-	-	0.2	U	-	**47**	-	-	-	-	-	0.1	UJ	RPD	0.25	UJ	MSD
YVD-03	YVD-03-160620	6/20/2016	N	59037151	**4.6**	-	-	0.2	U	-	**61**	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-03	YVD-03-160929	9/29/2016	N	K1611758	**4.39**	-	-	0.10	U	-	**44.4**	-	-	-	-	-	0.050	U	MBK	0.5	U	-
YVD-03	YVD-03-161213	12/13/2016	N	K1615045	**4.47**	-	-	0.10	U	-	**43.3**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-03	YVD-030617-02	3/6/2017	N	K1702228	**4.42**	-	-	0.10	U	-	**40.7**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-03	YVD-030617-03	3/6/2017	FD	K1702228	**4.48**	-	-	0.10	U	-	**40.7**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-03	YVD-060517-13	6/5/2017	N	K1705702	**4.61**	-	-	0.10	U	-	**46.4**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-03	YVD-092517-05	9/25/2017	N	K1710274	**4.45**	-	-	0.10	U	-	**46.3**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-03	YVD-120517-19	12/5/2017	N	K1713091	**4.52**	-	-	0.10	U	-	**50.8**	-	-	-	-	-	0.050	U	-	0.5	UJ	MSD
YVD-03	YVD-060518-27	6/5/2018	N	874860	**4.70**	-	-	0.05	U	-	**41.7**	-	-	0.07	U	-	-	-	-	0.5	UJ	MSD

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-02	YVD-02-140602	06/02/2014	N	SXF0008	**3.8**	-	-	-	-	-	-	-	-	-	-	-	**82.2**	-	-	**82.5**	-	-
YVD-02	YVD-02-140921	09/21/2014	N	SXI0148	**1.2**	J	FDP	-	-	-	-	-	-	-	-	-	**89.4**	-	-	**90**	-	-
YVD-02	YVD-D1-140921	09/21/2014	FD	SXI0148	**0.86**	J	FDP	-	-	-	-	-	-	-	-	-	**89.4**	-	-	**90**	-	-
YVD-02	YVD-02-141215	12/15/2014	N	SXL0103	**0.61**	-	-	-	-	-	-	-	-	-	-	-	**94.7**	-	-	**95**	-	-
YVD-02	YVD-02-150615	06/15/2015	N	59010751	**1.1**	-	-	-	-	-	-	-	-	-	-	-	**75**	J+	FBK	**75**	J+	FBK
YVD-02	YVD-02-150923	09/23/2015	N	59020281	**1**	J+	FBK		-	-	-	-	-	-	-	-	**95**	-	-	**95**	-	-
YVD-02	YVD-02-151214	12/14/2015	N	59025351	**0.68**	-	-	-	-	-	-	-	-	-	-	-	**100**	-	-	**100**	-	-
YVD-02	YVD-02-160308	03/08/2016	N	59029521	**0.59**	-	-	-	-	-	-	-	-	-	-	-	**110**	J	FDP	**110**	J	FDP
YVD-02	YVD-02-160620	6/20/2016	N	59037101	**0.52**	-	-	-	-	-	-	-	-	-	-	-	**75**	-	-	**75**	-	-
YVD-02	YVD-02-160928	9/28/2016	N	K1611629	-	-	-	**0.092**	-	-	-	-	-	-	-	-	**72**	-	-	**72**	-	-
YVD-02	YVD-030817-15	3/8/2017	N	K1702324	-	-	-	**0.099**	-	-	-	-	-	-	-	-	**103**	-	-	**103**	-	-
YVD-02	YVD-060617-14	6/6/2017	N	K1705754	-	-	-	**0.093**	-	-	-	-	-	-	-	-	**81**	-	-	**81**	-	-
YVD-02	YVD-060617-16	6/6/2017	FD	K1705754	-	-	-	**0.081**	-	-	-	-	-	-	-	-	**67**	-	-	**67**	-	-
YVD-02	YVD-092617-20	9/26/2017	N	K1710333	-	-	-	**0.09**	-	-	-	-	-	-	-	-	**75**	-	-	**75**	-	-
YVD-02	YVD-120417-02	12/4/2017	N	K1713026	-	-	-	**0.080**	-	-	-	-	-	-	-	-	**89**	-	-	**89**	-	-
YVD-02	YVD-120417-04	12/4/2017	FD	K1713026	-	-	-	**0.074**	-	-	-	-	-	-	-	-	**93**	-	-	**93**	-	-
YVD-02	YVD-061218-32	6/12/2018	N	875438	-	-	-	-	-	-	-	-	-	-	R	NR	-	R	NR	-	R	NR
YVD-03	YVD-03-130916	09/16/2013	N	SWI0113	-	-	-	-	-	-	**0.89**	-	-	-	-	-	**209**	-	-	**210**	-	-
YVD-03	YVD-03-131210	12/10/2013	N	SWL0063	-	-	-	-	-	-	-	-	-	**1.02**	-	-	**214**	-	-	**215**	-	-
YVD-03	YVD-03-140317	03/17/2014	N	SXC0081	**0.23**	-	-	-	-	-	-	-	-	-	-	-	**219**	-	-	**220**	-	-
YVD-03	YVD-03-140602	06/02/2014	N	SXF0008	**0.3**	-	-	-	-	-	-	-	-	-	-	-	**206**	-	-	**208**	-	-
YVD-03	YVD-03-140923	09/23/2014	N	SXI0158	**0.33**	J	FDP	-	-	-	-	-	-	-	-	-	**199**	-	-	**200**	-	-
YVD-03	YVD-D3-140923	09/23/2014	FD	SXI0158	**0.24**	J	FDP	-	-	-	-	-	-	-	-	-	**199**	-	-	**200**	-	-
YVD-03	YVD-03-141215	12/15/2014	N	SXL0108	**0.76**	-	-	-	-	-	-	-	-	-	-	-	**199**	-	-	**200**	-	-
YVD-03	YVD-03-150316	03/16/2015	N	5904541	0.25	U	-	-	-	-	-	-	-	-	-	-	**210**	-	-	**210**	-	-
YVD-03	YVD-03-150616	06/16/2015	N	59010751	**0.59**	-	-	-	-	-	-	-	-	-	-	-	**200**	-	-	**200**	-	-
YVD-03	YVD-03-150922	09/22/2015	N	59020141	0.25	U	-	-	-	-	-	-	-	-	-	-	**220**	-	-	**220**	-	-
YVD-03	YVD-03-151214	12/14/2015	N	59025351	**0.78**	-	-	-	-	-	-	-	-	-	-	-	**230**	-	-	**230**	-	-
YVD-03	YVD-03-160307	03/07/2016	N	59029521	**0.34**	-	-	-	-	-	-	-	-	-	-	-	**150**	J	FDP	**150**	J	FDP
YVD-03	YVD-03-160620	6/20/2016	N	59037151	**0.47**	-	-	-	-	-	-	-	-	-	-	-	**190**	-	-	**190**	-	-
YVD-03	YVD-03-160929	9/29/2016	N	K1611758	-	-	-	**0.047**	-	-	-	-	-	-	-	-	**196**	-	-	**196**	-	-
YVD-03	YVD-03-161213	12/13/2016	N	K1615045	-	-	-	**0.11**	-	-	-	-	-	-	-	-	**189**	-	-	**189**	-	-
YVD-03	YVD-030617-02	3/6/2017	N	K1702228	-	-	-	**0.083**	J	FDP	-	-	-	-	-	-	**190**	-	-	**190**	-	-
YVD-03	YVD-030617-03	3/6/2017	FD	K1702228	-	-	-	**0.061**	J	FDP	-	-	-	-	-	-	**192**	-	-	**192**	-	-
YVD-03	YVD-060517-13	6/5/2017	N	K1705702	-	-	-	**0.045**	-	-	-	-	-	-	-	-	**189**	-	-	**189**	-	-
YVD-03	YVD-092517-05	9/25/2017	N	K1710274	-	-	-	**0.038**	-	-	-	-	-	-	-	-	**193**	-	-	**193**	-	-
YVD-03	YVD-120517-19	12/5/2017	N	K1713091	-	-	-	**0.047**	-	-	-	-	-	-	-	-	**181**	-	-	**181**	-	-
YVD-03	YVD-060518-27	6/5/2018	N	874860	-	-	-	-	-	-	-	-	-	0.07	U	-	**188**	-	-	**188**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-04	YVD-04-130916	09/16/2013	N	SWI0113	**37.4**	-	-	**11.2**	-	-	**4.23**	-	-	**49.2**	-	-	**14.9**	-	-	0.5	U	-
YVD-04	YVD-04-131210	12/10/2013	N	SWL0063	**38.2**	-	-	**11.7**	-	-	**4.44**	-	-	**49.9**	-	-	**15**	-	-	1	U	-
YVD-04	YVD-04-140317	03/17/2014	N	SXC0081	**37.7**	-	-	**11.6**	-	-	**4.46**	-	-	**47.8**	-	-	**15.1**	-	-	**0.63**	-	-
YVD-04	YVD-04-140602	06/02/2014	N	SXF0008	**36.8**	-	-	**11.5**	-	-	**4.41**	-	-	**50.5**	-	-	**14.3**	-	-	1	U	-
YVD-04	YVD-04-140923	09/23/2014	N	SXI0158	**37.8**	-	-	**11.5**	-	-	**4.49**	-	-	**52.2**	J+	MSD	**15.3**	-	-	0.5	U	-
YVD-04	YVD-04-141215	12/15/2014	N	SXL0108	**38.8**	-	-	**12.4**	-	-	**4.62**	-	-	**50.0**	-	-	**15.2**	-	-	0.5	U	-
YVD-04	YVD-04-150315	03/15/2015	N	5904471	**38.0**	-	-	**12.0**	-	-	**4.70**	-	-	**52.0**	-	-	**16**	-	-	0.5	U	-
YVD-04	YVD-04-150615	06/15/2015	N	59010751	**38.0**	J+	MSD	**8.5**	J+	MSD	**4.70**	J+	MSD	**49.0**	J+	MSD	**15**	-	-	0.5	U	-
YVD-04	YVD-04-150922	09/22/2015	N	59020141	**36.0**	-	-	**11.0**	-	-	**4.60**	-	-	**51.0**	-	-	**15**	-	-	0.5	U	-
YVD-04	YVD-04-151213	12/13/2015	N	59025351	**39.0**	-	-	**12.0**	-	-	**4.90**	-	-	**53.0**	-	-	**15**	-	-	0.5	U	-
YVD-04	YVD-04-160307	03/07/2016	N	59029521	**36.0**	-	-	**12.0**	-	-	**4.60**	-	-	**51.0**	-	-	**14**	-	-	0.5	U	-
YVD-04	YVD-04-160620	6/20/2016	N	59037101	**36.0**	-	-	**12.0**	-	-	**4.80**	-	-	**53.0**	-	-	**15**	-	-	0.5	U	-
YVD-04	YVD-D1-160620	6/20/2016	FD	59037101	**35.0**	-	-	**12.0**	-	-	**4.50**	-	-	**51.0**	-	-	**15**	-	-	0.5	U	-
YVD-04	YVD-04-160928	9/28/2016	N	K1611629	**34.7**	-	-	**10.7**	-	-	**4.42**	-	-	**48.5**	-	-	**13.2**	-	-	**0.21**	-	-
YVD-04	YVD-04-D3-160928	9/28/2016	FD	K1611629	**34.7**	-	-	**10.9**	-	-	**4.49**	-	-	**49.9**	-	-	**13.2**	-	-	**0.20**	-	-
YVD-04	YVD-04-161213	12/13/2016	N	K1615045	**35.2**	-	-	**10.9**	-	-	**4.43**	-	-	**47.5**	-	-	**13.2**	-	-	**0.23**	-	-
YVD-04	YVD-031017-28	3/10/2017	N	K1702448	**37.8**	-	-	**10.9**	-	-	**4.25**	-	-	**46.7**	-	-	**13.2**	-	-	**0.21**	-	-
YVD-04	YVD-060517-11	6/5/2017	N	K1705702	**36.5**	-	-	**9.85**	-	-	**4.05**	-	-	**44.4**	-	-	**13.0**	-	-	**0.22**	-	-
YVD-04	YVD-092517-07	9/25/2017	N	K1710274	**37.2**	-	-	**11.7**	-	-	**4.62**	-	-	**51.1**	-	-	**12.9**	-	-	**0.21**	-	-
YVD-04	YVD-120417-13	12/4/2017	N	K1713091	**36.5**	-	-	**10.9**	-	-	**4.29**	-	-	**49.9**	-	-	**13.2**	-	-	**0.24**	-	-
YVD-04	YVD-060418-21	6/4/2018	N	874662	**37.0**	-	-	**11.65**	-	-	**4.46**	-	-	**51.0**	-	-	**12.3**	-	-	**0.19**	-	-
YVD-05	YVD-05-130917	09/17/2013	N	SWI0113	**66.0**	-	-	**31.0**	-	-	**6.95**	-	-	**46.2**	-	-	**10.2**	-	-	0.5	U	-
YVD-05	YVD-05-131211	12/11/2013	N	SWL0063	**41.5**	-	-	**17.0**	-	-	**3.33**	-	-	**45.5**	-	-	**10**	-	-	1	U	-
YVD-05	YVD-05-140317	03/17/2014	N	SXC0081	**33.7**	-	-	**13.5**	-	-	**2.75**	-	-	**43.1**	-	-	**8.4**	-	-	**1.3**	-	-
YVD-05	YVD-05-140601	06/01/2014	N	SXF0008	**30.8**	-	-	**13.2**	-	-	**2.84**	-	-	**43.9**	-	-	**8.4**	-	-	1	U	-
YVD-05	YVD-05-140922	09/22/2014	N	SXI0148	**31.6**	-	-	**13.7**	-	-	**2.75**	-	-	**45.1**	-	-	**7.6**	-	-	1	U	-
YVD-05	YVD-05-141215	12/15/2014	N	SXL0103	**36.9**	-	-	**17.0**	-	-	**4.21**	-	-	**45.5**	-	-	**4.56**	J+	MSD, FD	1	U	-
YVD-05	YVD-D1-141215	12/15/2014	FD	SXL0103	**34.2**	-	-	**15.0**	-	-	**3.54**	-	-	**44.9**	-	-	**7.8**	J+	MSD, FD	0.5	U	-
YVD-05	YVD-05-150316	03/16/2015	N	5904471	**33.0**	-	-	**15.0**	-	-	**3.60**	-	-	**47.0**	-	-	**8**	-	-	1	U	-
YVD-05	YVD-05-150616	06/16/2015	N	59010751	**35.0**	J+	MSD	**16.0**	J+	MSD	**4.00**	J+	MSD	**47.0**	J+	MSD	**8.9**	-	-	1	U	-
YVD-05	YVD-05-150922	09/22/2015	N	59020281	**42.0**	-	-	**20.0**	-	-	**4.90**	-	-	**51.0**	-	-	**8.8**	-	-	1	U	-
YVD-05	YVD-05-151214	12/14/2015	N	59025351	**37.0**	-	-	**17.0**	-	-	**4.30**	-	-	**52.0**	-	-	**7.9**	-	-	1	U	-
YVD-05	YVD-05-160307	03/07/2016	N	59029521	**32.0**	-	-	**15.0**	-	-	**3.60**	-	-	**48.0**	-	-	**8.3**	-	-	1	U	-
YVD-05	YVD-D1-160307	03/07/2016	FD	59029521	**32.0**	-	-	**15.0**	-	-	**3.60**	-	-	**48.0**	-	-	**8.7**	-	-	**0.59**	-	-
YVD-05	YVD-05-160620	6/20/2016	N	59037151	**31.0**	-	-	**14.0**	-	-	**3.40**	-	-	**48.0**	-	-	**9.1**	-	-	1	U	-
YVD-05	YVD-05-160928	9/28/2016	N	K1611698	**32.1**	-	-	**13.8**	-	-	**3.54**	-	-	**48.5**	-	-	**8.37**	-	-	**0.44**	-	-
YVD-05	YVD-05-161215	12/15/2016	N	K1615174	**33.3**	-	-	**13.1**	-	-	**3.37**	-	-	**46.5**	-	-	**8.30**	-	-	**0.48**	-	-
YVD-05	YVD-031317-32	3/13/2017	N	K1702489	**31.4**	-	-	**14.1**	-	-	**3.44**	-	-	**46.0**	-	-	**7.89**	-	-	**0.49**	-	-
YVD-05	YVD-031317-34	3/13/2017	FD	K1702489	**31.4**	-	-	**14.0**	-	-	**3.38**	-	-	**45.6**	-	-	**7.92**	-	-	**0.48**	-	-
YVD-05	YVD-060617-23	6/6/2017	N	K1705754	**31.6**	-	-	**13.9**	-	-	**3.51**	-	-	**48.1**	-	-	**8.12**	-	-	**0.47**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-04	YVD-04-130916	09/16/2013	N	SWI0113	**4.45**	-	-	0.2	U	-	**39.1**	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-04	YVD-04-131210	12/10/2013	N	SWL0063	**4.64**	-	-	0.4	U	-	**42.2**	J-	MSD	-	-	-	0.02	R	MSD	0.2	U	-
YVD-04	YVD-04-140317	03/17/2014	N	SXC0081	**4.03**	-	-	0.2	U	-	**35.2**	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-04	YVD-04-140602	06/02/2014	N	SXF0008	**3.78**	-	-	0.4	U	-	**36.2**	-	-	-	-	-	**0.113**	-	-	0.25	U	-
YVD-04	YVD-04-140923	09/23/2014	N	SXI0158	**3.87**	-	-	0.2	U	-	**35.8**	-	-	-	-	-	0.1	R	MSD	0.25	U	-
YVD-04	YVD-04-141215	12/15/2014	N	SXL0108	**3.81**	-	-	0.2	U	-	**35.8**	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-04	YVD-04-150315	03/15/2015	N	5904471	**4.3**	-	-	0.2	U	-	**34**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-04	YVD-04-150615	06/15/2015	N	59010751	**4**	-	-	0.2	U	-	**34**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-04	YVD-04-150922	09/22/2015	N	59020141	**3.9**	-	-	0.2	U	-	**35**	-	-	-	-	-	**0.13**	-	-	0.25	UJ	MSD
YVD-04	YVD-04-151213	12/13/2015	N	59025351	**4.1**	-	-	0.2	U	-	**36**	-	-	-	-	-	0.1	R	MSD	0.25	UJ	MSD
YVD-04	YVD-04-160307	03/07/2016	N	59029521	**3.7**	-	-	0.2	U	-	**34**	-	-	-	-	-	0.1	UJ	RPD	0.25	UJ	MSD
YVD-04	YVD-04-160620	6/20/2016	N	59037101	**4**	-	-	0.2	U	-	**35**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-04	YVD-D1-160620	6/20/2016	FD	59037101	**4**	-	-	0.2	U	-	**36**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-04	YVD-04-160928	9/28/2016	N	K1611629	**3.67**	-	-	0.10	U	-	**31.4**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-04	YVD-04-D3-160928	9/28/2016	FD	K1611629	**3.68**	-	-	0.10	U	-	**32.2**	-	-	-	-	-	0.050	U	MBK	0.5	U	-
YVD-04	YVD-04-161213	12/13/2016	N	K1615045	**3.74**	-	-	0.10	U	-	**31.7**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-04	YVD-031017-28	3/10/2017	N	K1702448	**3.70**	-	-	0.10	U	-	**32.9**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-04	YVD-060517-11	6/5/2017	N	K1705702	**3.53**	-	-	0.10	U	-	**33.4**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-04	YVD-092517-07	9/25/2017	N	K1710274	**3.57**	-	-	0.10	U	-	**32.7**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-04	YVD-120417-13	12/4/2017	N	K1713091	**3.79**	-	-	0.10	U	-	**32.5**	-	-	-	-	-	0.050	U	-	0.5	UJ	MSD
YVD-04	YVD-060418-21	6/4/2018	N	874662	**4.10**	-	-	0.05	U	-	**30.4**	-	-	0.08	U	FBK	-	-	-	0.5	UJ	MSD
YVD-05	YVD-05-130917	09/17/2013	N	SWI0113	**4.9**	-	-	0.2	U	-	**76.8**	-	-	-	-	-	**0.112**	-	-	**0.435**	-	-
YVD-05	YVD-05-131211	12/11/2013	N	SWL0063	**4.36**	-	-	0.4	U	-	**68.4**	J-	MSD	-	-	-	0.02	R	MSD	0.2	U	-
YVD-05	YVD-05-140317	03/17/2014	N	SXC0081	**3.3**	-	-	0.4	U	-	**52.7**	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-05	YVD-05-140601	06/01/2014	N	SXF0008	**3**	-	-	0.4	U	-	**50.5**	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-05	YVD-05-140922	09/22/2014	N	SXI0148	**2.82**	-	-	0.4	U	-	**48.1**	-	-	-	-	-	0.1	U	-	**0.259**	-	-
YVD-05	YVD-05-141215	12/15/2014	N	SXL0103	**1.5**	J	FDP, DU	0.4	U	-	**27.7**	J+	MSD, FDP, DUP	-	-	-	0.1	U	-	**0.272**	-	-
YVD-05	YVD-D1-141215	12/15/2014	FD	SXL0103	**2.65**	J	FDP, DU	0.2	U	-	**46**	J+	MSD, FDP, DUP	-	-	-	0.1	U	-	**0.264**	-	-
YVD-05	YVD-05-150316	03/16/2015	N	5904471	**2.8**	-	-	0.4	U	-	**47**	-	-	-	-	-	0.1	U	-	0.25	UJ	-
YVD-05	YVD-05-150616	06/16/2015	N	59010751	**3.1**	-	-	0.4	U	-	**49**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	-
YVD-05	YVD-05-150922	09/22/2015	N	59020281	**3**	-	-	0.4	U	-	**51**	-	-	-	-	-	0.1	U	-	0.25	R	MSD
YVD-05	YVD-05-151214	12/14/2015	N	59025351	**2.8**	-	-	0.4	U	-	**48**	-	-	-	-	-	0.1	R	MSD	**0.6**	J-	MSD
YVD-05	YVD-05-160307	03/07/2016	N	59029521	**2.7**	-	-	0.4	U	-	**47**	-	-	-	-	-	0.1	UJ	RPD	0.25	UJ	MSD
YVD-05	YVD-D1-160307	03/07/2016	FD	59029521	**2.9**	-	-	0.2	U	-	**48**	-	-	-	-	-	0.1	UJ	RPD	0.25	UJ	MSD
YVD-05	YVD-05-160620	6/20/2016	N	59037151	**3**	-	-	0.4	U	-	**49**	-	-	-	-	-	0.1	U	-	0.25	U	MSD
YVD-05	YVD-05-160928	9/28/2016	N	K1611698	**3.12**	-	-	0.10	U	-	**46.7**	-	-	-	-	-	0.050	U	MBK	0.5	R	MSD
YVD-05	YVD-05-161215	12/15/2016	N	K1615174	**3.15**	-	-	0.10	U	-	**49.0**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-05	YVD-031317-32	3/13/2017	N	K1702489	**2.88**	-	-	0.10	U	-	**41.5**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-05	YVD-031317-34	3/13/2017	FD	K1702489	**2.91**	-	-	0.10	U	-	**41.4**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-05	YVD-060617-23	6/6/2017	N	K1705754	**2.90**	-	-	0.10	U	-	**48.0**	-	-	-	-	-	0.050	U	-	0.5	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-04	YVD-04-130916	09/16/2013	N	SWI0113	-	-	-	-	-	-	0.1	U	-	-	-	-	**184**	-	-	**185**	-	-
YVD-04	YVD-04-131210	12/10/2013	N	SWL0063	-	-	-	-	-	-	-	-	-	**0.112**	-	-	**203**	-	-	**205**	-	-
YVD-04	YVD-04-140317	03/17/2014	N	SXC0081	**0.078**	-	-	-	-	-	-	-	-	-	-	-	**209**	-	-	**210**	-	-
YVD-04	YVD-04-140602	06/02/2014	N	SXF0008	**0.053**	-	-	-	-	-	-	-	-	-	-	-	**191**	-	-	**193**	-	-
YVD-04	YVD-04-140923	09/23/2014	N	SXI0158	**0.061**	-	-	-	-	-	-	-	-	-	-	-	**188**	-	-	**190**	-	-
YVD-04	YVD-04-141215	12/15/2014	N	SXL0108	0.1	U	-	-	-	-	-	-	-	-	-	-	**188**	-	-	**190**	-	-
YVD-04	YVD-04-150315	03/15/2015	N	5904471	0.25	UJ	MSD	-	-	-	-	-	-	-	-	-	**190**	-	-	**190**	-	-
YVD-04	YVD-04-150615	06/15/2015	N	59010751	0.25	U	-	-	-	-	-	-	-	-	-	-	**190**	-	-	**190**	-	-
YVD-04	YVD-04-150922	09/22/2015	N	59020141	0.25	U	-	-	-	-	-	-	-	-	-	-	**200**	-	-	**200**	-	-
YVD-04	YVD-04-151213	12/13/2015	N	59025351	**0.39**	-	-	-	-	-	-	-	-	-	-	-	**200**	-	-	**200**	-	-
YVD-04	YVD-04-160307	03/07/2016	N	59029521	0.25	U	-	-	-	-	-	-	-	-	-	-	**250**	J	FDP	**250**	J	FDP
YVD-04	YVD-04-160620	6/20/2016	N	59037101	0.25	U	-	-	-	-	-	-	-	-	-	-	**190**	-	-	**190**	-	-
YVD-04	YVD-D1-160620	6/20/2016	FD	59037101	0.25	U	-	-	-	-	-	-	-	-	-	-	**180**	-	-	**180**	-	-
YVD-04	YVD-04-160928	9/28/2016	N	K1611629	-	-	-	**0.014**	-	-	-	-	-	-	-	-	**187**	-	-	**187**	-	-
YVD-04	YVD-04-D3-160928	9/28/2016	FD	K1611629	-	-	-	**0.008**	J	-	-	-	-	-	-	-	**185**	-	-	**185**	-	-
YVD-04	YVD-04-161213	12/13/2016	N	K1615045	-	-	-	**0.026**	-	-	-	-	-	-	-	-	**181**	-	-	**181**	-	-
YVD-04	YVD-031017-28	3/10/2017	N	K1702448	-	-	-	**0.018**	-	-	-	-	-	-	-	-	**167**	-	-	**167**	-	-
YVD-04	YVD-060517-11	6/5/2017	N	K1705702	-	-	-	**0.006**	J	-	-	-	-	-	-	-	**182**	-	-	**182**	-	-
YVD-04	YVD-092517-07	9/25/2017	N	K1710274	-	-	-	**0.026**	-	-	-	-	-	-	-	-	**188**	-	-	**188**	-	-
YVD-04	YVD-120417-13	12/4/2017	N	K1713091	-	-	-	**0.013**	-	-	-	-	-	-	-	-	**185**	-	-	**185**	-	-
YVD-04	YVD-060418-21	6/4/2018	N	874662	-	-	-	-	-	-	-	-	-	0.07	U	-	**179**	-	-	**179**	-	-
YVD-05	YVD-05-130917	09/17/2013	N	SWI0113	-	-	-	-	-	-	**1.62**	-	-	-	-	-	**184**	-	-	**185**	-	-
YVD-05	YVD-05-131211	12/11/2013	N	SWL0063	-	-	-	-	-	-	-	-	-	**0.462**	-	-	**174**	-	-	**175**	-	-
YVD-05	YVD-05-140317	03/17/2014	N	SXC0081	**0.14**	-	-	-	-	-	-	-	-	-	-	-	**174**	-	-	**175**	-	-
YVD-05	YVD-05-140601	06/01/2014	N	SXF0008	**0.15**	-	-	-	-	-	-	-	-	-	-	-	**164**	-	-	**165**	-	-
YVD-05	YVD-05-140922	09/22/2014	N	SXI0148	**0.2**	-	-	-	-	-	-	-	-	-	-	-	**159**	-	-	**160**	-	-
YVD-05	YVD-05-141215	12/15/2014	N	SXL0103	**0.29**	J	FDP	-	-	-	-	-	-	-	-	-	**154**	-	-	**155**	-	-
YVD-05	YVD-D1-141215	12/15/2014	FD	SXL0103	**0.44**	J	FDP	-	-	-	-	-	-	-	-	-	**153**	-	-	**155**	-	-
YVD-05	YVD-05-150316	03/16/2015	N	5904471	0.25	UJ	MSD	-	-	-	-	-	-	-	-	-	**160**	-	-	**160**	-	-
YVD-05	YVD-05-150616	06/16/2015	N	59010751	**0.51**	-	-	-	-	-	-	-	-	-	-	-	**170**	-	-	**170**	-	-
YVD-05	YVD-05-150922	09/22/2015	N	59020281	**0.8**	-	-	-	-	-	-	-	-	-	-	-	**160**	-	-	**160**	-	-
YVD-05	YVD-05-151214	12/14/2015	N	59025351	**0.65**	-	-	-	-	-	-	-	-	-	-	-	**180**	-	-	**180**	-	-
YVD-05	YVD-05-160307	03/07/2016	N	59029521	0.25	U	-	-	-	-	-	-	-	-	-	-	**160**	J	FDP	**160**	J	FDP
YVD-05	YVD-D1-160307	03/07/2016	FD	59029521	0.25	U	-	-	-	-	-	-	-	-	-	-	**170**	J	FDP	**170**	J	FDP
YVD-05	YVD-05-160620	6/20/2016	N	59037151	0.25	U	-	-	-	-	-	-	-	-	-	-	**170**	-	-	**170**	-	-
YVD-05	YVD-05-160928	9/28/2016	N	K1611698	-	-	-	**0.01**	-	-	-	-	-	-	-	-	**171**	-	-	**171**	-	-
YVD-05	YVD-05-161215	12/15/2016	N	K1615174	-	-	-	**0.04**	-	-	-	-	-	-	-	-	**163**	-	-	**163**	-	-
YVD-05	YVD-031317-32	3/13/2017	N	K1702489	-	-	-	**0.03**	-	-	-	-	-	-	-	-	**166**	-	-	**166**	-	-
YVD-05	YVD-031317-34	3/13/2017	FD	K1702489	-	-	-	**0.02**	-	-	-	-	-	-	-	-	**168**	-	-	**168**	-	-
YVD-05	YVD-060617-23	6/6/2017	N	K1705754	-	-	-	**0.016**	-	-	-	-	-	-	-	-	**168**	-	-	**168**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-05	YVD-092517-09	9/25/2017	N	K1710274	**35.3**	-	-	**14.6**	-	-	**3.61**	-	-	**48.4**	-	-	**8.01**	-	-	**0.47**	-	-
YVD-05	YVD-120517-15	12/5/2017	N	K1713091	**31.3**	-	-	**13.5**	-	-	**3.36**	-	-	**46.5**	-	-	**7.92**	-	-	**0.51**	-	-
YVD-05	YVD-060518-29	6/5/2018	N	874860	**31.6**	-	-	**14.15**	-	-	**3.58**	-	-	**46.4**	-	-	**8.29**	-	-	**0.44**	-	-
YVD-06	YVD-06-130917	09/17/2013	N	SWI0113	**46.0**	-	-	**12.8**	-	-	**4.07**	-	-	**17.6**	-	-	**3.13**	-	-	0.5	U	-
YVD-06	YVD-06-131209	12/09/2013	N	SWL0055	**31.2**	J	FDP	**5.3**	J	FDP	**1.76**	-	-	**13.0**	J	FDP	**2.73**	-	-	0.5	U	-
YVD-06	YVD-D1-131209	12/09/2013	FD	SWL0055	**38.9**	J	FDP	**6.6**	J	FDP	**2.24**	-	-	**16.5**	J	FDP	8	U	-	5	U	-
YVD-06	YVD-06-140316	03/16/2014	N	SXC0081	**40.1**	-	-	**7.6**	-	-	**2.68**	-	-	**16.2**	-	-	**3.47**	-	-	**0.58**	-	-
YVD-06	YVD-D1-140316	03/16/2014	FD	SXC0081	**40.5**	-	-	**7.8**	-	-	**2.74**	-	-	**16.6**	-	-	**3.16**	-	-	**0.55**	-	-
YVD-06	YVD-06-140601	06/01/2014	N	SXF0008	**37.8**	-	-	**6.5**	-	-	**2.28**	-	-	**16.7**	-	-	**2.88**	J	DUP	0.5	U	-
YVD-06	YVD-D1-140601	06/01/2014	FD	SXF0008	**38.3**	-	-	**6.6**	-	-	**2.30**	-	-	**16.9**	-	-	**2.95**	-	-	0.5	U	-
YVD-06	YVD-06-140921	09/21/2014	N	SXI0148	**41.3**	-	-	**8.5**	-	-	**2.69**	-	-	**17.4**	-	-	**2.45**	-	-	0.5	U	-
YVD-06	YVD-06-141215	12/15/2014	N	SXL0103	**40.3**	-	-	**7.8**	-	-	**2.58**	-	-	**16.9**	-	-	**2.5**	J+	MSD	0.5	U	-
YVD-06	YVD-06-150316	03/16/2015	N	5904471	**38.0**	-	-	**6.8**	-	-	**2.20**	-	-	**17.0**	-	-	**2.8**	-	-	0.5	U	-
YVD-06	YVD-06-150616	06/16/2015	N	59010751	**40.0**	J+	MSD	**7.0**	J+	MSD	**2.20**	J+	MSD	**17.0**	J+	MSD	**2.7**	-	-	0.5	U	-
YVD-06	YVD-06-150922	09/22/2015	N	59020141	**41.0**	-	-	**9.8**	-	-	**3.10**	-	-	**17.0**	-	-	**2.8**	-	-	0.5	U	-
YVD-06	YVD-06-151214	12/14/2015	N	59025351	**42.0**	-	-	**7.3**	-	-	**2.40**	-	-	**18.0**	-	-	**2.4**	-	-	0.5	U	-
YVD-06	YVD-06-160307	03/07/2016	N	59029521	**38.0**	-	-	**7.2**	-	-	**2.50**	-	-	**17.0**	-	-	**2.8**	-	-	0.5	U	-
YVD-06	YVD-06-160620	6/20/2016	N	59037151	**37.0**	-	-	**6.6**	-	-	**2.30**	-	-	**17.0**	-	-	**3.1**	-	-	0.5	U	-
YVD-06	YVD-06-160929	9/29/2016	N	K1611704	**35.7**	-	-	**6.1**	-	-	**2.26**	-	-	**17.1**	-	-	**2.64**	-	-	**0.20**	-	-
YVD-06	YVD-06-161215	12/15/2016	N	K1615126	**33.5**	-	-	**5.7**	-	-	**2.12**	-	-	**17.1**	-	-	**3.14**	-	-	**0.23**	-	-
YVD-06	YVD-030617-04	3/6/2017	N	K1702228	**35.2**	-	-	**5.8**	-	-	**2.20**	-	-	**17.0**	-	-	**2.83**	-	-	**0.29**	-	-
YVD-06	YVD-060617-21	6/6/2017	N	K1705754	**36.9**	-	-	**6.07**	-	-	**2.17**	-	-	**16.3**	-	-	**2.54**	-	-	**0.19**	J	-
YVD-06	YVD-092617-17	9/26/2017	N	K1710333	**35.0**	-	-	**5.82**	-	-	**1.97**	-	-	**15.6**	-	-	**2.94**	-	-	**0.23**	-	-
YVD-06	YVD-092617-18	9/26/2017	FD	K1710333	**34.6**	-	-	**5.77**	-	-	**2.03**	-	-	**16.1**	-	-	**2.95**	-	-	**0.22**	-	-
YVD-06	YVD-120517-17	12/5/2017	N	K1713091	**34.7**	-	-	**5.81**	-	-	**2.11**	-	-	**17.3**	-	-	**3.23**	-	-	**0.25**	-	-
YVD-06	YVD-060318-15	6/3/2018	N	874568	**37.5**	-	-	**6.45**	-	-	**2.36**	-	-	**17.3**	-	-	**2.69**	-	-	**0.18**	-	-
YVD-07	YVD-07-130923	09/23/2013	N	SWI0178	**27.7**	-	-	**16.2**	-	-	**5.03**	-	-	**37.7**	-	-	-	-	-	-	-	-
YVD-07	YVD-07-130926	09/26/2013	N	SWI0190	-	-	-	-	-	-	-	-	-	-	-	-	**7.53**	-	-	0.5	U	-
YVD-07	YVD-07-131210	12/10/2013	N	SWL0055	**99.2**	-	-	**16.0**	-	-	1.00	U	-	**40.4**	-	-	**8.46**	-	-	**0.55**	-	-
YVD-07	YVD-07-140316	03/16/2014	N	SXC0081	**33.4**	-	-	**14.1**	-	-	**4.45**	-	-	**42.5**	-	-	**11.6**	-	-	**0.83**	-	-
YVD-07	YVD-07-140604	06/04/2014	N	SXF0025	**38.4**	-	-	**18.3**	-	-	**5.57**	-	-	**44.5**	-	-	**9.74**	-	-	1	U	-
YVD-07	YVD-07-140922	09/22/2014	N	SXI0158	**31.4**	-	-	**12.7**	-	-	**4.05**	-	-	**42.7**	J+	MSD	**10.3**	-	-	1	U	-
YVD-07	YVD-07-141216	12/16/2014	N	SXL0108	**29.9**	-	-	**12.2**	-	-	**3.83**	-	-	**40.6**	-	-	**8.76**	-	-	1	U	-
YVD-07	YVD-07-150316	03/16/2015	N	5904541	**37.0**	-	-	**15.0**	-	-	**4.30**	-	-	**50.0**	-	-	**15**	-	-	1	U	-
YVD-07	YVD-D2-150316	03/16/2015	FD	5904541	**35.0**	-	-	**14.0**	-	-	**4.30**	-	-	**48.0**	-	-	**16**	-	-	**0.65**	-	-
YVD-07	YVD-07-150616	06/16/2015	N	59010751	**34.0**	J+	MSD	**14.0**	J+	MSD	**4.20**	J+	MSD	**43.0**	J+	MSD	**13**	-	-	0.5	U	-
YVD-07	YVD-D1-150616	06/16/2015	FD	59010751	**35.0**	J+	MSD	**14.0**	J+	MSD	**4.20**	J+	MSD	**44.0**	J+	MSD	**14**	-	-	0.5	U	-
YVD-07	YVD-07-150923	09/23/2015	N	59020281	**33.0**	-	-	**14.0**	-	-	**4.20**	-	-	**48.0**	-	-	**9.9**	-	-	1	U	-
YVD-07	YVD-07-151214	12/14/2015	N	59025431	**30.0**	-	-	**13.0**	-	-	**4.50**	-	-	**48.0**	-	-	**6.7**	-	-	1	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-05	YVD-092517-09	9/25/2017	N	K1710274	**2.82**	-	-	0.10	U	-	**46.6**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-05	YVD-120517-15	12/5/2017	N	K1713091	**2.81**	-	-	0.10	U	-	**41.8**	-	-	-	-	-	0.050	U	MBK	0.5	UJ	MSD
YVD-05	YVD-060518-29	6/5/2018	N	874860	**2.79**	-	-	0.05	U	-	**43.6**	-	-	0.07	U	-	-	-	-	0.5	UJ	MSD
YVD-06	YVD-06-130917	09/17/2013	N	SWI0113	**0.51**	-	-	0.2	U	-	**8.14**	-	-	-	-	-	0.1	U	-	**0.4**	-	-
YVD-06	YVD-06-131209	12/09/2013	N	SWL0055	**0.49**	J	FDP	0.2	U	-	**8.53**	-	-	-	-	-	0.02	UJ	MSD	**0.62**	J	BK,MSD,FD
YVD-06	YVD-D1-131209	12/09/2013	FD	SWL0055	**6.4**	J	FDP	2	U	-	**9.1**	-	-	-	-	-	0.02	UJ	MSD	**0.4**	J	BK,MSD,FD
YVD-06	YVD-06-140316	03/16/2014	N	SXC0081	**0.61**	-	-	0.2	U	-	**8.33**	-	-	-	-	-	0.1	U	-	**0.297**	-	-
YVD-06	YVD-D1-140316	03/16/2014	FD	SXC0081	**0.62**	-	-	0.2	U	-	**8.18**	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-06	YVD-06-140601	06/01/2014	N	SXF0008	**0.51**	-	-	0.2	U	-	**7.59**	-	-	-	-	-	**0.172**	-	-	0.25	U	-
YVD-06	YVD-D1-140601	06/01/2014	FD	SXF0008	**0.56**	-	-	0.2	U	-	**7.63**	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-06	YVD-06-140921	09/21/2014	N	SXI0148	**0.44**	-	-	0.2	U	-	**7.98**	-	-	-	-	-	**0.139**	-	-	**0.359**	-	-
YVD-06	YVD-06-141215	12/15/2014	N	SXL0103	**0.45**	J	DUP	0.2	U	-	**7.47**	J+	MSD, DUP	-	-	-	0.1	U	-	0.25	U	-
YVD-06	YVD-06-150316	03/16/2015	N	5904471	**0.99**	-	-	0.2	U	-	**10**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-06	YVD-06-150616	06/16/2015	N	59010751	**0.53**	-	-	0.2	U	-	**7.9**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-06	YVD-06-150922	09/22/2015	N	59020141	**0.51**	-	-	0.2	U	-	**7.9**	-	-	-	-	-	**0.11**	-	-	0.25	UJ	MSD
YVD-06	YVD-06-151214	12/14/2015	N	59025351	**0.51**	-	-	0.2	U	-	**8**	-	-	-	-	-	0.1	R	MSD	**0.57**	J-	MSD
YVD-06	YVD-06-160307	03/07/2016	N	59029521	**0.51**	-	-	0.2	U	-	**7.8**	-	-	-	-	-	0.1	UJ	RPD	0.25	UJ	MSD
YVD-06	YVD-06-160620	6/20/2016	N	59037151	**0.53**	-	-	0.2	U	-	**8.1**	-	-	-	-	-	0.1	U	-	**0.42**	-	-
YVD-06	YVD-06-160929	9/29/2016	N	K1611704	**0.55**	-	-	0.10	U	-	**8.55**	-	-	-	-	-	0.050	U	MBK	0.5	U	-
YVD-06	YVD-06-161215	12/15/2016	N	K1615126	**0.70**	-	-	0.10	U	-	**10.2**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-06	YVD-030617-04	3/6/2017	N	K1702228	**0.61**	-	-	0.10	U	-	**8.38**	-	-	-	-	-	**0.021**	J	-	0.5	U	FBK
YVD-06	YVD-060617-21	6/6/2017	N	K1705754	**0.51**	-	-	0.10	U	-	**8.44**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-06	YVD-092617-17	9/26/2017	N	K1710333	**0.62**	-	-	0.10	U	-	**9.61**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-06	YVD-092617-18	9/26/2017	FD	K1710333	**0.62**	-	-	0.10	U	-	**9.58**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-06	YVD-120517-17	12/5/2017	N	K1713091	**0.73**	-	-	0.10	U	-	**9.87**	-	-	-	-	-	0.050	U	MBK	0.5	UJ	MSD
YVD-06	YVD-060318-15	6/3/2018	N	874568	**0.56**	-	-	0.05	U	-	**7.86**	-	-	0.09	U	FBK	-	-	-	0.5	U	-
YVD-07	YVD-07-130923	09/23/2013	N	SWI0178	-	-	-	-	-	-	-	-	-	-	-	-	0.1	U	-	**0.395**	-	-
YVD-07	YVD-07-130926	09/26/2013	N	SWI0190	**4.4**	-	-	0.2	U	-	**37.4**	-	-	-	-	-	-	-	-	-	-	-
YVD-07	YVD-07-131210	12/10/2013	N	SWL0055	**5.3**	-	-	0.2	U	-	**50**	-	-	-	-	-	0.02	UJ	MSD	0.2	UJ	MSD
YVD-07	YVD-07-140316	03/16/2014	N	SXC0081	**3.9**	-	-	0.2	U	-	**69.2**	-	-	-	-	-	**0.116**	-	-	0.25	U	-
YVD-07	YVD-07-140604	06/04/2014	N	SXF0025	**3.36**	-	-	0.4	U	-	**57**	-	-	-	-	-	0.1	U	-	**0.348**	J-	MSD
YVD-07	YVD-07-140922	09/22/2014	N	SXI0158	**5.52**	-	-	0.4	U	-	**51.8**	-	-	-	-	-	0.1	R	MSD	0.25	U	-
YVD-07	YVD-07-141216	12/16/2014	N	SXL0108	**2.92**	-	-	0.4	U	-	**51.2**	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-07	YVD-07-150316	03/16/2015	N	5904541	**4**	J-	MSD	0.4	U	-	**73**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-07	YVD-D2-150316	03/16/2015	FD	5904541	**4.2**	J-	MSD	0.2	U	-	**70**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-07	YVD-07-150616	06/16/2015	N	59010751	**3.3**	-	-	0.4	U	-	**74**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-07	YVD-D1-150616	06/16/2015	FD	59010751	**3.5**	-	-	0.2	U	-	**74**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-07	YVD-07-150923	09/23/2015	N	59020281	**4.7**	-	-	0.4	U	-	**68**	-	-	-	-	-	**0.22**	-	-	0.25	R	MSD
YVD-07	YVD-07-151214	12/14/2015	N	59025431	**2.4**	-	-	0.4	U	-	**59**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-05	YVD-092517-09	9/25/2017	N	K1710274	-	-	-	**0.012**	-	-	-	-	-	-	-	-	**173**	-	-	**173**	-	-
YVD-05	YVD-120517-15	12/5/2017	N	K1713091	-	-	-	**0.015**	-	-	-	-	-	-	-	-	**171**	-	-	**171**	-	-
YVD-05	YVD-060518-29	6/5/2018	N	874860	-	-	-	-	-	-	-	-	-	0.07	U	-	**170**	-	-	**170**	-	-
YVD-06	YVD-06-130917	09/17/2013	N	SWI0113	-	-	-	-	-	-	**0.41**	-	-	-	-	-	**149**	-	-	**150**	-	-
YVD-06	YVD-06-131209	12/09/2013	N	SWL0055	-	-	-	-	-	-	-	-	-	0.06	U	-	**154**	-	-	**155**	-	-
YVD-06	YVD-D1-131209	12/09/2013	FD	SWL0055	-	-	-	-	-	-	-	-	-	0.06	U	-	**159**	-	-	**160**	-	-
YVD-06	YVD-06-140316	03/16/2014	N	SXC0081	**0.14**	-	-	-	-	-	-	-	-	-	-	-	**174**	-	-	**175**	-	-
YVD-06	YVD-D1-140316	03/16/2014	FD	SXC0081	**0.13**	-	-	-	-	-	-	-	-	-	-	-	**159**	-	-	**160**	-	-
YVD-06	YVD-06-140601	06/01/2014	N	SXF0008	**0.064**	-	-	-	-	-	-	-	-	-	-	-	**156**	-	-	**158**	-	-
YVD-06	YVD-D1-140601	06/01/2014	FD	SXF0008	**0.057**	-	-	-	-	-	-	-	-	-	-	-	**153**	-	-	**155**	-	-
YVD-06	YVD-06-140921	09/21/2014	N	SXI0148	**0.18**	-	-	-	-	-	-	-	-	-	-	-	**149**	-	-	**150**	-	-
YVD-06	YVD-06-141215	12/15/2014	N	SXL0103	0.1	U	-	-	-	-	-	-	-	-	-	-	**149**	-	-	**150**	-	-
YVD-06	YVD-06-150316	03/16/2015	N	5904471	0.25	UJ	MSD	-	-	-	-	-	-	-	-	-	**150**	-	-	**150**	-	-
YVD-06	YVD-06-150616	06/16/2015	N	59010751	0.25	U	-	-	-	-	-	-	-	-	-	-	**150**	-	-	**150**	-	-
YVD-06	YVD-06-150922	09/22/2015	N	59020141	0.25	U	-	-	-	-	-	-	-	-	-	-	**170**	-	-	**170**	-	-
YVD-06	YVD-06-151214	12/14/2015	N	59025351	0.25	U	-	-	-	-	-	-	-	-	-	-	**170**	-	-	**170**	-	-
YVD-06	YVD-06-160307	03/07/2016	N	59029521	0.25	U	-	-	-	-	-	-	-	-	-	-	**160**	J	FDP	**160**	J	FDP
YVD-06	YVD-06-160620	6/20/2016	N	59037151	0.25	U	-	-	-	-	-	-	-	-	-	-	**150**	-	-	**150**	-	-
YVD-06	YVD-06-160929	9/29/2016	N	K1611704	-	-	-	**0.022**	-	-	-	-	-	-	-	-	**145**	-	-	**145**	-	-
YVD-06	YVD-06-161215	12/15/2016	N	K1615126	-	-	-	**0.010**	-	-	-	-	-	-	-	-	**136**	-	-	**136**	-	-
YVD-06	YVD-030617-04	3/6/2017	N	K1702228	-	-	-	**0.014**	-	-	-	-	-	-	-	-	**142**	-	-	**142**	-	-
YVD-06	YVD-060617-21	6/6/2017	N	K1705754	-	-	-	**0.010**	J	-	-	-	-	-	-	-	**144**	-	-	**144**	-	-
YVD-06	YVD-092617-17	9/26/2017	N	K1710333	-	-	-	**0.009**	J	-	-	-	-	-	-	-	**140**	-	-	**140**	-	-
YVD-06	YVD-092617-18	9/26/2017	FD	K1710333	-	-	-	**0.010**	J	-	-	-	-	-	-	-	**140**	-	-	**140**	-	-
YVD-06	YVD-120517-17	12/5/2017	N	K1713091	-	-	-	**0.021**	-	-	-	-	-	-	-	-	**137**	-	-	**137**	-	-
YVD-06	YVD-060318-15	6/3/2018	N	874568	-	-	-	-	-	-	-	-	-	0.07	U	-	**138**	-	-	**138**	-	-
YVD-07	YVD-07-130923	09/23/2013	N	SWI0178	-	-	-	-	-	-	**0.516**	-	-	-	-	-	**79.4**	-	-	**80**	-	-
YVD-07	YVD-07-130926	09/26/2013	N	SWI0190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
YVD-07	YVD-07-131210	12/10/2013	N	SWL0055	-	-	-	-	-	-	-	-	-	0.06	U	-	**135**	-	-	**135**	-	-
YVD-07	YVD-07-140316	03/16/2014	N	SXC0081	**0.22**	-	-	-	-	-	-	-	-	-	-	-	**134**	-	-	**135**	-	-
YVD-07	YVD-07-140604	06/04/2014	N	SXF0025	**0.69**	-	-	-	-	-	-	-	-	-	-	-	**137**	-	-	**138**	-	-
YVD-07	YVD-07-140922	09/22/2014	N	SXI0158	**0.2**	-	-	-	-	-	-	-	-	-	-	-	**134**	-	-	**135**	-	-
YVD-07	YVD-07-141216	12/16/2014	N	SXL0108	0.1	U	-	-	-	-	-	-	-	-	-	-	**133**	-	-	**135**	-	-
YVD-07	YVD-07-150316	03/16/2015	N	5904541	0.25	U	-	-	-	-	-	-	-	-	-	-	**140**	-	-	**140**	-	-
YVD-07	YVD-D2-150316	03/16/2015	FD	5904541	0.25	U	-	-	-	-	-	-	-	-	-	-	**140**	-	-	**140**	-	-
YVD-07	YVD-07-150616	06/16/2015	N	59010751	0.25	U	-	-	-	-	-	-	-	-	-	-	**150**	-	-	**150**	-	-
YVD-07	YVD-D1-150616	06/16/2015	FD	59010751	0.25	U	-	-	-	-	-	-	-	-	-	-	**140**	-	-	**140**	-	-
YVD-07	YVD-07-150923	09/23/2015	N	59020281	0.25	U	-	-	-	-	-	-	-	-	-	-	**160**	-	-	**160**	-	-
YVD-07	YVD-07-151214	12/14/2015	N	59025431	**0.97**	J	FDP	-	-	-	-	-	-	-	-	-	**140**	J	FDP	**140**	J	FDP

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-07	YVD-07-160308	03/08/2016	N	59029711	**25.0**	-	-	**11.0**	-	-	**4.00**	-	-	**42.0**	-	-	**6.7**	-	-	1	U	-
YVD-07	YVD-07-160621	6/21/2016	N	59037151	**19.0**	-	-	**9.0**	-	-	**3.50**	-	-	**37.0**	-	-	**6.2**	-	-	1	U	-
YVD-07	YVD-07-160929	9/29/2016	N	K1611704	**17.8**	-	-	**7.14**	-	-	**3.31**	-	-	**34.0**	-	-	**5.3**	-	-	**0.40**	-	-
YVD-07	YVD-07-161213	12/13/2016	N	K1615083	**25.9**	-	-	**10.2**	-	-	**3.59**	-	-	**36.6**	-	-	**6.38**	-	-	**0.40**	-	-
YVD-07	YVD-030717-07	3/7/2017	N	K1702324	**17.6**	-	-	**6.47**	-	-	**2.83**	-	-	**31.4**	-	-	**5.34**	-	-	**0.43**	-	-
YVD-07	YVD-060517-15	6/5/2017	N	K1705754	**19.4**	-	-	**7.31**	-	-	**2.98**	-	-	**32.9**	-	-	**6.07**	-	-	**0.39**	-	-
YVD-07	YVD-092617-21	9/26/2017	N	K1710333	**25.4**	-	-	**9.27**	-	-	**3.26**	-	-	**34.0**	-	-	**7.45**	-	-	**0.35**	-	-
YVD-07	YVD-120417-11	12/4/2017	N	K1713026	**29.5**	-	-	**11.1**	-	-	**3.56**	-	-	**36.1**	-	-	**8.32**	-	-	**0.37**	-	-
YVD-07	YVD-060418-23	6/4/2018	N	874662	**34.0**	-	-	**13.35**	-	-	**3.76**	-	-	**39.4**	-	-	**10.5**	-	-	**0.30**	-	-
YVD-08	YVD-08-130919	09/19/2013	N	SWI0138	**126**	-	-	**43.8**	-	-	**6.03**	-	-	**88.3**	-	-	**145**	-	-	5	U	-
YVD-08	YVD-08-131211	12/11/2013	N	SWL0063	**134**	-	-	**53.8**	-	-	**7.55**	-	-	**82.2**	-	-	**123**	-	-	5	U	-
YVD-08	YVD-08-140317	03/17/2014	N	SXC0095	**122**	-	-	**42.0**	-	-	**5.30**	-	-	**75.1**	-	-	**128**	-	-	5	U	-
YVD-08	YVD-08-140602	06/02/2014	N	SXF0017	**138**	-	-	**64.6**	-	-	**11.20**	-	-	**78.3**	-	-	**118**	-	-	2	U	-
YVD-08	YVD-08-140923	09/23/2014	N	SXI0173	**103**	-	-	**36.3**	-	-	**5.87**	-	-	**76.9**	-	-	**122**	-	-	2.5	U	-
YVD-08	YVD-08-141216	12/16/2014	N	SXL0108	**111**	-	-	**41.4**	-	-	**5.92**	-	-	**77.2**	-	-	**126**	-	-	2.5	U	-
YVD-08	YVD-08-150317	03/17/2015	N	5904541	**110**	-	-	**40.0**	-	-	**5.90**	-	-	**77.0**	-	-	**120**	-	-	2.5	U	-
YVD-08	YVD-D3-150317	03/17/2015	FD	5904541	**100**	-	-	**39.0**	-	-	**5.70**	-	-	**76.0**	-	-	**130**	-	-	0.5	U	-
YVD-08	YVD-08-150617	06/17/2015	N	59010961	**110**	-	-	**40.0**	-	-	**6.00**	J+	MSD	**82.0**	J+	MSD	**120**	-	-	2.5	U	-
YVD-08	YVD-D3-150617	06/17/2015	FD	59010961	**110**	-	-	**39.0**	-	-	**5.70**	J+	MSD	**77.0**	J+	MSD	**140**	-	-	5	U	-
YVD-08	YVD-08-150924	09/24/2015	N	59020391	**110**	-	-	**44.0**	-	-	**5.60**	-	-	**82.0**	-	-	**120**	-	-	2.5	U	-
YVD-08	YVD-08-151215	12/15/2015	N	59025501	**120**	-	-	**44.0**	-	-	**6.20**	-	-	**85.0**	-	-	**120**	-	-	2.5	U	-
YVD-08	YVD-D3-151215	12/15/2015	FD	59025501	**120**	-	-	**46.0**	-	-	**6.20**	-	-	**85.0**	-	-	**110**	-	-	5	U	-
YVD-08	YVD-08-160310	03/10/2016	N	59029941	**120**	-	-	**44.0**	-	-	**5.60**	-	-	**87.0**	-	-	**120**	-	-	2.5	U	-
YVD-08	YVD-08-160622	6/22/2016	N	59037271	**120**	-	-	**46.0**	-	-	**5.90**	-	-	**87.0**	-	-	**110**	-	-	2.5	U	-
YVD-08	YVD-D3-160622	6/22/2016	FD	59037271	**120**	-	-	**46.0**	-	-	**6.00**	-	-	**88.0**	-	-	**120**	-	-	0.5	U	-
YVD-08	YVD-08-160927	9/27/2016	N	K1611565	**120**	-	-	**47.0**	-	-	**4.95**	-	-	**84.7**	-	-	**96.0**	-	-	**0.18**	J	-
YVD-08	YVD-08-161213	12/13/2016	N	K1615045	**122**	-	-	**41.9**	-	-	**5.10**	-	-	**84.5**	-	-	**89.3**	-	-	**0.23**	-	-
YVD-08	YVD-030917-24	3/9/2017	N	K1702448	**136**	-	-	**44.4**	-	-	**4.95**	-	-	**83.4**	-	-	**95.2**	-	-	**0.20**	J	-
YVD-08	YVD-060717-29	6/7/2017	N	K1705833	**139**	-	-	**48.3**	-	-	**5.13**	-	-	**92.1**	-	-	**94.3**	-	-	**0.17**	J	-
YVD-08	YVD-092617-19	9/26/2017	N	K1710333	**137**	-	-	**44.3**	-	-	**5.12**	-	-	**89.3**	-	-	**98.0**	-	-	**0.19**	J	-
YVD-08	YVD-120517-23	12/5/2017	N	K1713157	**147**	-	-	**48.1**	-	-	**5.23**	-	-	**93.2**	-	-	**98.8**	-	-	**0.20**	J	-
YVD-08	YVD-031918-15	3/19/2018	N	870634	**134**	-	-	**45.95**	-	-	**5.40**	-	-	**90.5**	-	-	**103**	-	-	**0.15**	-	-
YVD-08	YVD-060518-31	6/5/2018	N	874860	**136**	-	-	**47.45**	-	-	**5.55**	-	-	**98.0**	-	-	**99.0**	-	-	**0.16**	-	-
YVD-08	YVD-090918-04	9/9/2018	N	880601	**146**	-	-	**49.15**	-	-	**5.70**	-	-	**99.5**	-	-	**103**	-	-	**0.18**	-	-
YVD-08	YVD-121118-19	12/11/2018	N	884939	**138**	-	-	**45.85**	-	-	**6.00**	-	-	**98.5**	-	-	**117**	-	-	**0.16**	-	-
YVD-09	YVD-09-130919	09/19/2013	N	SWI0138	**107**	-	-	**39.3**	-	-	**8.21**	-	-	**189**	-	-	**96.3**	-	-	5	U	-
YVD-09	YVD-09-131212	12/12/2013	N	SWL0078	**109**	-	-	**42.0**	-	-	**9.21**	-	-	**176**	-	-	**87.2**	-	-	5	U	-
YVD-09	YVD-09-140319	03/19/2014	N	SXC0107	**109**	-	-	**40.8**	-	-	**9.33**	-	-	**173**	-	-	**104**	-	-	**5.5**		-
YVD-09	YVD-09-140603	06/03/2014	N	SXF0025	**113**	-	-	**44.5**	-	-	**10.10**	-	-	**193**	-	-	**89.8**	-	-	5	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-07	YVD-07-160308	03/08/2016	N	59029711	**1.8**	-	-	0.4	U	-	**49**	J+	MSD	-	-	-	**1.1**	J+	FBK, FDP	0.25	U	-
YVD-07	YVD-07-160621	6/21/2016	N	59037151	**1.2**	-	-	0.4	U	-	**31**	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-07	YVD-07-160929	9/29/2016	N	K1611704	**1.37**	-	-	0.10	U	-	**37.1**	-	-	-	-	-	0.050	U	MBK	0.5	U	-
YVD-07	YVD-07-161213	12/13/2016	N	K1615083	**2.15**	-	-	0.10	U	-	**64.0**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-07	YVD-030717-07	3/7/2017	N	K1702324	**1.74**	J	HTQ	0.10	UJ	HTQ	**25.4**	-	-	-	-	-	1	U	-	0.5	U	-
YVD-07	YVD-060517-15	6/5/2017	N	K1705754	**2.07**	-	-	0.10	U	-	**33.5**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-07	YVD-092617-21	9/26/2017	N	K1710333	**3.47**	-	-	0.10	U	-	**51.0**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-07	YVD-120417-11	12/4/2017	N	K1713026	**4.40**	-	-	0.10	U	-	**56.5**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-07	YVD-060418-23	6/4/2018	N	874662	**3.34**	-	-	0.05	U	-	**63.5**	-	-	0.47	U	FBK	-	-	-	0.5	UJ	MSD
YVD-08	YVD-08-130919	09/19/2013	N	SWI0138	**8**	-	-	2	U	-	**105**	-	-	-	-	-	0.1	U	-	**0.935**	J+	FBK
YVD-08	YVD-08-131211	12/11/2013	N	SWL0063	**22.5**	-	-	2	U	-	**273**	J-	MSD	-	-	-	0.02	R	MSD	0.75	U	ERL
YVD-08	YVD-08-140317	03/17/2014	N	SXC0095	**14.3**	-	-	2	U	-	**173**	J-	MSD	-	-	-	**0.146**	-	-	**0.702**	-	-
YVD-08	YVD-08-140602	06/02/2014	N	SXF0017	**14.7**	-	-	0.8	U	-	**175**	J-	MSD	-	-	-	0.1	U	-	**1.12**	-	-
YVD-08	YVD-08-140923	09/23/2014	N	SXI0173	**8.1**	-	-	1	U	-	**107**	-	-	-	-	-	0.1	U	-	**0.867**	J+	MSD
YVD-08	YVD-08-141216	12/16/2014	N	SXL0108	**14**	-	-	1	U	-	**140**	-	-	-	-	-	0.1	U	-	**0.369**	-	-
YVD-08	YVD-08-150317	03/17/2015	N	5904541	**13**	J-	MSD	1	U	-	**130**	J-	MSD	-	-	-	0.1	U	-	**0.39**	J-	MSD
YVD-08	YVD-D3-150317	03/17/2015	FD	5904541	**14**	J-	MSD	0.2	U	-	**150**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-08	YVD-08-150617	06/17/2015	N	59010961	**19**	-	-	1	U	-	**140**	-	-	-	-	-	**0.14**	-	-	**0.26**	J-	MSD, FDP
YVD-08	YVD-D3-150617	06/17/2015	FD	59010961	**19**	-	-	0.2	U	-	**170**	-	-	-	-	-	0.1	U	-	**0.86**	J-	MSD, FDP
YVD-08	YVD-08-150924	09/24/2015	N	59020391	**20**	J+	MSD	1	U	-	**170**	J-	MSD	-	-	-	0.1	UJ	MSD	0.25	UJ	MSD
YVD-08	YVD-08-151215	12/15/2015	N	59025501	**26**	-	-	1	U	-	**190**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD
YVD-08	YVD-D3-151215	12/15/2015	FD	59025501	**26**	-	-	0.2	U	-	**180**	-	-	-	-	-	**0.15**	J-	MSD	0.25	R	MSD
YVD-08	YVD-08-160310	03/10/2016	N	59029941	**32**	-	-	1	U	-	**210**	J	DUP	-	-	-	0.1	U	-	0.25	UJ	FDP, MSD
YVD-08	YVD-08-160622	6/22/2016	N	59037271	**34**	-	-	1	U	-	**200**	-	-	-	-	-	0.1	UJ	MSD	0.25	R	MSD
YVD-08	YVD-D3-160622	6/22/2016	FD	59037271	**34**	-	-	0.2	U	-	**200**	-	-	-	-	-	0.1	UJ	FBK, MSD	0.25	R	MSD
YVD-08	YVD-08-160927	9/27/2016	N	K1611565	**30.6**	-	-	0.10	U	-	**193**	-	-	-	-	-	0.050	U	MBK	0.5	R	MSD
YVD-08	YVD-08-161213	12/13/2016	N	K1615045	**34.5**	J	HTQ	0.10	U	-	**182**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-08	YVD-030917-24	3/9/2017	N	K1702448	**37.3**	J	HTQ	0.10	U	-	**203**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-08	YVD-060717-29	6/7/2017	N	K1705833	**44.0**	-	-	0.10	U	-	**194**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-08	YVD-092617-19	9/26/2017	N	K1710333	**38.6**	J	HTQ	0.10	U	-	**213**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-08	YVD-120517-23	12/5/2017	N	K1713157	**49.3**	-	-	0.10	U	-	**184**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-08	YVD-031918-15	3/19/2018	N	870634	**46.3**	-	-	0.05	U	-	**183**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-08	YVD-060518-31	6/5/2018	N	874860	**53.0**	-	-	0.05	U	-	**197**	-	-	0.07	U	-	-	-	-	0.5	UJ	MSD
YVD-08	YVD-090918-04	9/9/2018	N	880601	**54.4**	-	-	0.05	U	-	**195**	-	-	0.07	U	-	-	-	-	0.5	R	MSD
YVD-08	YVD-121118-19	12/11/2018	N	884939	**59.4**	-	-	0.05	U	-	**207**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-09	YVD-09-130919	09/19/2013	N	SWI0138	**74.7**	-	-	2	U	-	**236**	-	-	-	-	-	0.1	U	-	0.533	R	FBK
YVD-09	YVD-09-131212	12/12/2013	N	SWL0078	**64.4**	-	-	2	U	-	**193**	-	-	-	-	-	0.02	U	-	0.661	U	ERL
YVD-09	YVD-09-140319	03/19/2014	N	SXC0107	**62.4**	-	-	2	U	-	**214**	-	-	-	-	-	0.1	U	-	**0.653**	J-	MSD
YVD-09	YVD-09-140603	06/03/2014	N	SXF0025	**57.1**	-	-	2	U	-	**214**	-	-	-	-	-	0.1	U	-	**0.613**	J-	MSD

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-07	YVD-07-160308	03/08/2016	N	59029711	0.25	U	-	-	-	-	-	-	-	-	-	-	**140**	-	-	**140**	-	-
YVD-07	YVD-07-160621	6/21/2016	N	59037151	0.25	U	-	-	-	-	-	-	-	-	-	-	**100**	-	-	**100**	-	-
YVD-07	YVD-07-160929	9/29/2016	N	K1611704	-	-	-	**0.020**	-	-	-	-	-	-	-	-	**113**	-	-	**113**	-	-
YVD-07	YVD-07-161213	12/13/2016	N	K1615083	-	-	-	**0.010**	J	-	-	-	-	-	-	-	**120**	-	-	**120**	-	-
YVD-07	YVD-030717-07	3/7/2017	N	K1702324	-	-	-	**0.019**	-	-	-	-	-	-	-	-	**107**	-	-	**107**	-	-
YVD-07	YVD-060517-15	6/5/2017	N	K1705754	-	-	-	**0.004**	J	-	-	-	-	-	-	-	**105**	-	-	**105**	-	-
YVD-07	YVD-092617-21	9/26/2017	N	K1710333	-	-	-	**0.022**	-	-	-	-	-	-	-	-	**116**	-	-	**116**	-	-
YVD-07	YVD-120417-11	12/4/2017	N	K1713026	-	-	-	**0.022**	-	-	-	-	-	-	-	-	**130**	-	-	**130**	-	-
YVD-07	YVD-060418-23	6/4/2018	N	874662	-	-	-	-	-	-	-	-	-	0.07	U	-	**126**	-	-	**126**	-	-
YVD-08	YVD-08-130919	09/19/2013	N	SWI0138	-	-	-	-	-	-	0.1	U	-	-	-	-	**354**	-	-	**355**	-	-
YVD-08	YVD-08-131211	12/11/2013	N	SWL0063	-	-	-	-	-	-	-	-	-	**1.46**	-	-	**259**	-	-	**260**	-	-
YVD-08	YVD-08-140317	03/17/2014	N	SXC0095	**0.13**	-	-	-	-	-	-	-	-	-	-	-	**294**	-	-	**295**	-	-
YVD-08	YVD-08-140602	06/02/2014	N	SXF0017	**2.7**	-	-	-	-	-	-	-	-	-	-	-	**279**	-	-	**280**	-	-
YVD-08	YVD-08-140923	09/23/2014	N	SXI0173	**0.35**	-	-	-	-	-	-	-	-	-	-	-	**249**	-	-	**250**	-	-
YVD-08	YVD-08-141216	12/16/2014	N	SXL0108	**0.34**	-	-	-	-	-	-	-	-	-	-	-	**264**	-	-	**265**	-	-
YVD-08	YVD-08-150317	03/17/2015	N	5904541	**0.67**	-	-	-	-	-	-	-	-	-	-	-	**230**	-	-	**230**	-	-
YVD-08	YVD-D3-150317	03/17/2015	FD	5904541	**0.49**	-	-	-	-	-	-	-	-	-	-	-	**240**	-	-	**240**	-	-
YVD-08	YVD-08-150617	06/17/2015	N	59010961	**0.53**	-	-	-	-	-	-	-	-	-	-	-	**280**	J	FDP	**280**	J	FDP
YVD-08	YVD-D3-150617	06/17/2015	FD	59010961	**0.39**	-	-	-	-	-	-	-	-	-	-	-	**220**	J	FDP	**220**	J	FDP
YVD-08	YVD-08-150924	09/24/2015	N	59020391	**0.31**	-	-	-	-	-	-	-	-	-	-	-	**260**	-	-	**260**	-	-
YVD-08	YVD-08-151215	12/15/2015	N	59025501	**0.33**	J-	MSD	-	-	-	-	-	-	-	-	-	**260**	-	-	**260**	-	-
YVD-08	YVD-D3-151215	12/15/2015	FD	59025501	**0.27**	J-	MSD	-	-	-	-	-	-	-	-	-	**250**	-	-	**250**	-	-
YVD-08	YVD-08-160310	03/10/2016	N	59029941	0.25	U	-	-	-	-	-	-	-	-	-	-	**240**	-	-	**240**	-	-
YVD-08	YVD-08-160622	6/22/2016	N	59037271	**0.31**	-	-	-	-	-	-	-	-	-	-	-	**230**	-	-	**230**	-	-
YVD-08	YVD-D3-160622	6/22/2016	FD	59037271	**0.28**	-	-	-	-	-	-	-	-	-	-	-	**230**	-	-	**230**	-	-
YVD-08	YVD-08-160927	9/27/2016	N	K1611565	-	-	-	**0.049**	-	-	-	-	-	-	-	-	**239**	-	-	**239**	-	-
YVD-08	YVD-08-161213	12/13/2016	N	K1615045	-	-	-	**0.058**	-	-	-	-	-	-	-	-	**222**	-	-	**222**	-	-
YVD-08	YVD-030917-24	3/9/2017	N	K1702448	-	-	-	**0.018**	-	-	-	-	-	-	-	-	**263**	-	-	**263**	-	-
YVD-08	YVD-060717-29	6/7/2017	N	K1705833	-	-	-	**0.025**	-	-	-	-	-	-	-	-	**236**	-	-	**236**	-	-
YVD-08	YVD-092617-19	9/26/2017	N	K1710333	-	-	-	**0.01**	-	-	-	-	-	-	-	-	**271**	-	-	**271**	-	-
YVD-08	YVD-120517-23	12/5/2017	N	K1713157	-	-	-	**0.013**	-	-	-	-	-	-	-	-	**233**	-	-	**233**	-	-
YVD-08	YVD-031918-15	3/19/2018	N	870634	-	-	-	-	-	-	-	-	-	0.07	U	-	**250**	-	-	**250**	-	-
YVD-08	YVD-060518-31	6/5/2018	N	874860	-	-	-	-	-	-	-	-	-	0.07	U	-	**238**	-	-	**238**	-	-
YVD-08	YVD-090918-04	9/9/2018	N	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	**237**	-	-	**237**	-	-
YVD-08	YVD-121118-19	12/11/2018	N	884939	-	-	-	-	-	-	-	-	-	0.07	U	-	**227**	-	-	**227**	-	-
YVD-09	YVD-09-130919	09/19/2013	N	SWI0138	-	-	-	-	-	-	0.232	R	FBK	-	-	-	**369**	-	-	**370**	-	-
YVD-09	YVD-09-131212	12/12/2013	N	SWL0078	-	-	-	-	-	-	-	-	-	**0.647**	-	-	**384**	-	-	**385**	-	-
YVD-09	YVD-09-140319	03/19/2014	N	SXC0107	**0.53**	-	-	-	-	-	-	-	-	-	-	-	**388**	-	-	**390**	-	-
YVD-09	YVD-09-140603	06/03/2014	N	SXF0025	**0.72**	-	-	-	-	-	-	-	-	-	-	-	**367**	-	-	**368**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-09	YVD-09-140924	09/24/2014	N	SXI0173	**118**	-	-	**41.7**	-	-	**8.88**	-	-	**203**	-	-	**68.2**	-	-	5	U	-
YVD-09	YVD-09-141217	12/17/2014	N	SXL0121	**130**	-	-	**56.3**	-	-	**12.90**	-	-	**187**	-	-	**85**	-	-	5	U	-
YVD-09	YVD-09-150318	03/18/2015	N	5904651	**110**	-	-	**46.0**	-	-	**9.30**	J-	MSD	**190**	-	-	**74**	-	-	5	U	-
YVD-09	YVD-09-150617	06/17/2015	N	59010961	**110**	-	-	**43.0**	-	-	**9.80**	J+	MSD	**190**	J+	MSD	**89**	-	-	5	U	-
YVD-09	YVD-09-150923	09/23/2015	N	59020391	**110**	-	-	**46.0**	-	-	**9.60**	-	-	**180**	-	-	**78**	-	-	0.5	U	-
YVD-09	YVD-09-151215	12/15/2015	N	59025501	**110**	-	-	**42.0**	-	-	**9.60**	-	-	**190**	-	-	**77**	-	-	5	U	-
YVD-09	YVD-09-160310	03/10/2016	N	59029941	**110**	-	-	**42.0**	-	-	**9.20**	-	-	**190**	-	-	**72**	-	-	5	U	-
YVD-09	YVD-09-160622	6/22/2016	N	59037271	**100**	-	-	**42.0**	-	-	**8.90**	-	-	**190**	-	-	**76**	-	-	5	U	-
YVD-09	YVD-09-160929	9/29/2016	N	K1611704	**103**	-	-	**41.2**	-	-	**7.62**	-	-	**184**	-	-	**66.7**	-	-	**0.34**	-	-
YVD-09	YVD-09-161213	12/13/2016	N	K1615045	**107**	-	-	**38.1**	-	-	**8.42**	-	-	**185**	-	-	**59.8**	-	-	**0.40**	-	-
YVD-09	YVD-D2-161213	12/13/2016	FD	K1615045	**108**	-	-	**37.1**	-	-	**8.04**	-	-	**181**	-	-	**61.4**	-	-	**0.40**	-	-
YVD-09	YVD-031317-35	3/13/2017	N	K1702489	**108**	-	-	**39.2**	-	-	**7.78**	-	-	**185**	-	-	**63.9**	-	-	**0.37**	-	-
YVD-09	YVD-060517-08	6/5/2017	N	K1705702	**110**	-	-	**39.4**	-	-	**6.98**	-	-	**163**	-	-	**62.6**	-	-	**0.39**	-	-
YVD-09	YVD-092617-29	9/26/2017	N	K1710381	**109**	-	-	**37.2**	-	-	**8.07**	-	-	**175**	-	-	**61.0**	-	-	**0.38**	-	-
YVD-09	YVD-092617-30	9/26/2017	FD	K1710381	**109**	-	-	**37.4**	-	-	**8.11**	-	-	**176**	-	-	**61.1**	-	-	**0.38**	-	-
YVD-09	YVD-120517-21	12/5/2017	N	K1713091	**108**	-	-	**35.9**	-	-	**7.27**	-	-	**174**	-	-	**63.0**	-	-	**0.38**	-	-
YVD-09	YVD-031918-18	3/19/2018	N	870634	**108**	-	-	**35.90**	-	-	**7.80**	-	-	**166**	-	-	**69.2**	-	-	**0.34**	-	-
YVD-09	YVD-060318-13	6/3/2018	N	874568	**107**	-	-	**37.75**	-	-	**8.35**	-	-	**182**	-	-	**63.4**	-	-	**0.36**	-	-
YVD-09	YVD-090918-06	9/9/2018	N	880601	**108**	-	-	**35.90**	-	-	**8.10**	-	-	**174**	-	-	**71.0**	-	-	**0.35**	-	-
YVD-09	YVD-121118-15	12/11/2018	N	884939	**102**	-	-	**34.25**	-	-	**8.60**	-	-	**172**	-	-	**65.6**	-	-	**0.34**	-	-
YVD-09 (FD)	YVD-121118-17	12/11/2018	FD	884939	**103**	-	-	**34.55**	-	-	**8.75**	-	-	**175**	-	-	**68.0**	-	-	**0.33**	-	-
YVD-10	YVD-10-130917	09/17/2013	N	SWI0123	**216**	-	-	**51.8**	-	-	**3.28**	-	-	**104**	-	-	**95.4**	-	-	5	U	-
YVD-10	YVD-10-131212	12/12/2013	N	SWL0078	**202**	-	-	**55.6**	-	-	**4.49**	-	-	**102**	-	-	**91.4**	-	-	5	U	-
YVD-10	YVD-10-140319	03/19/2014	N	SXC0107	**218**	-	-	**54.0**	-	-	**3.93**	-	-	**96.8**	-	-	**86.8**	-	-	5	U	-
YVD-10	YVD-10-140603	06/03/2014	N	SXF0025	**232**	-	-	**58.6**	-	-	**4.07**	-	-	**103**	-	-	**94.3**	-	-	5	U	-
YVD-10	YVD-10-140924	09/24/2014	N	SXI0173	**276**	-	-	**65.8**	-	-	**3.86**	-	-	**116**	-	-	**115**	-	-	5	U	-
YVD-10	YVD-10-141217	12/17/2014	N	SXL0144	**248**	-	-	**60.4**	-	-	**3.88**	-	-	**110**	-	-	**97.9**	-	-	5	U	-
YVD-10	YVD-10-150318	03/18/2015	N	5904651	**400**	-	-	**92.0**	-	-	**4.00**	J-	MSD	**130**	-	-	**180**	-	-	5	U	-
YVD-10	YVD-10-150617	06/17/2015	N	59010961	**390**	-	-	**95.0**	-	-	**4.60**	J+	MSD	**130**	J+	MSD	**39**	-	-	5	U	-
YVD-10	YVD-10-150923	09/23/2015	N	59020391	**330**	-	-	**89.0**	-	-	**4.30**	-	-	**120**	-	-	**160**	-	-	5	U	-
YVD-10	YVD-10-151214	12/14/2015	N	59025351	**350**	-	-	**84.0**	-	-	**4.30**	-	-	**120**	-	-	**150**	-	-	5	U	-
YVD-10	YVD-10-160309	03/09/2016	N	59029711	**310**	-	-	**73.0**	-	-	**4.10**	-	-	**120**	-	-	**140**	-	-	5	U	-
YVD-10	YVD-10-160621	6/21/2016	N	59037271	**270**	-	-	**73.0**	-	-	**4.50**	-	-	**110**	-	-	**120**	-	-	5	U	-
YVD-10	YVD-10-160929	9/29/2016	N	K1611698	**286**	-	-	**63.1**	-	-	**2.48**	-	-	**114**	-	-	**105**	-	-	0.2	U	MBK
YVD-10	YVD-10-161212	12/12/2016	N	K1615029	**303**	-	-	**66.9**	-	-	**2.68**	-	-	**118**	-	-	**141**	-	-	**0.10**	J	-
YVD-10	YVD-030917-27	3/9/2017	N	K1702448	**569**	-	-	**128**	-	-	**2.89**	-	-	**133**	-	-	**173**	-	-	**0.09**	J	-
YVD-10	YVD-060617-22	6/6/2017	N	K1705754	**349**	-	-	**76.7**	-	-	**2.57**	-	-	**119**	-	-	**125**	-	-	**0.14**	J	-
YVD-10	YVD-092617-31	9/26/2017	N	K1710381	**316**	-	-	**66.7**	-	-	**2.56**	-	-	**111**	-	-	**113**	-	-	**0.09**	J	-
YVD-10	YVD-120517-30	12/5/2017	N	K1713091	**327**	-	-	**67.3**	-	-	**2.37**	-	-	**114**	-	-	**128**	-	-	**0.11**	J	-
YVD-10	YVD-031818-06	3/18/2018	N	870610	**296**	-	-	**61.00**	-	-	**2.60**	-	-	**123**	-	-	**121**	-	-	0.10	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-09	YVD-09-140924	09/24/2014	N	SXI0173	**48**	-	-	2	U	-	**166**	-	-	-	-	-	0.1	U	-	**0.502**	J+	MSD
YVD-09	YVD-09-141217	12/17/2014	N	SXL0121	**53.9**	-	-	2	U	-	**223**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-09	YVD-09-150318	03/18/2015	N	5904651	**47**	-	-	2	U	-	**190**	-	-	-	-	-	**0.14**	-	-	0.25	UJ	MSD
YVD-09	YVD-09-150617	06/17/2015	N	59010961	**54**	-	-	2	U	-	**230**	-	-	-	-	-	**0.14**	-	-	**0.37**	J-	MSD
YVD-09	YVD-09-150923	09/23/2015	N	59020391	**56**	J+	MSD	0.2	U	-	**270**	J-	MSD	-	-	-	**0.21**	J	MSD	**0.26**	J-	MSD
YVD-09	YVD-09-151215	12/15/2015	N	59025501	**52**	-	-	2	U	-	**250**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD
YVD-09	YVD-09-160310	03/10/2016	N	59029941	**48**	-	-	2	U	-	**250**	J	DUP	-	-	-	**0.12**	-	-	0.25	UJ	FDP, MSD
YVD-09	YVD-09-160622	6/22/2016	N	59037271	**49**	-	-	2	U	-	**260**	-	-	-	-	-	0.1	UJ	MSD	0.25	R	MSD
YVD-09	YVD-09-160929	9/29/2016	N	K1611704	**43.2**	-	-	0.10	U	-	**243**	-	-	-	-	-	0.050	U	MBK	0.5	U	-
YVD-09	YVD-09-161213	12/13/2016	N	K1615045	**42.8**	J	HTQ	0.10	U	-	**238**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-09	YVD-D2-161213	12/13/2016	FD	K1615045	**43.3**	J	HTQ	0.10	U	-	**240**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-09	YVD-031317-35	3/13/2017	N	K1702489	**44.3**	-	-	**0.04**	J	-	**225**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-09	YVD-060517-08	6/5/2017	N	K1705702	**44.6**	-	-	0.10	U	-	**237**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-09	YVD-092617-29	9/26/2017	N	K1710381	**44.1**	J	HTQ	0.10	U	-	**223**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-09	YVD-092617-30	9/26/2017	FD	K1710381	**44.1**	J	HTQ	0.10	U	-	**224**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-09	YVD-120517-21	12/5/2017	N	K1713091	**46.9**	-	-	0.10	U	-	**211**	-	-	-	-	-	0.050	U	-	0.5	UJ	MSD
YVD-09	YVD-031918-18	3/19/2018	N	870634	**48.5**	-	-	0.05	U	-	**180**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-09	YVD-060318-13	6/3/2018	N	874568	**50.6**	-	-	0.05	U	-	**182**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-09	YVD-090918-06	9/9/2018	N	880601	**51.4**	-	-	0.05	U	-	**172**	-	-	0.07	U	-	-	-	-	0.5	R	MSD
YVD-09	YVD-121118-15	12/11/2018	N	884939	**52.8**	-	-	0.05	U	-	**166**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-09 (FD)	YVD-121118-17	12/11/2018	FD	884939	**54.6**	-	-	0.05	U	-	**170**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-10	YVD-10-130917	09/17/2013	N	SWI0123	**95**		-	2	U	-	**199**	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-10	YVD-10-131212	12/12/2013	N	SWL0078	**86.9**	-	-	2	U	-	**174**	-	-	-	-	-	0.02	U	-	0.6495	U	ERL
YVD-10	YVD-10-140319	03/19/2014	N	SXC0107	**77.6**	-	-	2	U	-	**163**	-	-	-	-	-	**0.109**	-	-	**0.507**	J-	MSD
YVD-10	YVD-10-140603	06/03/2014	N	SXF0025	**86.1**	-	-	2	U	-	**188**	-	-	-	-	-	**0.105**	-	-	**0.577**	J-	MSD
YVD-10	YVD-10-140924	09/24/2014	N	SXI0173	**97.2**	-	-	2	U	-	**217**	-	-	-	-	-	0.1	U	-	**0.443**	J+	MSD
YVD-10	YVD-10-141217	12/17/2014	N	SXL0144	**78.7**	-	-	2	U	-	**180**	-	-	-	-	-	0.5	U	-	0.25	R	MSD
YVD-10	YVD-10-150318	03/18/2015	N	5904651	**120**	-	-	2	U	-	**370**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-10	YVD-10-150617	06/17/2015	N	59010961	**20**	-	-	2	U	-	**110**	-	-	-	-	-	**0.12**	-	-	**0.44**	J-	MSD
YVD-10	YVD-10-150923	09/23/2015	N	59020391	**120**	J+	MSD	2	U	-	**370**	J-	MSD	-	-	-	**0.72**	J	MSD	0.25	UJ	MSD
YVD-10	YVD-10-151214	12/14/2015	N	59025351	**120**	-	-	2	U	-	**360**	-	-	-	-	-	0.1	R	MSD	0.25	UJ	MSD
YVD-10	YVD-10-160309	03/09/2016	N	59029711	**98**	-	-	2	U	-	**280**	J+	MSD	-	-	-	0.1	UJ	FDP	0.25	R	MSD
YVD-10	YVD-10-160621	6/21/2016	N	59037271	**96**	-	-	2	U	-	**240**	-	-	-	-	-	**0.11**	J-	MSD	0.25	R	MSD
YVD-10	YVD-10-160929	9/29/2016	N	K1611698	**84**	-	-	0.10	U	-	**223**	-	-	-	-	-	0.050	U	MBK	0.5	R	MSD
YVD-10	YVD-10-161212	12/12/2016	N	K1615029	**109**	J	HTQ	0.10	U	-	**191**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-10	YVD-030917-27	3/9/2017	N	K1702448	**123**	J	HTQ	0.10	U	-	**799**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-10	YVD-060617-22	6/6/2017	N	K1705754	**99.4**	-	-	0.10	U	-	**368**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-10	YVD-092617-31	9/26/2017	N	K1710381	**93.9**	J	HTQ	0.10	U	-	**265**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-10	YVD-120517-30	12/5/2017	N	K1713091	**109**	J	HTQ	0.10	U	-	**224**	-	-	-	-	-	0.050	U	-	0.5	UJ	MSD
YVD-10	YVD-031818-06	3/18/2018	N	870610	**91.4**	-	-	0.05	U	-	**202**	-	-	0.07	U	-	-	-	-	0.5	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-09	YVD-09-140924	09/24/2014	N	SXI0173	**0.32**	J+	FBK	-	-	-	-	-	-	-	-	-	**359**	-	-	**360**	-	-
YVD-09	YVD-09-141217	12/17/2014	N	SXL0121	**1.3**	-	-	-	-	-	-	-	-	-	-	-	**359**	-	-	**360**	-	-
YVD-09	YVD-09-150318	03/18/2015	N	5904651	**0.38**	-	-	-	-	-	-	-	-	-	-	-	**350**	-	-	**350**	-	-
YVD-09	YVD-09-150617	06/17/2015	N	59010961	**0.36**	-	-	-	-	-	-	-	-	-	-	-	**350**	-	-	**350**	-	-
YVD-09	YVD-09-150923	09/23/2015	N	59020391	**0.27**	-	-	-	-	-	-	-	-	-	-	-	**330**	-	-	**330**	-	-
YVD-09	YVD-09-151215	12/15/2015	N	59025501	**0.25**	J-	MSD	-	-	-	-	-	-	-	-	-	**340**	-	-	**340**	-	-
YVD-09	YVD-09-160310	03/10/2016	N	59029941	**0.33**	-	-	-	-	-	-	-	-	-	-	-	**360**	-	-	**360**	-	-
YVD-09	YVD-09-160622	6/22/2016	N	59037271	**0.29**	-	-	-	-	-	-	-	-	-	-	-	**350**	-	-	**350**	-	-
YVD-09	YVD-09-160929	9/29/2016	N	K1611704	-	-	-	**0.016**	-	-	-	-	-	-	-	-	**347**	-	-	**347**	-	-
YVD-09	YVD-09-161213	12/13/2016	N	K1615045	-	-	-	**0.048**	-	-	-	-	-	-	-	-	**340**	-	-	**340**	-	-
YVD-09	YVD-D2-161213	12/13/2016	FD	K1615045	-	-	-	**0.078**	-	-	-	-	-	-	-	-	**340**	-	-	**340**	-	-
YVD-09	YVD-031317-35	3/13/2017	N	K1702489	-	-	-	**0.025**	-	-	-	-	-	-	-	-	**329**	-	-	**329**	-	-
YVD-09	YVD-060517-08	6/5/2017	N	K1705702	-	-	-	**0.007**	J	-	-	-	-	-	-	-	**341**	-	-	**341**	-	-
YVD-09	YVD-092617-29	9/26/2017	N	K1710381	-	-	-	**0.029**	-	-	-	-	-	-	-	-	**351**	-	-	**351**	-	-
YVD-09	YVD-092617-30	9/26/2017	FD	K1710381	-	-	-	**0.039**	-	-	-	-	-	-	-	-	**415**	-	-	**415**	-	-
YVD-09	YVD-120517-21	12/5/2017	N	K1713091	-	-	-	**0.009**	J	-	-	-	-	-	-	-	**351**	-	-	**351**	-	-
YVD-09	YVD-031918-18	3/19/2018	N	870634	-	-	-	-	-	-	-	-	-	0.07	U	-	**350**	-	-	**350**	-	-
YVD-09	YVD-060318-13	6/3/2018	N	874568	-	-	-	-	-	-	-	-	-	0.07	U	-	**348**	-	-	**348**	-	-
YVD-09	YVD-090918-06	9/9/2018	N	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	**354**	-	-	**354**	-	-
YVD-09	YVD-121118-15	12/11/2018	N	884939	-	-	-	-	-	-	-	-	-	0.07	U	-	**358**	-	-	**358**	-	-
YVD-09 (FD)	YVD-121118-17	12/11/2018	FD	884939	-	-	-	-	-	-	-	-	-	0.07	U	-	**357**	-	-	**357**	-	-
YVD-10	YVD-10-130917	09/17/2013	N	SWI0123	-	-	-	-	-	-	**0.148**	-	-	-	-	-	**464**	-	-	**465**	-	-
YVD-10	YVD-10-131212	12/12/2013	N	SWL0078	-	-	-	-	-	-	-	-	-	**1.4**	-	-	**459**	-	-	**460**	-	-
YVD-10	YVD-10-140319	03/19/2014	N	SXC0107	**0.77**	-	-	-	-	-	-	-	-	-	-	-	**489**	-	-	**490**	-	-
YVD-10	YVD-10-140603	06/03/2014	N	SXF0025	**0.8**	-	-	-	-	-	-	-	-	-	-	-	**487**	-	-	**488**	-	-
YVD-10	YVD-10-140924	09/24/2014	N	SXI0173	**0.48**	J+	FBK	-	-	-	-	-	-	-	-	-	**523**	-	-	**525**	-	-
YVD-10	YVD-10-141217	12/17/2014	N	SXL0144	**0.69**	J-	MSD	-	-	-	-	-	-	-	-	-	**503**	-	-	**505**	-	-
YVD-10	YVD-10-150318	03/18/2015	N	5904651	**0.42**	-	-	-	-	-	-	-	-	-	-	-	**590**	-	-	**590**	-	-
YVD-10	YVD-10-150617	06/17/2015	N	59010961	**0.72**	-	-	-	-	-	-	-	-	-	-	-	**600**	-	-	**600**	-	-
YVD-10	YVD-10-150923	09/23/2015	N	59020391	**0.56**	-	-	-	-	-	-	-	-	-	-	-	**620**	-	-	**620**	-	-
YVD-10	YVD-10-151214	12/14/2015	N	59025351	**0.58**	-	-	-	-	-	-	-	-	-	-	-	**600**	-	-	**600**	-	-
YVD-10	YVD-10-160309	03/09/2016	N	59029711	**0.42**	-	-	-	-	-	-	-	-	-	-	-	**520**	-	-	**520**	-	-
YVD-10	YVD-10-160621	6/21/2016	N	59037271	**0.71**	-	-	-	-	-	-	-	-	-	-	-	**510**	-	-	**510**	-	-
YVD-10	YVD-10-160929	9/29/2016	N	K1611698	-	-	-	**0.028**	-	-	-	-	-	-	-	-	**513**	-	-	**513**	-	-
YVD-10	YVD-10-161212	12/12/2016	N	K1615029	-	-	-	**0.074**	-	-	-	-	-	-	-	-	**524**	-	-	**524**	-	-
YVD-10	YVD-030917-27	3/9/2017	N	K1702448	-	-	-	**0.066**	-	-	-	-	-	-	-	-	**637**	-	-	**637**	-	-
YVD-10	YVD-060617-22	6/6/2017	N	K1705754	-	-	-	**0.036**	-	-	-	-	-	-	-	-	**525**	-	-	**525**	-	-
YVD-10	YVD-092617-31	9/26/2017	N	K1710381	-	-	-	**0.011**	-	-	-	-	-	-	-	-	**523**	-	-	**523**	-	-
YVD-10	YVD-120517-30	12/5/2017	N	K1713091	-	-	-	**0.023**	-	-	-	-	-	-	-	-	**540**	-	-	**540**	-	-
YVD-10	YVD-031818-06	3/18/2018	N	870610	-	-	-	-	-	-	-	-	-	0.07	U	-	**527**	-	-	**527**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-10	YVD-060318-06	6/3/2018	N	874568	**298**	-	-	**65.00**	-	-	**2.93**	-	-	**118**	-	-	**122**	-	-	0.10	U	-
YVD-10	YVD-090918-13	9/9/2018	N	880601	**308**	-	-	**63.50**	-	-	**2.58**	-	-	**114**	-	-	**128**	-	-	**0.10**	-	-
YVD-10	YVD-121018-08	12/10/2018	N	884857	**274**	-	-	**58.00**	J	MSD	**2.64**	-	-	**112**	-	-	**124**	-	-	0.10	U	FBK
YVD-11	YVD-11-130923	09/23/2013	N	SWI0178	**183**	-	-	**51.9**	-	-	**5.44**	J	FDP	**23.2**	-	-	-	-	-	-	-	-
YVD-11	YVD-D2-130923	09/23/2013	FD	SWI0178	**175**	-	-	**46.0**	-	-	**3.60**	J	FDP	**23.0**	-	-	-	-	-	-	-	-
YVD-11	YVD-11-130926	09/26/2013	N	SWI0190	-	-	-	-	-	-	-	-	-	-	-	-	**54.7**	-	-	5	U	-
YVD-11	YVD-D3-130926	09/26/2013	FD	SWI0190	-	-	-	-	-	-	-	-	-	-	-	-	**61.4**	-	-	5	U	-
YVD-11	YVD-11-131212	12/12/2013	N	SWL0073	**171**	-	-	**43.4**	-	-	**3.37**	-	-	**23.2**	-	-	**58.7**	-	-	5	U	-
YVD-11	YVD-11-140318	03/18/2014	N	SXC0107	**183**	-	-	**44.4**	-	-	**3.15**	-	-	**22.2**	-	-	**61.6**	-	-	5	U	-
YVD-11	YVD-11-140603	06/03/2014	N	SXF0017	**176**	-	-	**50.3**	-	-	**5.38**	-	-	**26.1**	-	-	**67.2**	-	-	5	U	-
YVD-11	YVD-11-140924	09/24/2014	N	SXI0173	**193**	-	-	**47.9**	-	-	**3.86**	-	-	**25.6**	-	-	**67.2**	-	-	2.5	U	-
YVD-11	YVD-11-141217	12/17/2014	N	SXL0121	**198**	-	-	**53.6**	-	-	**4.77**	-	-	**25.6**	-	-	**72.1**	-	-	5	U	-
YVD-11	YVD-11-150317	03/17/2015	N	5904651	**190**	-	-	**51.0**	-	-	**4.30**	J-	MSD	**26.0**	-	-	**76**	-	-	5	U	-
YVD-11	YVD-11-150616	06/16/2015	N	59010961	**200**	-	-	**50.0**	-	-	**3.20**	J+	MSD	**27.0**	J+	MSD	**86**	-	-	5	U	-
YVD-11	YVD-11-150923	09/23/2015	N	59020281	**200**	-	-	**55.0**	-	-	**3.40**	-	-	**25.0**	-	-	**90**	-	-	5	U	-
YVD-11	YVD-11-151215	12/15/2015	N	59025431	**210**	-	-	**60.0**	-	-	**5.20**	-	-	**25.0**	-	-	**100**	-	-	5	U	-
YVD-11	YVD-D2-151215	12/15/2015	FD	59025431	**210**	-	-	**58.0**	-	-	**4.90**	-	-	**25.0**	-	-	**98**	-	-	0.5	U	-
YVD-11	YVD-11-160309	03/09/2016	N	59029711	**200**	-	-	**53.0**	-	-	**3.30**	-	-	**25.0**	-	-	**99**	-	-	5	U	-
YVD-11	YVD-11-160621	6/21/2016	N	59037151	**200**	-	-	**56.0**	-	-	**3.50**	-	-	**27.0**	-	-	**120**	-	-	5	U	-
YVD-11	YVD-11-160927	9/27/2016	N	K1611629	**204**	-	-	**52.6**	-	-	**3.13**	-	-	**26.1**	-	-	**82.0**	-	-	**0.18**	J	-
YVD-11	YVD-11-161214	12/14/2016	N	K1615126	**209**	-	-	**57.8**	-	-	**4.82**	-	-	**25.6**	-	-	**82.5**	-	-	**0.19**	J	-
YVD-11	YVD-031317-37	3/13/2017	N	K1702489	**235**	-	-	**62.1**	-	-	**3.02**	-	-	**25.5**	-	-	**102**	-	-	**0.21**	-	-
YVD-11	YVD-060517-10	6/5/2017	N	K1705702	**271**	-	-	**69.1**	-	-	**2.98**	-	-	**24.9**	-	-	**129**	-	-	**0.18**	J	-
YVD-11	YVD-092617-26	9/26/2017	N	K1710381	**276**	-	-	**68.6**	-	-	**3.24**	-	-	**28.8**	-	-	**135**	-	-	**0.17**	J	-
YVD-11	YVD-120417-06	12/4/2017	N	K1713026	**248**	-	-	**58.6**	-	-	**2.78**	-	-	**25.8**	-	-	**110**	-	-	**0.16**	J	-
YVD-11	YVD-031918-12	3/19/2018	N	870634	**223**	-	-	**51.50**	-	-	**2.98**	-	-	**26.0**	-	-	**91.4**	-	-	**0.11**	-	-
YVD-11	YVD-031918-14	3/19/2018	FD	870634	**222**	-	-	**50.50**	-	-	**2.94**	-	-	**25.8**	-	-	**89.1**	-	-	**0.12**	-	-
YVD-11	YVD-060418-14	6/4/2018	N	874662	**224**	-	-	**57.00**	-	-	**3.26**	-	-	**28.4**	-	-	**114**	-	-	**0.12**	-	-
YVD-11	YVD-060418-16	6/4/2018	FD	874662	**231**	-	-	**57.50**	-	-	**3.28**	-	-	**28.9**	-	-	**114**	-	-	**0.12**	-	-
YVD-11	YVD-090918-05	9/9/2018	N	880601	**223**	-	-	**53.00**	-	-	**3.05**	-	-	**28.2**	-	-	**102**	-	-	**0.20**	-	-
YVD-11	YVD-121018-10	12/10/2018	N	884857	**182**	-	-	**44.90**	J	MSD	**2.88**	-	-	**27.4**	-	-	**75.6**	-	-	0.14	U	FBK
YVD-12	YVD-12-130919	09/19/2013	N	SWI0142	**98.6**	-	-	**37.5**	-	-	**3.14**	-	-	**77.3**	-	-	**98.2**	-	-	5	U	-
YVD-12	YVD-12-130925	09/25/2013	N	SWI0175	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
YVD-12	YVD-12-131211	12/11/2013	N	SWL0073	**93.5**	-	-	**36.2**	-	-	**3.63**	-	-	**73.2**	-	-	**97**	-	-	5	U	-
YVD-12	YVD-12-140318	03/18/2014	N	SXC0095	**92.9**	-	-	**35.9**	-	-	**3.27**	-	-	**73.4**	-	-	**95.2**	-	-	5	U	-
YVD-12	YVD-12-140603	06/03/2014	N	SXF0017	**92.6**	-	-	**34.9**	-	-	**2.96**	-	-	**70.7**	-	-	**8.33**	-	-	0.5	U	-
YVD-12	YVD-12-140922	09/22/2014	N	SXI0148	**98.4**	-	-	**39.1**	-	-	**3.13**	-	-	**77.9**	-	-	**78.5**	-	-	5	U	-
YVD-12	YVD-D2-140922	09/22/2014	FD	SXI0148	**99.3**	-	-	**39.0**	-	-	**3.00**	-	-	**77.8**	-	-	**82.4**	-	-	2	U	-
YVD-12	YVD-12-141216	12/16/2014	N	SXL0121	**99.3**	-	-	**39.6**	-	-	**3.23**	-	-	**71.8**	-	-	**84.1**	-	-	5	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-10	YVD-060318-06	6/3/2018	N	874568	**92.0**	-	-	0.05	U	-	**208**	-	-	0.08	U	FBK	-	-	-	0.5	U	-
YVD-10	YVD-090918-13	9/9/2018	N	880601	**90.0**	-	-	0.05	U	-	**238**	-	-	0.07	U	-	-	-	-	0.5	R	MSD
YVD-10	YVD-121018-08	12/10/2018	N	884857	**87.0**	-	-	0.05	U	-	**196**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-11	YVD-11-130923	09/23/2013	N	SWI0178	-	-	-	-	-	-	-	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-11	YVD-D2-130923	09/23/2013	FD	SWI0178	-	-	-	-	-	-	-	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-11	YVD-11-130926	09/26/2013	N	SWI0190	**38.4**	-	-	2	U	-	**207**	-	-	-	-	-	-	-	-	-	-	-
YVD-11	YVD-D3-130926	09/26/2013	FD	SWI0190	**46.2**	-	-	2	U	-	**228**	-	-	-	-	-	-	-	-	-	-	-
YVD-11	YVD-11-131212	12/12/2013	N	SWL0073	**49.9**	-	-	2	U	-	**208**	-	-	-	-	-	0.02	UJ	MSD	0.2	UJ	MSD
YVD-11	YVD-11-140318	03/18/2014	N	SXC0107	**43.7**	-	-	2	U	-	**193**	-	-	-	-	-	0.1	U	-	**0.503**	J-	MSD
YVD-11	YVD-11-140603	06/03/2014	N	SXF0017	**49.1**	-	-	2	U	-	**203**	J-	MSD	-	-	-	0.1	U	-	**0.564**	-	-
YVD-11	YVD-11-140924	09/24/2014	N	SXI0173	**46.6**	-	-	1	U	-	**159**	-	-	-	-	-	0.1	U	-	**0.453**	J+	MSD
YVD-11	YVD-11-141217	12/17/2014	N	SXL0121	**49.1**	-	-	2	U	-	**158**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-11	YVD-11-150317	03/17/2015	N	5904651	**52**	-	-	2	U	-	**150**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-11	YVD-11-150616	06/16/2015	N	59010961	**56**	-	-	2	U	-	**140**	-	-	-	-	-	0.1	U	-	**0.31**	J-	MSD
YVD-11	YVD-11-150923	09/23/2015	N	59020281	**66**	-	-	2	U	-	**130**	-	-	-	-	-	**0.12**	-	-	0.25	R	MSD
YVD-11	YVD-11-151215	12/15/2015	N	59025431	**74**	-	-	2	U	-	**140**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD
YVD-11	YVD-D2-151215	12/15/2015	FD	59025431	**70**	-	-	0.2	U	-	**130**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD
YVD-11	YVD-11-160309	03/09/2016	N	59029711	**65**	-	-	2	U	-	**140**	J+	MSD	-	-	-	**0.14**	J	FDP	0.25	R	MSD
YVD-11	YVD-11-160621	6/21/2016	N	59037151	**71**	-	-	2	U	-	**130**	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-11	YVD-11-160927	9/27/2016	N	K1611629	**48.9**	J	HTQ	0.10	U	-	**100**	-	-	-	-	-	0.050	U	MBK	0.5	U	-
YVD-11	YVD-11-161214	12/14/2016	N	K1615126	**55.5**	-	-	0.10	U	-	**104**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-11	YVD-031317-37	3/13/2017	N	K1702489	**77.3**	-	-	**0.06**	J	-	**99.8**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-11	YVD-060517-10	6/5/2017	N	K1705702	**97.1**	-	-	0.10	U	-	**133**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-11	YVD-092617-26	9/26/2017	N	K1710381	**103**	J	HTQ	0.10	UJ	HTQ	**219**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-11	YVD-120417-06	12/4/2017	N	K1713026	**84.8**	-	-	0.10	U	-	**124**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-11	YVD-031918-12	3/19/2018	N	870634	**61.8**	-	-	0.05	U	-	**103**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-11	YVD-031918-14	3/19/2018	FD	870634	**61.2**	-	-	0.05	U	-	**100**	-	-	0.07	U	-	-	-	-	-	-	-
YVD-11	YVD-060418-14	6/4/2018	N	874662	**68.6**	-	-	0.05	U	-	**91.2**	-	-	0.34	U	FBK	-	-	-	0.5	UJ	MSD
YVD-11	YVD-060418-16	6/4/2018	FD	874662	**68.2**	-	-	0.05	U	-	**90.0**	-	-	0.08	U	FBK	-	-	-	**0.6**	J	MSD
YVD-11	YVD-090918-05	9/9/2018	N	880601	**62.8**	-	-	0.05	U	-	**90.6**	-	-	0.07	U	-	-	-	-	0.5	R	MSD
YVD-11	YVD-121018-10	12/10/2018	N	884857	**41.1**	-	-	0.05	U	-	**75.4**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-12	YVD-12-130919	09/19/2013	N	SWI0142	-	-	-	-	-	-	**245**	-	-	-	-	-	0.1	U	-	0.608	R	FBK
YVD-12	YVD-12-130925	09/25/2013	N	SWI0175	**15**	-	-	2	U	-	-	-	-	-	-	-	-	-	-	-	-	-
YVD-12	YVD-12-131211	12/11/2013	N	SWL0073	**20.1**	-	-	2	U	-	**262**	-	-	-	-	-	0.02	UJ	MSD	0.23	R	MSD, FBK
YVD-12	YVD-12-140318	03/18/2014	N	SXC0095	**17**	-	-	2	U	-	**236**	J-	MSD	-	-	-	**0.248**	-	-	**0.564**	-	-
YVD-12	YVD-12-140603	06/03/2014	N	SXF0017	**1.44**	-	-	0.2	U	-	**21.3**	J-	MSD	-	-	-	0.1	U	-	**0.415**	-	-
YVD-12	YVD-12-140922	09/22/2014	N	SXI0148	**13.3**	-	-	2	U	-	**200**	-	-	-	-	-	0.1	U	-	**0.669**	-	-
YVD-12	YVD-D2-140922	09/22/2014	FD	SXI0148	**15.5**	-	-	0.8	U	-	**200**	-	-	-	-	-	0.1	U	-	**0.653**	-	-
YVD-12	YVD-12-141216	12/16/2014	N	SXL0121	**15.1**	-	-	2	U	-	**228**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-10	YVD-060318-06	6/3/2018	N	874568	-	-	-	-	-	-	-	-	-	0.07	U	-	**543**	-	-	**543**	-	-
YVD-10	YVD-090918-13	9/9/2018	N	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	**557**	-	-	**557**	-	-
YVD-10	YVD-121018-08	12/10/2018	N	884857	-	-	-	-	-	-	-	-	-	0.07	U	-	**544**	-	-	**544**	-	-
YVD-11	YVD-11-130923	09/23/2013	N	SWI0178	-	-	-	-	-	-	0.1	UJ	FDP	-	-	-	**254**	J	FDP	**255**	J	FDP
YVD-11	YVD-D2-130923	09/23/2013	FD	SWI0178	-	-	-	-	-	-	**0.753**	J	FDP	-	-	-	**199**	J	FDP	**200**	J	FDP
YVD-11	YVD-11-130926	09/26/2013	N	SWI0190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
YVD-11	YVD-D3-130926	09/26/2013	FD	SWI0190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
YVD-11	YVD-11-131212	12/12/2013	N	SWL0073	-	-	-	-	-	-	-	-	-	**0.245**	-	-	**294**	-	-	**295**	-	-
YVD-11	YVD-11-140318	03/18/2014	N	SXC0107	**0.17**	-	-	-	-	-	-	-	-	-	-	-	**324**	-	-	**325**	-	-
YVD-11	YVD-11-140603	06/03/2014	N	SXF0017	**0.84**	-	-	-	-	-	-	-	-	-	-	-	**312**	-	-	**313**	-	-
YVD-11	YVD-11-140924	09/24/2014	N	SXI0173	**0.17**	J+	FBK	-	-	-	-	-	-	-	-	-	**294**	-	-	**295**	-	-
YVD-11	YVD-11-141217	12/17/2014	N	SXL0121	**0.46**	-	-	-	-	-	-	-	-	-	-	-	**289**	-	-	**290**	-	-
YVD-11	YVD-11-150317	03/17/2015	N	5904651	**0.3**	-	-	-	-	-	-	-	-	-	-	-	**290**	-	-	**290**	-	-
YVD-11	YVD-11-150616	06/16/2015	N	59010961	0.25	U	-	-	-	-	-	-	-	-	-	-	**290**	-	-	**290**	-	-
YVD-11	YVD-11-150923	09/23/2015	N	59020281	0.25	U	-	-	-	-	-	-	-	-	-	-	**310**	-	-	**310**	-	-
YVD-11	YVD-11-151215	12/15/2015	N	59025431	**0.59**	J	FDP	-	-	-	-	-	-	-	-	-	**110**	J	FDP	**110**	J	FDP
YVD-11	YVD-D2-151215	12/15/2015	FD	59025431	**1.5**	J	FDP	-	-	-	-	-	-	-	-	-	**360**	J	FDP	**360**	J	FDP
YVD-11	YVD-11-160309	03/09/2016	N	59029711	0.25	U	-	-	-	-	-	-	-	-	-	-	**340**	-	-	**340**	-	-
YVD-11	YVD-11-160621	6/21/2016	N	59037151	0.25	U	-	-	-	-	-	-	-	-	-	-	**340**	-	-	**340**	-	-
YVD-11	YVD-11-160927	9/27/2016	N	K1611629	-	-	-	**0.071**	-	-	-	-	-	-	-	-	**375**	-	-	**375**	-	-
YVD-11	YVD-11-161214	12/14/2016	N	K1615126	-	-	-	**0.421**	-	-	-	-	-	-	-	-	**352**	-	-	**352**	-	-
YVD-11	YVD-031317-37	3/13/2017	N	K1702489	-	-	-	**0.016**	-	-	-	-	-	-	-	-	**353**	-	-	**353**	-	-
YVD-11	YVD-060517-10	6/5/2017	N	K1705702	-	-	-	**0.029**	-	-	-	-	-	-	-	-	**341**	-	-	**341**	-	-
YVD-11	YVD-092617-26	9/26/2017	N	K1710381	-	-	-	**0.006**	J	-	-	-	-	-	-	-	**347**	-	-	**347**	-	-
YVD-11	YVD-120417-06	12/4/2017	N	K1713026	-	-	-	0.015	U	MBK	-	-	-	-	-	-	**361**	-	-	**361**	-	-
YVD-11	YVD-031918-12	3/19/2018	N	870634	-	-	-	-	-	-	-	-	-	0.07	U	-	**386**	-	-	**386**	-	-
YVD-11	YVD-031918-14	3/19/2018	FD	870634	-	-	-	-	-	-	-	-	-	0.07	U	-	**387**	-	-	**387**	-	-
YVD-11	YVD-060418-14	6/4/2018	N	874662	-	-	-	-	-	-	-	-	-	0.07	U	-	**377**	-	-	**377**	-	-
YVD-11	YVD-060418-16	6/4/2018	FD	874662	-	-	-	-	-	-	-	-	-	0.07	U	-	**380**	-	-	**380**	-	-
YVD-11	YVD-090918-05	9/9/2018	N	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	**395**	-	-	**395**	-	-
YVD-11	YVD-121018-10	12/10/2018	N	884857	-	-	-	-	-	-	-	-	-	0.07	U	-	**410**	-	-	**410**	-	-
YVD-12	YVD-12-130919	09/19/2013	N	SWI0142	-	-	-	-	-	-	**0.356**	J+	FBK	-	-	-	**204**	-	-	**205**	-	-
YVD-12	YVD-12-130925	09/25/2013	N	SWI0175	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
YVD-12	YVD-12-131211	12/11/2013	N	SWL0073	-	-	-	-	-	-	-	-	-	**0.218**	-	-	**194**	-	-	**195**	-	-
YVD-12	YVD-12-140318	03/18/2014	N	SXC0095	**0.22**	-	-	-	-	-	-	-	-	-	-	-	**204**	-	-	**205**	-	-
YVD-12	YVD-12-140603	06/03/2014	N	SXF0017	**0.28**	J+	FBK	-	-	-	-	-	-	-	-	-	**199**	-	-	**200**	-	-
YVD-12	YVD-12-140922	09/22/2014	N	SXI0148	**0.25**	-	-	-	-	-	-	-	-	-	-	-	**189**	-	-	**190**	-	-
YVD-12	YVD-D2-140922	09/22/2014	FD	SXI0148	**0.2**	-	-	-	-	-	-	-	-	-	-	-	**194**	-	-	**195**	-	-
YVD-12	YVD-12-141216	12/16/2014	N	SXL0121	**0.25**	-	-	-	-	-	-	-	-	-	-	-	**194**	-	-	**195**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-12	YVD-12-150317	03/17/2015	N	5904541	**93.0**	-	-	**37.0**	-	-	**3.60**	-	-	**73.0**	-	-	**75**	-	-	5	U	-
YVD-12	YVD-12-150617	06/17/2015	N	59010961	**90.0**	-	-	**35.0**	-	-	**2.60**	J+	MSD	**83.0**	J+	MSD	**84**	-	-	5	U	-
YVD-12	YVD-12-150924	09/24/2015	N	59020391	**92.0**	-	-	**39.0**	-	-	**3.50**	-	-	**73.0**	-	-	**78**	-	-	5	U	-
YVD-12	YVD-12-151216	12/16/2015	N	59025501	**95.0**	-	-	**37.0**	-	-	**3.10**	-	-	**74.0**	-	-	**76**	-	-	5	U	-
YVD-12	YVD-12-160309	03/09/2016	N	59029941	**95.0**	-	-	**35.0**	-	-	**2.60**	-	-	**73.0**	-	-	**73**	-	-	5	U	-
YVD-12	YVD-D3-160309	03/09/2016	FD	59029941	**95.0**	-	-	**36.0**	-	-	**2.50**	-	-	**72.0**	-	-	**79**	-	-	0.5	U	-
YVD-12	YVD-12-160622	6/22/2016	N	59037271	**89.0**	-	-	**36.0**	-	-	**2.90**	-	-	**72.0**	-	-	**90**	-	-	5	U	-
YVD-12	YVD-12-160929	9/29/2016	N	K1611704	**88.9**	-	-	**37.2**	-	-	**2.28**	-	-	**67.7**	-	-	**83.5**	-	-	**0.33**	-	-
YVD-12	YVD-12-161213	12/13/2016	N	K1615083	**93.4**	-	-	**33.6**	-	-	**2.29**	-	-	**67.9**	-	-	**81.7**	-	-	**0.33**	-	-
YVD-12	YVD-030917-20	3/9/2017	N	K1702404	**97.3**	-	-	**35.4**	-	-	**2.27**	-	-	**67.4**	-	-	**91.7**	-	-	**0.38**	-	-
YVD-12	YVD-060617-25	6/6/2017	N	K1705833	**98.4**	-	-	**35.8**	-	-	**2.24**	-	-	**66.5**	-	-	**94.1**	-	-	**0.32**	-	-
YVD-12	YVD-092517-15	9/25/2017	N	K1710333	**97.6**	-	-	**34.2**	-	-	**2.27**	-	-	**64.4**	-	-	**94.7**	-	-	**0.34**	-	-
YVD-12	YVD-120417-03	12/4/2017	N	K1713026	**89.7**	-	-	**32.9**	-	-	**2.06**	-	-	**70.8**	-	-	**85.4**	-	-	**0.41**	-	-
YVD-12	YVD-031918-13	3/19/2018	N	870610	**98.0**	-	-	**35.25**	-	-	**2.30**	-	-	**70.5**	-	-	**97.7**	-	-	**0.35**	-	-
YVD-12	YVD-060318-11	6/3/2018	N	874568	**103**	-	-	**38.35**	-	-	**2.58**	-	-	**68.0**	-	-	**100**	-	-	**0.34**	-	-
YVD-12	YVD-090918-16	9/9/2018	N	880601	**110**	-	-	**38.65**	-	-	**2.52**	-	-	**67.0**	-	-	**105**	-	-	**0.33**	-	-
YVD-12	YVD-121018-13	12/10/2018	N	884857	**106**	-	-	**37.65**	J	MSD	**2.52**	-	-	**69.5**	-	-	**98.9**	-	-	0.29	U	FBK
YVD-13	YVD-13-130919	09/19/2013	N	SWI0138	**102**	-	-	**29.9**	-	-	**4.30**	-	-	**114**	-	-	**90.3**	-	-	5	U	-
YVD-13	YVD-13-131211	12/11/2013	N	SWL0073	**101**	-	-	**29.4**	-	-	**4.16**	-	-	**110**	-	-	**77.8**	-	-	5	U	-
YVD-13	YVD-13-140318	03/18/2014	N	SXC0095	**102**	-	-	**29.3**	-	-	**4.27**	-	-	**106**	-	-	**80.3**	-	-	5	U	-
YVD-13	YVD-13-140603	06/03/2014	N	SXF0017	**94.8**	-	-	**27.7**	-	-	**3.70**	-	-	**113**	-	-	**39.7**	-	-	2	U	-
YVD-13	YVD-13-140923	09/23/2014	N	SXI0173	**104**	-	-	**29.0**	-	-	**4.40**	-	-	**118**	-	-	**81.7**	-	-	5	U	-
YVD-13	YVD-13-141217	12/17/2014	N	SXL0121	**114**	-	-	**33.1**	-	-	**4.74**	-	-	**119**	-	-	**86.5**	-	-	5	U	-
YVD-13	YVD-13-150317	03/17/2015	N	5904541	**100**	-	-	**30.0**	-	-	**4.00**	-	-	**120**	-	-	**72**	-	-	5	U	-
YVD-13	YVD-13-150617	06/17/2015	N	59010961	**110**	-	-	**30.0**	-	-	**4.40**	J+	MSD	**120**	J+	MSD	**81**	-	-	5	U	-
YVD-13	YVD-13-150924	09/24/2015	N	59020391	**98.0**	-	-	**31.0**	-	-	**4.10**	-	-	**110**	-	-	**70**	-	-	5	U	-
YVD-13	YVD-13-151216	12/16/2015	N	59025501	**100**	-	-	**30.0**	-	-	**4.30**	-	-	**120**	-	-	**69**	-	-	5	U	-
YVD-13	YVD-13-160309	03/09/2016	N	59029941	**100**	-	-	**29.0**	-	-	**4.20**	-	-	**120**	-	-	**85**	-	-	5	U	-
YVD-13	YVD-13-160622	6/22/2016	N	59037271	**100**	-	-	**30.0**	-	-	**4.20**	-	-	**120**	-	-	**76**	-	-	5	U	-
YVD-13	YVD-13-160928	9/28/2016	N	K1611698	**101**	-	-	**28.1**	-	-	**3.91**	-	-	**113**	-	-	**60.0**	-	-	**0.30**	-	-
YVD-13	YVD-13-161214	12/13/2016	N	K1615083	**100**	-	-	**27.5**	-	-	**4.02**	-	-	**111**	-	-	**57.3**	-	-	**0.33**	-	-
YVD-13	YVD-030717-08	3/7/2017	N	K1702324	**96.9**	-	-	**26.7**	-	-	**3.63**	-	-	**105**	-	-	**52.8**	-	-	**0.35**	-	-
YVD-13	YVD-030717-10	3/7/2017	FD	K1702324	**97.3**	-	-	**27.1**	-	-	**3.71**	-	-	**107**	-	-	**53.6**	-	-	**0.37**	-	-
YVD-13	YVD-060717-33	6/7/2017	N	K1705833	**99.0**	-	-	**27.9**	-	-	**3.83**	-	-	**114**	-	-	**54.6**	-	-	**0.30**	-	-
YVD-13	YVD-092617-25	9/26/2017	N	K1710333	**94.9**	-	-	**24.5**	-	-	**3.66**	-	-	**105**	-	-	**52.8**	-	-	**0.33**	-	-
YVD-13	YVD-120417-07	12/4/2017	N	K1713026	**93.4**	-	-	**24.5**	-	-	**3.41**	-	-	**102**	-	-	**53.9**	-	-	**0.36**	-	-
YVD-13	YVD-031918-19	3/19/2018	N	870634	**96.0**	-	-	**25.45**	-	-	**3.82**	-	-	**102**	-	-	**63.0**	-	-	**0.34**	-	-
YVD-13	YVD-060318-09	6/3/2018	N	874568	**91.0**	-	-	**25.90**	-	-	**4.01**	-	-	**108**	-	-	**63.3**	-	-	**0.35**	-	-
YVD-13	YVD-090918-14	9/9/2018	N	880601	**92.0**	-	-	**24.55**	-	-	**3.90**	-	-	**104**	-	-	**66.6**	-	-	**0.34**	-	-
YVD-13	YVD-121018-11	12/10/2018	N	884857	**87.5**	-	-	**24.20**	J	MSD	**3.95**	-	-	**104**	-	-	**70.8**	-	-	0.25	U	FBK

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-12	YVD-12-150317	03/17/2015	N	5904541	**14**	J-	MSD	2	U	-	**190**	J-	MSD	-	-	-	0.1	U	-	**0.56**	J-	MSD
YVD-12	YVD-12-150617	06/17/2015	N	59010961	**12**	-	-	2	U	-	**180**	-	-	-	-	-	0.1	U	-	**0.35**	J-	MSD
YVD-12	YVD-12-150924	09/24/2015	N	59020391	**15**	J+	MSD	2	U	-	**210**	J-	MSD	-	-	-	0.1	UJ	MSD	0.25	UJ	MSD
YVD-12	YVD-12-151216	12/16/2015	N	59025501	**14**	-	-	2	U	-	**180**	-	-	-	-	-	0.1	R	MSD	**0.58**	J-	MSD
YVD-12	YVD-12-160309	03/09/2016	N	59029941	**13**	-	-	2	U	-	**170**	J	DUP	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-12	YVD-D3-160309	03/09/2016	FD	59029941	**15**	-	-	0.2	U	-	**180**	J	DUP	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-12	YVD-12-160622	6/22/2016	N	59037271	**14**	-	-	2	U	-	**180**	-	-	-	-	-	0.1	UJ	MSD	0.25	R	MSD
YVD-12	YVD-12-160929	9/29/2016	N	K1611704	**13.5**	-	-	0.10	U	-	**158**	-	-	-	-	-	0.050	U	MBK	0.5	U	-
YVD-12	YVD-12-161213	12/13/2016	N	K1615083	**12.2**	-	-	0.10	U	-	**150**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-12	YVD-030917-20	3/9/2017	N	K1702404	**13.4**	-	-	0.10	U	-	**227**	-	-	-	-	-	0.050	U	-	0.5	UJ	MSD
YVD-12	YVD-060617-25	6/6/2017	N	K1705833	**13.6**	-	-	0.10	U	-	**155**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-12	YVD-092517-15	9/25/2017	N	K1710333	**14.0**	-	-	0.10	U	-	**177**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-12	YVD-120417-03	12/4/2017	N	K1713026	**13.4**	-	-	0.10	U	-	**169**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-12	YVD-031918-13	3/19/2018	N	870610	**13.6**	-	-	0.05	U	-	**167**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-12	YVD-060318-11	6/3/2018	N	874568	**15.1**	-	-	0.05	U	-	**171**	-	-	0.07	U	FBK	-	-	-	0.5	U	-
YVD-12	YVD-090918-16	9/9/2018	N	880601	**15.8**	-	-	0.05	U	-	**180**	-	-	0.07	U	-	-	-	-	0.5	R	MSD
YVD-12	YVD-121018-13	12/10/2018	N	884857	**15.5**	-	-	0.05	U	-	**170**	-	-	0.07	U	-	-	-	-	10	U	-
YVD-13	YVD-13-130919	09/19/2013	N	SWI0138	**27.6**	-	-	2	U	-	**365**	-	-	-	-	-	0.1	U	-	0.395	R	FBK
YVD-13	YVD-13-131211	12/11/2013	N	SWL0073	**21.7**	-	-	2	U	-	**278**	-	-	-	-	-	0.02	UJ	MSD	0.2	UJ	MSD
YVD-13	YVD-13-140318	03/18/2014	N	SXC0095	**24.2**	-	-	2	U	-	**312**	J-	MSD	-	-	-	**0.288**		-	**0.613**	-	-
YVD-13	YVD-13-140603	06/03/2014	N	SXF0017	**12.4**	-	-	0.8	U	-	**151**	J-	MSD	-	-	-	**0.103**		-	**0.727**	-	-
YVD-13	YVD-13-140923	09/23/2014	N	SXI0173	**26.7**	-	-	2	U	-	**328**	-	-	-	-	-	0.1	U	-	**9.13**	J+	MSD
YVD-13	YVD-13-141217	12/17/2014	N	SXL0121	**27.3**	-	-	2	U	-	**355**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-13	YVD-13-150317	03/17/2015	N	5904541	**24**	J-	MSD	2	U	-	**290**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-13	YVD-13-150617	06/17/2015	N	59010961	**27**	-	-	2	U	-	**310**	-	-	-	-	-	0.1	U	-	**0.68**	J-	MSD
YVD-13	YVD-13-150924	09/24/2015	N	59020391	**26**	J+	MSD	2	U	-	**330**	J-	MSD	-	-	-	0.1	UJ	MSD	0.25	UJ	MSD
YVD-13	YVD-13-151216	12/16/2015	N	59025501	**26**	-	-	2	U	-	**310**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD
YVD-13	YVD-13-160309	03/09/2016	N	59029941	**32**	-	-	2	U	-	**390**	J	DUP	-	-	-	0.1	U	-	0.25	UJ	FDP, MSD
YVD-13	YVD-13-160622	6/22/2016	N	59037271	**28**	-	-	2	U	-	**390**	-	-	-	-	-	0.1	UJ	MSD	0.25	R	MSD
YVD-13	YVD-13-160928	9/28/2016	N	K1611698	**23.5**	J	HTQ	0.10	U	-	**321**	-	-	-	-	-	0.050	U	MBK	0.5	R	MSD
YVD-13	YVD-13-161214	12/13/2016	N	K1615083	**23.1**	-	-	0.10	U	-	**313**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-13	YVD-030717-08	3/7/2017	N	K1702324	**23.3**	J	HTQ	**0.05**	J	HTQ	**277**	-	-	-	-	-	1	U	-	0.5	U	-
YVD-13	YVD-030717-10	3/7/2017	FD	K1702324	**23.7**	J	HTQ	**0.04**	J	HTQ	**280**	-	-	-	-	-	1	U	-	0.5	U	-
YVD-13	YVD-060717-33	6/7/2017	N	K1705833	**22.7**	-	-	0.10	U	-	**282**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-13	YVD-092617-25	9/26/2017	N	K1710333	**23.2**	-	-	0.10	U	-	**298**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-13	YVD-120417-07	12/4/2017	N	K1713026	**24.3**	-	-	0.10	U	-	**271**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-13	YVD-031918-19	3/19/2018	N	870634	**25.8**	-	-	0.05	U	-	**249**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-13	YVD-060318-09	6/3/2018	N	874568	**25.2**	-	-	0.05	U	-	**235**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-13	YVD-090918-14	9/9/2018	N	880601	**26.1**	-	-	0.05	U	-	**222**	-	-	0.07	U	-	-	-	-	0.5	R	MSD
YVD-13	YVD-121018-11	12/10/2018	N	884857	**28.6**	-	-	0.05	U	-	**225**	-	-	0.07	U	-	-	-	-	0.5	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-12	YVD-12-150317	03/17/2015	N	5904541	**0.31**	-	-	-	-	-	-	-	-	-	-	-	**190**	-	-	**190**	-	-
YVD-12	YVD-12-150617	06/17/2015	N	59010961	0.25	U	-	-	-	-	-	-	-	-	-	-	**190**	-	-	**190**	-	-
YVD-12	YVD-12-150924	09/24/2015	N	59020391	0.25	U	-	-	-	-	-	-	-	-	-	-	**190**	-	-	**190**	-	-
YVD-12	YVD-12-151216	12/16/2015	N	59025501	0.25	UJ	MSD	-	-	-	-	-	-	-	-	-	**210**	-	-	**210**	-	-
YVD-12	YVD-12-160309	03/09/2016	N	59029941	0.25	U	-	-	-	-	-	-	-	-	-	-	**210**	-	-	**210**	-	-
YVD-12	YVD-D3-160309	03/09/2016	FD	59029941	0.25	U	-	-	-	-	-	-	-	-	-	-	**200**	-	-	**200**	-	-
YVD-12	YVD-12-160622	6/22/2016	N	59037271	0.25	U	-	-	-	-	-	-	-	-	-	-	**190**	-	-	**190**	-	-
YVD-12	YVD-12-160929	9/29/2016	N	K1611704	-	-	-	**0.026**	-	-	-	-	-	-	-	-	**188**	-	-	**188**	-	-
YVD-12	YVD-12-161213	12/13/2016	N	K1615083	-	-	-	**0.018**	-	-	-	-	-	-	-	-	**183**	-	-	**183**	-	-
YVD-12	YVD-030917-20	3/9/2017	N	K1702404	-	-	-	**0.008**	J	-	-	-	-	-	-	-	**132**	-	-	**132**	-	-
YVD-12	YVD-060617-25	6/6/2017	N	K1705833	-	-	-	**0.010**	J	-	-	-	-	-	-	-	**183**	-	-	**183**	-	-
YVD-12	YVD-092517-15	9/25/2017	N	K1710333	-	-	-	0.010	U	-	-	-	-	-	-	-	**188**	-	-	**188**	-	-
YVD-12	YVD-120417-03	12/4/2017	N	K1713026	-	-	-	0.013	U	MBK	-	-	-	-	-	-	**186**	-	-	**186**	-	-
YVD-12	YVD-031918-13	3/19/2018	N	870610	-	-	-	-	-	-	-	-	-	0.07	U	-	**181**	-	-	**181**	-	-
YVD-12	YVD-060318-11	6/3/2018	N	874568	-	-	-	-	-	-	-	-	-	0.07	U	-	**178**	-	-	**178**	-	-
YVD-12	YVD-090918-16	9/9/2018	N	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	**185**	-	-	**185**	-	-
YVD-12	YVD-121018-13	12/10/2018	N	884857	-	-	-	-	-	-	-	-	-	0.07	U	-	**184**	-	-	**184**	-	-
YVD-13	YVD-13-130919	09/19/2013	N	SWI0138	-	-	-	-	-	-	0.175	R	FBK	-	-	-	**134**	-	-	**135**	-	-
YVD-13	YVD-13-131211	12/11/2013	N	SWL0073	-	-	-	-	-	-	-	-	-	**0.11**	-	-	**139**	-	-	**140**	-	-
YVD-13	YVD-13-140318	03/18/2014	N	SXC0095	**0.17**	-	-	-	-	-	-	-	-	-	-	-	**134**	-	-	**135**	-	-
YVD-13	YVD-13-140603	06/03/2014	N	SXF0017	**0.078**	J+	FBK	-	-	-	-	-	-	-	-	-	**129**	-	-	**130**	-	-
YVD-13	YVD-13-140923	09/23/2014	N	SXI0173	0.05	U	-	-	-	-	-	-	-	-	-	-	**124**	-	-	**125**	-	-
YVD-13	YVD-13-141217	12/17/2014	N	SXL0121	0.1	U	-	-	-	-	-	-	-	-	-	-	**124**	-	-	**125**	-	-
YVD-13	YVD-13-150317	03/17/2015	N	5904541	0.25	U	-	-	-	-	-	-	-	-	-	-	**130**	-	-	**130**	-	-
YVD-13	YVD-13-150617	06/17/2015	N	59010961	0.25	U	-	-	-	-	-	-	-	-	-	-	**140**	-	-	**140**	-	-
YVD-13	YVD-13-150924	09/24/2015	N	59020391	0.25	U	-	-	-	-	-	-	-	-	-	-	**150**	-	-	**150**	-	-
YVD-13	YVD-13-151216	12/16/2015	N	59025501	0.25	UJ	MSD	-	-	-	-	-	-	-	-	-	**140**	-	-	**140**	-	-
YVD-13	YVD-13-160309	03/09/2016	N	59029941	0.25	U	-	-	-	-	-	-	-	-	-	-	**140**	-	-	**140**	-	-
YVD-13	YVD-13-160622	6/22/2016	N	59037271	0.25	U	-	-	-	-	-	-	-	-	-	-	**130**	-	-	**130**	-	-
YVD-13	YVD-13-160928	9/28/2016	N	K1611698	-	-	-	**0.014**	-	-	-	-	-	-	-	-	**133**	-	-	**133**	-	-
YVD-13	YVD-13-161214	12/13/2016	N	K1615083	-	-	-	**0.047**	-	-	-	-	-	-	-	-	**132**	-	-	**132**	-	-
YVD-13	YVD-030717-08	3/7/2017	N	K1702324	-	-	-	**0.010**	J	-	-	-	-	-	-	-	**138**	-	-	**138**	-	-
YVD-13	YVD-030717-10	3/7/2017	FD	K1702324	-	-	-	**0.009**	J	-	-	-	-	-	-	-	**139**	-	-	**139**	-	-
YVD-13	YVD-060717-33	6/7/2017	N	K1705833	-	-	-	**0.014**	-	-	-	-	-	-	-	-	**134**	-	-	**134**	-	-
YVD-13	YVD-092617-25	9/26/2017	N	K1710333	-	-	-	0.010	U	-	-	-	-	-	-	-	**142**	-	-	**142**	-	-
YVD-13	YVD-120417-07	12/4/2017	N	K1713026	-	-	-	0.015	U	MBK	-	-	-	-	-	-	**141**	-	-	**141**	-	-
YVD-13	YVD-031918-19	3/19/2018	N	870634	-	-	-	-	-	-	-	-	-	0.07	U	-	**138**	-	-	**138**	-	-
YVD-13	YVD-060318-09	6/3/2018	N	874568	-	-	-	-	-	-	-	-	-	0.07	U	-	**137**	-	-	**137**	-	-
YVD-13	YVD-090918-14	9/9/2018	N	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	**140**	-	-	**140**	-	-
YVD-13	YVD-121018-11	12/10/2018	N	884857	-	-	-	-	-	-	-	-	-	0.07	U	-	**142**	-	-	**142**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-14	YVD-14-130918	09/18/2013	N	SWI0123	**260**	-	-	**65.4**	-	-	**3.45**	-	-	**110**	-	-	**118**	-	-	5	U	-
YVD-14	YVD-14-131212	12/12/2013	N	SWL0078	**249**	-	-	**65.6**	-	-	**3.29**	-	-	**108**	-	-	**104**	-	-	5	U	-
YVD-14	YVD-14-140319	03/19/2014	N	SXC0107	**248**	-	-	**64.5**	-	-	**3.37**	-	-	**102**	-	-	**108**	-	-	5	U	-
YVD-14	YVD-14-140604	06/04/2014	N	SXF0025	**240**	-	-	**63.2**	-	-	**3.46**	-	-	**112**	-	-	**109**	-	-	5	U	-
YVD-14	YVD-14-140924	09/24/2014	N	SXI0173	**268**	-	-	**72.0**	-	-	**4.10**	-	-	**124**	-	-	**110**	-	-	5	U	-
YVD-14	YVD-14-141217	12/17/2014	N	SXL0121	**252**	-	-	**70.9**	-	-	**3.83**	-	-	**113**	-	-	**110**	-	-	5	U	-
YVD-14	YVD-14-150318	03/18/2015	N	5904651	**260**	-	-	**70.0**	-	-	**3.60**	J-	MSD	**130**	-	-	**110**	-	-	5	U	-
YVD-14R	YVD-14R-151216	12/16/2015	N	59025501	**250**	-	-	**69.0**	-	-	**4.40**	-	-	**120**	-	-	**110**	-	-	5	U	-
YVD-14R	YVD-14R-160309	03/09/2016	N	59029941	**250**	-	-	**67.0**	-	-	**4.40**	-	-	**130**	-	-	**110**	-	-	5	U	-
YVD-14R	YVD-14R-160622	6/22/2016	N	59037271	**230**	-	-	**67.0**	-	-	**4.30**	-	-	**130**	-	-	**110**	-	-	5	U	-
YVD-14R	YVD-14R-160928	9/28/2016	N	K1611698	**252**	-	-	**65.9**	-	-	**4.05**	-	-	**126**	-	-	**95.7**	-	-	**0.16**	J	-
YVD-14R	YVD-14R-161212	12/12/2016	N	K1615029	**251**	-	-	**65.7**	-	-	**4.09**	-	-	**119**	-	-	**94.7**	-	-	**0.24**	-	-
YVD-14R	YVD-D1-161212	12/12/2016	FD	K1615029	**255**	-	-	**66.5**	-	-	**4.17**	-	-	**121**	-	-	**93.3**	-	-	**0.19**	-	-
YVD-14R	YVD-030917-19	3/9/2017	N	K1702404	**257**	-	-	**66.1**	-	-	**3.80**	-	-	**117**	-	-	**97.0**	-	-	**0.18**	J	-
YVD-14R	YVD-030917-21	3/9/2017	FD	K1702404	**251**	-	-	**65.2**	-	-	**3.75**	-	-	**115**	-	-	**95.0**	-	-	**0.19**	J	-
YVD-14R	YVD-060517-06	6/5/2017	N	K1705702	**243**	-	-	**62.3**	-	-	**3.53**	-	-	**110**	-	-	**98.4**	-	-	**0.20**	-	-
YVD-14R	YVD-092517-14	9/25/2017	N	K1710333	**238**	-	-	**61.2**	-	-	**3.85**	-	-	**121**	-	-	**99.8**	-	-	**0.18**	J	-
YVD-14R	YVD-120417-12	12/4/2017	N	K1713026	**230**	-	-	**59.3**	-	-	**3.54**	-	-	**116**	-	-	**98.3**	-	-	**0.22**	-	-
YVD-14R	YVD-031818-11	3/18/2018	N	870610	**232**	-	-	**60.00**	-	-	**3.96**	-	-	**127**	-	-	**102**	-	-	**0.13**	-	-
YVD-14R	YVD-060318-04	6/3/2018	N	874568	**233**	-	-	**63.00**	-	-	**4.18**	-	-	**130**	-	-	**105**	-	-	**0.15**	-	-
YVD-14R	YVD-090918-09	9/9/2018	N	880601	**250**	-	-	**63.50**	-	-	**4.09**	-	-	**130**	-	-	**115**	-	-	**0.18**	-	-
YVD-14R	YVD-121018-02	12/10/2018	N	884857	**256**	-	-	**66.00**	J	MSD	**4.39**	-	-	**131**	-	-	**133**	-	-	0.15	U	FBK
YVD-14R (FD)	YVD-121018-04	12/10/2018	FD	884857	**254**	-	-	**66.00**	J	MSD	**4.36**	-	-	**131**	-	-	**132**	-	-	0.15	U	FBK
YVD-15	YVD-15-130917	09/17/2013	N	SWI0123	**125**	-	-	**51.6**	-	-	**2.73**	-	-	**127**	-	-	**62.8**	-	-	5	U	-
YVD-15	YVD-15-131212	12/12/2013	N	SWL0078	**131**	-	-	**59.4**	-	-	**4.48**	-	-	**114**	-	-	**120**	-	-	5	U	-
YVD-15	YVD-15-140319	03/19/2014	N	SXC0107	**124**	-	-	**57.9**	-	-	**5.23**	-	-	**93.5**	-	-	**54.9**	-	-	5	U	-
YVD-15	YVD-15-140603	06/03/2014	N	SXF0025	**138**	-	-	**64.7**	-	-	**5.20**	-	-	**110**	-	-	**82.5**	-	-	5	U	-
YVD-15	YVD-15-140924	09/24/2014	N	SXI0173	**132**	-	-	**56.9**	-	-	**3.11**	-	-	**135**	-	-	**58.7**	-	-	5	U	-
YVD-15	YVD-15-141217	12/17/2014	N	SXL0121	**175**	-	-	**81.6**	-	-	**3.67**	-	-	**60.3**	-	-	**57.6**	-	-	5	U	-
YVD-15	YVD-15-150317	03/17/2015	N	5904651	**280**	-	-	**130.0**	-	-	**8.40**	J-	MSD	**160**	-	-	**65**	-	-	5	U	-
YVD-15	YVD-15-150617	06/17/2015	N	59011021	**140**	-	-	**66.0**	J	RPD	**4.60**	J	RPD	**110**	J	RPD	**42**	-	-	0.5	U	-
YVD-15	YVD-15-150925	09/25/2015	N	59020431	**98.0**	-	-	**46.0**	-	-	**3.90**	-	-	**80.0**	-	-	**22**	-	-	5	U	-
YVD-15	YVD-15-151215	12/15/2015	N	59025431	**120**	-	-	**59.0**	-	-	**4.10**	-	-	**80.0**	-	-	**37**	-	-	5	U	-
YVD-15	YVD-15-160309	03/09/2016	N	59029711	**120**	-	-	**60.0**	-	-	**4.20**	-	-	**75.0**	-	-	**32**	-	-	5	U	-
YVD-15	YVD-15-160621	6/21/2016	N	59037271	**110**	-	-	**56.0**	-	-	**3.50**	-	-	**74.0**	-	-	**26**	-	-	5	U	-
YVD-15	YVD-15-160928	9/28/2016	N	K1611629	**112**	-	-	**50.9**	-	-	**3.15**	-	-	**66.2**	-	-	**22.5**	-	-	**0.29**	-	-
YVD-15	YVD-15-161215	12/15/2016	N	K1615126	**113**	-	-	**50.4**	-	-	**3.40**	-	-	**59.1**	-	-	**22.1**	-	-	**0.32**	-	-
YVD-15	YVD-030917-23	3/9/2017	N	K1702404	**119**	-	-	**52.9**	-	-	**2.95**	-	-	**55.3**	-	-	**23.0**	-	-	**0.34**	-	-
YVD-15	YVD-060617-20	6/6/2017	N	K1705754	**126**	-	-	**54.6**	-	-	**2.98**	-	-	**62.9**	-	-	**21.8**	-	-	**0.32**	-	-
YVD-15	YVD-092517-10	9/25/2017	N	K1710333	**112**	-	-	**50.2**	-	-	**3.21**	-	-	**74.5**	-	-	**22.1**	-	-	**0.35**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-14	YVD-14-130918	09/18/2013	N	SWI0123	**112**	-	-	2	U	-	**213**	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-14	YVD-14-131212	12/12/2013	N	SWL0078	**105**	-	-	2	U	-	**186**	-	-	-	-	-	0.02	U	-	0.7957	U	ERL
YVD-14	YVD-14-140319	03/19/2014	N	SXC0107	**101**	-	-	2	U	-	**190**	-	-	-	-	-	0.1	U	-	**0.562**	J-	MSD
YVD-14	YVD-14-140604	06/04/2014	N	SXF0025	**102**	-	-	2	U	-	**191**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-14	YVD-14-140924	09/24/2014	N	SXI0173	**96.7**	-	-	2	U	-	**178**	-	-	-	-	-	**0.107**	-	-	0.25	U	-
YVD-14	YVD-14-141217	12/17/2014	N	SXL0121	**96.1**	-	-	2	U	-	**185**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-14	YVD-14-150318	03/18/2015	N	5904651	**91**	-	-	2	U	-	**180**	-	-	-	-	-	**0.11**	-	-	0.25	UJ	MSD
YVD-14R	YVD-14R-151216	12/16/2015	N	59025501	**98**	-	-	2	U	-	**160**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD
YVD-14R	YVD-14R-160309	03/09/2016	N	59029941	**100**	-	-	2	U	-	**180**	J	DUP	-	-	-	0.1	U	-	0.25	UJ	FDP, MSD
YVD-14R	YVD-14R-160622	6/22/2016	N	59037271	**110**	-	-	2	U	-	**150**	-	-	-	-	-	0.1	UJ	MSD	0.25	R	MSD
YVD-14R	YVD-14R-160928	9/28/2016	N	K1611698	**92.1**	J	HTQ	0.10	U	-	**140**	-	-	-	-	-	0.050	U	MBK	0.5	R	MSD
YVD-14R	YVD-14R-161212	12/12/2016	N	K1615029	**92.3**	J	HTQ	0.10	UJ	HTQ	**158**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-14R	YVD-D1-161212	12/12/2016	FD	K1615029	**92.3**	J	HTQ	0.10	UJ	HTQ	**155**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-14R	YVD-030917-19	3/9/2017	N	K1702404	**91.1**	-	-	0.10	U	-	**147**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-14R	YVD-030917-21	3/9/2017	FD	K1702404	**92.2**	J	HTQ	0.10	U	-	**151**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-14R	YVD-060517-06	6/5/2017	N	K1705702	**95.7**	-	-	0.10	U	-	**142**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-14R	YVD-092517-14	9/25/2017	N	K1710333	**97.3**	-	-	0.10	U	-	**138**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-14R	YVD-120417-12	12/4/2017	N	K1713026	**96.7**	-	-	0.10	U	-	**124**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-14R	YVD-031818-11	3/18/2018	N	870610	**90.2**	-	-	0.05	U	-	**128**	-	-	**0.17**	-	-	-	-	-	0.5	U	-
YVD-14R	YVD-060318-04	6/3/2018	N	874568	**96.5**	-	-	0.05	U	-	**123**	-	-	0.19	U	FBK	-	-	-	0.5	U	-
YVD-14R	YVD-090918-09	9/9/2018	N	880601	**115**	-	-	0.05	U	-	**125**	-	-	0.07	U	-	-	-	-	0.5	R	MSD
YVD-14R	YVD-121018-02	12/10/2018	N	884857	**117**	-	-	0.05	U	-	**139**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-14R (FD)	YVD-121018-04	12/10/2018	FD	884857	**115**	-	-	0.05	U	-	**136**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-15	YVD-15-130917	09/17/2013	N	SWI0123	**72.5**	-	-	2	U	-	**51.5**	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-15	YVD-15-131212	12/12/2013	N	SWL0078	**71.2**	-	-	2	U	-	**114**	-	-	-	-	-	0.02	U	-	0.2	U	-
YVD-15	YVD-15-140319	03/19/2014	N	SXC0107	**47.4**	-	-	2	U	-	**44.7**	-	-	-	-	-	**0.112**	-	-	**0.553**	J-	MSD
YVD-15	YVD-15-140603	06/03/2014	N	SXF0025	**88.1**	-	-	2	U	-	**39**	-	-	-	-	-	0.1	U	-	**0.475**	J-	MSD
YVD-15	YVD-15-140924	09/24/2014	N	SXI0173	**54.8**	-	-	2	U	-	**50.7**	-	-	-	-	-	**0.246**	-	-	**1.19**	J+	MSD
YVD-15	YVD-15-141217	12/17/2014	N	SXL0121	**66.9**	-	-	2	U	-	**53.4**	-	-	-	-	-	0.1	U	-	**0.414**	J-	MSD
YVD-15	YVD-15-150317	03/17/2015	N	5904651	**67**	-	-	2	U	-	**53**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-15	YVD-15-150617	06/17/2015	N	59011021	**39**	J-	MSD, HT	0.2	U	-	**59**	-	-	-	-	-	0.1	U	-	0.25	R	MSD
YVD-15	YVD-15-150925	09/25/2015	N	59020431	**14**	-	-	2	U	-	**47**	-	-	-	-	-	0.1	U	-	2.5	U	-
YVD-15	YVD-15-151215	12/15/2015	N	59025431	**38**	-	-	2	U	-	**40**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD
YVD-15	YVD-15-160309	03/09/2016	N	59029711	**36**	-	-	2	U	-	**65**	J+	MSD	-	-	-	0.1	UJ	FDP	0.25	R	MSD
YVD-15	YVD-15-160621	6/21/2016	N	59037271	**31**	-	-	2	U	-	**86**	-	-	-	-	-	**0.13**	J-	MSD	0.25	R	MSD
YVD-15	YVD-15-160928	9/28/2016	N	K1611629	**26.6**	-	-	0.10	U	-	**108**	-	-	-	-	-	0.050	U	MBK	0.5	U	-
YVD-15	YVD-15-161215	12/15/2016	N	K1615126	**25.5**	-	-	0.10	U	-	**108**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-15	YVD-030917-23	3/9/2017	N	K1702404	**25.0**	J	HTQ	0.10	U	-	**125**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-15	YVD-060617-20	6/6/2017	N	K1705754	**23.0**	-	-	0.10	U	-	**143**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-15	YVD-092517-10	9/25/2017	N	K1710333	**21.8**	-	-	0.10	U	-	**167**	-	-	-	-	-	0.050	U	-	0.5	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-14	YVD-14-130918	09/18/2013	N	SWI0123	-	-	-	-	-	-	0.1	U	-	-	-	-	**605**	-	-	**605**	-	-
YVD-14	YVD-14-131212	12/12/2013	N	SWL0078	-	-	-	-	-	-	-	-	-	0.06	U	-	**544**	-	-	**545**	-	-
YVD-14	YVD-14-140319	03/19/2014	N	SXC0107	0.05	U	-	-	-	-	-	-	-	-	-	-	**634**	-	-	**635**	-	-
YVD-14	YVD-14-140604	06/04/2014	N	SXF0025	**0.078**	-	-	-	-	-	-	-	-	-	-	-	**569**	-	-	**570**	-	-
YVD-14	YVD-14-140924	09/24/2014	N	SXI0173	**0.087**	J+	FBK	-	-	-	-	-	-	-	-	-	**554**	-	-	**555**	-	-
YVD-14	YVD-14-141217	12/17/2014	N	SXL0121	0.1	U	-	-	-	-	-	-	-	-	-	-	**539**	-	-	**540**	-	-
YVD-14	YVD-14-150318	03/18/2015	N	5904651	0.25	U	-	-	-	-	-	-	-	-	-	-	**530**	-	-	**530**	-	-
YVD-14R	YVD-14R-151216	12/16/2015	N	59025501	0.25	UJ	MSD	-	-	-	-	-	-	-	-	-	**550**	-	-	**550**	-	-
YVD-14R	YVD-14R-160309	03/09/2016	N	59029941	0.25	U	-	-	-	-	-	-	-	-	-	-	**600**	-	-	**600**	-	-
YVD-14R	YVD-14R-160622	6/22/2016	N	59037271	0.25	U	-	-	-	-	-	-	-	-	-	-	**490**	-	-	**490**	-	-
YVD-14R	YVD-14R-160928	9/28/2016	N	K1611698	-	-	-	**0.015**	-	-	-	-	-	-	-	-	**535**	-	-	**535**	-	-
YVD-14R	YVD-14R-161212	12/12/2016	N	K1615029	-	-	-	**0.058**	-	-	-	-	-	-	-	-	**578**	-	-	**578**	-	-
YVD-14R	YVD-D1-161212	12/12/2016	FD	K1615029	-	-	-	**0.092**	-	-	-	-	-	-	-	-	**571**	-	-	**571**	-	-
YVD-14R	YVD-030917-19	3/9/2017	N	K1702404	-	-	-	**0.020**	-	-	-	-	-	-	-	-	**526**	-	-	**526**	-	-
YVD-14R	YVD-030917-21	3/9/2017	FD	K1702404	-	-	-	**0.019**	-	-	-	-	-	-	-	-	**514**	-	-	**514**	-	-
YVD-14R	YVD-060517-06	6/5/2017	N	K1705702	-	-	-	**0.038**	-	-	-	-	-	-	-	-	**505**	-	-	**505**	-	-
YVD-14R	YVD-092517-14	9/25/2017	N	K1710333	-	-	-	**0.018**	-	-	-	-	-	-	-	-	**515**	-	-	**515**	-	-
YVD-14R	YVD-120417-12	12/4/2017	N	K1713026	-	-	-	**0.024**	-	-	-	-	-	-	-	-	**504**	-	-	**504**	-	-
YVD-14R	YVD-031818-11	3/18/2018	N	870610	-	-	-	-	-	-	-	-	-	0.07	U	-	**514**	-	-	**514**	-	-
YVD-14R	YVD-060318-04	6/3/2018	N	874568	-	-	-	-	-	-	-	-	-	0.07	U	-	**521**	-	-	**521**	-	-
YVD-14R	YVD-090918-09	9/9/2018	N	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	**532**	-	-	**532**	-	-
YVD-14R	YVD-121018-02	12/10/2018	N	884857	-	-	-	-	-	-	-	-	-	0.07	U	-	**528**	-	-	**528**	-	-
YVD-14R (FD)	YVD-121018-04	12/10/2018	FD	884857	-	-	-	-	-	-	-	-	-	0.07	U	-	**528**	-	-	**528**	-	-
YVD-15	YVD-15-130917	09/17/2013	N	SWI0123	-	-	-	-	-	-	0.1	U	-	-	-	-	**514**	-	-	**515**	-	-
YVD-15	YVD-15-131212	12/12/2013	N	SWL0078	-	-	-	-	-	-	-	-	-	**0.238**	-	-	**494**	-	-	**495**	-	-
YVD-15	YVD-15-140319	03/19/2014	N	SXC0107	**0.22**	-	-	-	-	-	-	-	-	-	-	-	**534**	-	-	**535**	-	-
YVD-15	YVD-15-140603	06/03/2014	N	SXF0025	**0.31**	-	-	-	-	-	-	-	-	-	-	-	**509**	-	-	**510**	-	-
YVD-15	YVD-15-140924	09/24/2014	N	SXI0173	**0.072**	J+	FBK	-	-	-	-	-	-	-	-	-	**541**	-	-	**545**	-	-
YVD-15	YVD-15-141217	12/17/2014	N	SXL0121	**0.17**	-	-	-	-	-	-	-	-	-	-	-	**518**	-	-	**520**	-	-
YVD-15	YVD-15-150317	03/17/2015	N	5904651	**0.27**	-	-	-	-	-	-	-	-	-	-	-	**550**	-	-	**550**	-	-
YVD-15	YVD-15-150617	06/17/2015	N	59011021	0.25	U	-	-	-	-	-	-	-	-	-	-	**550**	-	-	**550**	-	-
YVD-15	YVD-15-150925	09/25/2015	N	59020431	0.25	U	-	-	-	-	-	-	-	-	-	-	**480**	-	-	**480**	-	-
YVD-15	YVD-15-151215	12/15/2015	N	59025431	0.25	UJ	FDP	-	-	-	-	-	-	-	-	-	**540**	J	FDP	**540**	J	FDP
YVD-15	YVD-15-160309	03/09/2016	N	59029711	0.25	U	-	-	-	-	-	-	-	-	-	-	**520**	-	-	**520**	-	-
YVD-15	YVD-15-160621	6/21/2016	N	59037271	0.25	U	-	-	-	-	-	-	-	-	-	-	**430**	-	-	**430**	-	-
YVD-15	YVD-15-160928	9/28/2016	N	K1611629	-	-	-	**0.023**	-	-	-	-	-	-	-	-	**401**	-	-	**401**	-	-
YVD-15	YVD-15-161215	12/15/2016	N	K1615126	-	-	-	**0.095**	-	-	-	-	-	-	-	-	**395**	-	-	**395**	-	-
YVD-15	YVD-030917-23	3/9/2017	N	K1702404	-	-	-	**0.011**	-	-	-	-	-	-	-	-	**395**	-	-	**395**	-	-
YVD-15	YVD-060617-20	6/6/2017	N	K1705754	-	-	-	**0.017**	-	-	-	-	-	-	-	-	**399**	-	-	**399**	-	-
YVD-15	YVD-092517-10	9/25/2017	N	K1710333	-	-	-	0.010	U	-	-	-	-	-	-	-	**412**	-	-	**412**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-15	YVD-120517-28	12/5/2017	N	K1713091	**112**	-	-	**48.0**	-	-	**2.89**	-	-	**78.6**	-	-	**21.8**	-	-	**0.34**	-	-
YVD-15	YVD-031818-09	3/18/2018	N	870610	**104**	-	-	**46.60**	-	-	**3.25**	-	-	**94.5**	-	-	**21.7**	-	-	**0.32**	-	-
YVD-15	YVD-060318-08	6/3/2018	N	874568	**100**	-	-	**45.50**	-	-	**3.36**	-	-	**97.5**	-	-	**22.0**	-	-	**0.34**	-	-
YVD-15	YVD-090918-11	9/9/2018	N	880601	**97.5**	-	-	**42.70**	-	-	**3.18**	-	-	**99.0**	-	-	**22.8**	-	-	**0.35**	-	-
YVD-15	YVD-121018-06	12/10/2018	N	884857	**92.5**	-	-	**41.00**	J	MSD	**3.25**	-	-	**97.5**	-	-	**24.3**	-	-	0.33	U	FBK
YVD-16	YVD-16-130923	09/23/2013	N	SWI0178	**85.0**	-	-	**32.9**	-	-	**6.16**	-	-	**81.7**	-	-	-	-	-	-	-	-
YVD-16	YVD-16-130926	09/26/2013	N	SWI0190	-	-	-	-	-	-	-	-	-	-	-	-	**44.1**	-	-	5	U	-
YVD-16	YVD-16-131212	12/12/2013	N	SWL0073	**87.7**	-	-	**32.1**	-	-	**5.25**	-	-	**79.8**	-	-	**46.7**	-	-	5	U	-
YVD-16	YVD-16-140318	03/18/2014	N	SXC0107	**105.0**	-	-	**53.2**	-	-	**15.00**	-	-	**75.5**	-	-	**46.1**	-	-	5	U	-
YVD-16	YVD-16-140603	06/03/2014	N	SXF0017	**86.3**	-	-	**37.0**	-	-	**8.47**	-	-	**78.4**	-	-	**36.7**	-	-	2	U	-
YVD-16	YVD-16-140923	09/23/2014	N	SXI0173	**99.2**	-	-	**38.9**	-	-	**7.48**	-	-	**94.1**	-	-	**38**	-	-	2.5	U	-
YVD-16	YVD-16-141217	12/17/2014	N	SXL0121	**94.9**	-	-	**37.1**	-	-	**6.77**	-	-	**83.7**	-	-	**37.9**	-	-	2.5	U	-
YVD-16	YVD-D3-141217	12/17/2014	FD	SXL0121	**92.9**	-	-	**36.2**	-	-	**6.27**	-	-	**81.7**	-	-	**39.9**	-	-	0.5	U	-
YVD-16	YVD-16-150317	03/17/2015	N	5904651	**93.0**	-	-	**34.0**	-	-	**6.10**	J-	MSD	**87.0**	-	-	**39**	-	-	2.5	U	-
YVD-16	YVD-16-150616	06/16/2015	N	59010961	**96.0**	-	-	**35.0**	-	-	**6.20**	J+	MSD	**91.0**	J+	MSD	**43**	-	-	2.5	U	-
YVD-16	YVD-16-150923	09/23/2015	N	59020281	**88.0**	-	-	**37.0**	-	-	**6.50**	-	-	**85.0**	-	-	**39**	-	-	2.5	U	-
YVD-16	YVD-16-151215	12/15/2015	N	59025431	**89.0**	-	-	**34.0**	-	-	**5.70**	-	-	**85.0**	-	-	**38**	-	-	2.5	U	-
YVD-16	YVD-16-160309	03/09/2016	N	59029711	**90.0**	-	-	**36.0**	-	-	**7.40**	-	-	**86.0**	-	-	**39**	-	-	2.5	U	-
YVD-16	YVD-16-160621	6/21/2016	N	59037151	**85.0**	-	-	**33.0**	-	-	**5.90**	-	-	**86.0**	-	-	**42**	-	-	2.5	U	-
YVD-16	YVD-D2-160621	6/21/2016	FD	59037151	**86.0**	-	-	**34.0**	-	-	**6.00**	-	-	**88.0**	-	-	**40**	-	-	0.5	U	-
YVD-16	YVD-16-160928	9/28/2016	N	K1611629	**92.4**	-	-	**33.2**	-	-	**5.69**	-	-	**90.2**	-	-	**33.3**	-	-	**0.22**	-	-
YVD-16	YVD-16-161215	12/15/2016	N	K1615126	**88.4**	-	-	**31.1**	-	-	**5.59**	-	-	**82.5**	-	-	**33.7**	-	-	**0.24**	-	-
YVD-16	YVD-030917-22	3/9/2017	N	K1702404	**87.1**	-	-	**31.2**	-	-	**5.16**	-	-	**79.8**	-	-	**33.9**	-	-	**0.25**	-	-
YVD-16	YVD-060517-12	6/5/2017	N	K1705754	**86.8**	-	-	**31.6**	-	-	**5.08**	-	-	**83.0**	-	-	**33.6**	-	-	**0.25**	-	-
YVD-16	YVD-092617-28	9/26/2017	N	K1710381	**89**	-	-	**31.7**	-	-	**5.44**	-	-	**84.1**	-	-	**32.8**	-	-	**0.23**	-	-
YVD-16	YVD-120517-22	12/5/2017	N	K1713091	**87.9**	-	-	**30.1**	-	-	**5.17**	-	-	**80.1**	-	-	**33.3**	-	-	**0.24**	-	-
YVD-16	YVD-031918-16	3/19/2018	N	870634	**88.5**	-	-	**30.25**	-	-	**5.25**	-	-	**79.0**	-	-	**34.4**	-	-	**0.20**	-	-
YVD-16	YVD-060318-10	6/3/2018	N	874568	**90.0**	-	-	**32.80**	-	-	**5.55**	-	-	**88.0**	-	-	**34.9**	-	-	**0.22**	-	-
YVD-16	YVD-090918-07	9/9/2018	N	880601	**89.5**	-	-	**30.55**	-	-	**5.20**	-	-	**83.5**	-	-	**35.7**	-	-	**0.21**	-	-
YVD-16	YVD-121118-20	12/11/2018	N	884939	**89.5**	-	-	**31.05**	-	-	**5.85**	-	-	**84.0**	-	-	**32.6**	-	-	**0.19**	-	-
YVD-17	YVD-17-130919	09/19/2013	N	SWI0142	**72.7**	-	-	**35.8**	-	-	**8.32**	-	-	**12.2**	-	-	**3.1**	-	-	0.5	U	-
YVD-17	YVD-17-130924	09/24/2013	N	SWI0175	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
YVD-17	YVD-17-131210	12/10/2013	N	SWL0055	**54.2**	-	-	**28.4**	-	-	**5.25**	-	-	**7.9**	-	-	**2.98**	-	-	0.5	U	-
YVD-17	YVD-17-140316	03/16/2014	N	SXC0081	**36.0**	-	-	**17.6**	-	-	**1.73**	-	-	**6.1**	-	-	**3.45**	-	-	**0.65**	-	-
YVD-17	YVD-17-140601	06/01/2014	N	SXF0008	**42.3**	-	-	**18.5**	-	-	**2.22**	-	-	**8.7**	-	-	**3.17**	-	-	0.5	U	-
YVD-17	YVD-17-140922	09/22/2014	N	SXI0148	**47.5**	-	-	**21.2**	-	-	**2.91**	-	-	**9.9**	-	-	**2.87**	-	-	0.5	U	-
YVD-17	YVD-17-141215	12/15/2014	N	SXL0103	**42.1**	-	-	**17.8**	-	-	**1.84**	-	-	**9.2**	-	-	**2.99**	J+	MSD	0.5	U	-
YVD-17	YVD-17-150316	03/16/2015	N	5904471	**33.0**	-	-	**17.0**	-	-	**1.40**	-	-	**6.3**	-	-	**3.5**	-	-	**0.5**	-	-
YVD-17	YVD-D1-150316	03/16/2015	FD	5904471	**33.0**	-	-	**17.0**	-	-	**1.50**	-	-	**6.2**	-	-	**3.5**	-	-	**0.51**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-15	YVD-120517-28	12/5/2017	N	K1713091	**22.7**	J	HTQ	0.10	U	-	**145**	-	-	-	-	-	0.050	U	-	0.5	UJ	MSD
YVD-15	YVD-031818-09	3/18/2018	N	870610	**24.4**	-	-	0.05	U	-	**129**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-15	YVD-060318-08	6/3/2018	N	874568	**27.0**	-	-	0.05	U	-	**118**	-	-	0.07	U	FBK	-	-	-	0.5	U	-
YVD-15	YVD-090918-11	9/9/2018	N	880601	**24.4**	-	-	0.05	U	-	**110**	-	-	0.07	U	-	-	-	-	0.5	R	MSD
YVD-15	YVD-121018-06	12/10/2018	N	884857	**26.3**	-	-	0.05	U	-	**111**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-16	YVD-16-130923	09/23/2013	N	SWI0178	-	-	-	-	-	-	-	-	-	-	-	-	0.1	U	-	**0.375**	-	-
YVD-16	YVD-16-130926	09/26/2013	N	SWI0190	**28.8**	-	-	2	U	-	**140**	-	-	-	-	-	-	-	-	-	-	-
YVD-16	YVD-16-131212	12/12/2013	N	SWL0073	**28.8**	-	-	2	U	-	**163**	-	-	-	-	-	0.02	UJ	MSD	0.2	UJ	MSD
YVD-16	YVD-16-140318	03/18/2014	N	SXC0107	**23.5**	-	-	2	U	-	**130**	-	-	-	-	-	0.1	U	-	**1.01**	J-	MSD
YVD-16	YVD-16-140603	06/03/2014	N	SXF0017	**21.9**	-	-	0.8	U	-	**131**	J-	MSD	-	-	-	0.1	U	-	**0.741**	-	-
YVD-16	YVD-16-140923	09/23/2014	N	SXI0173	**21.4**	-	-	1	U	-	**114**	-	-	-	-	-	0.1	U	-	**0.747**	J+	MSD
YVD-16	YVD-16-141217	12/17/2014	N	SXL0121	**20.6**	-	-	1	U	-	**118**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-16	YVD-D3-141217	12/17/2014	FD	SXL0121	**22.4**	-	-	0.2	U	-	**130**	-	-	-	-	-	0.1	U	-	**0.29**	J-	MSD
YVD-16	YVD-16-150317	03/17/2015	N	5904651	**22**	-	-	1	U	-	**120**	-	-	-	-	-	**0.11**	-	-	**0.29**	J-	MSD
YVD-16	YVD-16-150616	06/16/2015	N	59010961	**23**	-	-	1	U	-	**120**	-	-	-	-	-	**0.1**	-	-	0.25	UJ	MSD
YVD-16	YVD-16-150923	09/23/2015	N	59020281	**23**	-	-	1	U	-	**130**	-	-	-	-	-	0.1	U	-	0.25	R	MSD
YVD-16	YVD-16-151215	12/15/2015	N	59025431	**22**	-	-	1	U	-	**120**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD
YVD-16	YVD-16-160309	03/09/2016	N	59029711	**23**	-	-	1	U	-	**130**	J+	MSD	-	-	-	**0.15**	J	FDP	0.25	R	MSD
YVD-16	YVD-16-160621	6/21/2016	N	59037151	**22**	-	-	1	U	-	**120**	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-16	YVD-D2-160621	6/21/2016	FD	59037151	**22**	-	-	0.2	U	-	**120**	-	-	-	-	-	0.1	U	-	0.25	U	-
YVD-16	YVD-16-160928	9/28/2016	N	K1611629	**19.7**	-	-	0.10	U	-	**110**	-	-	-	-	-	0.050	U	MBK	0.5	U	-
YVD-16	YVD-16-161215	12/15/2016	N	K1615126	**19.7**	-	-	0.10	U	-	**112**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-16	YVD-030917-22	3/9/2017	N	K1702404	**20.1**	J	HTQ	0.10	U	-	**113**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-16	YVD-060517-12	6/5/2017	N	K1705754	**19.7**	-	-	0.10	U	-	**117**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-16	YVD-092617-28	9/26/2017	N	K1710381	**19.1**	J	HTQ	0.10	U	-	**115**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-16	YVD-120517-22	12/5/2017	N	K1713091	**19.8**	J	HTQ	0.10	U	-	**110**	-	-	-	-	-	0.050	U	-	0.5	UJ	MSD
YVD-16	YVD-031918-16	3/19/2018	N	870634	**20.3**	-	-	0.05	U	-	**106**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-16	YVD-060318-10	6/3/2018	N	874568	**20.7**	-	-	0.05	U	-	**104**	-	-	0.07	U	FBK	-	-	-	0.5	U	-
YVD-16	YVD-090918-07	9/9/2018	N	880601	**21.4**	-	-	0.05	U	-	**107**	-	-	0.07	U	-	-	-	-	0.5	R	MSD
YVD-16	YVD-121118-20	12/11/2018	N	884939	**21.8**	-	-	0.05	U	-	**106**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-17	YVD-17-130919	09/19/2013	N	SWI0142	-	-	-	-	-	-	**6.48**	-	-	-	-	-	0.1	U	-	2.5	U	-
YVD-17	YVD-17-130924	09/24/2013	N	SWI0175	**0.8**	-	-	0.2	U	-	-	-	-	-	-	-	-	-	-	-	-	-
YVD-17	YVD-17-131210	12/10/2013	N	SWL0055	**0.68**	-	-	0.2	U	-	**6.64**	-	-	-	-	-	0.02	UJ	MSD	0.29	R	FBK, MSD
YVD-17	YVD-17-140316	03/16/2014	N	SXC0081	**1.07**	-	-	0.2	U	-	**6.42**	-	-	-	-	-	**0.166**	-	-	0.25	U	-
YVD-17	YVD-17-140601	06/01/2014	N	SXF0008	**0.67**	-	-	0.2	U	-	**5.74**	-	-	-	-	-	0.1	U	-	**0.287**	-	-
YVD-17	YVD-17-140922	09/22/2014	N	SXI0148	**0.96**	-	-	0.2	U	-	**5.08**	-	-	-	-	-	0.1	U	-	**0.293**	-	-
YVD-17	YVD-17-141215	12/15/2014	N	SXL0103	**0.66**	J	DUP	0.2	U	-	**6.01**	J+	MSD, DUP	-	-	-	0.1	U	-	0.25	U	-
YVD-17	YVD-17-150316	03/16/2015	N	5904471	**1.1**	-	-	0.2	U	-	**5.7**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-17	YVD-D1-150316	03/16/2015	FD	5904471	**1.2**	-	-	0.2	U	-	**5.7**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-15	YVD-120517-28	12/5/2017	N	K1713091	-	-	-	**0.013**	-	-	-	-	-	-	-	-	**414**	-	-	**414**	-	-
YVD-15	YVD-031818-09	3/18/2018	N	870610	-	-	-	-	-	-	-	-	-	0.07	U	-	**397**	-	-	**397**	-	-
YVD-15	YVD-060318-08	6/3/2018	N	874568	-	-	-	-	-	-	-	-	-	0.07	U	-	**401**	-	-	**401**	-	-
YVD-15	YVD-090918-11	9/9/2018	N	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	**395**	-	-	**395**	-	-
YVD-15	YVD-121018-06	12/10/2018	N	884857	-	-	-	-	-	-	-	-	-	0.07	U	-	**400**	-	-	**400**	-	-
YVD-16	YVD-16-130923	09/23/2013	N	SWI0178	-	-	-	-	-	-	0.1	U	-	-	-	-	**189**	-	-	**190**	-	-
YVD-16	YVD-16-130926	09/26/2013	N	SWI0190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
YVD-16	YVD-16-131212	12/12/2013	N	SWL0073	-	-	-	-	-	-	-	-	-	0.06	U	-	**309**	-	-	**310**	-	-
YVD-16	YVD-16-140318	03/18/2014	N	SXC0107	**1.4**	-	-	-	-	-	-	-	-	-	-	-	**298**	-	-	**300**	-	-
YVD-16	YVD-16-140603	06/03/2014	N	SXF0017	**0.83**	-	-	-	-	-	-	-	-	-	-	-	**287**	-	-	**288**	-	-
YVD-16	YVD-16-140923	09/23/2014	N	SXI0173	**0.22**	-	-	-	-	-	-	-	-	-	-	-	**303**	-	-	**305**	-	-
YVD-16	YVD-16-141217	12/17/2014	N	SXL0121	**0.25**	J	FDP	-	-	-	-	-	-	-	-	-	**298**	-	-	**300**	-	-
YVD-16	YVD-D3-141217	12/17/2014	FD	SXL0121	**0.1**	J	FDP	-	-	-	-	-	-	-	-	-	**308**	-	-	**310**	-	-
YVD-16	YVD-16-150317	03/17/2015	N	5904651	0.25	U	-	-	-	-	-	-	-	-	-	-	**310**	-	-	**310**	-	-
YVD-16	YVD-16-150616	06/16/2015	N	59010961	0.25	U	-	-	-	-	-	-	-	-	-	-	**310**	-	-	**310**	-	-
YVD-16	YVD-16-150923	09/23/2015	N	59020281	0.25	U	-	-	-	-	-	-	-	-	-	-	**330**	-	-	**330**	-	-
YVD-16	YVD-16-151215	12/15/2015	N	59025431	0.25	UJ	FDP	-	-	-	-	-	-	-	-	-	**350**	J	FDP	**350**	J	FDP
YVD-16	YVD-16-160309	03/09/2016	N	59029711	**0.27**	-	-	-	-	-	-	-	-	-	-	-	**300**	-	-	**300**	-	-
YVD-16	YVD-16-160621	6/21/2016	N	59037151	0.25	U	-	-	-	-	-	-	-	-	-	-	**300**	-	-	**300**	-	-
YVD-16	YVD-D2-160621	6/21/2016	FD	59037151	0.25	U	-	-	-	-	-	-	-	-	-	-	**300**	-	-	**300**	-	-
YVD-16	YVD-16-160928	9/28/2016	N	K1611629	-	-	-	**0.016**	-	-	-	-	-	-	-	-	**301**	-	-	**301**	-	-
YVD-16	YVD-16-161215	12/15/2016	N	K1615126	-	-	-	**0.068**	-	-	-	-	-	-	-	-	**298**	-	-	**298**	-	-
YVD-16	YVD-030917-22	3/9/2017	N	K1702404	-	-	-	**0.045**	-	-	-	-	-	-	-	-	**295**	-	-	**295**	-	-
YVD-16	YVD-060517-12	6/5/2017	N	K1705754	-	-	-	**0.021**	-	-	-	-	-	-	-	-	**298**	-	-	**298**	-	-
YVD-16	YVD-092617-28	9/26/2017	N	K1710381	-	-	-	**0.016**	-	-	-	-	-	-	-	-	**309**	-	-	**309**	-	-
YVD-16	YVD-120517-22	12/5/2017	N	K1713091	-	-	-	**0.048**	-	-	-	-	-	-	-	-	**294**	-	-	**294**	-	-
YVD-16	YVD-031918-16	3/19/2018	N	870634	-	-	-	-	-	-	-	-	-	0.07	U	-	**297**	-	-	**297**	-	-
YVD-16	YVD-060318-10	6/3/2018	N	874568	-	-	-	-	-	-	-	-	-	0.07	U	-	**314**	-	-	**314**	-	-
YVD-16	YVD-090918-07	9/9/2018	N	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	**309**	-	-	**309**	-	-
YVD-16	YVD-121118-20	12/11/2018	N	884939	-	-	-	-	-	-	-	-	-	0.07	U	-	**306**	-	-	**306**	-	-
YVD-17	YVD-17-130919	09/19/2013	N	SWI0142	-	-	-	-	-	-	**3.64**	-	-	-	-	-	**213**	-	-	**215**	-	-
YVD-17	YVD-17-130924	09/24/2013	N	SWI0175	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
YVD-17	YVD-17-131210	12/10/2013	N	SWL0055	-	-	-	-	-	-	-	-	-	**1.61**	-	-	**169**	-	-	**170**	-	-
YVD-17	YVD-17-140316	03/16/2014	N	SXC0081	**0.3**	-	-	-	-	-	-	-	-	-	-	-	**144**	-	-	**145**	-	-
YVD-17	YVD-17-140601	06/01/2014	N	SXF0008	**0.52**	-	-	-	-	-	-	-	-	-	-	-	**169**	-	-	**170**	-	-
YVD-17	YVD-17-140922	09/22/2014	N	SXI0148	**0.36**	-	-	-	-	-	-	-	-	-	-	-	**183**	-	-	**185**	-	-
YVD-17	YVD-17-141215	12/15/2014	N	SXL0103	**0.19**	-	-	-	-	-	-	-	-	-	-	-	**168**	-	-	**170**	-	-
YVD-17	YVD-17-150316	03/16/2015	N	5904471	0.25	UJ	MSD	-	-	-	-	-	-	-	-	-	**130**	-	-	**130**	-	-
YVD-17	YVD-D1-150316	03/16/2015	FD	5904471	0.25	UJ	MSD	-	-	-	-	-	-	-	-	-	**130**	-	-	**130**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-17	YVD-17-150617	06/17/2015	N	59010961	**41.0**	-	-	**18.0**	-	-	**1.80**	J+	MSD	**8.7**	J+	MSD	**3**	-	-	0.5	U	-
YVD-17	YVD-17-150924	09/24/2015	N	59020391	**40.0**	-	-	**18.0**	-	-	**2.00**	-	-	**9.0**	-	-	**3.1**	-	-	**0.6**	-	-
YVD-17	YVD-17-151216	12/16/2015	N	59025501	**38.0**	-	-	**17.0**	-	-	**1.40**	-	-	**8.0**	-	-	**2.6**	-	-	0.5	U	-
YVD-17	YVD-17-160310	03/10/2016	N	59029941	**35.0**	-	-	**16.0**	-	-	**1.20**	-	-	**6.4**	-	-	**2.8**	-	-	0.5	U	-
YVD-17	YVD-17-160623	6/23/2016	N	59037371	**39.0**	-	-	**18.0**	-	-	**1.60**	-	-	**8.3**	-	-	**3.4**	-	-	0.5	U	-
YVD-17	YVD-17-160926	9/26/2016	N	K1611565	**40.8**	-	-	**17.3**	-	-	**1.59**	-	-	**8.3**	-	-	**2.91**	-	-	**0.32**	-	-
YVD-17	YVD-17-161215	12/15/2016	N	K1615174	**39.6**	-	-	**15.8**	-	-	**1.46**	-	-	**7.4**	-	-	**2.42**	-	-	**0.34**	-	-
YVD-17	YVD-031017-29	3/10/2017	N	K1702448	**36.6**	-	-	**15.7**	-	-	**0.26**	-	-	**5.4**	-	-	**2.65**	-	-	**0.33**	-	-
YVD-17	YVD-060617-24	6/6/2017	N	K1705754	**40.2**	-	-	**15.8**	-	-	**1.16**	-	-	**7.81**	-	-	**2.40**	-	-	**0.35**	-	-
YVD-17	YVD-092517-08	9/25/2017	N	K1710274	**43.1**	-	-	**16.4**	-	-	**1.73**	-	-	**9.5**	-	-	**2.89**	-	-	**0.37**	-	-
YVD-17	YVD-120517-26	12/5/2017	N	K1713091	**43.6**	-	-	**15.4**	-	-	**1.55**	-	-	**9.87**	-	-	**2.71**	-	-	**0.39**	-	-
YVD-17	YVD-060418-20	6/4/2018	N	874662	**39.1**	-	-	**16.5**	-	-	**0.78**	-	-	**7.20**	-	-	**2.87**	-	-	**0.30**	-	-
YVD-18	YVD-18-130919	09/19/2013	N	SWI0142	**42.9**	-	-	**13.7**	-	-	**3.22**	-	-	**78.3**	-	-	**61.4**	-	-	5	U	-
YVD-18	YVD-18-130925	09/25/2013	N	SWI0175	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
YVD-18	YVD-18-131211	12/11/2013	N	SWL0073	**50.4**	-	-	**17.1**	-	-	**3.02**	-	-	**71.3**	-	-	**62.9**	-	-	5	U	-
YVD-18	YVD-D2-131211	12/11/2013	FD	SWL0073	**50.2**	-	-	**16.7**	-	-	**3.06**	-	-	**70.9**	-	-	**66.5**	-	-	5	U	-
YVD-18	YVD-18-140318	03/18/2014	N	SXC0095	**51.7**	-	-	**16.5**	-	-	**3.30**	-	-	**77.5**	-	-	**66.7**	-	-	5	U	-
YVD-18	YVD-D2-140318	03/18/2014	FD	SXC0095	**52.0**	-	-	**16.6**	-	-	**3.26**	-	-	**78.0**	-	-	**62.1**	-	-	5	U	-
YVD-18	YVD-18-140603	06/03/2014	N	SXF0017	**46.8**	-	-	**15.4**	-	-	**3.24**	-	-	**77.7**	-	-	**64**	-	-	2	U	-
YVD-18	YVD-18-140923	09/23/2014	N	SXI0173	**48.5**	-	-	**15.6**	-	-	**3.80**	-	-	**81.6**	-	-	**54.7**	-	-	2.5	U	-
YVD-18	YVD-18-141216	12/16/2014	N	SXL0121	**52.7**	-	-	**17.7**	-	-	**3.63**	-	-	**81.8**	-	-	**59.6**	-	-	2.5	U	-
YVD-18	YVD-18-150317	03/17/2015	N	5904541	**56.0**	-	-	**19.0**	-	-	**3.50**	-	-	**87.0**	-	-	**64**	-	-	2.5	U	-
YVD-18	YVD-18-150617	06/17/2015	N	59010961	**55.0**	-	-	**18.0**	-	-	**4.10**	J+	MSD	**86.0**	J+	MSD	**65**	-	-	2.5	U	-
YVD-18	YVD-18-150924	09/24/2015	N	59020391	**52.0**	-	-	**19.0**	-	-	**3.50**	-	-	**77.0**	-	-	**63**	-	-	2.5	U	-
YVD-18	YVD-18-151216	12/16/2015	N	59025501	**60.0**	-	-	**20.0**	-	-	**4.00**	-	-	**91.0**	-	-	**66**	-	-	2.5	U	-
YVD-18	YVD-18-160309	03/09/2016	N	59029941	**62.0**	-	-	**21.0**	-	-	**3.80**	-	-	**89.0**	-	-	**63**	-	-	2.5	U	-
YVD-18	YVD-18-160622	6/22/2016	N	59037271	**55.0**	-	-	**19.0**	-	-	**3.70**	-	-	**86.0**	-	-	**61**	-	-	2.5	U	-
YVD-18	YVD-18-160928	9/28/2016	N	K1611629	**58.2**	-	-	**19.7**	-	-	**3.75**	-	-	**83.8**	-	-	**56.8**	-	-	**0.36**	-	-
YVD-18	YVD-18-161214	12/14/2016	N	K1615083	**62.5**	-	-	**19.6**	-	-	**3.69**	-	-	**82.5**	-	-	**56.3**	-	-	**0.38**	-	-
YVD-18	YVD-D3-161214	12/14/2016	FD	K1615083	**60.6**	-	-	**20.1**	-	-	**3.82**	-	-	**84.0**	-	-	**56.4**	-	-	**0.37**	-	-
YVD-18	YVD-030617-05	3/6/2017	N	K1702324	**65.4**	-	-	**20.5**	-	-	**3.39**	-	-	**78.8**	-	-	**55.9**	-	-	**0.40**	-	-
YVD-18	YVD-060717-31	6/7/2017	N	K1705833	**65.2**	-	-	**21.4**	-	-	**3.82**	-	-	**81.8**	-	-	**57.0**	-	-	**0.34**	-	-
YVD-18	YVD-092617-27	9/26/2017	N	K1710333	**58.5**	-	-	**18.3**	-	-	**3.64**	-	-	**77.0**	-	-	**54.8**	-	-	**0.38**	-	-
YVD-18	YVD-120417-05	12/4/2017	N	K1713026	**62.6**	-	-	**20.0**	-	-	**3.62**	-	-	**81.6**	-	-	**58.9**	-	-	**0.40**	-	-
YVD-18	YVD-031918-17	3/19/2018	N	870634	**67.5**	-	-	**22.00**	-	-	**3.78**	-	-	**83.0**	-	-	**68.2**	-	-	**0.34**	-	-
YVD-18	YVD-060318-07	6/3/2018	N	874568	**70.0**	-	-	**23.30**	-	-	**4.18**	-	-	**88.5**	-	-	**65.9**	-	-	**0.33**	-	-
YVD-18	YVD-090918-12	9/9/2018	N	880601	**67.5**	-	-	**22.05**	-	-	**4.20**	-	-	**78.0**	-	-	**67.1**	-	-	**0.35**	-	-
YVD-18	YVD-121018-09	12/10/2018	N	884857	**68.0**	-	-	**22.00**	J	MSD	**4.10**	-	-	**87.0**	-	-	**66.8**	-	-	0.32	U	FBK

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-17	YVD-17-150617	06/17/2015	N	59010961	**0.59**	-	-	0.2	U	-	**5.4**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-17	YVD-17-150924	09/24/2015	N	59020391	0.2	U	-	**1.2**	-	-	**5.6**	J-	MSD	-	-	-	0.1	UJ	MSD	0.25	UJ	MSD
YVD-17	YVD-17-151216	12/16/2015	N	59025501	**0.55**	-	-	0.2	U	-	**5.4**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD
YVD-17	YVD-17-160310	03/10/2016	N	59029941	**0.32**	-	-	0.2	U	-	**4.8**	J	DUP	-	-	-	0.1	U	-	0.25	UJ	FDP
YVD-17	YVD-17-160623	6/23/2016	N	59037371	**0.55**	-	-	0.2	U	-	**5.3**	-	-	-	-	-	0.1	R	MSD	0.25	U	-
YVD-17	YVD-17-160926	9/26/2016	N	K1611565	**1.16**	-	-	0.10	U	-	**7.9**	-	-	-	-	-	0.050	U	MBK	0.5	R	MSD
YVD-17	YVD-17-161215	12/15/2016	N	K1615174	**0.59**	-	-	0.10	U	-	**6.0**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-17	YVD-031017-29	3/10/2017	N	K1702448	**0.42**	-	-	0.10	U	-	**6.3**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-17	YVD-060617-24	6/6/2017	N	K1705754	**0.50**	-	-	0.10	U	-	**6.02**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-17	YVD-092517-08	9/25/2017	N	K1710274	**0.99**	-	-	0.10	U	-	**7.17**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-17	YVD-120517-26	12/5/2017	N	K1713091	**0.71**	-	-	0.10	U	-	**7.53**	-	-	-	-	-	0.050	U	-	0.5	UJ	MSD
YVD-17	YVD-060418-20	6/4/2018	N	874662	**0.66**	-	-	0.05	U	-	**6.54**	-	-	0.09	U	FBK	-	-	-	0.5	UJ	MSD
YVD-18	YVD-18-130919	09/19/2013	N	SWI0142	-	-	-	-	-	-	**122**	-	-	-	-	-	0.1	U	-	0.456	R	FBK
YVD-18	YVD-18-130925	09/25/2013	N	SWI0175	**13.6**	-	-	2	U	-	-	-	-	-	-	-	-	-	-	-	-	-
YVD-18	YVD-18-131211	12/11/2013	N	SWL0073	**14.2**	J	FDP	2	U	-	**116**	-	-	-	-	-	0.02	UJ	MSD	1.5	UJ	MSD
YVD-18	YVD-D2-131211	12/11/2013	FD	SWL0073	**23.5**	J	FDP	2	U	-	**129**	-	-	-	-	-	0.02	UJ	MSD	0.2	UJ	MSD
YVD-18	YVD-18-140318	03/18/2014	N	SXC0095	**18.8**	-	-	2	U	-	**147**	J-	MSD	-	-	-	**0.134**	J	FDP	**0.358**	-	-
YVD-18	YVD-D2-140318	03/18/2014	FD	SXC0095	**17.1**	-	-	2	U	-	**140**	J-	MSD	-	-	-	**0.28**	J	FDP	**0.342**	-	-
YVD-18	YVD-18-140603	06/03/2014	N	SXF0017	**16.9**	-	-	0.8	U	-	**135**	J-	MSD	-	-	-	0.1	U	-	**0.796**	-	-
YVD-18	YVD-18-140923	09/23/2014	N	SXI0173	**13.8**	-	-	1	U	-	**111**	-	-	-	-	-	0.1	U	-	**0.335**	J+	MSD
YVD-18	YVD-18-141216	12/16/2014	N	SXL0121	**16.5**	-	-	1	U	-	**131**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-18	YVD-18-150317	03/17/2015	N	5904541	**20**	J-	MSD	1	U	-	**140**	J-	MSD	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-18	YVD-18-150617	06/17/2015	N	59010961	**17**	-	-	1	U	-	**120**	-	-	-	-	-	0.1	U	-	0.25	UJ	MSD
YVD-18	YVD-18-150924	09/24/2015	N	59020391	**20**	J+	MSD	1	U	-	**140**	J-	MSD	-	-	-	0.1	UJ	MSD	0.25	UJ	MSD
YVD-18	YVD-18-151216	12/16/2015	N	59025501	**23**	-	-	1	U	-	**150**	-	-	-	-	-	0.1	R	MSD	0.25	R	MSD
YVD-18	YVD-18-160309	03/09/2016	N	59029941	**22**	-	-	1	U	-	**150**	J	DUP	-	-	-	0.1	U	-	0.25	UJ	FDP, MSD
YVD-18	YVD-18-160622	6/22/2016	N	59037271	**21**	-	-	1	U	-	**140**	-	-	-	-	-	0.1	UJ	MSD	0.25	R	MSD
YVD-18	YVD-18-160928	9/28/2016	N	K1611629	**20.5**	-	-	0.10	U	-	**135**	-	-	-	-	-	0.050	U	MBK	0.5	U	-
YVD-18	YVD-18-161214	12/14/2016	N	K1615083	**21.5**	-	-	0.10	U	-	**139**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-18	YVD-D3-161214	12/14/2016	FD	K1615083	**21.5**	-	-	0.10	U	-	**142**	-	-	-	-	-	**0.115**	-	-	0.5	U	-
YVD-18	YVD-030617-05	3/6/2017	N	K1702324	**23.7**	J	HTQ	**0.04**	J	HTQ	**140**	-	-	-	-	-	1	U	-	0.5	U	-
YVD-18	YVD-060717-31	6/7/2017	N	K1705833	**22.9**	-	-	0.10	U	-	**135**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-18	YVD-092617-27	9/26/2017	N	K1710333	**21.6**	-	-	0.10	U	-	**137**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-18	YVD-120417-05	12/4/2017	N	K1713026	**24.4**	-	-	0.10	U	-	**144**	-	-	-	-	-	0.050	U	-	0.5	U	-
YVD-18	YVD-031918-17	3/19/2018	N	870634	**27.7**	-	-	0.05	U	-	**161**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-18	YVD-060318-07	6/3/2018	N	874568	**26.3**	-	-	0.05	U	-	**147**	-	-	0.07	U	-	-	-	-	0.5	U	-
YVD-18	YVD-090918-12	9/9/2018	N	880601	**26.0**	-	-	0.05	U	-	**127**	-	-	0.07	U	-	-	-	-	0.5	R	MSD
YVD-18	YVD-121018-09	12/10/2018	N	884857	**27.0**	-	-	0.05	U	-	**145**	-	-	0.07	U	-	-	-	-	0.5	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
YVD-17	YVD-17-150617	06/17/2015	N	59010961	**0.25**	-	-	-	-	-	-	-	-	-	-	-	**160**	-	-	**160**	-	-
YVD-17	YVD-17-150924	09/24/2015	N	59020391	**0.26**	-	-	-	-	-	-	-	-	-	-	-	**170**	-	-	**170**	-	-
YVD-17	YVD-17-151216	12/16/2015	N	59025501	0.25	UJ	MSD	-	-	-	-	-	-	-	-	-	**180**	-	-	**180**	-	-
YVD-17	YVD-17-160310	03/10/2016	N	59029941	0.25	U	-	-	-	-	-	-	-	-	-	-	**150**	-	-	**150**	-	-
YVD-17	YVD-17-160623	6/23/2016	N	59037371	0.25	U	-	-	-	-	-	-	-	-	-	-	**170**	-	-	**170**	-	-
YVD-17	YVD-17-160926	9/26/2016	N	K1611565	-	-	-	**0.095**	-	-	-	-	-	-	-	-	**182**	-	-	**182**	-	-
YVD-17	YVD-17-161215	12/15/2016	N	K1615174	-	-	-	**0.103**	-	-	-	-	-	-	-	-	**154**	-	-	**157**	J	-
YVD-17	YVD-031017-29	3/10/2017	N	K1702448	-	-	-	**0.038**	-	-	-	-	-	-	-	-	**142**	-	-	**156**	J	-
YVD-17	YVD-060617-24	6/6/2017	N	K1705754	-	-	-	**0.055**	-	-	-	-	-	-	-	-	**167**	-	-	**167**	-	-
YVD-17	YVD-092517-08	9/25/2017	N	K1710274	-	-	-	**0.046**	-	-	-	-	-	-	-	-	**179**	-	-	**179**	-	-
YVD-17	YVD-120517-26	12/5/2017	N	K1713091	-	-	-	**0.036**	-	-	-	-	-	-	-	-	**187**	-	-	**187**	-	-
YVD-17	YVD-060418-20	6/4/2018	N	874662	-	-	-	-	-	-	-	-	-	0.07	U	-	**160**	-	-	**160**	-	-
YVD-18	YVD-18-130919	09/19/2013	N	SWI0142	-	-	-	-	-	-	0.1	U	-	-	-	-	**119**	-	-	**120**	-	-
YVD-18	YVD-18-130925	09/25/2013	N	SWI0175	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
YVD-18	YVD-18-131211	12/11/2013	N	SWL0073	-	-	-	-	-	-	-	-	-	0.06	U	-	**109**	-	-	**110**	-	-
YVD-18	YVD-D2-131211	12/11/2013	FD	SWL0073	-	-	-	-	-	-	-	-	-	0.06	U	-	**114**	-	-	**115**	-	-
YVD-18	YVD-18-140318	03/18/2014	N	SXC0095	**0.068**	-	-	-	-	-	-	-	-	-	-	-	**119**	-	-	**120**	-	-
YVD-18	YVD-D2-140318	03/18/2014	FD	SXC0095	**0.082**	-	-	-	-	-	-	-	-	-	-	-	**124**	-	-	**125**	-	-
YVD-18	YVD-18-140603	06/03/2014	N	SXF0017	**0.071**	J+	FBK	-	-	-	-	-	-	-	-	-	**117**	-	-	**118**	-	-
YVD-18	YVD-18-140923	09/23/2014	N	SXI0173	**0.086**	-	-	-	-	-	-	-	-	-	-	-	**114**	-	-	**115**	-	-
YVD-18	YVD-18-141216	12/16/2014	N	SXL0121	0.1	U	-	-	-	-	-	-	-	-	-	-	**114**	-	-	**115**	-	-
YVD-18	YVD-18-150317	03/17/2015	N	5904541	0.25	U	-	-	-	-	-	-	-	-	-	-	**110**	-	-	**110**	-	-
YVD-18	YVD-18-150617	06/17/2015	N	59010961	0.25	U	-	-	-	-	-	-	-	-	-	-	**110**	-	-	**110**	-	-
YVD-18	YVD-18-150924	09/24/2015	N	59020391	0.25	U	-	-	-	-	-	-	-	-	-	-	**120**	-	-	**120**	-	-
YVD-18	YVD-18-151216	12/16/2015	N	59025501	0.25	UJ	MSD	-	-	-	-	-	-	-	-	-	**120**	-	-	**120**	-	-
YVD-18	YVD-18-160309	03/09/2016	N	59029941	0.25	U	-	-	-	-	-	-	-	-	-	-	**120**	-	-	**120**	-	-
YVD-18	YVD-18-160622	6/22/2016	N	59037271	0.25	U	-	-	-	-	-	-	-	-	-	-	**130**	-	-	**130**	-	-
YVD-18	YVD-18-160928	9/28/2016	N	K1611629	-	-	-	**0.013**	-	-	-	-	-	-	-	-	**114**	-	-	**114**	-	-
YVD-18	YVD-18-161214	12/14/2016	N	K1615083	-	-	-	**0.043**	-	-	-	-	-	-	-	-	**111**	-	-	**111**	-	-
YVD-18	YVD-D3-161214	12/14/2016	FD	K1615083	-	-	-	**0.019**	-	-	-	-	-	-	-	-	**111**	-	-	**111**	-	-
YVD-18	YVD-030617-05	3/6/2017	N	K1702324	-	-	-	**0.024**	-	-	-	-	-	-	-	-	**110**	-	-	**110**	-	-
YVD-18	YVD-060717-31	6/7/2017	N	K1705833	-	-	-	**0.018**	-	-	-	-	-	-	-	-	**114**	-	-	**114**	-	-
YVD-18	YVD-092617-27	9/26/2017	N	K1710333	-	-	-	**0.018**	-	-	-	-	-	-	-	-	**115**	-	-	**115**	-	-
YVD-18	YVD-120417-05	12/4/2017	N	K1713026	-	-	-	0.017	U	MBK	-	-	-	-	-	-	**114**	-	-	**114**	-	-
YVD-18	YVD-031918-17	3/19/2018	N	870634	-	-	-	-	-	-	-	-	-	0.07	U	-	**111**	-	-	**111**	-	-
YVD-18	YVD-060318-07	6/3/2018	N	874568	-	-	-	-	-	-	-	-	-	0.07	U	-	**110**	-	-	**110**	-	-
YVD-18	YVD-090918-12	9/9/2018	N	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	**112**	-	-	**112**	-	-
YVD-18	YVD-121018-09	12/10/2018	N	884857	-	-	-	-	-	-	-	-	-	0.07	U	-	**115**	-	-	**115**	-	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
Equipment Blank	YVD-EB-130918	09/18/2013	EB	SWI0123	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Equipment Blank	YVD-EB-130925	09/25/2013	EB	SWI0175	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Equipment Blank	YVD-EB-131212	12/12/2013	EB	SWL0078	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Equipment Blank	YVD-EB-140317	03/17/2014	EB	SXC0081	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Equipment Blank	YVD-EB-140318	03/18/2014	EB	SXC0095	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Equipment Blank	YVD-EB-140319	03/19/2014	EB	SXC0107	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Equipment Blank	YVD-EB-140604	06/04/2014	EB	SXF0025	1	U	-	0.5	U	-	1	U	-	0.5	U	-	**1.46**	-	-	0.5	U	-
Equipment Blank	YVD-EB-140924	09/24/2014	EB	SXI0173	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Equipment Blank	YVD-EB-141217	12/17/2014	EB	SXL0144	1	U	-	0.5	U	-	1	U	-	0.5	U	-	**0.9**	-	-	0.5	U	-
Equipment Blank	YVD-EB-150617	06/17/2015	EB	59011021	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Equipment Blank	YVD-EB-150925	09/25/2015	EB	59020431	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Equipment Blank	YVD-EB-151216	12/16/2015	EB	59025501	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Equipment Blank	YVD-EB-160310	03/10/2016	EB	59029941	1	U	-	0.5	U	-	1	U	-	**1.1**	-	-	**1.1**	-	-	**0.67**	-	-
Equipment Blank	YVD-EB-160623	6/23/2016	EB	59037371	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Equipment Blank	YVD-EB-160926	9/26/2016	EB	K1611506	**0.097**	-	-	**0.0346**	-	-	**0.1**	J	-	**0.13**	J	-	0.2	U	-	0.2	U	-
Equipment Blank	YVD-EB-160927	9/27/2016	EB	K1611629	**0.011**	J	-	**0.0004**	J	-	0.2	U	-	**0.04**	J	-	0.1	U	-	0.1	U	-
Equipment Blank	YVD-EB-160928	9/28/2016	EB	K1611629	**0.05**	J	-	0.05	U	-	0.2	U	-	**0.04**	J	-	**0.03**	J	-	0.1	U	-
Equipment Blank	YVD-EB1-161214	12/14/2016	EB	K1615083	0.021	U	MBK	0.0053	U	MBK	0.21	U	-	0.21	U	-	0.2	U	-	0.2	U	-
Equipment Blank	YVD-EB2-161215	12/15/2016	EB	K1615126	0.021	U	MBK	0.0053	U	MBK	0.21	U	-	0.21	U	MBK	0.2	U	-	0.2	U	-
Equipment Blank	YVD-EB3-161216	12/16/2016	EB	K1615174	0.035	U	MBK	0.0053	U	MBK	0.21	U	-	0.21	U	MBK	0.2	U	-	0.2	U	-
Field Blank	YVD-F1-130916	09/16/2013	FB	SWI0113	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F2-130917	09/17/2013	FB	SWI0113	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F3-130918	09/18/2013	FB	SWI0123	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F4-130918	09/18/2013	FB	SWI0138	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F5-130919	09/19/2013	FB	SWI0142	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F6-130923	09/23/2013	FB	SWI0178	1	U	-	0.5	U	-	1	U	-	0.5	U	-	-	-	-	-	-	-
Field Blank	YVD-F7-130924	09/24/2013	FB	SWI0175	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F7-130926	09/26/2013	FB	SWI0190	-	-	-	-	-	-	-	-	-	-	-	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F1-131209	12/09/2013	FB	SWL0055	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F2-131210	12/10/2013	FB	SWL0063	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F3-131211	12/11/2013	FB	SWL0073	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F4-131212	12/12/2013	FB	SWL0078	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F1-140316	03/16/2014	FB	SXC0081	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F2-140317	03/17/2014	FB	SXC0095	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F3-140318	03/18/2014	FB	SXC0107	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F4-140319	03/19/2014	FB	SXC0107	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F1-140601	06/01/2014	FB	SXF0008	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F2-140602	06/02/2014	FB	SXF0017	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F3-140603	06/03/2014	FB	SXF0025	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F1-140921	09/21/2014	FB	SXI0148	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
Equipment Blank	YVD-EB-130918	09/18/2013	EB	SWI0123	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Equipment Blank	YVD-EB-130925	09/25/2013	EB	SWI0175	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Equipment Blank	YVD-EB-131212	12/12/2013	EB	SWL0078	0.2	U	-	0.2	U	-	0.5	U	-	0.02	U	-	0.02	U	-	0.2	U	-
Equipment Blank	YVD-EB-140317	03/17/2014	EB	SXC0081	0.2	U	-	0.2	U	-	0.5	U	-	**0.124**	-	-	**0.124**	-	-	0.25	U	-
Equipment Blank	YVD-EB-140318	03/18/2014	EB	SXC0095	0.2	U	-	0.2	U	-	0.5	U	-	**0.13**	-	-	**0.13**	-	-	0.25	U	-
Equipment Blank	YVD-EB-140319	03/19/2014	EB	SXC0107	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Equipment Blank	YVD-EB-140604	06/04/2014	EB	SXF0025	0.2	U	-	0.2	U	-	**1.24**	-	-	0.1	U	-	0.1	U	-	0.25	U	-
Equipment Blank	YVD-EB-140924	09/24/2014	EB	SXI0173	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	**1.2**	-	-
Equipment Blank	YVD-EB-141217	12/17/2014	EB	SXL0144	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Equipment Blank	YVD-EB-150617	06/17/2015	EB	59011021	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	**0.37**	-	-
Equipment Blank	YVD-EB-150925	09/25/2015	EB	59020431	0.2	U	-	0.2	U	-	0.5	U	-	**0.1**	-	-	**0.1**	-	-	**0.38**	-	-
Equipment Blank	YVD-EB-151216	12/16/2015	EB	59025501	0.2	U	-	0.2	U	-	0.5	U	-	**0.12**	J-	MSD	**0.12**	J-	MSD	0.25	U	-
Equipment Blank	YVD-EB-160310	03/10/2016	EB	59029941	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	**1.9**	-	-
Equipment Blank	YVD-EB-160623	6/23/2016	EB	59037371	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	**0.43**	-	-
Equipment Blank	YVD-EB-160926	9/26/2016	EB	K1611506	0.1	U	-	0.10	U	-	0.2	U	-	0.050	U	MBK	0.050	U	MBK	0.5	R	MSD
Equipment Blank	YVD-EB-160927	9/27/2016	EB	K1611629	0.05	UJ	HTQ	0.05	UJ	HTQ	**0.08**	J	-	0.050	U	MBK	0.050	U	MBK	0.5	U	-
Equipment Blank	YVD-EB-160928	9/28/2016	EB	K1611629	0.05	U	-	0.05	U	-	**0.51**	-	-	0.050	U	MBK	0.050	U	MBK	0.5	U	-
Equipment Blank	YVD-EB1-161214	12/14/2016	EB	K1615083	0.1	U	-	0.10	U	-	0.2	U	-	0.050	U	-	0.050	U	-	0.5	U	-
Equipment Blank	YVD-EB2-161215	12/15/2016	EB	K1615126	0.1	U	-	0.10	U	-	0.2	U	-	0.050	U	-	0.050	U	-	0.5	U	-
Equipment Blank	YVD-EB3-161216	12/16/2016	EB	K1615174	0.1	U	-	0.10	U	-	**0.4**	-	-	0.050	U	-	0.050	U	-	0.5	U	-
Field Blank	YVD-F1-130916	09/16/2013	FB	SWI0113	0.2	U	-	0.2	U	-	**0.53**	-	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F2-130917	09/17/2013	FB	SWI0113	0.2	U	-	0.2	U	-	**0.51**	-	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F3-130918	09/18/2013	FB	SWI0123	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F4-130918	09/18/2013	FB	SWI0138	0.2	U	-	0.2	U	-	0.5	U	-	**0.12**	-	-	**0.12**	-	-	0.25	U	-
Field Blank	YVD-F5-130919	09/19/2013	FB	SWI0142	-	-	-	-	-	-	0.5	U	-	0.1	U	-	0.1	U	-	**0.373**	-	-
Field Blank	YVD-F6-130923	09/23/2013	FB	SWI0178	-	-	-	-	-	-	-	-	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F7-130924	09/24/2013	FB	SWI0175	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F7-130926	09/26/2013	FB	SWI0190	0.2	U	-	0.2	U	-	0.5	U	-	-	-	-	-	-	-	-	-	-
Field Blank	YVD-F1-131209	12/09/2013	FB	SWL0055	0.2	U	-	0.2	U	-	0.5	U	-	0.02	U	-	0.02	U	-	**0.33**	-	-
Field Blank	YVD-F2-131210	12/10/2013	FB	SWL0063	0.2	U	-	0.2	U	-	0.5	U	-	0.02	U	-	0.02	U	-	**3.7**	-	-
Field Blank	YVD-F3-131211	12/11/2013	FB	SWL0073	0.2	U	-	0.2	U	-	0.5	U	-	0.02	U	-	0.02	U	-	**0.43**	-	-
Field Blank	YVD-F4-131212	12/12/2013	FB	SWL0078	0.2	U	-	0.2	U	-	0.5	U	-	0.02	U	-	0.02	U	-	0.2	U	-
Field Blank	YVD-F1-140316	03/16/2014	FB	SXC0081	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F2-140317	03/17/2014	FB	SXC0095	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F3-140318	03/18/2014	FB	SXC0107	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F4-140319	03/19/2014	FB	SXC0107	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F1-140601	06/01/2014	FB	SXF0008	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F2-140602	06/02/2014	FB	SXF0017	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F3-140603	06/03/2014	FB	SXF0025	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F1-140921	09/21/2014	FB	SXI0148	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
Equipment Blank	YVD-EB-130918	09/18/2013	EB	SWI0123	-	-	-	-	-	-	0.1	U	-	-	-	-	4	U	-	4	U	-
Equipment Blank	YVD-EB-130925	09/25/2013	EB	SWI0175	-	-	-	-	-	-	0.1	U	-	-	-	-	4	U	-	4	U	-
Equipment Blank	YVD-EB-131212	12/12/2013	EB	SWL0078	-	-	-	-	-	-	-	-	-	0.06	U	-	4	U	-	4	U	-
Equipment Blank	YVD-EB-140317	03/17/2014	EB	SXC0081	-	-	-	0.05	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Equipment Blank	YVD-EB-140318	03/18/2014	EB	SXC0095	-	-	-	**0.05**	-	-	-	-	-	-	-	-	4	U	-	4	U	-
Equipment Blank	YVD-EB-140319	03/19/2014	EB	SXC0107	-	-	-	0.05	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Equipment Blank	YVD-EB-140604	06/04/2014	EB	SXF0025	-	-	-	0.05	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Equipment Blank	YVD-EB-140924	09/24/2014	EB	SXI0173	-	-	-	**0.062**	-	-	-	-	-	-	-	-	4	U	-	4	U	-
Equipment Blank	YVD-EB-141217	12/17/2014	EB	SXL0144	-	-	-	0.1	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Equipment Blank	YVD-EB-150617	06/17/2015	EB	59011021	-	-	-	0.25	U	-	-	-	-	-	-	-	**5**	-	-	**5**	-	-
Equipment Blank	YVD-EB-150925	09/25/2015	EB	59020431	-	-	-	0.25	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Equipment Blank	YVD-EB-151216	12/16/2015	EB	59025501	-	-	-	0.25	U	-	-	-	-	-	-	-	**5**	-	-	**5**	-	-
Equipment Blank	YVD-EB-160310	03/10/2016	EB	59029941	-	-	-	0.25	U	-	-	-	-	-	-	-	**15**	-	-	**15**	-	-
Equipment Blank	YVD-EB-160623	6/23/2016	EB	59037371	-	-	-	0.25	U	-	-	-	-	-	-	-	**5**	-	-	**5**	-	-
Equipment Blank	YVD-EB-160926	9/26/2016	EB	K1611506	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Equipment Blank	YVD-EB-160927	9/27/2016	EB	K1611629	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Equipment Blank	YVD-EB-160928	9/28/2016	EB	K1611629	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Equipment Blank	YVD-EB1-161214	12/14/2016	EB	K1615083	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Equipment Blank	YVD-EB2-161215	12/15/2016	EB	K1615126	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Equipment Blank	YVD-EB3-161216	12/16/2016	EB	K1615174	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-F1-130916	09/16/2013	FB	SWI0113	-	-	-	-	-	-	0.1	U	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F2-130917	09/17/2013	FB	SWI0113	-	-	-	-	-	-	0.1	U	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F3-130918	09/18/2013	FB	SWI0123	-	-	-	-	-	-	0.1	U	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F4-130918	09/18/2013	FB	SWI0138	-	-	-	-	-	-	0.1	U	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F5-130919	09/19/2013	FB	SWI0142	-	-	-	-	-	-	**0.243**	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F6-130923	09/23/2013	FB	SWI0178	-	-	-	-	-	-	0.1	U	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F7-130924	09/24/2013	FB	SWI0175	-	-	-	-	-	-	0.1	U	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F7-130926	09/26/2013	FB	SWI0190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Blank	YVD-F1-131209	12/09/2013	FB	SWL0055	-	-	-	-	-	-	-	-	-	0.06	U	-	4	U	-	4	U	-
Field Blank	YVD-F2-131210	12/10/2013	FB	SWL0063	-	-	-	-	-	-	-	-	-	0.06	U	-	4	U	-	4	U	-
Field Blank	YVD-F3-131211	12/11/2013	FB	SWL0073	-	-	-	-	-	-	-	-	-	0.06	U	-	4	U	-	4	U	-
Field Blank	YVD-F4-131212	12/12/2013	FB	SWL0078	-	-	-	-	-	-	-	-	-	0.06	U	-	4	U	-	4	U	-
Field Blank	YVD-F1-140316	03/16/2014	FB	SXC0081	-	-	-	0.05	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F2-140317	03/17/2014	FB	SXC0095	-	-	-	0.05	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F3-140318	03/18/2014	FB	SXC0107	-	-	-	0.05	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F4-140319	03/19/2014	FB	SXC0107	-	-	-	0.05	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F1-140601	06/01/2014	FB	SXF0008	-	-	-	0.05	U	-	-	-	-	-	-	-	**4.25**	-	-	**4.25**	-	-
Field Blank	YVD-F2-140602	06/02/2014	FB	SXF0017	-	-	-	**0.061**	-	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F3-140603	06/03/2014	FB	SXF0025	-	-	-	0.05	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F1-140921	09/21/2014	FB	SXI0148	-	-	-	0.05	U	-	-	-	-	-	-	-	4	U	-	4	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
Field Blank	YVD-F2-140922	09/22/2014	FB	SXI0148	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F3-140923	09/23/2014	FB	SXI0158	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F4-140924	09/24/2014	FB	SXI0173	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F1-141215	12/15/2014	FB	SXL0103	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F2-141215	12/15/2014	FB	SXL0108	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F3-141216	12/16/2014	FB	SXL0121	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F4-141217	12/17/2014	FB	SXL0144	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F1-150315	03/15/2015	FB	5904471	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F2-150316	03/16/2015	FB	5904541	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F3-150317	03/17/2015	FB	5904651	**1.2**	-	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F1-150615	06/15/2015	FB	59010751	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F2-150616	06/16/2015	FB	59010961	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F3-150617	06/17/2015	FB	59011021	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F1-150922	09/22/2015	FB	59020141	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F2-150923	09/23/2015	FB	59020281	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F3-150923	09/23/2015	FB	59020391	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F4-150924	09/24/2015	FB	59020391	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F5-150925	09/25/2015	FB	59020431	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F1-151213	12/13/2015	FB	59025351	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F2-151214	12/14/2015	FB	59025431	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F3-151215	12/15/2015	FB	59025501	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F4-151216	12/16/2015	FB	59025501	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F1-160307	03/07/2016	FB	59029521	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F2-160308	03/08/2016	FB	59029711	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F3-160309	03/09/2016	FB	59029941	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F4-160310	03/10/2016	FB	59029941	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F1-160620	6/20/2016	FB	59037101	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F2-160621	6/21/2016	FB	59037151	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F3-160622	6/22/2016	FB	59037271	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-F4-160623	6/23/2016	FB	59037371	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Field Blank	YVD-FB-160926	9/26/2016	FB	K1611506	0.02	U	MBK	**0.0025**	J	-	**0.08**	J	-	**0.03**	J	-	0.2	U	-	0.2	U	-
Field Blank	YVD-FB-160927	9/27/2016	FB	K1611565	0.02	U	MBK	0.05	U	-	0.2	U	-	0.2	U	-	0.2	U	-	0.2	U	-
Field Blank	YVD-FB-160928	9/28/2016	FB	K1611629	**0.05**	J	-	0.05	U	-	0.2	U	-	**0.05**	J	-	0.1	U	-	0.1	U	-
Field Blank	YVD-FB-160929	9/29/2016	FB	K1611698	**0.07**	J	-	0.05	U	-	0.2	U	-	**0.05**	J	-	0.2	U	-	0.2	U	-
Field Blank	YVD-FB1-161212	12/12/2016	FB	K1615029	0.021	U	MBK	0.0053	U	MBK	0.21	U	-	0.21	U	MBK	0.2	U	-	0.2	U	-
Field Blank	YVD-FB2-161213	12/13/2016	FB	K1615045	0.021	U	MBK	0.0053	U	MBK	0.21	U	-	0.21	U	MBK	0.2	U	-	0.2	U	-
Field Blank	YVD-FB3-161214	12/14/2016	FB	K1615083	0.021	U	MBK	0.0053	U	-	0.21	U	-	0.21	U	MBK	0.2	U	-	0.2	U	-
Field Blank	YVD-FB4-161215	12/15/2016	FB	K1615126	0.021	U	MBK	0.0053	U	MBK	0.21	U	-	0.21	U	MBK	0.2	U	-	0.2	U	-
Field Blank	YVD-FB5-161216	12/16/2016	FB	K1615174	0.021	U	MBK	0.0053	U	MBK	0.21	U	-	0.21	U	MBK	0.2	U	-	0.2	U	-
Field Blank	YVD-030617-01	3/6/2017	FB	K1702228	0.021	U	MBK	0.0053	U	MBK	**0.08**	J	-	**0.04**	J	-	0.2	U	-	0.2	U	-
Field Blank	YVD-030717-06	3/7/2017	FB	K1702324	0.021	U	MBK	0.0053	U	MBK	0.21	U	-	0.21	U	-	0.2	U	-	0.2	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
Field Blank	YVD-F2-140922	09/22/2014	FB	SXI0148	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F3-140923	09/23/2014	FB	SXI0158	0.2	U	-	0.2	U	-	0.5	U	-	**0.128**	-	-	**0.128**	-	-	0.25	U	-
Field Blank	YVD-F4-140924	09/24/2014	FB	SXI0173	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F1-141215	12/15/2014	FB	SXL0103	0.2	UJ	DUP	0.2	U	-	0.5	UJ	DUP	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F2-141215	12/15/2014	FB	SXL0108	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F3-141216	12/16/2014	FB	SXL0121	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F4-141217	12/17/2014	FB	SXL0144	0.2	R	HTQ	0.2	R	HTQ	0.5	U	-	**0.101**	-	-	**0.101**	-	-	0.25	U	-
Field Blank	YVD-F1-150315	03/15/2015	FB	5904471	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F2-150316	03/16/2015	FB	5904541	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F3-150317	03/17/2015	FB	5904651	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F1-150615	06/15/2015	FB	59010751	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F2-150616	06/16/2015	FB	59010961	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F3-150617	06/17/2015	FB	59011021	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F1-150922	09/22/2015	FB	59020141	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	**0.26**	-	-
Field Blank	YVD-F2-150923	09/23/2015	FB	59020281	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F3-150923	09/23/2015	FB	59020391	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F4-150924	09/24/2015	FB	59020391	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F5-150925	09/25/2015	FB	59020431	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F1-151213	12/13/2015	FB	59025351	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F2-151214	12/14/2015	FB	59025431	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F3-151215	12/15/2015	FB	59025501	0.2	U	-	0.2	U	-	0.5	U	-	0.1	R	MSD	0.1	R	MSD	0.25	U	-
Field Blank	YVD-F4-151216	12/16/2015	FB	59025501	0.2	U	-	0.2	U	-	0.5	U	-	0.1	R	MSD	0.1	R	MSD	0.25	U	-
Field Blank	YVD-F1-160307	03/07/2016	FB	59029521	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F2-160308	03/08/2016	FB	59029711	0.2	U	-	0.2	U	-	0.5	U	-	**0.19**	-	-	**0.19**	-	-	0.25	U	-
Field Blank	YVD-F3-160309	03/09/2016	FB	59029941	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	**0.3**	-	-
Field Blank	YVD-F4-160310	03/10/2016	FB	59029941	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F1-160620	6/20/2016	FB	59037101	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F2-160621	6/21/2016	FB	59037151	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-F3-160622	6/22/2016	FB	59037271	0.2	U	-	0.2	U	-	0.5	U	-	**0.22**	-	-	**0.22**	-	-	**0.36**	-	-
Field Blank	YVD-F4-160623	6/23/2016	FB	59037371	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Field Blank	YVD-FB-160926	9/26/2016	FB	K1611506	0.1	U	-	0.10	U	-	0.2	U	-	0.050	U	MBK	0.050	U	MBK	0.5	R	MSD
Field Blank	YVD-FB-160927	9/27/2016	FB	K1611565	0.1	U	-	0.10	U	-	0.2	U	-	0.050	U	MBK	0.050	U	MBK	0.5	R	MSD
Field Blank	YVD-FB-160928	9/28/2016	FB	K1611629	0.05	U	-	0.05	U	-	**3.61**	-	-	0.050	U	MBK	0.050	U	MBK	0.5	U	-
Field Blank	YVD-FB-160929	9/29/2016	FB	K1611698	0.1	U	-	0.10	U	-	0.2	U	-	0.050	U	MBK	0.050	U	MBK	0.5	R	MSD
Field Blank	YVD-FB1-161212	12/12/2016	FB	K1615029	0.1	U	HTQ	0.10	UJ	HTQ	0.2	U	MBK	0.050	U	-	0.050	U	-	0.5	U	-
Field Blank	YVD-FB2-161213	12/13/2016	FB	K1615045	0.1	U	-	0.10	U	-	0.2	U	-	0.050	U	-	0.050	U	-	0.5	U	-
Field Blank	YVD-FB3-161214	12/14/2016	FB	K1615083	0.1	U	-	0.10	U	-	**0.35**	-	-	0.050	U	-	0.050	U	-	0.5	U	-
Field Blank	YVD-FB4-161215	12/15/2016	FB	K1615126	0.1	U	-	0.10	U	-	0.2	U	-	0.050	U	-	0.050	U	-	0.5	U	-
Field Blank	YVD-FB5-161216	12/16/2016	FB	K1615174	0.1	U	-	0.10	U	-	0.2	U	-	0.050	U	-	0.050	U	-	0.5	U	-
Field Blank	YVD-030617-01	3/6/2017	FB	K1702228	0.1	U	-	0.10	U	-	0.2	U	-	0.050	U	-	0.050	U	-	**0.2**	J	-
Field Blank	YVD-030717-06	3/7/2017	FB	K1702324	0.1	UJ	HTQ	0.10	UJ	HTQ	0.2	U	-	1	U	-	1	U	-	0.5	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
Field Blank	YVD-F2-140922	09/22/2014	FB	SXI0148	-	-	-	0.05	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F3-140923	09/23/2014	FB	SXI0158	-	-	-	0.05	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F4-140924	09/24/2014	FB	SXI0173	-	-	-	**0.054**	-	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F1-141215	12/15/2014	FB	SXL0103	-	-	-	0.1	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F2-141215	12/15/2014	FB	SXL0108	-	-	-	0.1	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F3-141216	12/16/2014	FB	SXL0121	-	-	-	0.1	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F4-141217	12/17/2014	FB	SXL0144	-	-	-	0.1	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F1-150315	03/15/2015	FB	5904471	-	-	-	0.25	U	-	-	-	-	-	-	-	**15**	-	-	**15**	-	-
Field Blank	YVD-F2-150316	03/16/2015	FB	5904541	-	-	-	0.25	U	-	-	-	-	-	-	-	**7.5**	-	-	**7.5**	-	-
Field Blank	YVD-F3-150317	03/17/2015	FB	5904651	-	-	-	0.25	U	-	-	-	-	-	-	-	**4.5**	-	-	**4.5**	-	-
Field Blank	YVD-F1-150615	06/15/2015	FB	59010751	-	-	-	0.25	U	-	-	-	-	-	-	-	**10**	-	-	**10**	-	-
Field Blank	YVD-F2-150616	06/16/2015	FB	59010961	-	-	-	0.25	U	-	-	-	-	-	-	-	**5**	-	-	**5**	-	-
Field Blank	YVD-F3-150617	06/17/2015	FB	59011021	-	-	-	0.25	U	-	-	-	-	-	-	-	**5**	-	-	**5**	-	-
Field Blank	YVD-F1-150922	09/22/2015	FB	59020141	-	-	-	0.25	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F2-150923	09/23/2015	FB	59020281	-	-	-	**0.26**	-	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F3-150923	09/23/2015	FB	59020391	-	-	-	0.25	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F4-150924	09/24/2015	FB	59020391	-	-	-	0.25	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F5-150925	09/25/2015	FB	59020431	-	-	-	0.25	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F1-151213	12/13/2015	FB	59025351	-	-	-	0.25	U	-	-	-	-	-	-	-	**5**	-	-	**5**	-	-
Field Blank	YVD-F2-151214	12/14/2015	FB	59025431	-	-	-	0.25	U	-	-	-	-	-	-	-	**5**	-	-	**5**	-	-
Field Blank	YVD-F3-151215	12/15/2015	FB	59025501	-	-	-	0.25	U	-	-	-	-	-	-	-	**5**	-	-	**5**	-	-
Field Blank	YVD-F4-151216	12/16/2015	FB	59025501	-	-	-	0.25	U	-	-	-	-	-	-	-	**5**	-	-	**5**	-	-
Field Blank	YVD-F1-160307	03/07/2016	FB	59029521	-	-	-	0.25	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F2-160308	03/08/2016	FB	59029711	-	-	-	0.25	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F3-160309	03/09/2016	FB	59029941	-	-	-	0.25	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F4-160310	03/10/2016	FB	59029941	-	-	-	0.25	U	-	-	-	-	-	-	-	**13**	-	-	**13**	-	-
Field Blank	YVD-F1-160620	6/20/2016	FB	59037101	-	-	-	0.25	U	-	-	-	-	-	-	-	**5**	-	-	**5**	-	-
Field Blank	YVD-F2-160621	6/21/2016	FB	59037151	-	-	-	0.25	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Field Blank	YVD-F3-160622	6/22/2016	FB	59037271	-	-	-	0.25	U	-	-	-	-	-	-	-	**5**	-	-	**5**	-	-
Field Blank	YVD-F4-160623	6/23/2016	FB	59037371	-	-	-	0.25	U	-	-	-	-	-	-	-	**10**	-	-	**10**	-	-
Field Blank	YVD-FB-160926	9/26/2016	FB	K1611506	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-FB-160927	9/27/2016	FB	K1611565	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-FB-160928	9/28/2016	FB	K1611629	-	-	-	0.01	U	-	-	-	-	-	-	-	15	U	-	15	U	-
Field Blank	YVD-FB-160929	9/29/2016	FB	K1611698	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-FB1-161212	12/12/2016	FB	K1615029	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-FB2-161213	12/13/2016	FB	K1615045	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-FB3-161214	12/14/2016	FB	K1615083	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-FB4-161215	12/15/2016	FB	K1615126	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-FB5-161216	12/16/2016	FB	K1615174	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-030617-01	3/6/2017	FB	K1702228	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-030717-06	3/7/2017	FB	K1702324	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Calcium			Magnesium			Potassium			Sodium			Chloride			Fluoride		
Analytical Method					EPA 200.7			EPA 200.7			EPA 200.7			EPA 200.7			EPA 300			EPA 300.0		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
Field Blank	YVD-030817-11	3/8/2017	FB	K1702324	0.021	U	MBK	0.0053	U	MBK	0.21	U	-	0.21	U	-	0.2	U	-	0.2	U	-
Field Blank	YVD-030917-17	3/9/2017	FB	K1702404	0.021	U	MBK	0.0053	U	MBK	0.21	U	-	0.21	U	-	0.2	U	-	0.2	U	-
Field Blank	YVD-031017-26	3/10/2017	FB	K1702448	0.021	U	MBK	0.0053	U	MBK	0.21	U	-	0.21	U	-	0.2	U	-	0.2	U	-
Field Blank	YVD-031317-30	3/13/2017	FB	K1702489	0.021	U	MBK	0.0053	U	MBK	0.21	U	-	0.21	U	-	0.2	U	-	0.2	U	-
Field Blank	YVD-060417-01	6/4/2017	FB	K1705702	0.025	U	MBK	0.0053	U	MBK	0.021	U	-	**0.11**	J	-	21	U	-	0.2	U	-
Field Blank	YVD-060517-07	6/5/2017	FB	K1705702	0.029	U	MBK	0.0053	U	MBK	**0.06**	J	-	**0.11**	J	-	0.2	U	-	0.2	U	-
Field Blank	YVD-060617-17	6/6/2017	FB	K1705754	0.021	U	MBK	0.0053	U	MBK	0.21	U	-	0.21	U	-	0.2	U	-	0.2	U	-
Field Blank	YVD-060717-28	6/7/2017	FB	K1705833	0.021	U	MBK	0.0053	U	MBK	0.21	U	-	**0.02**	J	-	0.2	U	-	0.2	U	-
Field Blank	YVD-092517-01	9/25/2017	FB	K1710274	0.021	U	MBK	**0.0018**	J	-	0.21	U	MBK	0.21	U	MBK	0.20	U	-	0.20	U	-
Field Blank	YVD-092617-16	9/26/2017	FB	K1710333	0.026	U	MBK	0.0076	U	MBK	**0.09**	J	-	0.21	U	MBK	0.20	U	-	0.20	U	-
Field Blank	YVD-120417-01	12/4/2017	FB	K1713026	0.021	U	MBK	0.0053	U	MBK	0.21	U	-	0.21	U	-	0.20	U	-	0.20	U	-
Field Blank	YVD-120517-32	12/5/2017	FB	K1713091	0.021	U	MBK	0.0053	U	MBK	0.21	U	-	**0.07**	J	-	**0.42**	-	-	0.20	U	-
Field Blank	YVD-120617-25	12/6/2017	FB	K1713157	0.021	U	MBK	0.0053	U	MBK	0.21	U	-	0.21	U	MBK	0.20	U	-	0.20	U	-
Field Blank	YVD-031818-01	3/18/2018	FB	870610	0.4	U	-	0.06	U	-	0.62	U	-	0.7	U	-	0.1	U	-	0.1	U	-
Field Blank	YVD-031918-10	3/19/2018	FB	870634	0.4	U	-	0.06	U	-	0.62	U	-	0.7	U	-	0.1	U	-	0.1	U	-
Field Blank	YVD-060318-01	6/3/2018	FB	874568	0.4	U	-	0.06	U	-	0.62	U	-	0.7	U	-	0.1	U	-	0.1	U	-
Field Blank	YVD-060418-12	6/4/2018	FB	874568	0.4	U	-	0.06	U	-	0.62	U	-	0.7	U	-	0.1	U	-	0.1	U	-
Field Blank	YVD-060518-26	6/5/2018	FB	874860	0.4	U	-	0.06	U	-	0.62	U	-	0.7	U	-	0.1	U	-	0.1	U	-
Field Blank	YVD-061218-33	6/12/2018	FB	875438	0.4	U	-	0.06	U	-	0.62	U	-	0.7	U	-	0.1	U	-	0.1	U	-
Field Blank	YVD-090918-01	9/9/2018	FB	880601	0.4	U	-	0.06	U	-	0.62	U	-	0.7	U	-	0.1	U	-	0.1	U	-
Field Blank	YVD-121018-01	12/10/2018	FB	884857	0.4	U	-	0.06	UJ	MSD	0.62	U	-	0.7	U	-	**0.28**		-	**0.10**	U	-
Field Blank	YVD-121118-12	12/11/2018	FB	884939	0.4	U	-	0.06	U	-	0.62	U	-	0.7	U	-	**0.14**		-	0.1	U	-
Blank Check	WW-1	4/25/2016	BC	59032861	1.7	U	-	0.83	U	-	**190**	-	-	**400**	-	-	160	U	-	100	U	-
Blank Check	DW-1	4/25/2016	BC	59032861	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-
Blank Check	DI-1	4/25/2016	BC	59032861	1	U	-	0.5	U	-	1	U	-	0.5	U	-	0.8	U	-	0.5	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Nitrate (as N)			Nitrite (as N)			Sulfate			Ammonia (as N)			Ammonia (as N)			Total Kjeldahl Nitrogen (TKN)		
Analytical Method					EPA 300.0			EPA 300.0			EPA 300.0			SM 4500 NH3-G			EPA 350.1			EPA 351.2		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
Field Blank	YVD-030817-11	3/8/2017	FB	K1702324	0.1	U	-	0.10	U	-	0.03	J	-	1	U	-	1	U	-	0.5	U	-
Field Blank	YVD-030917-17	3/9/2017	FB	K1702404	0.1	U	-	0.10	U	-	0.2	U	-	0.050	U	-	0.050	U	-	0.5	U	-
Field Blank	YVD-031017-26	3/10/2017	FB	K1702448	0.1	U	-	0.10	U	-	0.26	-	-	0.050	U	-	0.050	U	-	0.5	U	-
Field Blank	YVD-031317-30	3/13/2017	FB	K1702489	0.1	U	-	0.10	U	-	0.2	U	-	0.050	U	-	0.050	U	-	0.5	U	-
Field Blank	YVD-060417-01	6/4/2017	FB	K1705702	5.3	U	-	21	U	-	5.3	U	-	0.050	U	-	0.050	U	-	**0.7**	-	-
Field Blank	YVD-060517-07	6/5/2017	FB	K1705702	0.1	U	-	0.10	U	-	**0.25**	-	-	0.050	U	-	0.050	U	-	0.5	U	-
Field Blank	YVD-060617-17	6/6/2017	FB	K1705754	0.1	U	-	0.10	U	-	0.2	U	-	0.050	U	-	0.050	U	-	0.5	U	-
Field Blank	YVD-060717-28	6/7/2017	FB	K1705833	0.1	U	-	0.10	U	-	0.2	U	-	0.050	U	-	0.050	U	-	0.5	U	-
Field Blank	YVD-092517-01	9/25/2017	FB	K1710274	0.10	U	-	0.10	U	-	0.20	U	-	0.050	U	-	0.050	U	-	0.5	U	-
Field Blank	YVD-092617-16	9/26/2017	FB	K1710333	0.10	U	-	0.10	U	-	**0.86**	-	-	0.050	U	-	0.050	U	-	0.5	U	-
Field Blank	YVD-120417-01	12/4/2017	FB	K1713026	0.10	U	-	0.10	U	-	0.20	U	-	0.050	U	-	0.050	U	-	0.5	U	-
Field Blank	YVD-120517-32	12/5/2017	FB	K1713091	0.10	U	HTQ	0.10	UJ	HTQ	**0.71**	-	-	0.050	U	-	0.050	U	-	0.5	UJ	MSD
Field Blank	YVD-120617-25	12/6/2017	FB	K1713157	0.10	U	-	0.10	U	-	0.20	U	-	0.050	U	MBK	0.050	U	MBK	0.5	U	-
Field Blank	YVD-031818-01	3/18/2018	FB	870610	0.05	U	-	0.05	U	-	0.1	U	-	0.07	U	-	-	-	-	0.5	U	-
Field Blank	YVD-031918-10	3/19/2018	FB	870634	0.05	U	-	0.05	U	-	0.1	U	-	0.07	U	-	-	-	-	0.5	U	-
Field Blank	YVD-060318-01	6/3/2018	FB	874568	0.05	U	-	0.05	U	-	0.1	U	-	**0.18**	-	-	-	-	-	0.5	U	-
Field Blank	YVD-060418-12	6/4/2018	FB	874568	0.05	U	-	0.05	U	-	0.1	U	-	**0.08**	-	-	-	-	-	0.5	U	-
Field Blank	YVD-060518-26	6/5/2018	FB	874860	0.05	U	-	0.05	U	-	0.1	U	-	0.07	U	-	-	-	-	0.5	UJ	MSD
Field Blank	YVD-061218-33	6/12/2018	FB	875438	0.05	U	-	0.05	U	-	0.1	U	-	0.07	U	-	-	-	-	0.5	U	-
Field Blank	YVD-090918-01	9/9/2018	FB	880601	0.05	U	-	0.05	U	-	0.1	U	-	0.07	U	-	-	-	-	0.5	R	MSD
Field Blank	YVD-121018-01	12/10/2018	FB	884857	0.05	U	-	0.05	U	-	0.1	U	-	0.07	U	-	-	-	-	0.5	U	-
Field Blank	YVD-121118-12	12/11/2018	FB	884939	0.05	U	-	0.05	U	-	0.1	U	-	0.07	U	-	-	-	-	0.5	U	
Blank Check	WW-1	4/25/2016	BC	59032861	40	U	-	40	U	-	100	U	-	**0.33**	-	-	**0.33**	-	-	**1.4**	-	-
Blank Check	DW-1	4/25/2016	BC	59032861	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-
Blank Check	DI-1	4/25/2016	BC	59032861	0.2	U	-	0.2	U	-	0.5	U	-	0.1	U	-	0.1	U	-	0.25	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Analyte					Phosphorus			Phosphorus			Phosphorus			Phosphorus			Alkalinity, Bicarbonate (as CaCO3)			Alkalinity, Total (as CaCO3)		
Analytical Method					EPA 365.1			EPA 365.3			EPA 365.4			SM 4500 P-E			SM 2320B			SM 2320B		
Well ID	Sample Name	Sample Date	Sample Type	Sample Group	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code	Result (mg/L)	Qualifier	Validation Code
Field Blank	YVD-030817-11	3/8/2017	FB	K1702324	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-030917-17	3/9/2017	FB	K1702404	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-031017-26	3/10/2017	FB	K1702448	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-031317-30	3/13/2017	FB	K1702489	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-060417-01	6/4/2017	FB	K1705702	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-060517-07	6/5/2017	FB	K1705702	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-060617-17	6/6/2017	FB	K1705754	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-060717-28	6/7/2017	FB	K1705833	-	-	-	0.01	U	-	-	-	-	-	-	-	2	U	-	2	U	-
Field Blank	YVD-092517-01	9/25/2017	FB	K1710274	-	-	-	0.010	U	-	-	-	-	-	-	-	2.0	U	-	2.0	U	-
Field Blank	YVD-092617-16	9/26/2017	FB	K1710333	-	-	-	0.010	U	-	-	-	-	-	-	-	2.0	U	-	2.0	U	-
Field Blank	YVD-120417-01	12/4/2017	FB	K1713026	-	-	-	0.010	U	-	-	-	-	-	-	-	15	U	MBK	15	U	-
Field Blank	YVD-120517-32	12/5/2017	FB	K1713091	-	-	-	0.010	U	-	-	-	-	-	-	-	15	U	MBK	15	U	-
Field Blank	YVD-120617-25	12/6/2017	FB	K1713157	-	-	-	0.010	U	-	-	-	-	-	-	-	15	U	MBK	15	U	-
Field Blank	YVD-031818-01	3/18/2018	FB	870610	-	-	-	-	-	-	-	-	-	0.07	U	-	5	U	-	5	U	-
Field Blank	YVD-031918-10	3/19/2018	FB	870634	-	-	-	-	-	-	-	-	-	0.07	U	-	5	U	-	5	U	-
Field Blank	YVD-060318-01	6/3/2018	FB	874568	-	-	-	-	-	-	-	-	-	0.07	U	-	5	U	-	5	U	-
Field Blank	YVD-060418-12	6/4/2018	FB	874568	-	-	-	-	-	-	-	-	-	0.07	U	-	5	U	-	5	U	-
Field Blank	YVD-060518-26	6/5/2018	FB	874860	-	-	-	-	-	-	-	-	-	0.07	U	-	5	U	-	5	U	-
Field Blank	YVD-061218-33	6/12/2018	FB	875438	-	-	-	-	-	-	-	-	-	0.07	U	-	5	U	-	5	U	-
Field Blank	YVD-090918-01	9/9/2018	FB	880601	-	-	-	-	-	-	-	-	-	0.07	U	-	5	U	-	5	U	-
Field Blank	YVD-121018-01	12/10/2018	FB	884857	-	-	-	-	-	-	-	-	-	0.07	U	-	5	U	-	5	U	-
Field Blank	YVD-121118-12	12/11/2018	FB	884939	-	-	-	-	-	-	-	-	-	0.07	U	-	5	U	-	5	U	-
Blank Check	WW-1	4/25/2016	BC	59032861	-	-	-	0.25	U	-	-	-	-	-	-	-	**110**	-	-	**110**	-	-
Blank Check	DW-1	4/25/2016	BC	59032861	-	-	-	0.25	U	-	-	-	-	-	-	-	4	U	-	4	U	-
Blank Check	DI-1	4/25/2016	BC	59032861	-	-	-	0.25	U	-	-	-	-	-	-	-	4	U	-	4	U	-

Table 3
Historical Groundwater Chemistry Data, 2013 to 2018

Notes:
Bold: detected result
- : not applicable
(as N): reported as nitrogen
(as CaCO3): reported as calcium carbonate
BC: blank check
DUP: Laboratory duplicate relative percent difference was outside acceptance limits.
EB: equipment blank
EPA: U.S. Environmental Protection Agency
ERL: elevated reporting limit
FB: field blank
FBK: field blank contamination
FD: field duplicate
FDP: Field duplicate relative percent difference exceeded acceptance limits.
HTQ: holding time violation
J: The compound was positively identified; however, the associated numerical value is an estimated concentration.
J-: The result is an estimated quantity, but the result may be biased low.
J+: The result is an estimated quantity, but the result may be biased high.
MBK: method blank contamination
mg/L: milligrams per liter
MSD: Matrix spike/matrix spike duplicate percent recoveries were outside acceptance limits.
N: normal sample
NR: Sample did not meet collection criteria; not a representative sample.
PRS: Incorrect sample preservation.
R: The sample results are rejected as unusable. The compound may or may not be present in the sample.
RPD: Relative percent difference was outside acceptance limits.
SM: Standard Method
U: The compound was analyzed for but not detected. The associated value is the compound reporting limit, or the compound is considered non-detect at the listed value due to associated blank contamination.
UJ: The compound was not detected above the reported sample reporting limit; however, the reporting limit is approximate and may or may not represent the actual limit of quantitation.

Table 4
Water Level and Water Table Elevations, 2013 to 2018

Well ID	Date of Measurement	Reference Point Elevation (feet NAVD88)	Depth to Water (feet BTOC)	Groundwater Elevation (feet NAVD88)
DC-01	9/16/2013	1,199.17	150.45	1,048.72
DC-01	12/9/2013	1,199.17	150.66	1,048.51
DC-01	3/16/2014	1,199.17	150.43	1,048.74
DC-01	6/1/2014	1,199.17	150.50	1,048.67
DC-01	9/21/2014	1,199.17	150.32	1,048.85
DC-01	12/14/2014	1,199.17	150.20	1,048.97
DC-01	3/5/2015	1,199.17	150.35	1,048.82
DC-01	6/15/2015	1,199.17	150.41	1,048.76
DC-01	9/21/2015	1,199.17	150.50	1,048.67
DC-01	12/13/2015	1,199.17	150.46	1,048.71
DC-01	3/8/2016	1,199.17	150.53	1,048.64
DC-01	6/19/2016	1,199.17	150.70	1,048.47
DC-01	9/25/2016	1,199.17	150.70	1,048.47
DC-01	12/11/2016	1,199.17	150.65	1,048.52
DC-03	9/16/2013	910.58	72.43	838.15
DC-03	12/9/2013	910.58	72.55	838.03
DC-03	3/16/2014	910.58	73.62	836.96
DC-03	6/1/2014	910.58	73.25	837.33
DC-03	9/21/2014	910.58	72.26	838.32
DC-03	12/14/2014	910.58	72.40	838.18
DC-03	3/5/2015	910.58	73.60	836.98
DC-03	6/15/2015	910.58	73.12	837.46
DC-03	9/21/2015	910.58	72.35	838.23
DC-03	12/13/2015	910.58	73.64	837.94
DC-03	3/8/2016	910.58	73.99	836.59
DC-03	6/19/2016	910.58	73.84	836.74
DC-03	9/25/2016	910.58	72.87	837.71
DC-03	12/11/2016	910.58	72.93	837.65
DC-03D	9/16/2013	911.33	73.03	838.30
DC-03D	12/9/2013	911.33	73.16	838.17
DC-03D	3/16/2014	911.33	74.35	836.98
DC-03D	6/1/2014	911.33	73.90	837.43
DC-03D	9/21/2014	911.33	72.87	838.46
DC-03D	12/14/2014	911.33	73.13	838.20
DC-03D	3/5/2015	911.33	74.28	837.05
DC-03D	6/15/2015	911.33	73.72	837.61
DC-03D	9/21/2015	911.33	72.96	838.37
DC-03D	12/13/2015	911.33	73.31	838.02
DC-03D	3/8/2016	911.33	74.66	836.67
DC-03D	6/19/2016	911.33	74.47	836.86
DC-03D	9/25/2016	911.33	73.44	837.89
DC-03D	12/11/2016	911.33	73.73	837.60

Table 4
Water Level and Water Table Elevations, 2013 to 2018

Well ID	Date of Measurement	Reference Point Elevation (feet NAVD88)	Depth to Water (feet BTOC)	Groundwater Elevation (feet NAVD88)
DC-04	9/16/2013	877.22	31.75	845.47
DC-04	12/9/2013	877.22	32.61	844.61
DC-04	3/16/2014	877.22	34.55	842.67
DC-04	6/1/2014	877.22	34.65	842.57
DC-04	9/21/2014	877.22	31.99	845.23
DC-04	12/14/2014	877.22	32.98	844.24
DC-04	3/5/2015	877.22	34.31	842.91
DC-04	6/15/2015	877.22	34.70	842.52
DC-04	9/21/2015	877.22	33.61	843.61
DC-04	12/13/2015	877.22	34.38	842.84
DC-04	3/8/2016	877.22	35.60	841.62
DC-04	6/19/2016	877.22	34.74	842.48
DC-04	9/25/2016	877.22	33.81	843.41
DC-04	12/11/2016	877.22	34.33	842.89
DC-05	9/16/2013	911.95	67.78	844.17
DC-05	12/9/2013	911.95	68.28	843.67
DC-05	3/16/2014	911.95	69.25	842.70
DC-05	6/1/2014	911.95	70.15	841.80
DC-05	9/21/2014	911.95	69.43	842.52
DC-05	12/14/2014	911.95	68.80	843.15
DC-05	3/5/2015	911.95	69.33	842.62
DC-05	6/15/2015	911.95	70.28	841.67
DC-05	9/21/2015	911.95	69.94	842.01
DC-05	12/13/2015	911.95	69.59	842.36
DC-05	3/8/2016	911.95	70.58	841.37
DC-05	6/19/2016	911.95	71.43	840.52
DC-05	9/25/2016	911.95	71.08	840.87
DC-05	12/11/2016	911.95	70.24	841.71
DC-05D	9/16/2013	915.91	71.92	843.99
DC-05D	12/9/2013	915.91	72.04	843.87
DC-05D	3/16/2014	915.91	73.83	842.08
DC-05D	6/1/2014	915.91	74.80	841.11
DC-05D	9/21/2014	915.91	73.78	842.13
DC-05D	12/14/2014	915.91	73.02	842.89
DC-05D	3/5/2015	915.91	73.66	842.25
DC-05D	6/15/2015	915.91	74.71	841.20
DC-05D	9/21/2015	915.91	74.38	841.53
DC-05D	12/13/2015	915.91	73.88	842.03
DC-05D	3/8/2016	915.91	74.70	841.21
DC-05D	6/19/2016	915.91	75.71	840.20
DC-05D	9/25/2016	915.91	75.40	840.51
DC-05D	12/11/2016	915.91	74.65	841.26

Table 4
Water Level and Water Table Elevations, 2013 to 2018

Well ID	Date of Measurement	Reference Point Elevation (feet NAVD88)	Depth to Water (feet BTOC)	Groundwater Elevation (feet NAVD88)
DC-07	9/16/2013	889.29	44.76	844.53
DC-07	12/9/2013	889.29	44.15	845.14
DC-07	3/16/2014	889.29	44.76	844.53
DC-07	6/1/2014	889.29	35.12	854.17
DC-07	9/21/2014	889.29	44.59	844.70
DC-07	12/14/2014	889.29	44.13	845.16
DC-07	3/5/2015	889.29	44.90	844.39
DC-07	6/15/2015	889.29	45.30	843.99
DC-07	9/21/2015	889.29	45.08	844.21
DC-07	12/13/2015	889.29	44.65	844.64
DC-07	3/8/2016	889.29	45.50	843.79
DC-07	6/19/2016	889.29	46.16	843.13
DC-07	9/25/2016	889.29	45.69	843.60
DC-07	12/11/2016	889.29	45.61	843.68
DC-09	9/16/2013	1,048.60	147.16	901.44
DC-09	12/9/2013	1,048.60	143.10	905.50
DC-09	3/16/2014	1,048.60	139.81	908.79
DC-09	6/1/2014	1,048.60	142.53	906.07
DC-09	9/21/2014	1,048.60	143.67	904.93
DC-09	12/14/2014	1,048.60	139.42	909.18
DC-09	3/5/2015	1,048.60	137.83	910.77
DC-09	6/15/2015	1,048.60	146.33	902.27
DC-09	9/21/2015	1,048.60	151.28	897.32
DC-09	12/13/2015	1,048.60	147.46	901.14
DC-09	3/8/2016	1,048.60	146.70	901.90
DC-09	6/19/2016	1,048.60	151.03	897.57
DC-09	9/25/2016	1,048.60	151.98	896.62
DC-09	12/11/2016	1,048.60	148.71	899.89
DC-14	9/16/2013	1,036.61	131.08	905.53
DC-14	12/9/2013	1,036.61	131.10	905.51
DC-14	3/16/2014	1,036.61	130.32	906.29
DC-14	6/1/2014	1,036.61	130.02	906.59
DC-14	9/21/2014	1,036.61	130.25	906.36
DC-14	12/14/2014	1,036.61	137.91	898.70
DC-14	3/5/2015	1,036.61	129.51	907.10
DC-14	6/15/2015	1,036.61	129.37	907.24
DC-14	9/21/2015	1,036.61	130.28	906.33
DC-14	12/13/2015	1,036.61	130.71	905.90
DC-14	3/8/2016	1,036.61	131.26	905.35
DC-14	6/19/2016	1,036.61	131.89	904.72
DC-14	9/25/2016	1,036.61	132.76	903.85
DC-14	12/11/2016	1,036.61	133.45	903.16

Table 4
Water Level and Water Table Elevations, 2013 to 2018

Well ID	Date of Measurement	Reference Point Elevation (feet NAVD88)	Depth to Water (feet BTOC)	Groundwater Elevation (feet NAVD88)
YVD-02	9/16/2013	1,288.97	24.21	1,264.76
YVD-02	12/9/2013	1,288.97	32.85	1,256.12
YVD-02	3/16/2014	1,288.97	34.45	1,254.52
YVD-02	6/1/2014	1,288.97	22.10	1,266.87
YVD-02	9/21/2014	1,288.97	26.14	1,262.83
YVD-02	12/14/2014	1,288.97	33.01	1,255.96
YVD-02	3/5/2015	1,288.97	34.42	1,254.55
YVD-02	6/15/2015	1,288.97	19.69	1,269.28
YVD-02	9/21/2015	1,288.97	25.36	1,263.61
YVD-02	12/13/2015	1,288.97	33.25	1,255.72
YVD-02	3/8/2016	1,288.97	33.93	1,255.04
YVD-02	6/19/2016	1,288.97	27.49	1,261.48
YVD-02	9/25/2016	1,288.97	27.72	1,261.25
YVD-02	12/11/2016	1,288.97	32.52	1,256.45
YVD-03	9/16/2013	1,120.68	189.88	930.80
YVD-03	12/9/2013	1,120.68	190.42	930.26
YVD-03	3/16/2014	1,120.68	189.10	931.58
YVD-03	6/1/2014	1,120.68	188.97	931.71
YVD-03	9/21/2014	1,120.68	189.04	931.64
YVD-03	12/14/2014	1,120.68	188.73	931.95
YVD-03	3/5/2015	1,120.68	187.92	932.76
YVD-03	6/15/2015	1,120.68	188.70	931.98
YVD-03	9/21/2015	1,120.68	189.63	931.05
YVD-03	12/13/2015	1,120.68	189.85	930.83
YVD-03	3/8/2016	1,120.68	190.64	930.04
YVD-03	6/19/2016	1,120.68	191.31	929.37
YVD-03	9/25/2016	1,120.68	191.61	929.07
YVD-03	12/11/2016	1,120.68	191.25	929.43
YVD-04	9/16/2013	1,118.66	220.55	898.11
YVD-04	12/9/2013	1,118.66	223.50	895.16
YVD-04	3/16/2014	1,118.66	222.20	896.46
YVD-04	6/1/2014	1,118.66	221.04	897.62
YVD-04	9/21/2014	1,118.66	220.67	897.99
YVD-04	12/14/2014	1,118.66	221.30	897.36
YVD-04	3/5/2015	1,118.66	220.72	897.94
YVD-04	6/15/2015	1,118.66	221.61	897.05
YVD-04	9/21/2015	1,118.66	221.99	896.67
YVD-04	12/13/2015	1,118.66	221.71	896.95
YVD-04	3/8/2016	1,118.66	220.74	897.92
YVD-04	6/19/2016	1,118.66	221.50	897.16
YVD-04	9/25/2016	1,118.66	221.05	897.61
YVD-04	12/11/2016	1,118.66	221.07	897.59

Table 4
Water Level and Water Table Elevations, 2013 to 2018

Well ID	Date of Measurement	Reference Point Elevation (feet NAVD88)	Depth to Water (feet BTOC)	Groundwater Elevation (feet NAVD88)
YVD-05	9/16/2013	1,051.78	167.50	884.28
YVD-05	12/9/2013	1,051.78	166.35	885.43
YVD-05	3/16/2014	1,051.78	165.40	886.38
YVD-05	6/1/2014	1,051.78	165.58	886.20
YVD-05	9/21/2014	1,051.78	166.01	885.77
YVD-05	12/14/2014	1,051.78	165.35	886.43
YVD-05	3/5/2015	1,051.78	164.86	886.92
YVD-05	6/15/2015	1,051.78	166.04	885.74
YVD-05	9/21/2015	1,051.78	168.04	883.74
YVD-05	12/13/2015	1,051.78	167.75	884.03
YVD-05	3/8/2016	1,051.78	167.71	884.07
YVD-05	6/19/2016	1,051.78	168.45	883.33
YVD-05	9/25/2016	1,051.78	168.97	882.81
YVD-05	12/11/2016	1,051.78	168.51	883.27
YVD-06	9/16/2013	1,053.51	110.65	942.86
YVD-06	12/9/2013	1,053.51	108.21	945.30
YVD-06	3/16/2014	1,053.51	105.98	947.53
YVD-06	6/1/2014	1,053.51	106.49	947.02
YVD-06	9/21/2014	1,053.51	108.02	945.49
YVD-06	12/14/2014	1,053.51	106.32	947.19
YVD-06	3/5/2015	1,053.51	104.68	948.83
YVD-06	6/15/2015	1,053.51	106.37	947.14
YVD-06	9/21/2015	1,053.51	109.01	944.50
YVD-06	12/13/2015	1,053.51	108.72	944.79
YVD-06	3/8/2016	1,053.51	108.90	944.61
YVD-06	6/19/2016	1,053.51	111.03	942.48
YVD-06	9/25/2016	1,053.51	112.05	941.46
YVD-06	12/11/2016	1,053.51	NM	
YVD-07	9/16/2013	1,073.03	157.99	915.04
YVD-07	12/9/2013	1,073.03	157.26	915.77
YVD-07	3/16/2014	1,073.03	153.95	919.08
YVD-07	6/1/2014	1,073.03	153.87	919.16
YVD-07	9/21/2014	1,073.03	155.93	917.10
YVD-07	12/14/2014	1,073.03	155.40	917.63
YVD-07	3/5/2015	1,073.03	153.42	919.61
YVD-07	6/15/2015	1,073.03	154.30	918.73
YVD-07	9/21/2015	1,073.03	157.09	915.94
YVD-07	12/13/2015	1,073.03	158.05	914.98
YVD-07	3/8/2016	1,073.03	157.96	915.07
YVD-07	6/19/2016	1,073.03	158.75	914.28
YVD-07	9/25/2016	1,073.03	160.29	912.74
YVD-07	12/11/2016	1,073.03	160.00	913.03

Table 4
Water Level and Water Table Elevations, 2013 to 2018

Well ID	Date of Measurement	Reference Point Elevation (feet NAVD88)	Depth to Water (feet BTOC)	Groundwater Elevation (feet NAVD88)
YVD-08	9/16/2013	1,014.38	170.83	843.55
YVD-08	12/9/2013	1,014.38	171.08	843.30
YVD-08	3/16/2014	1,014.38	170.66	843.72
YVD-08	6/1/2014	1,014.38	170.50	843.88
YVD-08	9/21/2014	1,014.38	170.50	843.88
YVD-08	12/14/2014	1,014.38	170.22	844.16
YVD-08	3/5/2015	1,014.38	169.83	844.55
YVD-08	6/15/2015	1,014.38	170.13	844.25
YVD-08	9/21/2015	1,014.38	170.67	843.71
YVD-08	12/13/2015	1,014.38	170.63	843.75
YVD-08	3/8/2016	1,014.38	171.00	843.38
YVD-08	6/19/2016	1,014.38	171.51	842.87
YVD-08	9/25/2016	1,014.38	171.75	842.63
YVD-08	12/11/2016	1,014.38	171.52	842.86
YVD-09	9/16/2013	966.81	111.14	855.67
YVD-09	12/9/2013	966.81	109.93	856.88
YVD-09	3/16/2014	966.81	109.65	857.16
YVD-09	6/1/2014	966.81	109.95	856.86
YVD-09	9/21/2014	966.81	110.08	856.73
YVD-09	12/14/2014	966.81	109.90	856.91
YVD-09	3/5/2015	966.81	109.95	856.86
YVD-09	6/15/2015	966.81	110.35	856.46
YVD-09	9/21/2015	966.81	110.83	855.98
YVD-09	12/13/2015	966.81	110.89	855.92
YVD-09	3/8/2016	966.81	111.16	855.65
YVD-09	6/19/2016	966.81	111.41	855.40
YVD-09	9/25/2016	966.81	111.68	855.13
YVD-09	12/11/2016	966.81	111.84	854.97
YVD-10	9/16/2013	958.00	90.04	867.96
YVD-10	12/9/2013	958.00	89.20	868.80
YVD-10	3/16/2014	958.00	89.39	868.61
YVD-10	6/1/2014	958.00	90.35	867.65
YVD-10	9/21/2014	958.00	90.41	867.59
YVD-10	12/14/2014	958.00	88.76	869.24
YVD-10	3/5/2015	958.00	89.90	868.10
YVD-10	6/15/2015	958.00	91.10	866.90
YVD-10	9/21/2015	958.00	91.85	866.15
YVD-10	12/13/2015	958.00	91.52	866.48
YVD-10	3/8/2016	958.00	91.91	866.09
YVD-10	6/19/2016	958.00	92.92	865.08
YVD-10	9/25/2016	958.00	92.99	865.01
YVD-10	12/11/2016	958.00	93.02	864.98

Table 4
Water Level and Water Table Elevations, 2013 to 2018

Well ID	Date of Measurement	Reference Point Elevation (feet NAVD88)	Depth to Water (feet BTOC)	Groundwater Elevation (feet NAVD88)
YVD-11	9/16/2013	967.91	106.03	861.88
YVD-11	12/9/2013	967.91	105.77	862.14
YVD-11	3/16/2014	967.91	105.72	862.19
YVD-11	6/1/2014	967.91	106.07	861.84
YVD-11	9/21/2014	967.91	106.04	861.87
YVD-11	12/14/2014	967.91	106.08	861.83
YVD-11	3/5/2015	967.91	106.18	861.73
YVD-11	6/15/2015	967.91	106.67	861.24
YVD-11	9/21/2015	967.91	106.52	861.39
YVD-11	12/13/2015	967.91	106.88	861.03
YVD-11	3/8/2016	967.91	107.58	860.33
YVD-11	6/19/2016	967.91	108.52	859.39
YVD-11	9/25/2016	967.91	108.95	858.96
YVD-11	12/11/2016	967.91	108.90	859.01
YVD-12	9/16/2013	961.91	138.50	823.41
YVD-12	12/9/2013	961.91	138.34	823.57
YVD-12	3/16/2014	961.91	137.55	824.36
YVD-12	6/1/2014	961.91	137.61	824.30
YVD-12	9/21/2014	961.91	137.45	824.46
YVD-12	12/14/2014	961.91	137.25	824.66
YVD-12	3/5/2015	961.91	136.52	825.39
YVD-12	6/15/2015	961.91	137.85	824.06
YVD-12	9/21/2015	961.91	138.95	822.96
YVD-12	12/13/2015	961.91	138.11	823.80
YVD-12	3/8/2016	961.91	138.26	823.65
YVD-12	6/19/2016	961.91	139.23	822.68
YVD-12	9/25/2016	961.91	139.13	822.78
YVD-12	12/11/2016	961.91	138.56	823.35
YVD-13	9/16/2013	965.59	127.43	838.16
YVD-13	12/9/2013	965.59	127.25	838.34
YVD-13	3/16/2014	965.59	127.58	838.01
YVD-13	6/1/2014	965.59	127.59	838.00
YVD-13	9/21/2014	965.59	127.29	838.30
YVD-13	12/14/2014	965.59	127.20	838.39
YVD-13	3/5/2015	965.59	127.35	838.24
YVD-13	6/15/2015	965.59	127.60	837.99
YVD-13	9/21/2015	965.59	127.36	838.23
YVD-13	12/13/2015	965.59	127.13	838.46
YVD-13	3/8/2016	965.59	127.87	837.72
YVD-13	6/19/2016	965.59	128.17	837.42
YVD-13	9/25/2016	965.59	127.88	837.71
YVD-13	12/11/2016	965.59	127.57	838.02

Table 4
Water Level and Water Table Elevations, 2013 to 2018

Well ID	Date of Measurement	Reference Point Elevation (feet NAVD88)	Depth to Water (feet BTOC)	Groundwater Elevation (feet NAVD88)
YVD-14	9/16/2013	920.19	77.30	842.89
YVD-14	12/9/2013	920.19	76.97	843.22
YVD-14	3/16/2014	920.19	77.45	842.74
YVD-14	6/1/2014	920.19	77.61	842.58
YVD-14	9/21/2014	920.19	77.28	842.91
YVD-14	12/14/2014	920.19	76.90	843.29
YVD-14	3/5/2015	920.19	77.51	842.68
YVD-14	6/17/2015	NM	NM	
YVD-14	9/21/2015	NM	NM	
YVD-14R	12/13/2015	921.41	77.76	843.65
YVD-14R	3/8/2016	921.41	78.53	842.88
YVD-14R	6/19/2016	921.41	79.03	842.38
YVD-14R	9/25/2016	921.41	78.68	842.73
YVD-14R	12/11/2016	921.41	78.57	842.84
YVD-15	9/16/2013	940.61	90.34	850.27
YVD-15	12/9/2013	940.61	90.49	850.12
YVD-15	3/16/2014	940.61	91.62	848.99
YVD-15	6/1/2014	940.61	92.57	848.04
YVD-15	9/21/2014	940.61	88.84	851.77
YVD-15	12/14/2014	940.61	90.56	850.05
YVD-15	3/5/2015	940.61	92.03	848.58
YVD-15	6/15/2015	940.61	93.22	847.39
YVD-15	9/21/2015	940.61	93.43	847.18
YVD-15	12/13/2015	940.61	93.21	847.40
YVD-15	3/8/2016	940.61	93.83	846.78
YVD-15	6/19/2016	940.61	94.70	845.91
YVD-15	9/25/2016	940.61	94.70	845.91
YVD-15	12/11/2016	940.61	94.44	846.17
YVD-16	9/16/2013	975.90	112.95	862.95
YVD-16	12/9/2013	975.90	112.84	863.06
YVD-16	3/16/2014	975.90	112.50	863.40
YVD-16	6/1/2014	975.90	112.62	863.28
YVD-16	9/21/2014	975.90	113.02	862.88
YVD-16	12/14/2014	975.90	112.86	863.04
YVD-16	3/5/2015	975.90	112.42	863.48
YVD-16	6/15/2015	975.90	112.85	863.05
YVD-16	9/21/2015	975.90	113.95	861.95
YVD-16	12/13/2015	975.90	114.04	861.86
YVD-16	3/8/2016	975.90	114.51	861.39
YVD-16	6/19/2016	975.90	115.18	860.72
YVD-16	9/25/2016	975.90	115.67	860.23
YVD-16	12/11/2016	975.90	115.17	860.73

Table 4
Water Level and Water Table Elevations, 2013 to 2018

Well ID	Date of Measurement	Reference Point Elevation (feet NAVD88)	Depth to Water (feet BTOC)	Groundwater Elevation (feet NAVD88)
YVD-17	9/16/2013	866.73	32.07	834.66
YVD-17	12/9/2013	866.73	34.81	831.92
YVD-17	3/16/2014	866.73	37.97	828.76
YVD-17	6/1/2014	866.73	35.50	831.23
YVD-17	9/21/2014	866.73	31.86	834.87
YVD-17	12/14/2014	866.73	34.74	831.99
YVD-17	3/5/2015	866.73	37.79	828.94
YVD-17	6/15/2015	866.73	34.57	832.16
YVD-17	9/21/2015	866.73	31.92	834.81
YVD-17	12/13/2015	866.73	35.16	831.57
YVD-17	3/8/2016	866.73	37.47	829.26
YVD-17	6/19/2016	866.73	35.37	831.36
YVD-17	9/25/2016	866.73	32.31	834.42
YVD-17	12/11/2016	866.73	35.20	831.53
YVD-18	9/16/2013	965.74	127.49	838.25
YVD-18	12/9/2013	965.74	127.45	838.29
YVD-18	3/16/2014	965.74	127.75	837.99
YVD-18	6/1/2014	965.74	127.69	838.05
YVD-18	9/21/2014	965.74	127.33	838.41
YVD-18	12/14/2014	965.74	127.33	838.41
YVD-18	3/5/2015	965.74	127.46	838.28
YVD-18	6/15/2015	965.74	127.71	838.03
YVD-18	9/21/2015	965.74	127.42	838.32
YVD-18	12/13/2015	965.74	127.24	838.50
YVD-18	3/8/2016	965.74	128.05	837.69
YVD-18	6/19/2016	965.74	128.29	837.45
YVD-18	9/25/2016	965.74	127.92	837.82
YVD-18	12/11/2016	965.74	127.66	838.08

Notes:
BTOC: below top of casing
NAVD88: North American Vertical Datum of 1988
NM: not measured due to well damage

Table 5

Cow Palace Dairy Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2013 – Crop Year 2014

Field	CP-SU01	CP-SU02	CP-SU03	CP-SU04 A	CP-SU04 B	CP-SU05	CP-SU06
Acres	**69.0**	**71.7**	**155.4**	**71.0**	**40.1**	**37.1**	**85.0**
Report Number	F13-0488	F13-0493	F13-0494	F13-0401	F13-0400	F13-0402	F13-0495
Sample Date	9/24/2013	9/27/2013	9/27/2013	9/17/2013	9/17/2013	9/17/2013	10/1/2013
Previous Crop	Silage Corn	Silage Corn	Silage Corn	Alfalfa	Alfalfa	Alfalfa	Silage Corn
Upcoming Crop	Triticale	Triticale	Triticale	Alfalfa	Alfalfa	Alfalfa	Triticale
Soil Measurements (lbs/ac)							
1' Nitrate	330	219	188	68	53	41	220
2' Nitrate	254	184	179	53	143	19	199
3' Nitrate	256	219	246	66	250	17	121
1'+2' Root Zone	**584**	**403**	**367**	**121**	**196**	**60**	**419**
Calculations & Recommendations	(Calculations were not made in the fall of 2013)						
Recommended N Application (lbs/ac)	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Field Applications (lbs/ac)							
2013 September	0	0	0	0	5	0	0
2013 October	28	55	54	70	57	80	122
2013 November	0	0	20	54	0	0	0
2013 December	0	0	0	0	0	0	0
2014 January	0	0	0	0	0	0	0
2014 February	0	0	0	0	0	0	0
2014 March	0	0	49	0	0	151	0
2014 April	0	0	0	11	114	0	0
Available N Applied	**28**	**55**	**122**	**134**	**176**	**231**	**122**

Table 5

Cow Palace Dairy Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2014 – Crop Year 2014

Field	CP-SU01	CP-SU02	CP-SU03	CP-SU04 A	CP-SU04 B	CP-SU05	CP-SU06
Acres	**69.0**	**71.7**	**155.4**	**71.0**	**40.1**	**37.1**	**85.0**
Report Number	F14-0311	F14-0335	F14-0281	F14-0397	F14-0398	F14-0396	F14-0312
Sample Date	5/13/2014	5/14/2014	5/6/2014	5/23/2014	5/23/2014	5/23/2014	5/13/2014
Previous Crop	Triticale	Triticale	Triticale	Alfalfa	Alfalfa	Alfalfa	Triticale
Upcoming Crop	Silage Corn	Silage Corn	Silage Corn	Alfalfa	Alfalfa	Alfalfa	Sudangrass
Crop Rotation Changes	No	No	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	112	99	124	61	53	104	119
2' Nitrate	143	118	138	48	91	81	186
1'+2' Root Zone	**255**	**217**	**262**	**109**	**144**	**185**	**305**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	261	288	279	292	292	292	279
Soil N supply, plus organic matter release	-269	-250	-264	-158	-173	-200	-331
N used to consume past crop residue	20	20	20	0	0	0	20
N that is positionally unavailable	35	35	35	5	5	5	55
Calculated N need	**47**	**93**	**70**	**139**	**124**	**97**	**23**
Recommendations (lbs/ac)							
Initial Calculated N Application	47	93	70	139	124	97	23
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0	0
Adjusted N Application	**47**	**93**	**70**	**139**	**124**	**97**	**23**
Adjusted N Application Upper Range	**56**	**112**	**84**	**167**	**149**	**116**	**28**
Field Applications (lbs/ac)							
2014 May	2	2	4	0	0	0	5
2014 June	86	110	76	0	0	0	0
2014 July	34	28	36	42	50	128	0
2014 August	0	0	0	42	50	0	0
Available N Applied	**122**	**140**	**116**	**84**	**101**	**128**	**5**

Table 5

Cow Palace Dairy Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2014 – Crop Year 2015

Field	CP-SU01	CP-SU02	CP-SU03	CP-SU04 A	CP-SU04 B	CP-SU05	CP-SU06
Acres	**69.0**	**71.7**	**155.4**	**71.0**	**40.1**	**37.1**	**85.0**
Report Number	F14-0688	F14-0701	F14-0702	F14-0532	F14-0644	F14-0533	F14-0689
Sample Date	10/2/2014	10/6/2014	10/6/2014	9/15/2014	9/25/2014	9/16/2014	10/2/2014
Previous Crop	Silage Corn	Silage Corn	Silage Corn	Alfalfa	Alfalfa	Alfalfa	Sudangrass
Upcoming Crop	Triticale	Triticale	Triticale	Alfalfa	Alfalfa	Triticale	Triticale
Crop Rotation Changes	No	No	No	No	No	Yes	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	175	134	171	56	67	48	157
2' Nitrate	158	125	205	62	74	16	173
3' Nitrate	176	150	222	85	126	13	138
1'+2' Root Zone	**333**	**259**	**376**	**118**	**141**	**64**	**330**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	200	200	200	240	225	200	200
Soil N supply, plus organic matter release	-471	-412	-537	-216	-263	-90	-466
N used to consume past crop residue	25	25	25	0	0		25
Additional crop removal from the 6th cutting				30	30		
Alfalfa crown N release						-25	
N that is positionally unavailable	170	150	210	40	56	13	150
Calculated N need.	**0**	**0**	**0**	**94**	**48**	**98**	**0**
Recommendations (lbs/ac)							
Initial Calculated N Application	35	40	35	94	48	98	40
+ In-season petiole adjustment (if applicable)	20	20	10	0	0	0	20
Adjusted N Application	**55**	**60**	**45**	**94**	**48**	**98**	**60**
Adjusted N Application Upper Range	**66**	**72**	**54**	**113**	**58**	**118**	**72**
Field Applications (lbs/ac)							
2014 October	29	34	31	58	51	36	49
...							
2015 March	13	13	0	0	0	44	0
2015 April	0	0	14	42	50	0	29
Available N Applied	**42**	**47**	**45**	**100**	**102**	**80**	**77**

Table 5

Cow Palace Dairy Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2015 – Crop Year 2015

Field	CP-SU01	CP-SU02	CP-SU03	CP-SU04 A	CP-SU04 B	CP-SU05	CP-SU06
Acres	**69.0**	**71.7**	**155.4**	**71.0**	**40.1**	**37.1**	**85.0**
Report Number	F15-0323	F15-0324	F15-0366	F15-0371	F15-0372	F15-0321	F15-0365
Sample Date	4/30/2015	4/30/2015	4/28/2015	5/14/2015	5/14/2015	5/4/2015	5/4/2015
Previous Crop	Triticale	Triticale	Triticale	Alfalfa	Alfalfa	Triticale	Triticale
Upcoming Crop	Sorghum	Sorghum	Sorghum	Alfalfa	Alfalfa	Sudangrass	Sudangrass
Crop Rotation Changes	Yes	Yes	Yes	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	51	39	60	45	57	30	32
2' Nitrate	65	84	374	10	31	25	56
1'+2' Root Zone	**116**	**123**	**434**	**55**	**88**	**55**	**88**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	215	215	215	360	330	225	225
Soil N supply (residual, OM, past manure)	-154	-163	-477	-133	-143	-113	-143
N used to consume past crop residue	20	20	20	0	0	20	20
N that is positionally unavailable	15	20	120	0	0	10	15
Calculated N need.	**96**	**92**	**0**	**227**	**187**	**142**	**117**
Recommendations (lbs/ac)							
Initial Calculated N Application	96	92	30	227	187	142	117
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0	0
Adjusted N Application	**96**	**92**	**30**	**227**	**187**	**142**	**117**
Adjusted N Application Upper Range	**115**	**110**	**36**	**272**	**224**	**170**	**140**
Field Applications (lbs/ac)							
2015 May	23	31	5	0	0	94	8
2015 June	22	21	25	117	0	0	0
2015 July	50	48	0	0	167	1	98
2015 August	10	10	10	111	19	6	0
Available N Applied	**105**	**111**	**40**	**228**	**185**	**101**	**105**

Table 5

Cow Palace Dairy Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2015 – Crop Year 2016

Field	CP-SU01	CP-SU02	CP-SU03	CP-SU04 A	CP-SU04 B	CP-SU05	CP-SU06
Acres	**69.0**	**71.7**	**155.4**	**71.0**	**40.1**	**37.1**	**85.0**
Report Number:	F15-0576	F15-0577	F15-0694	F15-0531	F15-0532	F15-0695	F15-0546
Sample Date	9/24/2015	9/24/2015	10/1/2015	9/16/2015	9/16/2015	10/1/2015	8/26/2015
Previous Crop	Sorghum	Sorghum	Sorghum	Alfalfa	Alfalfa	Sudangrass	Sudangrass
Upcoming Crop	Triticale	Triticale	Triticale	Alfalfa	Alfalfa	Triticale	Triticale
Crop Rotation Changes	No	No	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	215	133	69	103	51	73	65
2' Nitrate	195	128	30	36	45	57	102
1'+2' Root Zone	**410**	**261**	**99**	**139**	**96**	**130**	**167**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	187	187	187	240	240	187	200
Soil N supply (residual, OM, past manure)	-595	-432	-240	-209	-214	-207	-237
N used to consume past crop residue	20	20	15	0	0	15	25
N that is positionally unavailable	145	135	110	35	60	55	80
Calculated N need.	**0**	**0**	**72**	**66***	**86**	**50**	**68***
Recommendations (lbs/ac)							
Initial Calculated N Application	0	30	72	66	86	50	68
+ In-season petiole adjustment (if applicable)	20	45	70	50	60	0	25
Adjusted N Application	**20**	**75**	**142**	**116**	**146**	**50**	**93**
Adjusted N Application Upper Range	**24**	**90**	**170**	**139**	**175**	**60**	**112**
Field Applications (lbs/ac)							
2015 October	0	31	46	56	106	0	59
2015 November	0	0	21	0	0	0	0
...							
2016 March	0	0	20	0	0	42	0
2016 April	21	46	47	0	0	0	0
Available N Applied	**21**	**77**	**134**	**56**	**106**	**42**	**59**
Notes							
CP-SU04 A	A math error was made in original calculations, originally recommending 63 lbs.						
CP-SU06	A math error was made in original calculations, originally recommending 48 lbs.						

Table 5

Cow Palace Dairy Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2016 – Crop Year 2016

Field	CP-SU01	CP-SU02	CP-SU03	CP-SU04 A	CP-SU04 B	CP-SU05	CP-SU06
Acres	**69.0**	**71.7**	**155.4**	**71.0**	**40.1**	**37.1**	**85.0**
Report Number:	F16-0234	F16-0235	F16-0269	F16-0307	F16-0308	F16-0270	F16-0271
Sample Date	5/3/2016	5/3/2016	5/4/2016	5/20/2016	5/20/2016	5/5/2016	5/5/2016
Previous Crop	Triticale	Triticale	Triticale	Alfalfa	Alfalfa	Triticale	Triticale
Upcoming Crop	Silage Corn	Silage Corn	Silage Corn	Alfalfa	Alfalfa	Sudangrass	Sudangrass
Crop Rotation Changes	No	No	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	37	28	21	43	46	36	43
2' Nitrate	74	39	16	48	44	54	91
1'+2' Root Zone	**111**	**67**	**37**	**91**	**90**	**90**	**134**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	261	261	261	358	358	225	225
Soil N supply (residual, OM, past manure)	-177	-131	-99	-158	-142	-153	-202
N used to consume past crop residue	20	20	20	0	0	20	15
N that is positionally unavailable	15	15	15	15	15	15	15
Calculated N need.	**119**	**165***	**197***	**215**	**231**	**107**	**53**
Recommendations (lbs/ac)							
Initial Calculated N Application	119	165	197	195	210	107	53
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0	0
Adjusted N Application	**119**	**165**	**197**	**195**	**210**	**107**	**53**
Adjusted N Application Upper Range	**143**	**198**	**236**	**234**	**252**	**128**	**64**
Field Applications (lbs/ac)							
2016 May	76	74	1	0	0	0	6
2016 June	39	73	74	122	127	87	0
2016 July	0	0	97	73	76	35	55
Available N Applied	**115**	**147**	**172**	**195**	**203**	**122**	**60**
Notes							
CP-SU02	A math error was made in original calculations, originally recommending 174 lbs.						
CP-SU03	A math error was made in original calculations, originally recommending 187 lbs.						

Table 5

Cow Palace Dairy Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2016 – Crop Year 2017

Field	CP-SU01	CP-SU02	CP-SU03	CP-SU04 A	CP-SU04 B	CP-SU05	CP-SU06
Acres	**69.0**	**71.7**	**155.4**	**71.0**	**40.1**	**37.1**	**85.0**
Report Number:	F16-0491	F16-0492	F16-0684	F16-0685	F16-0686	F16-0387	F16-0388
Sample Date	9/14/2016	9/14/2016	10/25/2016	10/25/2016	10/25/2016	8/30/2016	8/30/2016
Previous Crop	Silage Corn	Silage Corn	Silage Corn	Alfalfa	Alfalfa	Sudangrass	Sudangrass
Upcoming Crop	Triticale	Triticale	Triticale	Alfalfa	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	No	No	No	No	No	Yes	Yes
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	73	60	154	38	27	80	35
2' Nitrate	59	51	49	12	12	54	23
1'+2' Root Zone	**132**	**111**	**203**	**50**	**39**	**134**	**58**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	187	225	187	225	225	210	210
Residual Nitrates (3')	-206	-88	-246	-95	-72	-182	-100
Residual Ammonium (3')	-6	-7	-8	-18	-8	-8	-7
Mineralization (past manure)	-10	-10	-5	-5	-5	-12	-12
Mineralization (organic matter)	-15	-19	-16	-18	-15	-15	-14
N used to consume past crop residue	20	0	0	0	0	15	15
N that may not be accessible	90	23	67	62	51	65	54
Calculated N need.	**60**	**124***	**0**	**151**	**176**	**73**	**146**
Recommendations (lbs/ac)							
Initial Calculated N Application	60	124	40	150	170	73	130
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0	0
Adjusted N Application	**60**	**124**	**40**	**150**	**170**	**73**	**130**
Adjusted N Application Upper Range	**72**	**149**	**48**	**180**	**204**	**88**	**156**
Field Applications (lbs/ac)							
2016 October	30	30	0	0	0	0	0
2016 November	30	30	38	0	23	0	0
2016 December	0	0	0	0	45	0	0
...							
2017 March	0	0	0	137	44	150	0
2017 April	0	0	0	0	74	0	130
Available N Applied	**59**	**60**	**38**	**137**	**186**	**150**	**130**
Notes							
CP-SU02	Calculations made for Alfalfa Section. Triticale's Calculated N need was 81 lbs.						

Table 5

Cow Palace Dairy Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2017 – Crop Year 2017

Field	CP-SU01	CP-SU02	CP-SU03	CP-SU04 A	CP-SU04 B	CP-SU05	CP-SU06
Acres	**69.0**	**71.7**	**155.4**	**71.0**	**40.1**	**37.1**	**85.0**
Report Number:	F17-0231	F17-0232	F17-0334	F17-0274	F17-0275	F17-0335	F17-0336
Sample Date	5/4/2017	5/4/2017	5/26/2017	5/15/2017	5/15/2017	5/29/2017	5/29/2017
Previous Crop	Triticale	Triticale	Triticale	Alfalfa	Alfalfa	Triticale	Triticale
Upcoming Crop	Alfalfa	Alfalfa	Silage Corn	Alfalfa	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	Yes	Yes	No	No	No	Yes	Yes
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	32	22	35	119	90	40	55
2' Nitrate	34	13	42	51	32	30	43
1'+2' Root Zone	**66**	**35**	**77**	**170**	**122**	**70**	**98**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	300	300	261	358	358	358	358
Residual nitrates (3')	-66	-35	-77	-170	-122	-70	-98
Residual ammonium (3')	-25	-17	-8	-26	-22	-6	-15
Mineralization (past manure)	-10	-10	-10	-10	-10	-10	-10
Mineralization (organic matter)	-52	-46	-44	-52	-42	-42	-42
N used to consume past crop residue	20	20	20	0	0	0	0
N that may not be accessible	15	15	15	15	15	15	20
Calculated N need	**182**	**227**	**157**	**115**	**177**	**245**	**213**
Recommendations (lbs/ac)							
Initial Calculated N Application	182	175	157	115	145	42	129
+ In-season petiole adjustment (if applicable)							
Adjusted N Application	**182**	**175**	**157**	**115**	**145**	**42**	**129**
Adjusted N Application Upper Range	**200**	**193**	**173**	**127**	**160**	**46**	**142**
Field Applications (lbs/ac)							
2017 May	68	66	0	0	0	0	0
2017 June	0	0	128	0	0	0	0
2017 July	0	0	40	0	0	0	0
2017 August	36	35	0	82	92	0	87
2017 September	0	35	0	0	0	47	0
Available N Applied	**104**	**135**	**169**	**82**	**92**	**47**	**87**

Table 5

Cow Palace Dairy Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2017 – Crop Year 2018

Field	CP-SU01	CP-SU02	CP-SU03	CP-SU04 A	CP-SU04 B	CP-SU05	CP-SU06
Acres	**69.0**	**71.7**	**155.4**	**71.0**	**40.1**	**37.1**	**85.0**
Report Number:	F17-0479	F17-0480	F17-0656	F17-0567	F17-0568	F17-0481	F17-0569
Sample Date	9/26/2017	9/26/2017	10/19/2017	10/2/2017	10/2/2017	9/26/2017	10/2/2017
Previous Crop	Alfalfa	Alfalfa	Silage Corn	Alfalfa	Alfalfa	Alfalfa	Alfalfa
Upcoming Crop	Alfalfa	Alfalfa	Triticale	Triticale	Triticale	Alfalfa	Alfalfa
Crop Rotation Changes	No	No	No	Yes	Yes	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	51	57	95	56	50	35	41
2' Nitrate	34	24	73	29	24	13	19
1'+2' Root Zone	**85**	**81**	**168**	**85**	**74**	**48**	**60**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	195	211	200	187	187	211	227
Residual nitrates (3')	-127	-113	-289	-115	-106	-68	-74
Residual ammonium (3')	-7	-17	-8	-28	-23	-11	-26
Mineralization (past manure)	-10	-10	-10	-5	-5	-10	-10
Mineralization (organic matter)	-16	-17	-13	-16	-13	-15	-15
N used to consume past crop residue	0	0	20			0	0
N released from past crop residue				-40	-40		
N that may not be accessible	59	59	145	53	57	32	30
Calculated N need	**94**	**113**	**45**	**36**	**57**	**139**	**132**
Recommendations (lbs/ac)							
Initial Calculated N Application	94	113	45	36	57	44	132
+ In-season petiole adjustment (if applicable)							
Adjusted N Application	**94**	**113**	**45**	**36**	**57**	**44**	**132**
Adjusted N Application Upper Range	**103**	**124**	**50**	**40**	**63**	**48**	**145**
Field Applications (lbs/ac)							
2017 October	0	93	0	0	0	45	0
2017 November	0	0	0	37	59	0	0
2017 December	0	0	0	0	0	0	0
2018 January	0	0	0	0	0	0	0
2018 February	0	0	0	0	0	0	0
2018 March	0	0	26	0	0	0	0
2018 April	0	0	22	0	0	22	0
Available N Applied	**0**	**93**	**48**	**37**	**59**	**67**	**0**

Table 5

Cow Palace Dairy Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2018 – Crop Year 2018

Field	CP-SU01	CP-SU02	CP-SU03	CP-SU04 A	CP-SU04 B	CP-SU05	CP-SU06
Acres	**69.0**	**71.7**	**155.4**	**71.0**	**40.1**	**37.1**	**85.0**
Report Number:	F18-0301	F18-0332	F18-0315	F18-0285	F18-0286	F18-0302	F18-0333
Sample Date	5/16/2018	5/18/2018	5/10/2018	5/14/2018	5/14/2018	5/16/2018	5/18/2018
Previous Crop	Alfalfa	Alfalfa	Triticale	Triticale	Triticale	Alfalfa	Alfalfa
Upcoming Crop	Alfalfa	Alfalfa	Silage Corn	Italian Rye	Italian Rye	Alfalfa	Alfalfa
Crop Rotation Changes	No	No	No	Yes	Yes	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	49	38	25	31	29	40	20
2' Nitrate	21	16	28	33	23	14	10
1'+2' Root Zone	**70**	**54**	**53**	**64**	**52**	**54**	**30**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	357	357	276	180	180	357	357
Residual nitrates (3')	-70	-54	-53	-64	-52	-54	-30
Residual ammonium (3')	-22	-16	-18	-18	-17	-25	-23
Mineralization (past manure)	-10	-10	-15	-10	-10	-15	-10
Mineralization (organic matter)	-46	-40	-54	-50	-40	-38	-38
N used to consume past crop residue	0	0	25	20	20	0	0
N released from past crop residue	0	0	0	0	0	0	0
N that may not be accessible	15	15	15	20	15	15	15
Calculated N need	**224**	**252**	**176**	**78**	**96**	**240**	**271**
Recommendations (lbs/ac)							
Initial Calculated N Application	147	147	176	78	96	54	147
+ In-season petiole adjustment (if applicable)							
Adjusted N Application	**147**	**147**	**176**	**78**	**96**	**54**	**147**
Adjusted N Application Upper Range	**162**	**162**	**194**	**86**	**106**	**59**	**162**
Field Applications (lbs/ac)							
2018 June	40	0	32	0	0	22	0
2018 July	88	97	73	0	0	22	0
2018 August	0	0	33	76	84	0	114
2018 September	25	55	0	0	0	0	25
Available N Applied	**153**	**153**	**138**	**76**	**84**	**44**	**140**

Table 5

Cow Palace Dairy Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2018 – Crop Year 2019

Field	CP-SU01	CP-SU02	CP-SU03	CP-SU04 A	CP-SU04 B	CP-SU05	CP-SU06
Acres	**69.0**	**71.7**	**155.4**	**71.0**	**40.1**	**37.1**	**85.0**
Report Number:	F18-0615	F18-0617	F18-0663	F18-0517	F18-0518	F18-0530	F18-0531
Sample Date	10/9/2018	10/9/2018	10/11/2018	9/25/2018	9/25/2018	9/26/2018	9/26/2018
Previous Crop	Alfalfa	Alfalfa	Silage Corn	Italian Rye	Italian Rye	Alfalfa	Alfalfa
Upcoming Crop	Alfalfa	Alfalfa	Triticale	Triticale	Triticale	Alfalfa	Alfalfa
Crop Rotation Changes	No	No	No	Yes	Yes	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	70	50	70	30	32	30	29
2' Nitrate	32	11	27	6	5	3	14
1'+2' Root Zone	**102**	**61**	**97**	**36**	**37**	**33**	**43**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	195	211	200	187	187	211	227
Residual nitrates (3')	-148	-69	-147	-43	-45	-43	-58
Residual ammonium (3')	-24	-8	-16	-6	-6	-6	-6
Mineralization (past manure)	-10	-10	-10	-10	-10	-10	-10
Mineralization (organic matter)	-18	-14	-13	-18	-16	-15	-14
N used to consume past crop residue	0	0	20	10	10	0	0
N released from past crop residue	0	0	0	0	0	0	0
N that may not be accessible	50	25	75	25	25	20	25
Calculated N need	**45**	**135**	**109**	**145**	**145**	**157**	**164**
Recommendations (lbs/ac)							
Initial Calculated N Application	45	135	109	145	145	157	150
+ In-season petiole adjustment (if applicable)							
Adjusted N Application	**45**	**135**	**109**	**145**	**145**	**157**	**150**
Adjusted N Application Upper Range	**50**	**149**	**120**	**160**	**160**	**173**	**165**
Field Applications (lbs/ac) (so far)							
Available N Applied	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Notes:

Justification or citation for crop nitrogen uptake predictions: Historical crop yields; PNW615; PNW0611; Progene Seed Company; UC Davis Cooperative Ext.; Western Fertilizer Handbook

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2013 – Crop Year 2014

Field	LD-SU02	LD-SU03	LD-SU04	LD-SU05	LD-SU06	LD-SU07	LD-SU08 N
Acres	**68.5**	**11.8**	**7.0**	**143.9**	**38.9**	**94.6**	**78.1**
Report Number	F13-0487	F13-0417	F13-0418	F13-0603	F13-0509	F13-0528	F13-0419
Sample Date	9/24/2013	9/20/2013	9/20/2013	10/18/2013	10/2/2013	10/4/2013	9/20/2013
Previous Crop	Silage Corn	Silage Corn	Silage Corn	Silage Corn	Silage Corn	Silage Corn	Silage Corn
Upcoming Crop	Triticale	Triticale	Triticale	Triticale	Triticale	Triticale	Triticale
Soil Measurements (lbs/ac)							
1' Nitrate	179	138	25	324	240	296	318
2' Nitrate	170	79	189	340	215	417	353
3' Nitrate	260	62	169	381	131	620	369
1'+2' Root Zone	**349**	**217**	**214**	**664**	**455**	**713**	**671**
Calculations & Recommendations (lbs/ac)	(Calculations were not made in the fall of 2013)						
Recommended N Application	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Field Applications (lbs/ac)							
2013 October	10	5	7	15	0	4	19
2013 November	0	0	0	0	31	0	0
Available N Applied	**10**	**5**	**7**	**15**	**31**	**4**	**19**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2013 – Crop Year 2014

Field	LD-SU08 S	LD-SU09	LD-SU10	LD-SU14	LD-SU16	LD-SU17
Acres	**79.1**	**59.4**	**155.0**	**40.3**	**16.3**	**38.4**
Report Number	F13-0500	F13-0501	F13-0529	F13-0510	F13-0420	F13-0492
Sample Date	10/1/2013	10/1/2013	10/4/2013	10/2/2013	9/20/2013	9/27/2013
Previous Crop	Silage Corn	Alfalfa	Silage Corn	Silage Corn	Silage Corn	Silage Corn
Upcoming Crop	Triticale	Alfalfa	Triticale	Triticale	Triticale	Triticale
Soil Measurements (lbs/ac)						
1' Nitrate	253	46	247	304	263	111
2' Nitrate	264	18	336	203	118	232
3' Nitrate	271	15	183	60	95	292
1'+2' Root Zone	**517**	**64**	**583**	**507**	**381**	**343**
Calculations & Recommendations (lbs/ac)	(Calculations were not made in the fall of 2013)					
Recommended N Application	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Field Applications (lbs/ac)						
2013 October	19	0	30	0	0	0
2013 November	0	0	0	0	0	0
Available N Applied	**19**	**0**	**30**	**0**	**0**	**0**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2014 – Crop Year 2014

Field	LD-SU02	LD-SU03	LD-SU04	LD-SU05	LD-SU06	LD-SU07	LD-SU08 N
Acres	**68.5**	**11.8**	**7**	**143.9**	**38.9**	**94.6**	**78.1**
Report Number	F14-0297	F14-0417	F14-0418	F14-0328	F14-0336	F14-0410	F14-0279
Sample Date	5/10/2014	5/19/2014	5/19/2014	5/14/2014	5/16/2014	5/23/2014	5/6/2014
Previous Crop	Triticale	Triticale	Triticale	Triticale	Triticale	Triticale	Triticale
Upcoming Crop	Silage Corn	Silage Corn	Silage Corn	Silage Corn	Silage Corn	Silage Corn	Triticale
Crop Rotation Changes	No	No	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	189	58	134	158	142	313	345
2' Nitrate	198	96	144	183	221	502	386
1'+2' Root Zone	**387**	**154**	**278**	**341**	**363**	**815**	**731**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	288	252	252	315	270	270	325
Soil N supply, plus organic matter release	-404	-184	-295	-329	-364	-752	-774
N used to consume past crop residue	20	20	20	20	20	20	20
N that is positionally unavailable	60	35	50	50	85	100	90
Calculated N need	**0**	**123**	**27**	**56**	**11**	**0**	**0**
Recommendations (lbs/ac)							
Initial Calculated N Application	0	123	27	56	11	0	0
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0	0
Adjusted N Application	**0**	**123**	**27**	**56**	**11**	**0**	**0**
Adjusted N Application Upper Range	**0**	**148**	**32**	**67**	**13**	**0**	**0**
Field Applications (lbs/ac)							
2014 May	0	0	0	0	0	0	0
2014 June	0	0	0	43	0	0	0
2014 July	0	117	34	0	0	0	0
2014 August	0	0	0	0	85	0	0
Available N Applied	**0**	**117**	**34**	**43**	**85**	**0**	**0**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2014 – Crop Year 2014

Field	LD-SU08 S	LD-SU09	LD-SU10	LD-SU14	LD-SU16	LD-SU17
Acres	**79.1**	**59.4**	**155**	**40.3**	**16.3**	**38.4**
Report Number	F14-0280	F14-0337	F14-0308	F14-0338	F14-0298	F14-0419
Sample Date	5/6/2014	5/16/2014	5/12/2014	5/16/2014	5/10/2014	5/19/2014
Previous Crop	Triticale	Alfalfa	Triticale	Triticale	Triticale	Triticale
Upcoming Crop	Silage Corn	Alfalfa	Silage Corn	Silage Corn	Silage Corn	Silage Corn
Crop Rotation Changes	No	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)						
1' Nitrate	187	24	187	173	277	48
2' Nitrate	209	23	192	114	118	70
1'+2' Root Zone	**396**	**47**	**379**	**287**	**395**	**118**
Nitrogen Budget Calculations (lbs/ac)						
Projected crop N use	297	292	315	297	252	252
Soil N supply, plus organic matter release	-368	-72	-351	-281	-390	-131
N used to consume past crop residue	20	0	20	20	20	20
N that is positionally unavailable	60	5	65	40	40	20
Calculated N need	**9**	**225**	**49**	**76**	**0**	**161**
Recommendations (lbs/ac)						
Initial Calculated N Application	9	225	49	76	0	161
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0
Adjusted N Application	**9**	**225**	**49**	**76**	**0**	**161**
Adjusted N Application Upper Range	**11**	**270**	**59**	**91**	**0**	**193**
Field Applications (lbs/ac)						
2014 May	0	0	43	0	0	0
2014 June	0	0	0	0	0	0
2014 July	0	0	0	65	0	159
2014 August	0	0	0	0	0	0
Available N Applied	**0**	**0**	**43**	**65**	**0**	**159**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2014 – Crop Year 2015

Field	LD-SU02	LD-SU03	LD-SU04	LD-SU05	LD-SU06	LD-SU07	LD-SU08 N
Acres	**68.5**	**11.8**	**7**	**143.9**	**38.9**	**94.6**	**78.1**
Report Number	F14-0691	F14-0640	F14-0641	F14-0737	F14-0474	F14-0475	F14-0476
Sample Date	10/7/2014	9/19/2014	9/19/2014	10/15/2014	8/22/2014	8/21/2014	8/21/2014
Previous Crop	Silage Corn	Silage Corn	Silage Corn	Silage Corn	Silage Corn	Silage Corn	Triticale
Upcoming Crop	Triticale	Triticale	Triticale	Triticale	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	No	No	No	No	Yes	Yes	Yes
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	223	118	94	204	102	212	131
2' Nitrate	205	62	76	293	128	391	303
3' Nitrate	222	81	80	314	156	625	371
1'+2' Root Zone	**428**	**180**	**170**	**497**	**230**	**603**	**434**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	200	175	175	175	225	225	300
Soil N supply, plus organic matter release	-623	-253	-248	-721	-359	-1109	-759
N used to consume past crop residue	25	25	25	25	35	25	25
N that is positionally unavailable	210	73	73	280	195	715	323
Calculated N need	**0**	**20**	**25**	**0**	**96**	**0**	**0**
Recommendations (lbs/ac)							
Initial Calculated N Application	30	40	40	40	96	0	0
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0	0
Adjusted N Application	**30**	**40**	**40**	**40**	**96**	**0**	**0**
Adjusted N Application Upper Range	**36**	**48**	**48**	**48**	**115**	**0**	**0**
Field Applications (lbs/ac)							
2014 October	30	41	66	0	0	0	0
2014 November	0	0	0	26	0	0	0
Available N Applied	**30**	**41**	**66**	**26**	**0**	**0**	**0**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2014 – Crop Year 2015

Field	LD-SU08 S	LD-SU09	LD-SU10	LD-SU14	LD-SU16	LD-SU17
Acres	**79.1**	**59.4**	**155**	**40.3**	**16.3**	**38.4**
Report Number	F14-0713	F14-0648	F14-0692	F14-0738	F14-0693	F14-0714
Sample Date	10/9/2014	9/29/2014	10/7/2014	10/15/2014	10/7/2014	10/9/2014
Previous Crop	Silage Corn	Alfalfa	Silage Corn	Silage Corn	Silage Corn	Silage Corn
Upcoming Crop	Triticale	Alfalfa	Triticale	Triticale	Triticale	Triticale
Crop Rotation Changes	No	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)						
1' Nitrate	203	48	230	248	183	87
2' Nitrate	158	9	260	139	153	87
3' Nitrate	226	7	236	96	99	84
1'+2' Root Zone	**361**	**57**	**490**	**387**	**336**	**174**
Nitrogen Budget Calculations (lbs/ac)						
Projected crop N use	200	210	200	175	175	200
Soil N supply, plus organic matter release	-512	-71	-637	-422	-400	-234
N used to consume past crop residue	25	0	25	25	25	25
N that is positionally unavailable	190	5	235	90	100	75
Calculated N need	**0**	**144**	**0**	**0**	**0**	**66**
Recommendations (lbs/ac)						
Initial Calculated N Application	40	144	30	40	35	66
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0
Adjusted N Application	**40**	**144**	**30**	**40**	**35**	**66**
Adjusted N Application Upper Range	**48**	**173**	**36**	**48**	**42**	**79**
Field Applications (lbs/ac)						
2014 October	0	0	0	42	0	62
2014 November	0	0	0	0	0	0
Available N Applied	**0**	**0**	**0**	**42**	**0**	**62**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2015 – Crop Year 2015

Field	LD-SU02	LD-SU03	LD-SU04	LD-SU05	LD-SU06	LD-SU07	LD-SU08 N
Acres	**68.5**	**11.8**	**7**	**143.9**	**38.9**	**94.6**	**78.1**
Report Number	F15-0360	F15-0361	F15-0362	F15-0358	F15-0354	F15-0352	F15-0357
Sample Date	5/1/2015	5/5/2015	5/5/2015	4/29/2015	5/11/2015	5/8/2015	5/12/2015
Previous Crop	Triticale	Triticale	Triticale	Triticale	Alfalfa	Alfalfa	Alfalfa
Upcoming Crop	Silage Corn	Silage Corn	Silage Corn	Sorghum	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	No	No	No	Yes	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	121	38	63	91	131	309	123
2' Nitrate	141	49	100	236	200	371	287
1'+2' Root Zone	**262**	**87**	**163**	**327**	**331**	**680**	**410**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	270	252	234	215	292	292	295
Soil N supply (residual, OM, past manure)	-327	-157	-230	-387	-396	-740	-410
N used to consume past crop residue	20	20	20	20	0	0	0
Alfalfa crown N release							
N that is positionally unavailable	40	10	20	80	40	50	85
Calculated N need	**3**	**125**	**44**	**0**	**0**	**0**	**0**
Recommendations (lbs/ac)							
Initial Calculated N Application	40	125	44	40	0	0	0
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0	0
Adjusted N Application	**40**	**125**	**44**	**40**	**0**	**0**	**0**
Adjusted N Application Upper Range	**48**	**150**	**53**	**48**	**0**	**0**	**0**
Field Applications (lbs/ac)							
2015 May	42	114	57	40	0	0	0
2015 June	0	0	0	0	0	0	0
2015 July	0	0	0	0	0	0	0
Available N Applied	**42**	**114**	**57**	**40**	**0**	**0**	**0**
Notes							
LD-SU16	A math error was made in original calculations, originally recommending 66 lbs.						

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2015 – Crop Year 2015

Field	LD-SU08 S	LD-SU09	LD-SU10	LD-SU14	LD-SU16	LD-SU17
Acres	**79.1**	**59.4**	**155**	**40.3**	**16.3**	**38.4**
Report Number	F15-0363	F15-0356	F15-0392	F15-0359	F15-0355	F15-0353
Sample Date	5/5/2015	5/12/2015	4/22/2015	5/7/2015	5/11/2015	5/8/2015
Previous Crop	Triticale	Alfalfa	Triticale	Triticale	Triticale	Triticale
Upcoming Crop	Silage Corn	Alfalfa	Sorghum	Sorghum	Silage Corn	Sudangrass
Crop Rotation Changes	No	No	Yes	Yes	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)						
1' Nitrate	66	19	127	225	77	36
2' Nitrate	75	12	188	137	74	56
1'+2' Root Zone	**141**	**31**	**315**	**362**	**151**	**92**
Nitrogen Budget Calculations (lbs/ac)						
Projected crop N use	243	240	255	215	252	200
Soil N supply (residual, OM, past manure)	-203	-85	-372	-362	-151	-142
N used to consume past crop residue	20		20	20	20	20
Alfalfa crown N release		-50				
N that is positionally unavailable	15	5	60	65	15	10
Calculated N need	**75**	**110**	**0**	**0**	**136***	**88**
Recommendations (lbs/ac)						
Initial Calculated N Application	75	110	45	0	136	88
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0
Adjusted N Application	**75**	**110**	**45**	**0**	**136**	**88**
Adjusted N Application Upper Range	**90**	**132**	**54**	**0**	**163**	**106**
Field Applications (lbs/ac)						
2015 May	137	0	40	0	64	0
2015 June	0	0	0	0	0	104
2015 July	0	48	0	0	0	0
Available N Applied	**137**	**48**	**40**	**0**	**64**	**104**
Notes						
LD-SU16	A math error was made in original calculations, originally recommending 66 lbs.					

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2015 – Crop Year 2016

Field	LD-SU02	LD-SU03	LD-SU04	LD-SU05	LD-SU06	LD-SU07	LD-SU08 N
Acres	**68.5**	**11.8**	**7**	**143.9**	**38.9**	**94.6**	**78.1**
Report Number:	F15-0689	F15-0578	F15-0579	F15-0690	F15-0475	F15-0476	F15-0473
Sample Date	10/6/2015	9/25/2015	9/25/2015	10/12/2015	9/9/2015	9/9/2015	9/8/2015
Previous Crop	Silage Corn	Silage Corn	Silage Corn	Sorghum	Alfalfa	Alfalfa	Alfalfa
Upcoming Crop	Triticale	Triticale	Triticale	Triticale	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	No	No	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	179	128	93	232	66	282	83
2' Nitrate	180	91	84	196	119	626	204
1'+2' Root Zone	**359**	**219**	**177**	**428**	**185**	**908**	**287**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	187	175	175	175	240	225	225
Soil N supply (residual, OM, past manure)	-524	-344	-352	-550	-315	-1276	-571
N used to consume past crop residue	20	20	20	15	0	0	0
N that is positionally unavailable	145	90	125	120	135	385	240
Calculated N need	**0**	**0**	**0**	**0**	**60**	**0**	**0**
Recommendations (lbs/ac)							
Initial Calculated N Application	0	30	30	15	60	0	0
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0	0
Adjusted N Application	**0**	**30**	**30**	**15**	**60**	**0**	**0**
Adjusted N Application Upper Range	**0**	**36**	**36**	**18**	**72**	**0**	**0**
Field Applications (lbs/ac)							
2015 September	0	0	0	0	0	0	0
2015 October	0	0	0	10	44	0	0
2015 November	0	0	0	0	0	0	0
...							
2016 February	0	49	80	0	17	0	0
2016 March	0	51	100	0	0	0	0
2016 April	0	0	0	33	18	0	13
Available N Applied	**0**	**100**	**180**	**43**	**80**	**0**	**13**
Notes							
LD-SU05	October 2015 application was to sections B, G, and H (60 acres).						

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2015 – Crop Year 2016

Field	LD-SU08 S	LD-SU09	LD-SU10	LD-SU14	LD-SU16	LD-SU17
Acres	**79.1**	**59.4**	**155**	**40.3**	**16.3**	**38.4**
Report Number:	F15-0691	F15-0580	F15-0581	F15-0692	F15-0693	F15-0474
Sample Date	10/9/2015	9/25/2015	9/25/2015	10/9/2015	10/6/2015	9/8/2015
Previous Crop	Silage Corn	Alfalfa	Sorghum	Sorghum	Silage Corn	Sudangrass
Upcoming Crop	Triticale	Triticale	Triticale	Triticale	Triticale	Triticale
Crop Rotation Changes	No	Yes	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)						
1' Nitrate	143	16	189	190	125	43
2' Nitrate	153	9	193	116	51	68
1'+2' Root Zone	**296**	**25**	**382**	**306**	**176**	**111**
Nitrogen Budget Calculations (lbs/ac)						
Projected crop N use	187	175	175	175	187	150
Soil N supply (residual, OM, past manure)	-536	-80	-475	-403	-337	-227
N used to consume past crop residue	20	20	20	20	20	20
N that is positionally unavailable	240	15	85	110	90	102
Calculated N need	**0**	**130**	**0**	**0**	**0**	**45**
Recommendations (lbs/ac)						
Initial Calculated N Application	35	130	30	35	35	45
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0
Adjusted N Application	**35**	**130**	**30**	**35**	**35**	**45**
Adjusted N Application Upper Range	**42**	**156**	**36**	**42**	**42**	**54**
Field Applications (lbs/ac)						
2015 September	0	0	0	0	34	0
2015 October	34	0	0	34	0	13
2015 November	0	73	0	0	0	0
...						
2016 February	18	0	0	25	0	0
2016 March	0	0	0	0	0	0
2016 April	14	0	0	0	0	0
Available N Applied	**66**	**73**	**0**	**59**	**34**	**13**
Notes						
LD-SU05	October 2015 application was to sections B, G, and H (60 acres).					

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2016 – Crop Year 2016

Field	LD-SU02	LD-SU03	LD-SU04	LD-SU05	LD-SU06	LD-SU07	LD-SU08 N
Acres	**68.5**	**11.8**	**7**	**143.9**	**38.9**	**94.6**	**78.1**
Report Number:	F16-0303	F16-0223	F16-0276	F16-0304	F16-0266	F16-0267	F16-0268
Sample Date	5/18/2016	4/27/2016	5/4/2016	5/19/2016	5/6/2016	5/6/2016	5/6/2016
Previous Crop	Triticale	Triticale	Triticale	Triticale	Alfalfa	Alfalfa	Alfalfa
Upcoming Crop	Silage Corn	Triticale	Triticale	Silage Corn	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	No	Yes	Yes	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	40	35	44	20	24	34	46
2' Nitrate	138	29	98	99	34	275	71
1'+2' Root Zone	**178**	**64**	**142**	**119**	**58**	**309**	**117**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	252	200	200	261	292	292	292
Soil N supply (residual, OM, past manure)	-258	-156	-282	-185	-122	-309	-218
N used to consume past crop residue	20	20	20	20	0	0	0
N that is positionally unavailable	45	15	65	20	15	15	15
Calculated N need	**59**	**79**	**3**	**116**	**185**	**0**	**89**
Recommendations (lbs/ac)							
Initial Calculated N Application	59	79	28	116	185	0	89
+ In-season petiole adjustment (if applicable)	20	0	0	30	0	0	0
Adjusted N Application	**79**	**79**	**28**	**146**	**185**	**0**	**89**
Adjusted N Application Upper Range	**95**	**95**	**34**	**175**	**222**	**0**	**107**
Field Applications (lbs/ac)							
2016 May	10	0	0	0	0	0	0
2016 June	0	0	0	21	26	0	11
2016 July	20	0	0	27	15	0	34
2016 August	0	0	0	0	20	0	0
Available N Applied	**30**	**0**	**0**	**47**	**62**	**0**	**44**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2016 – Crop Year 2016

Field	LD-SU08 S	LD-SU09	LD-SU10	LD-SU14	LD-SU16	LD-SU17
Acres	**79.1**	**59.4**	**155**	**40.3**	**16.3**	**38.4**
Report Number:	F16-0296	F16-0224	F16-0297	F16-0305	F16-0275	F16-0306
Sample Date	5/13/2016	4/27/2016	5/13/2016	5/18/2016	5/4/2016	5/19/2016
Previous Crop	Triticale	Triticale	Triticale	Triticale	Triticale	Triticale
Upcoming Crop	Silage Corn	Silage Corn	Silage Corn	Silage Corn	Triticale	Silage Corn
Crop Rotation Changes	No	No	No	No	Yes	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)						
1' Nitrate	51	23	21	119	20	15
2' Nitrate	132	32	58	78	46	25
1'+2' Root Zone	**183**	**55**	**79**	**197**	**66**	**40**
Nitrogen Budget Calculations (lbs/ac)						
Projected crop N use	243	270	243	252	200	225
Soil N supply (residual, OM, past manure)	-253	-134	-155	-237	-163	-91
N used to consume past crop residue	20	20	20	20	20	20
N that is positionally unavailable	30	15	15	20	15	15
Calculated N need	**40**	**171**	**123**	**55**	**72**	**169**
Recommendations (lbs/ac)						
Initial Calculated N Application	40	171	91	55	72	169
+ In-season petiole adjustment (if applicable)	25	0	0	25	0	0
Adjusted N Application	**65**	**171**	**91**	**80**	**72**	**169**
Adjusted N Application Upper Range	**78**	**205**	**109**	**96**	**86**	**203**
Field Applications (lbs/ac)						
2016 May	11	39	40	0	0	71
2016 June	9	0	0	16	0	0
2016 July	0	45	30	18	0	21
2016 August	0	0	0	0	0	0
Available N Applied	**20**	**84**	**70**	**34**	**0**	**92**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2016 – Crop Year 2017

Field	LD-SU02	LD-SU03	LD-SU04	LD-SU05	LD-SU06	LD-SU07	LD-SU08 N
Acres	**68.5**	**11.8**	**7**	**143.9**	**38.9**	**94.6**	**78.1**
Report Number:	F16-0630	F16-0382	F16-0383	F16-0493	F16-0384	F16-0385	F16-0632
Sample Date	10/14/2016	8/29/2016	8/27/2016	9/26/2016	8/27/2016	8/29/2016	10/17/2016
Previous Crop	Silage Corn	Triticale	Triticale	Silage Corn	Alfalfa	Alfalfa	Alfalfa
Upcoming Crop	Triticale	Alfalfa	Alfalfa	Triticale	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	No	Yes	Yes	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	85	79	68	60	41	48	112
2' Nitrate	120	29	31	110	71	197	75
1'+2' Root Zone	**205**	**108**	**99**	**170**	**112**	**245**	**187**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	187	195	195	175	270	270	225
Residual Nitrates (3')	-390	-146	-137	-388	-230	-638	-347
Residual Ammonium (3')	-8	-13	-24	-6	-7	-11	-7
Mineralization (past manure)	-5	-10	-10	-10	-13	-5	-5
Mineralization (organic matter)	-15	-22	-21	-15	-17	-19	-20
N used to consume past crop residue	20	20	20	20	0	0	0
N that may not be accessible	200	60	63	210	120	410	177
Calculated N need	**0**	**84**	**86**	**0**	**123**	**7**	**23**
Recommendations (lbs/ac)							
Initial Calculated N Application	35	84	86	35	123	35	35
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0	0
Adjusted N Application	**35**	**84**	**86**	**35**	**123**	**35**	**35**
Adjusted N Application Upper Range	**42**	**101**	**103**	**42**	**148**	**42**	**42**
Field Applications (lbs/ac)							
2016 September	0	0	0	0	0	0	0
2016 October	0	0	0	0	0	0	0
2016 November	35	0	0	35	56	33	35
...							
2017 March	25	36	52	0	23	14	29
2017 April	16	45	54	70	13	14	18
Available N Applied	**76**	**81**	**107**	**105**	**92**	**61**	**82**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2016 – Crop Year 2017

Field	LD-SU08 S	LD-SU09	LD-SU10	LD-SU14	LD-SU16	LD-SU17
Acres	**79.1**	**59.4**	**155**	**40.3**	**16.3**	**38.4**
Report Number:	F16-0597	F16-0494	F16-0598	F16-0633	F16-0386	F16-0631
Sample Date	10/10/2016	9/26/2016	10/10/2016	10/17/2016	8/29/2016	10/14/2016
Previous Crop	Silage Corn	Silage Corn	Silage Corn	Silage Corn	Triticale	Silage Corn
Upcoming Crop	Triticale	Triticale	Triticale	Triticale	Alfalfa	Triticale
Crop Rotation Changes	No	No	No	No	Yes	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)						
1' Nitrate	160	62	92	89	56	57
2' Nitrate	121	35	120	89	24	49
1'+2' Root Zone	**281**	**97**	**212**	**178**	**80**	**106**
Nitrogen Budget Calculations (lbs/ac)						
Projected crop N use	187	175	200	175	195	150
Residual Nitrates (3')	-442	-131	-322	-275	-110	-167
Residual Ammonium (3')	-6	-6	-7	-12	-24	-6
Mineralization (past manure)	-5	-10	-5	-5	-10	-5
Mineralization (organic matter)	-15	-16	-17	-16	-22	-10
N used to consume past crop residue	20	20	20	20	20	20
N that may not be accessible	178	51	137	124	50	83
Calculated N need	**0**	**83**	**6**	**11**	**99**	**65**
Recommendations (lbs/ac)						
Initial Calculated N Application	30	83	35	50	99	65
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0
Adjusted N Application	**30**	**83**	**35**	**50**	**99**	**65**
Adjusted N Application Upper Range	**36**	**100**	**42**	**60**	**119**	**78**
Field Applications (lbs/ac)						
2016 September	0	24	0	0	0	0
2016 October	0	0	34	0	0	58
2016 November	29	0	0	47	0	0
...						
2017 March	32	0	0	21	0	0
2017 April	18	0	0	13	0	0
Available N Applied	**80**	**24**	**34**	**81**	**0**	**58**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2017 – Crop Year 2017

Field	LD-SU02	LD-SU03	LD-SU04	LD-SU05	LD-SU06	LD-SU07	LD-SU08 N
Acres	**68.5**	**11.8**	**7**	**143.9**	**38.9**	**94.6**	**78.1**
Report Number:	F17-0338	F17-0280	F17-0281	F17-0282	F17-0233	F17-0234	F17-0235
Sample Date	5/25/2017	5/16/2017	5/16/2017	5/11/2017	5/10/2017	5/10/2017	5/9/2017
Previous Crop	Triticale	Triticale	Triticale	Triticale	Alfalfa	Alfalfa	Alfalfa
Upcoming Crop	Grass mix	Alfalfa	Alfalfa	Silage Corn	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	Yes	Yes	Yes	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	22	141	98	43	57	38	119
2' Nitrate	46	65	41	86	56	66	106
1'+2' Root Zone	**68**	**206**	**139**	**129**	**113**	**104**	**225**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	252	325	300	261	325	308	308
Residual nitrates (3')	-68	-206	-139	-129	-113	-104	-225
Residual ammonium (3')	-14	-44	-29	-22	-40	-26	-23
Mineralization (past manure)	-10	-10	-10	-10	-10	-5	-10
Mineralization (organic matter)	-46	-50	-50	-52	-62	-50	-74
N used to consume past crop residue	20	0	0	20	0	0	0
N that may not be accessible	15	20	20	20	15	15	40
Calculated N need	**149**	**35**	**92**	**88**	**115**	**138**	**16**
Recommendations (lbs/ac)							
Initial Calculated N Application	149	35	92	88	115	138	16
+ In-season petiole adjustment (if applicable)							
Adjusted N Application	**149**	**35**	**92**	**88**	**115**	**138**	**16**
Adjusted N Application Upper Range	**164**	**39**	**101**	**97**	**127**	**152**	**18**
Field Applications (lbs/ac)							
2017 May	0	0	0	0	0	0	0
2017 June	39	0	0	96	28	0	0
2017 July	39	107	63	90	50	42	0
2017 August	32	0	0	0	23	20	30
2017 September	0	0	0	0	0	0	0
Available N Applied	**110**	**107**	**63**	**185**	**100**	**62**	**30**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2017 – Crop Year 2017

Field	LD-SU08 S	LD-SU09	LD-SU10	LD-SU14	LD-SU16	LD-SU17
Acres	**79.1**	**59.4**	**155**	**40.3**	**16.3**	**38.4**
Report Number:	F17-0339	F17-0236	F17-0278	F17-0340	F17-0279	F17-0341
Sample Date	5/25/2017	5/9/2017	5/11/2017	5/26/2017	5/16/2017	5/29/2017
Previous Crop	Triticale	Triticale	Triticale	Triticale	Triticale	Triticale
Upcoming Crop	Silage Corn	Grass mix	Triticale-Sudan	Silage Corn	Alfalfa	Silage Corn
Crop Rotation Changes	No	Yes	Yes	No	Yes	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)						
1' Nitrate	32	14	22	29	52	14
2' Nitrate	67	11	68	39	29	22
1'+2' Root Zone	**99**	**25**	**90**	**68**	**81**	**36**
Nitrogen Budget Calculations (lbs/ac)						
Projected crop N use	243	275	275	243	325	225
Residual nitrates (3')	-99	-25	-90	-68	-81	-36
Residual ammonium (3')	-16	-27	-24	-14	-37	-15
Mineralization (past manure)	-10	-5	-10	-10	-10	-5
Mineralization (organic matter)	-40	-50	-48	-44	-58	-30
N used to consume past crop residue	20	20	20	20	0	15
N that may not be accessible	20	15	20	15	20	15
Calculated N need	**118**	**203**	**143**	**142**	**159**	**169**
Recommendations (lbs/ac)						
Initial Calculated N Application	118	166	143	142	101	155
+ In-season petiole adjustment (if applicable)						
Adjusted N Application	**118**	**166**	**143**	**142**	**101**	**155**
Adjusted N Application Upper Range	**130**	**183**	**157**	**156**	**111**	**171**
Field Applications (lbs/ac)						
2017 May	0	0	30	0	0	148
2017 June	39	238	0	51	37	0
2017 July	64	0	63	46	25	53
2017 August	0	0	0	0	0	0
2017 September	0	48	0	0	0	0
Available N Applied	**103**	**286**	**93**	**97**	**62**	**201**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2017 – Crop Year 2018

Field	LD-SU02	LD-SU03	LD-SU04	LD-SU05	LD-SU06	LD-SU07	LD-SU08 N
Acres	**68.5**	**11.8**	**7**	**143.9**	**38.9**	**94.6**	**78.1**
Report Number:	F17-0650	F17-0651	F17-0668	F17-0465	F17-0669	F17-0670	F17-0652
Sample Date	10/19/2017	10/20/2017	10/23/2017	9/22/2017	10/23/2017	10/23/2017	10/20/2017
Previous Crop	Grass mix	Alfalfa	Alfalfa	Silage Corn	Alfalfa	Alfalfa	Alfalfa
Upcoming Crop	Triticale	Alfalfa	Alfalfa	Triticale	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	Yes	No	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	23	34	29	115	43	34	71
2' Nitrate	28	24	24	118	37	71	59
1'+2' Root Zone	**51**	**58**	**53**	**233**	**80**	**105**	**130**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	175	195	195	175	211	211	211
Residual nitrates (3')	-92	-88	-93	-381	-137	-231	-231
Residual ammonium (3')	-10	-18	-19	-10	-8	-10	-10
Mineralization (past manure)	-10	-10	-10	-15	-10	-10	-10
Mineralization (organic matter)	-17	-18	-17	-20	-15	-16	-29
N used to consume past crop residue	15	0	0	35	0	0	0
N that may not be accessible	25	15	15	165	25	138	125
Calculated N need	**86**	**76**	**71**	**0**	**66**	**82**	**56**
Recommendations (lbs/ac)							
Initial Calculated N Application	86	50	50	30	54	54	54
+ In-season petiole adjustment (if applicable)							
Adjusted N Application	**86**	**50**	**50**	**30**	**54**	**54**	**54**
Adjusted N Application Upper Range	**95**	**55**	**55**	**33**	**59**	**59**	**59**
Field Applications (lbs/ac) (so far)							
2017 September	0	0	0	0	0	0	0
2017 October	0	35	73	0	0	24	24
2017 November	38	0	0	32	44	0	0
2017 December	0	0	0	0	0	0	0
2018 January	0	0	0	0	0	0	0
2018 February	0	0	0	0	0	0	0
2018 March	20	0	0	0	0	16	0
2018 April	18	0	0	33	0	15	0
Available N Applied	**76**	**35**	**73**	**64**	**44**	**55**	**24**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2017 – Crop Year 2018

Field	LD-SU08 S	LD-SU09	LD-SU10	LD-SU14	LD-SU16	LD-SU17
Acres	**79.1**	**59.4**	**155**	**40.3**	**16.3**	**38.4**
Report Number:	F17-0482	F17-0466	F17-0467	F17-0483	F17-0653	F17-0468
Sample Date	9/27/2017	9/8/2017	9/13/2017	9/27/2017	10/20/2017	9/22/2017
Previous Crop	Silage Corn	Grass mix	Triticale-Sudan	Silage Corn	Alfalfa	Silage Corn
Upcoming Crop	Triticale	Grassmix	Triticale	Triticale	Alfalfa	Triticale
Crop Rotation Changes	No	No	Yes	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)						
1' Nitrate	161	56	50	63	30	43
2' Nitrate	77	29	77	56	8	18
1'+2' Root Zone	**238**	**85**	**127**	**119**	**38**	**61**
Nitrogen Budget Calculations (lbs/ac)						
Projected crop N use	175	175	175	175	195	150
Residual nitrates (3')	-331	-113	-217	-190	-46	-79
Residual ammonium (3')	-12	-19	-17	-10	-19	-18
Mineralization (past manure)	-5	-10	-5	-5	-10	-10
Mineralization (organic matter)	-15	-17	-19	-16	-16	-12
N used to consume past crop residue	20	15	20	20	0	20
N that may not be accessible	116	50	117	92	25	30
Calculated N need	**0**	**81**	**54**	**66**	**129**	**81**
Recommendations (lbs/ac)						
Initial Calculated N Application	30	67	54	66	50	57
+ In-season petiole adjustment (if applicable)						
Adjusted N Application	**30**	**67**	**54**	**66**	**50**	**57**
Adjusted N Application Upper Range	**33**	**74**	**59**	**73**	**55**	**63**
Field Applications (lbs/ac) (so far)						
2017 September	0	48	27	0	0	0
2017 October	31	0	0	20	0	55
2017 November	0	0	0	20	0	0
2017 December	0	0	0	0	0	0
2018 January	0	0	0	0	0	0
2018 February	0	0	0	0	0	0
2018 March	0	0	0	18	0	0
2018 April	0	0	0	0	0	0
Available N Applied	**31**	**48**	**27**	**59**	**0**	**55**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2018 – Crop Year 2018

Field	LD-SU02	LD-SU03	LD-SU04	LD-SU05	LD-SU06	LD-SU07	LD-SU08 N
Acres	**68.5**	**11.8**	**7**	**143.9**	**38.9**	**94.6**	**78.1**
Report Number:	F18-0240	F18-0320	F18-0321	F18-0241	F18-0287	F18-0288	F18-0322
Sample Date	5/4/2018	5/11/2018	5/11/2018	5/1/2018	5/14/2018	5/14/2018	5/11/2018
Previous Crop	Triticale	Alfalfa	Alfalfa	Triticale	Alfalfa	Alfalfa	Alfalfa
Upcoming Crop	Silage Corn	Alfalfa	Alfalfa	Silage Corn	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	No	No	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	22	46	50	40	28	24	49
2' Nitrate	14	15	38	76	30	95	60
1'+2' Root Zone	**36**	**61**	**88**	**116**	**58**	**119**	**109**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	257	357	357	267	325	357	341
Residual nitrates (3')	-36	-61	-88	-116	-58	-119	-109
Residual ammonium (3')	-12	-20	-32	-11	-22	-24	-18
Mineralization (past manure)	-15	-15	-10	-15	-15	-10	-15
Mineralization (organic matter)	-48	-54	-52	-54	-44	-42	-40
N used to consume past crop residue	15	0	0	25	0	0	0
N released from past crop residue	0	0	0	0	0	0	0
N that may not be accessible	15	15	15	20	15	30	20
Calculated N need	**176**	**222**	**190**	**116**	**201**	**192**	**179**
Recommendations (lbs/ac)							
Initial Calculated N Application		88	88	111	88	88	82
+ In-season petiole adjustment (if applicable)							
Adjusted N Application	**147**	**88**	**88**	**111**	**88**	**88**	**82**
Adjusted N Application Upper Range	**162**	**97**	**97**	**122**	**97**	**97**	**90**
Field Applications (lbs/ac)							
2018 May	0	0	0	0	27	21	39
2018 June	0	0	0	0	47	40	68
2018 July	66	35	28	78	0	21	0
2018 August	0	0	0	23	20	18	30
Available N Applied	**66**	**35**	**28**	**101**	**95**	**99**	**137**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2018 – Crop Year 2018

Field	LD-SU08 S	LD-SU09	LD-SU10	LD-SU14	LD-SU16	LD-SU17
Acres	**79.1**	**59.4**	**155**	**40.3**	**16.3**	**38.4**
Report Number:	F18-0389	F18-0224	F18-0225	F18-0390	F18-0323	F18-0391
Sample Date	6/4/2018	4/26/2018	4/26/2018	5/31/2018	5/11/2018	5/31/2018
Previous Crop	Triticale	Grass mix	Triticale	Triticale	Alfalfa	Triticale
Upcoming Crop	Grass mix	Silage Corn	Silage Corn	Silage Corn	Alfalfa	Silage Corn
Crop Rotation Changes	Yes	Yes	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)						
1' Nitrate	44	17	16	48	31	7
2' Nitrate	78	10	64	48	11	4
1'+2' Root Zone	**122**	**27**	**80**	**96**	**42**	**11**
Nitrogen Budget Calculations (lbs/ac)						
Projected crop N use	257	306	261	248	357	211
Residual nitrates (3')	-122	-27	-80	-96	-42	-11
Residual ammonium (3')	-4	-17	-13	-6	-39	-4
Mineralization (past manure)	-15	-20	-20	-10	-10	-10
Mineralization (organic matter)	-40	-49	-58	-44	-54	-38
N used to consume past crop residue	20	25	25	20	0	20
N released from past crop residue	0	0	0	0	0	0
N that may not be accessible	25	10	20	20	15	15
Calculated N need	**121**	**228**	**135**	**132**	**227**	**183**
Recommendations (lbs/ac)						
Initial Calculated N Application	121	190	130	132	88	167
+ In-season petiole adjustment (if applicable)						
Adjusted N Application	**121**	**190**	**130**	**132**	**88**	**167**
Adjusted N Application Upper Range	**133**	**209**	**143**	**145**	**97**	**184**
Field Applications (lbs/ac)						
2018 May	0	0	141	0	0	0
2018 June	34	0	0	0	0	57
2018 July	34	0	0	26	37	0
2018 August	23	0	0	15	0	30
Available N Applied	**90**	**0**	**141**	**41**	**37**	**87**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2018 – Crop Year 2019

Field	LD-SU02	LD-SU03	LD-SU04	LD-SU05	LD-SU06	LD-SU07	LD-SU08 N
Acres	**68.5**	**11.8**	**7**	**143.9**	**38.9**	**94.6**	**78.1**
Report Number:	F18-0664	F18-0720	F18-0722	F18-0665	F18-0666	F18-0724	F18-0726
Sample Date	10/12/2018	10/17/2018	10/17/2018	10/12/2018	10/12/2018	10/17/2018	10/17/2018
Previous Crop	Silage Corn	Alfalfa	Alfalfa	Silage Corn	Alfalfa	Alfalfa	Alfalfa
Upcoming Crop	Triticale	Alfalfa	Alfalfa	Triticale	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	No	No	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	48	36	29	160	37	25	58
2' Nitrate	28	9	16	165	20	138	59
1'+2' Root Zone	**76**	**45**	**45**	**325**	**57**	**163**	**117**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	210	211	227	227	227	227	227
Residual nitrates (3')	-116	-51	-61	-538	-87	-404	-269
Residual ammonium (3')	-36	-33	-30	-28	-27	-25	-21
Mineralization (past manure)	-10	-10	-10	-10	-10	-10	-10
Mineralization (organic matter)	-16	-19	-18	-15	-17	-17	-24
N used to consume past crop residue	20	0	0	20	0	0	0
N released from past crop residue	0	0	0	0	0	-40	0
N that may not be accessible	75	20	25	285	25	280	130
Calculated N need	**127**	**118**	**133**	**0**	**111**	**11**	**33**
Recommendations (lbs/ac)							
Initial Calculated N Application	127	44	47		71	40	33
+ In-season petiole adjustment (if applicable)							
Adjusted N Application	**127**	**44**	**47**	**0**	**71**	**40**	**33**
Adjusted N Application Upper Range	**140**	**48**	**52**	**0**	**78**	**44**	**36**
Field Applications (lbs/ac) (so far)							
2018 October	19	0	0	0	0	0	35
2018 November	19	27	69	35	34	43	0
Available N Applied	**37**	**27**	**69**	**35**	**34**	**43**	**35**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2018 – Crop Year 2019

Field	LD-SU08 S	LD-SU09	LD-SU10	LD-SU14	LD-SU16	LD-SU17
Acres	**79.1**	**59.4**	**155**	**40.3**	**16.3**	**38.4**
Report Number:	F18-0519	F18-0607	F18-0609	F18-0667	F18-0668	F18-0930
Sample Date	9/25/2018	10/8/2018	10/8/2018	10/11/2018	10/12/2018	11/2/2018
Previous Crop	Grass mix	Silage Corn	Silage Corn	Silage Corn	Alfalfa	Silage Corn
Upcoming Crop	Triticale	Triticale	Triticale	Triticale	Alfalfa	Triticale
Crop Rotation Changes	Yes	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)						
1' Nitrate	41	30	79	69	33	44
2' Nitrate	88	9	70	46	8	4
1'+2' Root Zone	**129**	**39**	**149**	**115**	**41**	**48**
Nitrogen Budget Calculations (lbs/ac)						
Projected crop N use	228	187	227	227	227	192
Residual nitrates (3')	-265	-55	-206	-168	-50	-52
Residual ammonium (3')	-6	-24	-6	-39	-29	-14
Mineralization (past manure)	-10	-10	-10	-10	-10	-5
Mineralization (organic matter)	-15	-17	-18	-17	-17	-14
N used to consume past crop residue	10	20	20	20	0	20
N released from past crop residue	0	0	0	0	0	0
N that may not be accessible	160	30	90	80	20	25
Calculated N need	**102**	**131**	**97**	**93**	**141**	**152**
Recommendations (lbs/ac)						
Initial Calculated N Application	102	108	97	93	71	107
+ In-season petiole adjustment (if applicable)						
Adjusted N Application	**102**	**108**	**97**	**93**	**71**	**107**
Adjusted N Application Upper Range	**112**	**119**	**107**	**102**	**78**	**118**
Field Applications (lbs/ac) (so far)						
2018 October	40	0	65	0	0	43
2018 November	34	0	0	31	88	0
Available N Applied	**74**	**0**	**65**	**31**	**88**	**43**

Table 6

Liberty/H&S Bosma Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Notes:

Justification or citation for crop nitrogen uptake predictions: Historical crop yields; PNW615; PNW0611; Progene Seed Company; UC Davis Cooperative Ext.; Western Fertilizer Handbook

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2013 – Crop Year 2014

Field	GDS-SU01	GDS-SU02	GDS-SU03	GDS-SU04	GDS-SU05	GDS-SU06	GDS-SU07
Acres	**17.8**	**99.1**	**28.4**	**135.6**	**100.6**	**84.5**	**76.6**
Report Number	F13-0538	F13-0600	F13-0567	F13-0560	F13-0539	F13-0580	F13-0540
Sample Date	10/9/2013	10/17/2013	10/15/2013	10/14/2013	10/9/2013	10/16/2013	10/9/2013
Previous Crop	Alfalfa	Alfalfa	Alfalfa	Silage Corn	Alfalfa	Silage Corn	Alfalfa
Upcoming Crop	Alfalfa	Triticale	Alfalfa	Triticale	Triticale	Triticale	Alfalfa
Soil Measurements (lbs/ac)							
1' Nitrate	41	77	33	661	947	175	113
2' Nitrate	28	93	14	614	1041	326	260
3' Nitrate	13	52	12	673	973	419	265
1'+2' Root Zone	**69**	**170**	**47**	**1275**	**1988**	**501**	**373**
Calculations & Recommendations (lbs/ac)	(Calculations were not made in the fall of 2013)						
Recommended N Application	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Field Applications (lbs/ac)							
2013 October	247	0	0	17	17	11	9
2013 November	15	0	0	5	5	0	0
Available N Applied	**262**	**0**	**0**	**22**	**22**	**11**	**9**

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2013 – Crop Year 2014

Field	GDS-SU08	GDS-SU09	GDS-SU10	GDS-SU11	GDS-SU12	GDS-SU13	GDS-SU14
Acres	**165.5**	**34.6**	**38.5**	**8.1**	**40.5**	**47.0**	**65.2**
Report Number	F13-0601	F13-0561	F13-0568	F13-0581	F13-0527	F13-0569	F13-0602
Sample Date	10/17/2013	10/14/2013	10/15/2013	10/16/2013	10/7/2013	10/15/2013	10/17/2013
Previous Crop	Silage Corn	Silage Corn	Silage Corn	Sudangrass	Silage Corn	Alfalfa	Alfalfa
Upcoming Crop	Triticale	Triticale	Alfalfa	Alfalfa	Triticale	Triticale	Triticale
Soil Measurements (lbs/ac)							
1' Nitrate	565	93	172	132	687	35	131
2' Nitrate	610	108	136	140	527	24	120
3' Nitrate	583	106	78	113	388	28	77
1'+2' Root Zone	**1175**	**201**	**308**	**272**	**1214**	**59**	**251**
Calculations & Recommendations (lbs/ac)	(Calculations were not made in the fall of 2013)						
Recommended N Application	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Field Applications (lbs/ac)							
2013 October	0	20	0	0	0	94	0
2013 November	0	0	0	0	0	41	0
Available N Applied	**0**	**20**	**0**	**0**	**0**	**136**	**0**

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2014 – Crop Year 2014

Field	GDS-SU01	GDS-SU02	GDS-SU03	GDS-SU04	GDS-SU05	GDS-SU06	GDS-SU07
Acres	**17.8**	**99.1**	**28.4**	**135.6**	**100.6**	**84.5**	**76.6**
Report Number	F14-0331	F14-0282	F14-0330	F14-0292	F14-0293	F14-0284	F14-0329
Sample Date	5/14/2014	5/6/2014	5/14/2014	5/8/2014	5/8/2014	5/6/2014	5/14/2014
Previous Crop	Alfalfa	Triticale	Alfalfa	Triticale	Triticale	Triticale	Alfalfa
Upcoming Crop	Alfalfa	Sudan	Alfalfa	Silage Corn	Alfalfa	Silage Corn	Alfalfa
Crop Rotation Changes	No	No	No	No	Yes	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	36	30	62	657	812	208	41
2' Nitrate	44	14	30	727	970	223	110
1'+2' Root Zone	**80**	**44**	**92**	**1384**	**1782**	**431**	**151**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	292	270	292	234	260	315	292
Soil N supply, plus organic matter release	-120	-83	-125	-1335	-1625	-395	-179
N used to consume past crop residue	0	20	0	20	0	20	0
N that is positionally unavailable	5	5	5	172	5	75	5
Calculated N need	**177**	**212**	**172**	**0**	**0**	**15**	**118**
Recommendations (lbs/ac)							
Initial Calculated N Application	177	212	172	0	0	15	118
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0	0
Adjusted N Application	**177**	**212**	**172**	**0**	**0**	**15**	**118**
Adjusted N Application Upper Range	**212**	**254**	**206**	**0**	**0**	**18**	**142**
Field Applications (lbs/ac)							
2014 May	0	164	0	0	0	0	0
2014 June	26	0	49	3	3	3	3
2014 July	42	0	43	10	5	3	2
2014 August	0	0	42	90	90	0	0
2014 September	0	0	0	0	0	0	0
2014 October	0	0	0	0	0	0	0
Available N Applied	**68**	**164**	**134**	**102**	**99**	**6**	**5**

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2014 – Crop Year 2014

Field	GDS-SU08	GDS-SU09	GDS-SU10	GDS-SU11	GDS-SU12	GDS-SU13	GDS-SU14
Acres	**165.5**	**34.6**	**38.5**	**8.1**	**40.5**	**47.0**	**65.2**
Report Number	F14-0294	F14-0285	F14-0442	F14-0409	F14-0295	F14-0296	F14-0283
Sample Date	5/9/2014	5/6/2014	6/17/2014	5/22/2014	5/9/2014	5/9/2014	5/6/2014
Previous Crop	Triticale	Triticale	Alfalfa	Alfalfa	Triticale	Triticale	Triticale
Upcoming Crop	Silage Corn	Alfalfa	Alfalfa	Sudangrass	Silage Corn	Alfalfa	Alfalfa
Crop Rotation Changes	No	No	No	Yes	No	Yes	Yes
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	767	207	204	81	373	136	14
2' Nitrate	605	115	200	54	209	176	26
1'+2' Root Zone	**1372**	**322**	**404**	**135**	**582**	**312**	**40**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	252	315	260	292	270	292	270
Soil N supply, plus organic matter release	-1336	-331	-420	-193	-518	-345	-61
N used to consume past crop residue	20	20	0	0	20	0	20
N that is positionally unavailable	135	35	5	5	60	5	5
Calculated N need	**0**	**39**	**0**	**104**	**0**	**0**	**234**
Recommendations (lbs/ac)							
Initial Calculated N Application	0	39	0	104	0	20	234
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0	0
Adjusted N Application	**0**	**39**	**0**	**104**	**0**	**20**	**234**
Adjusted N Application Upper Range	**0**	**47**	**0**	**125**	**0**	**24**	**281**
Field Applications (lbs/ac)							
2014 May	0	0	0	0	0	103	92
2014 June	0	0	4	42	0	25	58
2014 July	0	0	12	19	0	0	0
2014 August	0	0	224	0	0	31	0
2014 September	0	0	42	0	0	26	0
2014 October	13	0	0	0	0	0	0
Available N Applied	**13**	**0**	**282**	**62**	**0**	**185**	**149**

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2014 – Crop Year 2015

Field	GDS-SU01	GDS-SU02	GDS-SU03	GDS-SU04	GDS-SU05	GDS-SU06	GDS-SU07
Acres	**17.8**	**99.1**	**28.4**	**135.6**	**100.6**	**84.5**	**76.6**
Report Number	F14-0642	F14-0498	F14-0643	F14-0690	F14-0649	F14-0703	F14-0645
Sample Date	9/25/2014	8/29/2014	9/25/2014	10/6/2014	9/29/2014	10/8/2014	9/26/2014
Previous Crop	Alfalfa	Sudan	Alfalfa	Silage Corn	Alfalfa	Silage Corn	Alfalfa
Upcoming Crop	Triticale	Alfalfa	Alfalfa	Triticale	Alfalfa	Triticale	Alfalfa
Crop Rotation Changes	Yes	Yes	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	48	42	59	750	675	181	64
2' Nitrate	16	20	22	612	927	276	143
3' Nitrate	6	21	15	730	838	291	156
1'+2' Root Zone	**64**	**62**	**81**	**1362**	**1602**	**457**	**207**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	210	225	210	175	210	200	225
Soil N supply, plus organic matter release	-92	-94	-105	-1928	-2196	-657	-363
N used to consume past crop residue	0	20	0	25	0	25	0
N that is positionally unavailable	7	28	15	640	50	250	75
Calculated N need	**125**	**179**	**120**	**0**	**0**	**0**	**0**
Recommendations (lbs/ac)							
Initial Calculated N Application	125	179	120	40	0	40	0
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0	0
Adjusted N Application	**125**	**179**	**120**	**40**	**0**	**40**	**0**
Adjusted N Application Upper Range	**150**	**215**	**144**	**48**	**0**	**48**	**0**
Field Applications (lbs/ac)							
2014 August	0	3	0	0	0	0	0
2014 September	0	101	0	0	0	0	28
2014 October	0	0	0	0	0	85	69
2014 November	0	0	0	0	0	0	0
2014 December	0	0	0	0	0	0	0
2015 January	0	0	0	0	0	0	0
2015 February	0	0	0	0	0	37	33
2015 March	0	0	0	0	0	0	0
2015 April	0	0	0	0	7	0	0
2015 May	0	0	0	0	25	0	0
Available N Applied	**0**	**104**	**0**	**0**	**32**	**122**	**130**
Notes							
GDS-SU05	Applications were made in corners only. 0 lbs applied to main pivot.						

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2014 – Crop Year 2015

Field	GDS-SU08	GDS-SU09	GDS-SU10	GDS-SU11	GDS-SU12	GDS-SU13	GDS-SU14
Acres	**165.5**	**34.6**	**38.5**	**8.1**	**40.5**	**47.0**	**65.2**
Report Number	F14-0704	F14-0694	F14-0646	F14-0647	F14-0705	F14-0510	F14-0499
Sample Date	10/8/2014	10/7/2014	9/26/2014	9/26/2014	10/8/2014	9/10/2014	8/29/2014
Previous Crop	Silage Corn	Alfalfa	Alfalfa	Sudangrass	Silage Corn	Alfalfa	Alfalfa
Upcoming Crop	Triticale	Triticale	Alfalfa	Alfalfa	Triticale	Alfalfa	Alfalfa
Crop Rotation Changes	No	Yes	No	Yes	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	358	184	84	83	315	94	26
2' Nitrate	610	238	180	52	144	140	29
3' Nitrate	685	238	258	34	145	128	62
1'+2' Root Zone	**968**	**422**	**264**	**135**	**459**	**234**	**55**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	175	175	225	225	175	225	225
Soil N supply, plus organic matter release	-1448	-604	-509	-183	-515	-370	-122
N used to consume past crop residue	25	25	0	0	25	20	25
N that is positionally unavailable	560	210	120	10	130	200	70
Calculated N need	**0**	**0**	**0**	**52**	**0**	**75**	**198**
Recommendations (lbs/ac)							
Initial Calculated N Application	40	40	0	52	40	75	198
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0	0
Adjusted N Application	**40**	**40**	**0**	**52**	**40**	**75**	**198**
Adjusted N Application Upper Range	**48**	**48**	**0**	**62**	**48**	**90**	**238**
Field Applications (lbs/ac)							
2014 August	0	0	0	0	0	0	13
2014 September	0	0	0	0	0	0	73
2014 October	0	121	55	0	0	0	0
2014 November	10	0	0	0	0	0	0
2014 December	20	0	0	0	0	0	0
2015 January	0	0	0	0	0	0	0
2015 February	0	0	0	0	0	0	0
2015 March	17	0	39	0	0	0	0
2015 April	16	0	0	0	0	0	0
2015 May	0	0	0	0	0	0	0
Available N Applied	**63**	**121**	**94**	**0**	**0**	**0**	**86**
Notes							
GDS-SU05	Applications were made in corners only. 0 lbs applied to main pivot.						

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2015 – Crop Year 2015

Field	GDS-SU01	GDS-SU02	GDS-SU03	GDS-SU04	GDS-SU05	GDS-SU06	GDS-SU07
Acres	**17.8**	**99.1**	**28.4**	**135.6**	**100.6**	**84.5**	**76.6**
Report Number	F15-0375	F15-0376	F15-0377	F15-0349	F15-0369	F15-0347	F15-0370
Sample Date	5/18/2015	5/18/2015	5/18/2015	4/28/2015	5/15/2015	4/29/2015	5/15/2015
Previous Crop	Triticale	Alfalfa	Alfalfa	Triticale	Alfalfa	Triticale	Alfalfa
Upcoming Crop	Idle	Alfalfa	Alfalfa	Silage Corn	Alfalfa	Silage Corn	Alfalfa
Crop Rotation Changes	Yes	No	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	74	44	40	571	420	101	42
2' Nitrate	32	37	16	680	810	237	85
1'+2' Root Zone	**106**	**81**	**56**	**1251**	**1230**	**338**	**127**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	210	260	210	210	260	297	292
Soil N supply (residual, OM, past manure)	-194	-161	-141	-1251	-1314	-405	-191
N used to consume past crop residue	20	0	0	20	0	20	0
N that is positionally unavailable	10	5	0	185	0	60	0
Calculated N need	**46**	**104**	**69**	**0**	**0**	**0**	**101**
Recommendations (lbs/ac)							
Initial Calculated N Application	46	104	69	30	0	45	101
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	20	0
Adjusted N Application	**46**	**104**	**69**	**30**	**0**	**65**	**101**
Adjusted N Application Upper Range	**55**	**125**	**83**	**36**	**0**	**78**	**121**
Field Applications (lbs/ac)							
2015 April	0	0	0	7	0	0	0
2015 May	0	9	168	35	10	0	0
2015 June	0	58	73	3	3	0	0
2015 July	0	0	155	0	0	0	0
2015 August	61	14	75	0	0	5	4
2015 September	0	66	0	0	0	0	0
2015 October	0	0	0	0	0	0	0
Available N Applied	**61**	**148**	**471**	**45**	**14**	**5**	**4**
Notes							
GDS-SU04, GDS-SU05 & GDR-SU08	Applications were made in corners only. 0 lbs applied to main pivot.						

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2015 – Crop Year 2015

Field	GDS-SU08	GDS-SU09	GDS-SU10	GDS-SU11	GDS-SU12	GDS-SU13	GDS-SU14
Acres	**165.5**	**34.6**	**38.5**	**8.1**	**40.5**	**47.0**	**65.2**
Report Number	F15-0350	F15-0348	F15-0409	F15-0410	F15-0351	F15-0378	F15-0379
Sample Date	5/1/2015	4/29/2015	6/29/2015	6/29/2015	5/1/2015	5/19/2015	5/19/2015
Previous Crop	Triticale	Triticale	Alfalfa	Alfalfa	Triticale	Alfalfa	Alfalfa
Upcoming Crop	Silage Corn	Silage Corn	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	No	No	No	No	Yes	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	230	86	46	43	87	33	35
2' Nitrate	509	105	28	31	103	51	60
1'+2' Root Zone	**739**	**191**	**74**	**74**	**190**	**84**	**95**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	243	297	180	180	270	292	292
Soil N supply (residual, OM, past manure)	-739	-263	-104	-105	-254	-142	-150
N used to consume past crop residue	20	20	0	0	20	0	0
N that is positionally unavailable	120	30	0	0	30	0	0
Calculated N need	**0**	**84**	**76**	**75**	**66**	**150**	**142**
Recommendations (lbs/ac)							
Initial Calculated N Application	30	84	76	75	66	150	142
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0	0
Adjusted N Application	**30**	**84**	**76**	**75**	**66**	**150**	**142**
Adjusted N Application Upper Range	**36**	**101**	**91**	**90**	**79**	**180**	**170**
Field Applications (lbs/ac)							
2015 April	0	0	0	0	0	0	0
2015 May	0	0	0	0	0	119	0
2015 June	0	0	0	0	0	53	76
2015 July	0	0	0	0	0	0	0
2015 August	0	0	0	0	0	0	0
2015 September	0	0	0	0	0	0	0
2015 October	4	0	0	0	0	0	0
Available N Applied	**4**	**0**	**0**	**0**	**0**	**172**	**76**
Notes							
GDS-SU04, GDS-SU05 & GDR-SU08	Applications were made in corners only. 0 lbs applied to main pivot.						

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2015 – Crop Year 2016

Field	GDS-SU01	GDS-SU02	GDS-SU03	GDS-SU04	GDS-SU05	GDS-SU06	GDS-SU07
Acres	**17.8**	**99.1**	**28.4**	**135.6**	**100.6**	**84.5**	**76.6**
Report Number	F15-0893	F15-0894	F15-0696	F15-0697	F15-0534	F15-0698	F15-0535
Sample Date	11/13/2015	11/13/2015	10/7/2015	10/7/2015	9/18/2015	9/29/2015	9/18/2015
Previous Crop	Idle	Alfalfa	Alfalfa	Silage Corn	Alfalfa	Silage Corn	Alfalfa
Upcoming Crop	Triticale	Alfalfa	Triticale	Triticale	Alfalfa	Triticale	Triticale
Crop Rotation Changes	Yes	No	Yes	No	No	No	Yes
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	63	98	157	328	556	145	58
2' Nitrate	63	45	139	283	894	221	27
1'+2' Root Zone	**126**	**143**	**296**	**611**	**1450**	**366**	**85**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	175	210	175	175	225	200	200
Soil N supply (residual, OM, past manure)	-227	-228	-481	-980	-2152	-798	-222
N used to consume past crop residue	15	0	-45	20	0	20	-50
N that is positionally unavailable	75	55	195	360	300	440	110
Calculated N need	**38**	**37**	**0**	**0**	**0**	**0**	**38**
Recommendations (lbs/ac)							
Initial Calculated N Application	40	40	0	0	0*	0	38
+ In-season petiole adjustment (if applicable)	45	40	30	0	0	35	0
Adjusted N Application	**85**	**80**	**30**	**0**	**0**	**35**	**38**
Adjusted N Application Upper Range	**102**	**96**	**36**	**0**	**0**	**42**	**46**
Field Applications (lbs/ac)							
2015 September	0	0	0	0	0	0	0
2015 October	0	0	0	0	0	0	0
...							
2016 March	0	0	0	0	0	0	0
2016 April	0	0	176	0	0	0	0
Available N Applied	**0**	**0**	**176**	**0**	**0**	**0**	**0**
Notes							
GDS-SU05	Additional recommendation was made for corners only at 50 lbs.						

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2015 – Crop Year 2016

Field	GDS-SU08	GDS-SU09	GDS-SU10	GDS-SU11	GDS-SU12	GDS-SU13	GDS-SU14
Acres	**165.5**	**34.6**	**38.5**	**8.1**	**40.5**	**47.0**	**65.2**
Report Number	F15-0699	F15-0700	F15-0536	F15-0538	F15-0701	F15-0537	F15-0539
Sample Date	10/2/2015	9/29/2015	9/15/2015	9/18/2015	10/2/2015	9/15/2015	9/15/2015
Previous Crop	Silage Corn	Silage Corn	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa
Upcoming Crop	W. Barley	Triticale	Alfalfa	Alfalfa	Triticale	Alfalfa	Alfalfa
Crop Rotation Changes	Yes	No	No	No	Yes	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	326	98	22	45	16	27	28
2' Nitrate	356	98	40	24	43	34	44
1'+2' Root Zone	**682**	**196**	**62**	**69**	**59**	**61**	**72**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	150	200	225	225	200	225	225
Soil N supply (residual, OM, past manure)	-1164	-349	-173	-134	-136	-163	-135
N used to consume past crop residue	20	20	0	0	20	0	0
N that is positionally unavailable	500	140	45	20	35	45	20
Calculated N need	**0**	**11**	**97**	**111**	**119**	**107**	**110**
Recommendations (lbs/ac)							
Initial Calculated N Application	0	45	97	111	119	107	110
+ In-season petiole adjustment (if applicable)	0	5	0	0	0	0	0
Adjusted N Application	**0**	**50**	**97**	**111**	**119**	**107**	**110**
Adjusted N Application Upper Range	**0**	**60**	**116**	**133**	**143**	**128**	**132**
Field Applications (lbs/ac)							
2015 September	0	0	0	0	0	0	42
2015 October	0	0	0	0	19	0	43
...							
2016 March	0	0	0	0	0	0	34
2016 April	0	0	0	0	0	0	0.4
Available N Applied	**0**	**0**	**0**	**0**	**19**	**0**	**119**
Notes							
GDS-SU05	Additional recommendation was made for corners only at 50 lbs.						

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2016 – Crop Year 2016

Field	GDS-SU01	GDS-SU02	GDS-SU03	GDS-SU04	GDS-SU05	GDS-SU06	GDS-SU07
Acres	**17.8**	**99.1**	**28.4**	**135.6**	**100.6**	**84.5**	**76.6**
Report Number	F16-0239	F16-0264	F16-0225	F16-0240	F16-0265	F16-0226	F16-0227
Sample Date	5/3/2016	5/5/2016	4/27/2016	4/29/2016	5/5/2016	4/28/2016	4/28/2016
Previous Crop	Triticale	Alfalfa	Triticale	Triticale	Alfalfa	Triticale	Triticale
Upcoming Crop	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Silage Corn	Silage Corn
Crop Rotation Changes	Yes	No	Yes	Yes	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	53	74	28	100	86	22	15
2' Nitrate	50	42	25	309	597	73	26
1'+2' Root Zone	**103**	**116**	**53**	**409**	**683**	**95**	**41**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	255	325	330	300	325	270	228
Soil N supply (residual, OM, past manure)	-204	-211	-154	-485	-844	-162	-104
N used to consume past crop residue	0	0	0	15	0	20	0
N that is positionally unavailable	15	15	15	80	0	15	15
Calculated N need	**66**	**129***	**191**	**0**	**0**	**143**	**139***
Recommendations (lbs/ac)							
Initial Calculated N Application	66	129	185	0	0	143	139
+ In-season petiole adjustment (if applicable)	0	40	0	0	0	0	0
Adjusted N Application	**66**	**169**	**185**	**0**	**0**	**143**	**139**
Adjusted N Application Upper Range	**79**	**203**	**222**	**0**	**0**	**172**	**167**
Field Applications (lbs/ac)							
2016 April	0	0	25	0	0	0	0
2016 May	0	1	18	0	0	0	0
2016 June	0	11	0	0	0	0	0
2016 July	0	1	30	0	0	0	0
2016 August	0	36	16	0	0	0	0
2016 September	0	32	0	0	0	0	0
2016 October	0	3	0	0	0	0	0
Available N Applied	**0**	**84**	**89**	**0**	**0**	**0**	**0**
Notes							
GDS-SU02	A math error was made in original calculations, originally recommending 189 lbs.						
GDS-SU07	A math error was made in original calculations, originally recommending 199 lbs.						

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2016 – Crop Year 2016

Field	GDS-SU08	GDS-SU09	GDS-SU10	GDS-SU11	GDS-SU12	GDS-SU13	GDS-SU14
Acres	**165.5**	**34.6**	**38.5**	**8.1**	**40.5**	**47.0**	**65.2**
Report Number	F16-0311	F16-0228	F16-0241	F16-0274	F16-0229	F16-0273	F16-0272
Sample Date	5/23/2016	4/28/2016	5/3/2016	5/9/2016	4/29/2016	5/9/2016	5/9/2016
Previous Crop	W. Barley	Triticale	Alfalfa	Alfalfa	Triticale	Alfalfa	Alfalfa
Upcoming Crop	Silage Corn	Silage Corn	Silage Corn	Alfalfa	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	No	No	Yes	No	Yes	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	140	41	40	109	40	70	63
2' Nitrate	449	49	16	87	27	74	111
1'+2' Root Zone	**589**	**90**	**56**	**196**	**67**	**144**	**174**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	358	288	288	325	357	325	325
Soil N supply (residual, OM, past manure)	-668	-168	-112	-286	-151	-228	-226
N used to consume past crop residue	20	20	-70	0	20	0	0
N that is positionally unavailable	15	15	15	15	15	15	15
Calculated N need	**0**	**155**	**121**	**54**	**241**	**112**	**114**
Recommendations (lbs/ac)							
Initial Calculated N Application	0	155	121	54	195	112	114
+ In-season petiole adjustment (if applicable)	0	0	20	0	30	0	0
Adjusted N Application	**0**	**155**	**141**	**54**	**225**	**112**	**114**
Adjusted N Application Upper Range	**0**	**186**	**169**	**65**	**270**	**134**	**137**
Field Applications (lbs/ac)							
2016 April	0	0	0	0	0	0	0
2016 May	0	0	0	58	142	0	0
2016 June	0	0	0	0	0	0	0
2016 July	0	0	0	0	43	0	34
2016 August	0	0	0	0	0	0	0
2016 September	0	0	0	0	21	0	0
2016 October	0	0	0	0	0	0	0
Available N Applied	**0**	**0**	**0**	**58**	**206**	**0**	**34**
Notes							
GDS-SU02	A math error was made in original calculations, originally recommending 189 lbs.						
GDS-SU07	A math error was made in original calculations, originally recommending 199 lbs.						

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2016 – Crop Year 2017

Field	GDS-SU01	GDS-SU02	GDS-SU03	GDS-SU04	GDS-SU05	GDS-SU06	GDS-SU07
Acres	**17.8**	**99.1**	**28.4**	**135.6**	**100.6**	**84.5**	**76.6**
Report Number	F16-0710	F16-0711	F16-0730	F16-0722	F16-0662	F16-0651	F16-0650
Sample Date	10/31/2016	10/31/2016	11/1/2016	11/1/2016	10/24/2016	10/19/2016	10/19/2016
Previous Crop	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Silage Corn	Silage Corn
Upcoming Crop	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Triticale	Triticale	Triticale
Crop Rotation Changes	No	No	No	No	Yes	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	46	74	36	156	124	144	295
2' Nitrate	25	28	12	433	593	194	171
1'+2' Root Zone	**71**	**102**	**48**	**589**	**717**	**338**	**466**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	210	210	210	210	200	200	200
Residual Nitrates (3')	-79	-139	-62	-1040	-1515	-607	-608
Residual Ammonium (3')	-6	-6	-13	-11	-9	-6	-7
Mineralization (past manure)	-10	-10	-10	-10	-5	-12	-12
Mineralization (organic matter)	-21	-27	-24	-19	-18	-18	-14
N used to consume past crop residue	0	0	0	0	-65	20	20
N that may not be accessible	20	54	27	470	20	291	176
Calculated N need	**114**	**82**	**128**	**0**	**0**	**0**	**0**
Recommendations (lbs/ac)							
Initial Calculated N Application	114	82	128	0	0	40	0
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0	0
Adjusted N Application	**114**	**82**	**128**	**0**	**0**	**40**	**0**
Adjusted N Application Upper Range	**137**	**98**	**154**	**0**	**0**	**48**	**0**
Field Applications (lbs/ac)							
2016 October	0	0	0	0	0	47	42
2016 November	33	39	41	0	0	0	0
2016 December	0	0	0	0	0	0	0
...							
2017 March	41	62	0	53	0	55	54
2017 April	65	0	0	24	16	0	0
Available N Applied	**138**	**101**	**41**	**77**	**16**	**102**	**97**

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2016 – Crop Year 2017

Field	GDS-SU08	GDS-SU09	GDS-SU10	GDS-SU11	GDS-SU12	GDS-SU13	GDS-SU14
Acres	**165.5**	**34.6**	**38.5**	**8.1**	**40.5**	**47.0**	**65.2**
Report Number	F16-0663	F16-0687	F16-0688	F16-0692	F16-0731	F16-0732	F16-0693
Sample Date	10/24/2016	10/21/2016	10/21/2016	10/28/2016	11/2/2016	11/2/2016	10/28/2016
Previous Crop	Silage Corn	Silage Corn	Silage Corn	Alfalfa	Alfalfa	Alfalfa	Alfalfa
Upcoming Crop	Triticale	Triticale	Triticale	Triticale	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	No	No	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	171	128	58	80	64	57	37
2' Nitrate	392	66	29	28	33	28	19
1'+2' Root Zone	**563**	**194**	**87**	**108**	**97**	**85**	**56**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	200	200	200	225	210	210	210
Residual Nitrates (3')	-1144	-279	-118	-124	-130	-109	-78
Residual Ammonium (3')	-7	-7	-7	-12	-9	-9	-7
Mineralization (past manure)	-5	-10	-10	-10	-10	-10	-10
Mineralization (organic matter)	-16	-18	-14	-28	-19	-16	-14
N used to consume past crop residue	20	20	20	0	0	0	0
N that may not be accessible	604	117	53	28	53	46	39
Calculated N need	**0**	**23**	**124**	**79**	**95**	**112**	**140**
Recommendations (lbs/ac)							
Initial Calculated N Application	0	40	124	79	95	112	140
+ In-season petiole adjustment (if applicable)	0	0	0	0	0	0	0
Adjusted N Application	**0**	**40**	**124**	**79**	**95**	**112**	**140**
Adjusted N Application Upper Range	**0**	**48**	**149**	**95**	**114**	**134**	**168**
Field Applications (lbs/ac)							
2016 October	0	0	72	0	0	0	0
2016 November	47	0	0	45	153	0	44
2016 December	0	0	0	0	0	0	20
...							
2017 March	29	0	0	0	0	67	0
2017 April	0	0	0	0	107	35	60
Available N Applied	**76**	**0**	**72**	**45**	**260**	**103**	**124**

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2017 – Crop Year 2017

Field	GDS-SU01	GDS-SU02	GDS-SU03	GDS-SU04	GDS-SU05	GDS-SU06	GDS-SU07
Acres	**17.8**	**99.1**	**28.4**	**135.6**	**100.6**	**84.5**	**76.6**
Report Number	F17-0345	F17-0346	F17-0347	F17-0303	F17-0276	F17-0304	F17-0305
Sample Date	5/31/2017	5/31/2017	5/31/2017	5/23/2017	5/17/2017	5/19/2017	5/19/2017
Previous Crop	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Triticale	Triticale	Triticale
Upcoming Crop	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Silage Corn	Silage Corn	Silage Corn
Crop Rotation Changes	No	No	No	No	Yes	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	89	80	73	101	53	48	93
2' Nitrate	33	43	51	242	107	82	134
1'+2' Root Zone	**122**	**123**	**124**	**343**	**160**	**130**	**227**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	325	325	325	325	288	297	297
Residual nitrates (3')	-122	-123	-124	-343	-160	-130	-227
Residual ammonium (3')	-23	-11	-22	-29	-35	-23	-13
Mineralization (past manure)	-10	-10	-10	-10	-5	-10	-10
Mineralization (organic matter)	-100	-74	-76	-52	-60	-48	-42
N used to consume past crop residue	0	0	0	0	20	20	20
N that may not be accessible	15	20	20	40	20	20	25
Calculated N need	**85**	**127**	**113**	**0**	**68**	**126**	**50**
Recommendations (lbs/ac)							
Initial Calculated N Application	85	127	113	0	68	126	50
+ In-season petiole adjustment (if applicable)							
Adjusted N Application	**85**	**127**	**113**	**0**	**68**	**126**	**50**
Adjusted N Application Upper Range	**94**	**140**	**124**	**0**	**75**	**139**	**55**
Field Applications (lbs/ac)							
2017 June	81	55	0	8	0	98	97
2017 July	0	0	0	0	0	0	0
Available N Applied	**81**	**55**	**0**	**8**	**0**	**98**	**97**
Notes							
GDS-SU02	A math error was made in original calculations, originally recommending 189 lbs.						
GDS-SU07	A math error was made in original calculations, originally recommending 199 lbs.						

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2017 – Crop Year 2017

Field	GDS-SU08	GDS-SU09	GDS-SU10	GDS-SU11	GDS-SU12	GDS-SU13	GDS-SU14
Acres	**165.5**	**34.6**	**38.5**	**8.1**	**40.5**	**47.0**	**65.2**
Report Number	F17-0306	F17-0353	F17-0307	F17-0277	F17-0337	F17-0354	F17-0308
Sample Date	5/22/2017	5/30/2017	5/22/2017	5/17/2017	5/25/2017	5/30/2017	5/23/2017
Previous Crop	Triticale	Triticale	Triticale	Triticale	Alfalfa	Alfalfa	Alfalfa
Upcoming Crop	Alfalfa	Alfalfa	Silage Corn	Alfalfa	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	Yes	Yes	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	112	250	70	61	93	123	60
2' Nitrate	206	212	54	55	24	71	31
1'+2' Root Zone	**318**	**462**	**124**	**116**	**117**	**194**	**91**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	357	325	315	250	357	325	325
Residual nitrates (3')	-318	-462	-124	-116	-117	-194	-91
Residual ammonium (3')	-23	-6	-11	-19	-21	-10	-19
Mineralization (past manure)	-10	-10	-10	-10	-10	-10	-10
Mineralization (organic matter)	-56	-44	-46	-64	-48	-46	-36
N used to consume past crop residue	20	0	20	20	0	0	0
N that may not be accessible	40	40	15	20	15	20	15
Calculated N need	**10**	**0**	**159**	**81**	**176**	**85**	**184**
Recommendations (lbs/ac)							
Initial Calculated N Application	10	0	159	81	176	85	184
+ In-season petiole adjustment (if applicable)							
Adjusted N Application	**10**	**0**	**159**	**81**	**176**	**85**	**184**
Adjusted N Application Upper Range	**11**	**0**	**175**	**89**	**194**	**94**	**202**
Field Applications (lbs/ac)							
2017 June	0	0	0	0	126	53	83
2017 July	0	0	0	0	0	0	54
Available N Applied	**0**	**0**	**0**	**0**	**126**	**53**	**137**
Notes							
GDS-SU02	A math error was made in original calculations, originally recommending 189 lbs.						
GDS-SU07	A math error was made in original calculations, originally recommending 199 lbs.						

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2017 – Crop Year 2018

Field	GDS-SU01	GDS-SU02	GDS-SU03	GDS-SU04	GDS-SU05	GDS-SU06	GDS-SU07
Acres	**17.8**	**99.1**	**28.4**	**135.6**	**100.6**	**84.5**	**76.6**
Report Number	F17-0532	F17-0533	F17-0534	F17-0535	F17-0637	F17-0638	F17-0639
Sample Date	10/5/2017	10/5/2017	10/5/2017	10/6/2017	10/17/2017	10/18/2017	10/18/2017
Previous Crop	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Silage Corn	Silage Corn	Silage Corn
Upcoming Crop	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Triticale	Triticale	Triticale
Crop Rotation Changes	No	No	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	25	52	30	44	120	107	94
2' Nitrate	10	20	12	178	236	100	103
1'+2' Root Zone	**35**	**72**	**42**	**222**	**356**	**207**	**197**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	195	195	195	227	200	200	200
Residual nitrates (3')	-45	-88	-55	-518	-697	-395	-330
Residual ammonium (3')	-24	-27	-11	-14	-19	-16	-18
Mineralization (past manure)	-10	-10	-10	-5	-5	-10	-10
Mineralization (organic matter)	-20	-24	-19	-18	-19	-15	-15
N used to consume past crop residue	0	0	0	0	20	20	20
N that may not be accessible	20	39	26	321	393	230	175
Calculated N need	**116**	**85**	**126**	**0**	**0**	**14**	**22**
Recommendations (lbs/ac)							
Initial Calculated N Application	116	85	52	40	35	40	40
+ In-season petiole adjustment (if applicable)							
Adjusted N Application	**116**	**85**	**52**	**40**	**35**	**40**	**40**
Adjusted N Application Upper Range	**128**	**94**	**57**	**44**	**39**	**44**	**44**
Field Applications (lbs/ac) (so far)							
2017 October	79	111	0	58	0	45	44
2017 November	20	8	0	0	0	0	0
Available N Applied	**99**	**119**	**0**	**58**	**0**	**45**	**44**

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2017 – Crop Year 2018

Field	GDS-SU08	GDS-SU09	GDS-SU10	GDS-SU11	GDS-SU12	GDS-SU13	GDS-SU14
Acres	**165.5**	**34.6**	**38.5**	**8.1**	**40.5**	**47.0**	**65.2**
Report Number	F17-0539	F17-0536	F17-0655	F17-0537	F17-0540	F17-0640	F17-0541
Sample Date	10/9/2017	10/6/2017	10/19/2017	10/6/2017	10/9/2017	10/18/2017	10/9/2017
Previous Crop	Alfalfa	Alfalfa	Silage Corn	Alfalfa	Alfalfa	Alfalfa	Alfalfa
Upcoming Crop	Alfalfa	Alfalfa	Triticale	Alfalfa	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	No	No	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	137	49	40	55	49	46	45
2' Nitrate	333	54	24	34	23	22	32
1'+2' Root Zone	**470**	**103**	**64**	**89**	**72**	**68**	**77**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	195	195	200	211	211	211	211
Residual nitrates (3')	-866	-146	-93	-136	-121	-86	-111
Residual ammonium (3')	-10	-19	-7	-31	-8	-17	-32
Mineralization (past manure)	-10	-10	-10	-10	-10	-5	-10
Mineralization (organic matter)	-17	-17	-11	-21	-17	-17	-13
N used to consume past crop residue	0	0	20	0	0	0	0
N that may not be accessible	415	69	20	73	66	20	60
Calculated N need	**0**	**72**	**119**	**86**	**121**	**106**	**105**
Recommendations (lbs/ac)							
Initial Calculated N Application	0	72	119	82	83	83	83
+ In-season petiole adjustment (if applicable)							
Adjusted N Application	**0**	**72**	**119**	**82**	**83**	**83**	**83**
Adjusted N Application Upper Range	**0**	**79**	**131**	**90**	**91**	**91**	**91**
Field Applications (lbs/ac) (so far)							
2017 October	0	0	0	0	0	0	102
2017 November	4	16	10	154	56	30	186
Available N Applied	**4**	**16**	**10**	**154**	**56**	**30**	**289**

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2018 – Crop Year 2018

Field	GDS-SU01	GDS-SU02	GDS-SU03	GDS-SU04	GDS-SU05	GDS-SU06	GDS-SU07
Acres	**17.8**	**99.1**	**28.4**	**135.6**	**100.6**	**84.5**	**76.6**
Report Number	F18-0368	F18-0354	F18-0369	F18-0355	F18-0316	F18-0317	F18-0318
Sample Date	5/22/2018	5/21/2018	5/22/2018	5/21/2018	5/9/2018	5/10/2018	5/10/2018
Previous Crop	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Triticale	Triticale	Triticale
Upcoming Crop	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Silage Corn	Silage Corn	Silage Corn
Crop Rotation Changes	No	No	No	No	Yes	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	40	66	31	48	70	37	84
2' Nitrate	35	23	11	92	135	61	111
1'+2' Root Zone	**75**	**89**	**42**	**140**	**205**	**98**	**195**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	325	325	325	390	294	294	294
Residual nitrates (3')	-75	-89	-42	-140	-205	-98	-195
Residual ammonium (3')	-25	-13	-38	-18	-18	-11	-12
Mineralization (past manure)	-10	-10	-10	-10	-5	-10	-10
Mineralization (organic matter)	-68	-62	-52	-44	-62	-48	-48
N used to consume past crop residue	0	0	0	0	25	25	25
N released from past crop residue	0	0	0	0	0	0	0
N that may not be accessible	15	15	15	30	65	20	50
Calculated N need	**162**	**166**	**198**	**208**	**94**	**172**	**104**
Recommendations (lbs/ac)							
Initial Calculated N Application	41	41	41	49	92	172	104
+ In-season petiole adjustment (if applicable)							
Adjusted N Application	**41**	**41**	**41**	**49**	**92**	**172**	**104**
Adjusted N Application Upper Range	**45**	**45**	**45**	**54**	**101**	**189**	**114**
Field Applications (lbs/ac)							
2018 March	74	0	0	0	63	0	0
2018 June	0	0	0	0	0	18	18
2018 July	0	0	0	0	0	69	68
2018 August	0	0	0	0	0	52	52
Available N Applied	**74**	**0**	**0**	**0**	**63**	**139**	**138**

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Pre-Plant 2018 – Crop Year 2018

Field	GDS-SU08	GDS-SU09	GDS-SU10	GDS-SU11	GDS-SU12	GDS-SU13	GDS-SU14
Acres	**165.5**	**34.6**	**38.5**	**8.1**	**40.5**	**47.0**	**65.2**
Report Number	F18-0370	F18-0356	F18-0328	F18-0371	F18-0379	F18-0380	F18-0381
Sample Date	5/22/2018	5/21/2018	5/9/2018	5/22/2018	5/24/2018	5/24/2018	5/24/2018
Previous Crop	Alfalfa	Alfalfa	Triticale	Alfalfa	Alfalfa	Alfalfa	Alfalfa
Upcoming Crop	Alfalfa	Alfalfa	Silage Corn	Alfalfa	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	No	No	No	No	No	No	No
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	72	41	31	49	62	59	55
2' Nitrate	241	42	42	29	40	27	31
1'+2' Root Zone	**313**	**83**	**73**	**78**	**102**	**86**	**86**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	357	357	322	357	357	325	325
Residual nitrates (3')	-313	-83	-73	-78	-102	-86	-86
Residual ammonium (3')	-21	-14	-14	-20	-46	-24	-15
Mineralization (past manure)	-10	-15	-15	-15	-10	-10	-10
Mineralization (organic matter)	-46	-44	-44	-64	-48	-44	-36
N used to consume past crop residue	0	0	25	0	0	0	0
N released from past crop residue	0	0	0	0	0	0	0
N that may not be accessible	75	15	15	15	15	15	15
Calculated N need	**42**	**216**	**216**	**195**	**166**	**176**	**193**
Recommendations (lbs/ac)							
Initial Calculated N Application	0	166	216	166	165	151	151
+ In-season petiole adjustment (if applicable)							
Adjusted N Application	**0**	**166**	**216**	**166**	**165**	**151**	**151**
Adjusted N Application Upper Range	**0**	**183**	**238**	**183**	**182**	**166**	**166**
Field Applications (lbs/ac)							
2018 March	0	72	126	0	34	71	0
2018 June	0	0	0	0	0	0	0
2018 July	0	0	0	0	0	0	0
2018 August	0	0	0	0	0	0	0
Available N Applied	**0**	**72**	**126**	**0**	**34**	**71**	**0**

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2018 – Crop Year 2019

Field	GDS-SU01	GDS-SU02	GDS-SU03	GDS-SU04	GDS-SU05	GDS-SU06	GDS-SU07
Acres	**17.8**	**99.1**	**28.4**	**135.6**	**100.6**	**84.5**	**76.6**
Report Number	F18-0706	F18-0708	F18-0710	F18-0769	F18-0547	F18-0553	F18-0554
Sample Date	10/16/2018	10/16/2018	10/16/2018	10/22/2018	9/28/2018	10/1/2018	10/1/2018
Previous Crop	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Silage Corn	Silage Corn	Silage Corn
Upcoming Crop	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa
Crop Rotation Changes	No	No	No	No	Yes	Yes	Yes
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	53	38	33	67	134	240	178
2' Nitrate	14	8	10	105	114	248	197
1'+2' Root Zone	**67**	**46**	**43**	**172**	**248**	**488**	**375**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	211	211	211	227	195	195	195
Residual nitrates (3')	-79	-52	-51	-432	-438	-739	-591
Residual ammonium (3')	-26	-28	-34	-14	-9	-13	-9
Mineralization (past manure)	-10	-10	-10	-5	-10	-10	-10
Mineralization (organic matter)	-23	-25	-20	-20	-20	-15	-14
N used to consume past crop residue	0	0	0	0	20	20	20
N released from past crop residue	0	0	0	0	0	0	0
N that may not be accessible	30	25	25	195	265	395	345
Calculated N need	**103**	**121**	**121**	**0**	**3**	**0**	**0**
Recommendations (lbs/ac)							
Initial Calculated N Application	43	43	43	40	40	0	0
+ In-season petiole adjustment (if applicable)							
Adjusted N Application	**43**	**43**	**43**	**40**	**40**	**0**	**0**
Adjusted N Application Upper Range	**47**	**47**	**47**	**44**	**44**	**0**	**0**
Field Applications (lbs/ac) (so far)							
Available N Applied	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Post-Harvest 2018 – Crop Year 2019

Field	GDS-SU08	GDS-SU09	GDS-SU10	GDS-SU11	GDS-SU12	GDS-SU13	GDS-SU14
Acres	**165.5**	**34.6**	**38.5**	**8.1**	**40.5**	**47.0**	**65.2**
Report Number	F18-0739	F18-0741	F18-0555	F18-0674	F18-0743	F18-0675	F18-0676
Sample Date	10/18/2018	10/18/2018	10/1/2018	10/15/2018	10/18/2018	10/15/2018	10/15/2018
Previous Crop	Alfalfa	Alfalfa	Silage Corn	Alfalfa	Alfalfa	Alfalfa	Alfalfa
Upcoming Crop	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Triticale
Crop Rotation Changes	No	No	Yes	No	No	No	Yes
Nitrogen Source	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure	Liquid Manure
Soil Measurements (lbs/ac)							
1' Nitrate	171	36	137	36	46	27	31
2' Nitrate	238	13	86	13	11	10	11
1'+2' Root Zone	**409**	**49**	**223**	**49**	**57**	**37**	**42**
Nitrogen Budget Calculations (lbs/ac)							
Projected crop N use	211	211	195	211	211	211	200
Residual nitrates (3')	-784	-68	-289	-65	-69	-48	-59
Residual ammonium (3')	-22	-17	-6	-35	-22	-30	-35
Mineralization (past manure)	-10	-10	-10	-10	-10	-10	-5
Mineralization (organic matter)	-19	-16	-14	-23	-16	-16	-14
N used to consume past crop residue	0	0	20	0	0	0	0
N released from past crop residue	0	0	0	0	0	0	-60
N that may not be accessible	280	25	130	30	25	25	40
Calculated N need	**0**	**125**	**26**	**108**	**119**	**132**	**67**
Recommendations (lbs/ac)							
Initial Calculated N Application	0	125	50	108	119	132	67
+ In-season petiole adjustment (if applicable)							
Adjusted N Application	**0**	**125**	**50**	**108**	**119**	**132**	**67**
Adjusted N Application Upper Range	**0**	**138**	**55**	**119**	**131**	**145**	**74**
Field Applications (lbs/ac) (so far)							
Available N Applied	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**

Table 7

George DeRuyter & Son/D&A Dairies Application Field Management Summary and Recommendation Calculations, Crop Years 2015 to 2018

Notes:

Justification or citation for crop nitrogen uptake predictions: Historical crop yields; PNW615; PNW0611; Progene Seed Company; UC Davis Cooperative Ext.; Western Fertilizer Handbook

Table 8a

Cow Palace Dairy Manure Nutrient Concentrations – Total N (as analyzed), 2013 to 2018

Manure Source		Manure Type	Fall 2013 (ppm)	Spring 2014 (ppm)	Fall 2014 (ppm)	Spring 2015 (ppm)	Fall 2015 (ppm)	Spring 2016 (ppm)	Fall 2016 (ppm)	Spring 2017 (ppm)	Fall 2017 (ppm)	Spring 2018 (ppm)	Fall 2018 (ppm)
CP-LG01	Lagoon 01	Lagoon Water	451	621	450	619	883	629	610	721	527		
CP-LG02	Lagoon 02	Lagoon Water		557	477	531	536	541	407	669		647	678
CP-LG03	Lagoon 03	Lagoon Water		522									
CP-LG04	Lagoon 04	Lagoon Water	645								350		
CP-CB02	Catch Basin 02	Lagoon Water		577	243		ND	485	1		711		
CP-SB-01	Settling Basin 01	Thick Slurry			646	1,882			1,068				
CP-Straw Manure	Straw Manure	Solid			6,000	5,500		5,200		10,500			
CP-Separator Material	Separator Material	Solid			2,800	13,100	2,700	3,500	6,000	8,200	6,100	3,300	4,300
CP-Compost	Compost	Solid			11,100	13,200	12,100	10,300	12,900	8,700	11,000	10,800	12,700
CP-Compost South	Compost South	Solid					11,400		12,100	9,600	11,200	11,800	12,800

Table 8b

Cow Palace Dairy Manure Nutrient Concentrations – Total NH4 (as analyzed), 2013 to 2018

Manure Source		Manure Type	Fall 2013 (ppm)	Spring 2014 (ppm)	Fall 2014 (ppm)	Spring 2015 (ppm)	Fall 2015 (ppm)	Spring 2016 (ppm)	Fall 2016 (ppm)	Spring 2017 (ppm)	Fall 2017 (ppm)	Spring 2018 (ppm)	Fall 2018 (ppm)
CP-LG01	Lagoon 01	Lagoon Water	360	263	288	455	465	385	315	424	382		
CP-LG02	Lagoon 02	Lagoon Water		262	252	425	375	330	215	413		455	380
CP-LG03	Lagoon 03	Lagoon Water		234									
CP-LG04	Lagoon 04	Lagoon Water	59								74		
CP-CB02	Catch Basin 02	Lagoon Water		161	121		21	258	2		237		
CP-SB-01	Settling Basin 01	Thick Slurry			421	540			490				
CP-Straw Manure	Straw Manure	Solid			647	940		1,185		654			
CP-Separator Material	Separator Material	Solid			81	71	695	307	670	1,045	673	583	317
CP-Compost	Compost	Solid			329	475	475	44	105	162	254	361	533
CP-Compost South	Compost South	Solid					217		100	26	196	269	530

Table 8c

Cow Palace Dairy Manure Nutrient Concentrations – Total P (as analyzed), 2013 to 2018

Manure Source		Manure Type	Fall 2013 (ppm)	Spring 2014 (ppm)	Fall 2014 (ppm)	Spring 2015 (ppm)	Fall 2015 (ppm)	Spring 2016 (ppm)	Fall 2016 (ppm)	Spring 2017 (ppm)	Fall 2017 (ppm)	Spring 2018 (ppm)	Fall 2018 (ppm)
CP-LG01	Lagoon 01	Lagoon Water	58	59	33	124	242	90	68	109	33		
CP-LG02	Lagoon 02	Lagoon Water		53	35	68	55	65	56	87	x	81	71
CP-LG03	Lagoon 03	Lagoon Water		38									
CP-LG04	Lagoon 04	Lagoon Water	42							x	74		
CP-CB02	Catch Basin 02	Lagoon Water		87	35		34	102	6	x	98		
CP-SB-01	Settling Basin 01	Thick Slurry			98	476			252				
CP-Straw Manure	Straw Manure	Solid			1,700	1,600		1,700		4,700	x		
CP-Separator Material	Separator Material	Solid			300	700	1,000	1,200	2,200	3,300	2,300	4,600	800
CP-Compost	Compost	Solid			6,300	7,700	7,000	4,500	5,600	4,300	5,700	5,600	6,400
CP-Compost South	Compost South	Solid					7,600		5,900	5,700	5,600	6,500	6,800

Table 8d

Cow Palace Dairy Manure Nutrient Concentrations – Total K (as analyzed), 2013 to 2018

Manure Source		Manure Type	Fall 2013 (ppm)	Spring 2014 (ppm)	Fall 2014 (ppm)	Spring 2015 (ppm)	Fall 2015 (ppm)	Spring 2016 (ppm)	Fall 2016 (ppm)	Spring 2017 (ppm)	Fall 2017 (ppm)	Spring 2018 (ppm)	Fall 2018 (ppm)
CP-LG01	Lagoon 01	Lagoon Water	682	602	657	839	991	832	847	1,133	854		
CP-LG02	Lagoon 02	Lagoon Water		597	686	873	960	828	1,467	1,267		930	805
CP-LG03	Lagoon 03	Lagoon Water		605									
CP-LG04	Lagoon 04	Lagoon Water	1,140								1,493		
CP-CB02	Catch Basin 02	Lagoon Water		874	844		248	1,521	23		2,220		
CP-SB-01	Settling Basin 01	Thick Slurry			942	1,136			1,521				
CP-Straw Manure	Straw Manure	Solid			7,100	6,900				15,100			
CP-Separator Material	Separator Material	Solid			900	1,100	1,300	1,000	2,100	1,400	1,300	2,100	1,100
CP-Compost	Compost	Solid			25,100	28,700	22,700	19,400	26,000	17,100	19,800	20,100	22,300
CP-Compost South	Compost South	Solid					28,400		25,500	20,800	21,300	27,700	24,500

Notes: ND: not detected ppm: parts per million

Table 9a

Liberty Dairy Manure Nutrient Concentrations – Total N (as analyzed), 2013 to 2018

Manure Source		Manure Type	Fall 2013 (ppm)	Spring 2014 (ppm)	Fall 2014 (ppm)	Spring 2015 (ppm)	Fall 2015 (ppm)	Spring 2016 (ppm)	Fall 2016 (ppm)	Spring 2017 (ppm)	Fall 2017 (ppm)	Spring 2018 (ppm)	Fall 2018 (ppm)
LD-LG01	Lagoon 01	Thin Slurry	1,376	2,417		2,358		808	1,301	794	1,315	1,427	1,602
LD-LG02	Lagoon 02	Lagoon Water					1,344						
LD-LG03	Lagoon 03	Lagoon Water				1,708		961					
LD-LG04	Lagoon 04	Lagoon Water								1,054			
LD-LG06	Lagoon 06	Lagoon Water			415			789		1,537			
LD-LG14	Lagoon 14	Thin Slurry	1,829	2,270	2,374	2,632	2,104		2,416	2,269	1,781	2,311	2,201
LD-LG-RW	Lagoon Red Water	Lagoon Water	160				1,843						
LD-Compost	Compost	Solid			9,500		11,100						
LD-Compost North	Compost	Solid								8,800	11,200	7,000	12,200
LD-Compost South	Compost South	Solid				12,500	12,100	12,000	147,000	13,600	11,600	13,400	11,200
LD-Corral Manure												5,500	
LD-Separator	Separator	Solid			3,100		4,600	5,200	4,500	4,100	4,800	4,700	4,300

Table 9b

Liberty Dairy Manure Nutrient Concentrations – Total NH4 (as analyzed), 2013 to 2018

Manure Source		Manure Type	Fall 2013 (ppm)	Spring 2014 (ppm)	Fall 2014 (ppm)	Spring 2015 (ppm)	Fall 2015 (ppm)	Spring 2016 (ppm)	Fall 2016 (ppm)	Spring 2017 (ppm)	Fall 2017 (ppm)	Spring 2018 (ppm)	Fall 2018 (ppm)
LD-LG01	Lagoon 01	Thin Slurry	675	920		1,105		390	605	469	321	844	549
LD-LG02	Lagoon 02	Lagoon Water					715						
LD-LG03	Lagoon 03	Lagoon Water				895		485					
LD-LG04	Lagoon 04	Lagoon Water								612			
LD-LG06	Lagoon 06	Lagoon Water			167			485		840			
LD-LG14	Lagoon 14	Thin Slurry	920	1,125	1,010	1,265	1,025		1,305	1,095	708	1,245	1,168
LD-LG-RW	Lagoon Red Water	Lagoon Water	76				800						
LD-Compost	Compost	Solid			500	750	710			50	251		
LD-Compost North	Compost	Solid								163	157	20	889
LD-Compost South	Compost South	Solid					345	182	40			246	900
LD-Corral Manure												79	
LD-Separator	Separator	Solid			460		620	1,185	700	1,012	631	828	633

Table 9c

Liberty Dairy Manure Nutrient Concentrations – Total P (as analyzed), 2013 to 2018

Manure Source		Manure Type	Fall 2013 (ppm)	Spring 2014 (ppm)	Fall 2014 (ppm)	Spring 2015 (ppm)	Fall 2015 (ppm)	Spring 2016 (ppm)	Fall 2016 (ppm)	Spring 2017 (ppm)	Fall 2017 (ppm)	Spring 2018 (ppm)	Fall 2018 (ppm)
LD-LG01	Lagoon 01	Thin Slurry	138	367		527		63	180	75	145	184	224
LD-LG02	Lagoon 02	Lagoon Water					125						
LD-LG03	Lagoon 03	Lagoon Water				246		76					
LD-LG04	Lagoon 04	Lagoon Water								117			
LD-LG06	Lagoon 06	Lagoon Water			43			53		229			
LD-LG14	Lagoon 14	Thin Slurry	275	481	398	1,050	310		452	436	278	543	355
LD-LG-RW	Lagoon Red Water	Lagoon Water	28				329						
LD-Compost	Compost	Solid			4,900	5,000	6,000						
LD-Compost North	Compost	Solid								4,600	5,100	5,700	4,500
LD-Compost South	Compost South	Solid					6,500	4,900	5,300	5,000	5,900	6,600	5,000
LD-Corral Manure												2,600	
LD-Separator	Separator	Solid			800		1,500	1,800	700	1,300	1,400	1,300	1,200

Table 9d

Liberty Dairy Manure Nutrient Concentrations – Total K (as analyzed), 2013 to 2018

Manure Source		Manure Type	Fall 2013 (ppm)	Spring 2014 (ppm)	Fall 2014 (ppm)	Spring 2015 (ppm)	Fall 2015 (ppm)	Spring 2016 (ppm)	Fall 2016 (ppm)	Spring 2017 (ppm)	Fall 2017 (ppm)	Spring 2018 (ppm)	Fall 2018 (ppm)
LD-LG01	Lagoon 01	Thin Slurry	2,895	3,658		3,005		2,307	2,298	1,595	2,905	2,577	3,243
LD-LG02	Lagoon 02	Lagoon Water					3,570						
LD-LG03	Lagoon 03	Lagoon Water				2,020		2,008					
LD-LG04	Lagoon 04	Lagoon Water								1,762			
LD-LG06	Lagoon 06	Lagoon Water			1,163			1,512		2,043			
LD-LG14	Lagoon 14	Thin Slurry	3,098	3,891	3,366	3,417	3,406		2,475	2,361	2,224	3,286	2,692
LD-LG-RW	Lagoon Red Water	Lagoon Water	378				2,041						
LD-Compost	Compost	Solid			21,000	25,300	23,300						
LD-Compost North	Compost	Solid								10,100	14,400	14,600	14,100
LD-Compost South	Compost South	Solid					23,800	16,400	11,800	11,800	19,900	20,600	16,700
LD-Corral Manure												15,200	
LD-Separator	Separator	Solid			3,700		3,000	3,300	2,000	2,700	3,100	3,900	3,400

Note: ppm: parts per million

Table 10a

George DeRuyter & Son Dairy Manure Nutrient Concentrations – Total N (as analyzed), 2013 to 2018

Manure Source		Manure Type	Fall 2013 (ppm)	Spring 2014 (ppm)	Fall 2014 (ppm)	Spring 2015 (ppm)	Fall 2015 (ppm)	Spring 2016 (ppm)	Fall 2016 (ppm)	Spring 2017 (ppm)	Fall 2017 (ppm)	Spring 2018 (ppm)	Fall 2018 (ppm)
GDS-LG01	Lagoon 01	Thin Slurry	1,897										
GDS-LG02	Lagoon 02	Thin Slurry		1,692	1,397	2,204	1,254	1,519	1,142	2,117		2,495	2,012
GDS-LG03	Lagoon 03	Lagoon Water	679								1,471	2,516	2,272
GDS-LG04	Lagoon 04	Lagoon Water								1,108			
GDS-DA-LG02	DA-LG02	Lagoon Water									1,047		
GDS-DA-LG03	D&A Lagoon 03	Lagoon Water		978	1,070	1,708	1,483	1,536	1,296	1,253			
GDS-DA-LG04												959	529
GDS-Compost	Compost	Compost			12,100	5,800	14,400						
GDS-Compost North	Compost	Compost								8,100	13,600	12,400	11,600
GDS-Compost South	Compost South	Compost					9,100	16,900	16,100	10,300	11,300	11,600	11,300

Table 10b

George DeRuyter & Son Dairy Manure Nutrient Concentrations – Total NH4 (as analyzed), 2013 to 2018

Manure Source		Manure Type	Fall 2013 (ppm)	Spring 2014 (ppm)	Fall 2014 (ppm)	Spring 2015 (ppm)	Fall 2015 (ppm)	Spring 2016 (ppm)	Fall 2016 (ppm)	Spring 2017 (ppm)	Fall 2017 (ppm)	Spring 2018 (ppm)	Fall 2018 (ppm)
GDS-LG01	Lagoon 01	Thin Slurry	1,085										
GDS-LG02	Lagoon 02	Thin Slurry		955	785	1,250	805	920	750	1,163		1,132	908
GDS-LG03	Lagoon 03	Lagoon Water	425								721	1,191	658
GDS-LG04	Lagoon 04	Lagoon Water								708			
GDS-DA-LG02	DA-LG02	Lagoon Water									644		
GDS-DA-LG03	D&A Lagoon 03	Lagoon Water		455	480	895	715	630	695	874			
GDS-DA-LG04												657	174
GDS-Compost	Compost	Compost			505	7	545						
GDS-Compost North	Compost	Compost								298	455	504	191
GDS-Compost South	Compost South	Compost					430	1,070	665	379	552	725	442

Table 10c

George DeRuyter & Son Dairy Manure Nutrient Concentrations – Total P (as analyzed), 2013 to 2018

Manure Source		Manure Type	Fall 2013 (ppm)	Spring 2014 (ppm)	Fall 2014 (ppm)	Spring 2015 (ppm)	Fall 2015 (ppm)	Spring 2016 (ppm)	Fall 2016 (ppm)	Spring 2017 (ppm)	Fall 2017 (ppm)	Spring 2018 (ppm)	Fall 2018 (ppm)
GDS-LG01	Lagoon 01	Thin Slurry	206										
GDS-LG02	Lagoon 02	Thin Slurry		159	122	210	70	91	75	184		609	293
GDS-LG03	Lagoon 03	Lagoon Water	56								168	661	438
GDS-LG04	Lagoon 04	Lagoon Water								54			
GDS-DA-LG02	DA-LG02	Lagoon Water									84		
GDS-DA-LG03	D&A Lagoon 03	Lagoon Water		129	106	246	109	108	111	64			
GDS-DA-LG04												69	34
GDS-Compost	Compost	Compost			6,800	2,100	8,100						
GDS-Compost North	Compost	Compost								4,500	4,400	6,700	6,000
GDS-Compost South	Compost South	Compost					5,500	8,100	7,900	5,900	4,500	6,500	13,200

Table 10d

George DeRuyter & Son Dairy Manure Nutrient Concentrations – Total K (as analyzed), 2013 to 2018

Manure Source		Manure Type	Fall 2013 (ppm)	Spring 2014 (ppm)	Fall 2014 (ppm)	Spring 2015 (ppm)	Fall 2015 (ppm)	Spring 2016 (ppm)	Fall 2016 (ppm)	Spring 2017 (ppm)	Fall 2017 (ppm)	Spring 2018 (ppm)	Fall 2018 (ppm)
GDS-LG01	Lagoon 01	Thin Slurry	2,158										
GDS-LG02	Lagoon 02	Thin Slurry		2,071	1,859	2,692	2,439	2,465	2,145	1,367		2,218	2,451
GDS-LG03	Lagoon 03	Lagoon Water	1,479								2,761	2,236	2,994
GDS-LG04	Lagoon 04	Lagoon Water								2,520			
GDS-DA-LG02	DA-LG02	Lagoon Water									2,184		
GDS-DA-LG03	D&A Lagoon 03	Lagoon Water		1,139	2,126	2,020	3,169	2,404	2,589	2,230			
GDS-DA-LG04												1,598	876
GDS-Compost	Compost	Compost			24,300	4,200	34,900						
GDS-Compost North	Compost	Compost								13,900	15,900	20,100	21,600
GDS-Compost South	Compost South	Compost					20,300	16,800	13,500	16,300	16,100	19,100	20,000

Notes: ND: not detected ppm: parts per million

Table 11
Irrigation Sensor Review – 2018 Field Capacity Exceedance List

Application Field	Station ID	Operational (Days)	Exceedances (Days)[1]	Exceedance Date
Cow Palace Dairy				
CP-SU01	CP-SU01-I-1	180		
	CP-SU01-I-2	180		
	CP-SU01-I-3	180		
CP-SU02	CP-SU02-I-1	173		
	CP-SU02-I-2	173		
CP-SU03	CP-SU03-I-1	180		
	CP-SU03-I-2	180		
	CP-SU03-I-3	180		
CP-SU04 A	CP-SU04A-I-1	180	1	5/18
	CP-SU04A-I-2	180		
CP-SU04 B	CP-SU04B-I-1	138	1	9/18
	CP-SU04B-I-2	138		
CP-SU05	CP-SU05-I-1	145		
	CP-SU05-I-2	145		
CP-SU06	CP-SU06-I-1	180		
	CP-SU06-I-2	180		
	CP-SU06-I-3	180	4	4/20, 6/3, 6/8, 8/19
Liberty/H&S Bosma Dairies				
LD-SU02	LD-SU02-I-1	180		
	LD-SU02-I-2	166		
	LD-SU02-I-3	180		
LD-SU03	LD-SU03-I-1	180		
	LD-SU03-I-2	180		
LD-SU04	LD-SU04-I-1	111		
	LD-SU04-I-2	111		
LD-SU05	LD-SU05-I-1	180		
	LD-SU05-I-2	180		
	LD-SU05-I-3	180		
LD-SU06	LD-SU06-I-1	180		
	LD-SU06-I-2	180		
LD-SU07	LD-SU07-I-1	173		
	LD-SU07-I-2	173		
LD-SU08 N	LD-SU08N-I-1	166		
	LD-SU08N-I-2	166	4	7/1, 7/10, 7/22, 8/1
	LD-SU08N-I-3	166		
LD-SU08 S	LD-SU08S-I-1	159		
	LD-SU08S-I-2	159		

Notes:

1. Number of times field capacity moisture level was exceeded at the 36-inch soil depth during 2018.

Table 11
Irrigation Sensor Review – 2018 Field Capacity Exceedance List

Application Field	Station ID	Operational (Days)	Exceedances (Days)[1]	Exceedance Date
Liberty/H&S Bosma Dairies				
LD-SU09	LD-SU09-I-1	28		
	LD-SU09-I-2	28		
LD-SU10	LD-SU10-I-1	180		
	LD-SU10-I-2	180		
	LD-SU10-I-3	180	1	7/29
LD-SU14	LD-SU14-I-1	159	15	7/29, 7/31, 8/1, 8/4, 8/6, 8/7, 8/9, 8/11, 8/13, 8/15, 8/17, 8/19, 8/20, 8/30, 9/5
	LD-SU14-I-2	159		
LD-SU16	LD-SU16-I-1	20		
	LD-SU16-I-2	20		
LD-SU17	LD-SU17-I-1	173		
	LD-SU17-I-2	173	6	7/23, 8/3, 8/7, 8/10, 8/19, 8/22
George DeRuyter & Son/D&A Dairies				
GDS-SU01	GDS-SU01-I-1	159		
	GDS-SU01-I-2	159	2	6/16, 7/14
GDS-SU02	GDS-SU02-I-1	77	4	8/11, 8/21, 9/5, 9/19
	GDS-SU02-I-2	77		
GDS-SU03	GDS-SU03-I-1	180	2	8/24, 9/2
	GDS-SU03-I-2	180		
GDS-SU04	GDS-SU04-I-1	180		
	GDS-SU04-I-2	180		
	GDS-SU04-I-3	180		
GDS-SU05	GDS-SU05-I-1	180		
	GDS-SU05-I-2	180		
	GDS-SU05-I-3	180		
GDS-SU06	GDS-SU06-I-1	152		
	GDS-SU06-I-2	152		
GDS-SU07	GDS-SU07-I-1	27		
	GDS-SU07-I-2	27		
	GDS-SU07-I-3	24		
GDS-SU08	GDS-SU08-I-1	173		
	GDS-SU08-I-2	173	8	6/22, 6/23, 6/25, 8/24, 8/27, 8/28, 8/29, 9/6
	GDS-SU08-I-3	173		
GDS-SU09	GDS-SU09-I-1	180		
	GDS-SU09-I-2	180		
	GDS-SU09-I-3	180		

Notes:

1. Number of times field capacity moisture level was exceeded at the 36-inch soil depth during 2018.

Table 11

Irrigation Sensor Review – 2018 Field Capacity Exceedance List

Application Field	Station ID	Operational (Days)	Exceedances (Days)[1]	Exceedance Date
George DeRuyter & Son/D&A Dairies				
GDS-SU10	GDS-SU10-I-1	91		
	GDS-SU10-I-2	91		
	GDS-SU10-I-3	91	6	6/30, 7/12, 7/16, 8/31, 9/4, 9/17
GDS-SU11	GDS-SU11-I-1	180		
	GDS-SU11-I-2	180	8	4/19,5/27, 7/12, 7/24, 8/6, 8/18, 9/16, 9/28
GDS-SU12	GDS-SU12-I-1	180		
	GDS-SU12-I-2	180		
GDS-SU13	GDS-SU13-I-1	180	2	5/25, 6/13
	GDS-SU13-I-2	180	1	4/13
	GDS-SU13-I-3	180	1	6/14
GDS-SU14	GDS-SU14-I-1	173		
	GDS-SU14-I-2	173	3	6/14, 6/26, 7/28
	GDS-SU14-I-3	173		
	TOTAL	**12,767**	**69**	
	PERCENT OF TOTAL		**0.54%**	

Notes:

1. Number of times field capacity moisture level was exceeded at the 36-inch soil depth during 2018.

Table 12
2018 Cow Palace Dairy Application Field Soil Sample Results

Sample ID	Sample Period	Sample Date	Sample Type	Depth Interval (inches)	Nitrate (ppm)	Ammonium (ppm)	Phosphorous (ppm)	Potassium (ppm)	pH (standard units)	Electrical Conductivity (mmhos/cm)	Organic Matter (%)
CP-SU01-A-18S	Pre-Plant	5/16/2018	Primary	0 to 12	13.29	3 J	223 J	1162	7.9	0.48	2.3
CP-SU01-B-18S	Pre-Plant	5/16/2018	Primary	12 to 24	5.28	2.9 J	97 J	1069	8.5	0.44	0.9
CP-SU01-B-18S-D	Pre-Plant	5/16/2018	Duplicate	12 to 24	5.38	2.9 J	92 J	1186	8.3	0.41	0.9
CP-SU02-A-18S	Pre-Plant	5/18/2018	Primary	0 to 12	11.58	2.6 J	149 J	1019	7.8	0.36	2.0
CP-SU02-B-18S	Pre-Plant	5/18/2018	Primary	12 to 24	4.54	1.9 J	64 J	667	8.5	0.31	0.7
CP-SU02-B-18S-D	Pre-Plant	5/18/2018	Duplicate	12 to 24	4.26	1.6 J	47 J	609	8.5	0.35	0.7
CP-SU03-A-18S	Pre-Plant	5/10/2018	Primary	0 to 12	6.48	3.3	113	722	8.2	0.28	2.7
CP-SU03-A-18S-D	Pre-Plant	5/10/2018	Duplicate	0 to 12	5.87	3.9	117	736	8.2	0.31	2.7
CP-SU03-B-18S	Pre-Plant	5/10/2018	Primary	12 to 24	7.13	1.3 J	54	274	8.4	0.35	1.0
CP-SU04A-A-18S	Pre-Plant	5/14/2018	Primary	0 to 12	9.13	3 J	109	760	7.6	0.38	2.5
CP-SU04A-A-18S-D	Pre-Plant	5/14/2018	Duplicate	0 to 12	9.48	2.4 J	105	690	8	0.25	2.5
CP-SU04A-B-18S	Pre-Plant	5/14/2018	Primary	12 to 24	9.46	2.2 J	53	393	8.3	0.21	1.0
CP-SU04B-A-18S	Pre-Plant	5/14/2018	Primary	0 to 12	8.32	2.8 J	89	783	8.1	0.25	2.0
CP-SU04B-B-18S	Pre-Plant	5/14/2018	Primary	12 to 24	6.44	2 J	38	332	8.7	0.2	0.8
CP-SU05-A-18S	Pre-Plant	5/16/2018	Primary	0 to 12	11.04	5.4	120 J	1083	7.9	0.4	1.9
CP-SU05-B-18S	Pre-Plant	5/16/2018	Primary	12 to 24	3.71	1.5 J	50 J	367	8.2	0.3	0.8
CP-SU06-A-18S	Pre-Plant	5/18/2018	Primary	0 to 12	6.09	5.1	139 J	594	8	0.26	1.9
CP-SU06-B-18S	Pre-Plant	5/18/2018	Primary	12 to 24	2.69	1.7 J	45 J	294	8.5	0.34	0.8
CP-SU01-A-18F	Post-Harvest	10/9/2018	Primary	0 to 12	18.84	1.7 J	185	1305	8	0.45	2.5
CP-SU01-B-18F	Post-Harvest	10/9/2018	Primary	12 to 24	8.23	1.5 J	109	1530	8.5	0.54	1.1
CP-SU01-C-18S	Post-Harvest	10/9/2018	Primary	24 to 36	12.04	3.1 J	92	1340	8.6	0.51	0.9
CP-SU02-A-18F	Post-Harvest	10/9/2018	Primary	0 to 12	15.06	3.2 U	74	995	8.1	0.34	1.8
CP-SU02-A-18F-D	Post-Harvest	10/9/2018	Duplicate	0 to 12	15.74	3.2 U	78	1050	8	0.36	2
CP-SU02-B-18F	Post-Harvest	10/9/2018	Primary	12 to 24	3.17	1 J	32	655	8.6	0.29	0.7
CP-SU02-C-18F	Post-Harvest	10/9/2018	Primary	24 to 36	1.95	3.2 U	25	445	8.6	0.31	0.5
CP-SU03-A-18F	Post-Harvest	10/11/2018	Primary	0 to 12	18.28 J	-- R	87 J	696	8	0.39	1.8
CP-SU03-B-18F	Post-Harvest	10/11/2018	Primary	12 to 24	6.78 J	2.6 J	36 J	264	8.5	0.3	0.6
CP-SU03-C-18F	Post-Harvest	10/11/2018	Primary	24 to 36	12.94 J	0.9 J	20 J	148	8.8	0.32	0.5
CP-SU03-C-18F-D	Post-Harvest	10/11/2018	Duplicate	24 to 36	12.87 J	1.1 J	18 J	139	8.6	0.31	0.5
CP-SU04A-A-18F	Post-Harvest	9/25/2018	Primary	0 to 12	8.81	3.2 U	99	589	7.9	0.26	2.4

Table 12
2018 Cow Palace Dairy Application Field Soil Sample Results

Sample ID	Sample Period	Sample Date	Sample Type	Depth Interval (inches)	Nitrate (ppm)	Ammonium (ppm)	Phosphorous (ppm)	Potassium (ppm)	pH (standard units)	Electrical Conductivity (mmhos/cm)	Organic Matter (%)
CP-SU04A-B-18F	Post-Harvest	9/25/2018	Primary	12 to 24	1.67	3.2 U	57 J	313	8.3	0.18	0.9
CP-SU04A-B-18F-D	Post-Harvest	9/25/2018	Duplicate	12 to 24	1.7	3.2 U	44 J	328	8.4	0.17	0.8
CP-SU04A-C-18F	Post-Harvest	9/25/2018	Primary	24 to 36	1.98	3.2 U	33	239	8.5	0.21	0.7
CP-SU04B-A-18F	Post-Harvest	9/25/2018	Primary	0 to 12	9.14	3.2 U	79	707	8	0.26	2.1
CP-SU04B-B-18F	Post-Harvest	9/25/2018	Primary	12 to 24	1.52	3.2 U	51	313	8.5	0.21	1
CP-SU04B-C-18F	Post-Harvest	9/25/2018	Primary	24 to 36	2.04	3.2 U	27	227	8.7	0.26	0.5
CP-SU05-A-18F	Post-Harvest	9/26/2018	Primary	0 to 12	8.32	3.2 U	100	994	8	0.36	1.9
CP-SU05-B-18F	Post-Harvest	9/26/2018	Primary	12 to 24	1.59	3.2 U	46	369	8.3	0.28	1
CP-SU05-C-18F	Post-Harvest	9/26/2018	Primary	24 to 36	2.06	3.2 U	36	215	8.3	0.33	0.8
CP-SU06-A-18F	Post-Harvest	9/26/2018	Primary	0 to 12	8.86	3.2 U	82	535	7.9	0.33	1.8
CP-SU06-A-18F-D	Post-Harvest	9/26/2018	Duplicate	0 to 12	8.63	3.2 U	83	550	8	0.35	1.7
CP-SU06-B-18F	Post-Harvest	9/26/2018	Primary	12 to 24	3.82	3.2 U	40	271	8.4	0.29	0.9
CP-SU06-C-18F	Post-Harvest	9/26/2018	Primary	24 to 36	4.09	3.2 U	21	213	8.4	0.33	0.6

Notes:

J: Estimated value.

mmhos/cm: millimhos per centimeter

ppm: parts per million

R: The sample results are rejected as unusable. The compound may or may not be present in the sample.

U: Result is not detected at the reported value.

Table 13

Cow Palace Dairy Application Field Soil Nitrate Concentrations, 2013 to 2018

Field	Fall 2013			Spring 2014		Fall 2014			Spring 2015		Fall 2015			Spring 2016		Fall 2016		
	1-foot	2-foot	3-foot	1-foot	2-foot	1-foot	2-foot	3-foot	1-foot	2-foot	1-foot	2-foot	3-foot	1-foot	2-foot	1-foot	2-foot	3-foot
CP-SU01	89.3	65.1	67.4	30.2	36.6	47.2	40.4	46.3	13.7	16.7	58.1	50.0	36.2	9.9	18.9	19.6	15.0	19.6
CP-SU02	66.4	52.6	57.5	29.9	33.8	40.5	35.8	39.4	11.8	24.1	40.3	36.5	34.4	8.4	11.1	18.2	14.5	23.8
CP-SU03	49.5	44.7	63.2	32.6	34.4	44.9	51.2	56.9	15.7	93.5	18.2	7.5	27.1	5.5	4.0	40.4	12.2	10.9
CP-SU04 A	19.9	15.2	18.4	18.0	13.6	16.5	17.8	23.6	13.3	2.9	30.2	10.4	10.4	12.6	13.7	11.1	3.4	12.5
CP-SU04 B	15.2	39.7	65.8	15.0	25.3	19.1	20.6	33.1	16.3	8.6	14.5	12.6	23.1	13.1	12.1	7.6	3.3	8.8
CP-SU05	11.5	5.1	4.9	28.9	20.2	13.3	4.1	3.8	8.4	6.7	20.2	15.1	9.9	10.1	15.5	22.3	14.1	13.7
CP-SU06	66.8	53.8	33.7	36.1	50.4	47.6	46.7	38.4	9.7	15.1	19.7	27.5	17.6	11.7	24.6	10.5	6.3	11.6
Average	45.5	39.5	44.4	27.2	30.6	32.7	30.9	34.5	12.7	23.9	28.7	22.8	22.7	10.2	14.3	18.5	9.8	14.4
Percent Change from Prior Year						-28%	-22%	-22%	-53%	-22%	-12%	-26%	-34%	-20%	-40%	-36%	-57%	-36%
Percent Change from Fall 2013											-37%	-42%	-49%			-59%	-75%	-68%

No. of Fields over 45 ppm in 2-Foot Depth:	3	1	2	1	1	0	0
Annual Percent Change[1]:			-33%	0%	-50%	-100%	-100%
			Fall to Fall	Spring to Spring	Fall to Fall	Spring to Spring	Fall to Fall

Field	Spring 2017		Fall 2017			Spring 2018		Fall 2018		
	1-foot	2-foot	1-foot	2-foot	3-foot	1-foot	2-foot	1-foot	2-foot	3-foot
CP-SU01	8.7	8.6	13.7	8.8	11.1	13.3	5.3	18.8	8.2	12.0
CP-SU02	6.8	3.7	17.3	6.8	8.5	11.6	4.5	15.1	3.2	2.0
CP-SU03	9.3	10.5	24.9	18.3	31.1	6.5	7.1	18.3	6.8	12.9
CP-SU04 A	34.9	14.5	16.5	8.3	8.4	9.1	9.5	8.8	1.7	2.0
CP-SU04 B	25.6	9.0	14.3	6.6	8.5	8.3	6.4	9.1	1.5	2.0
CP-SU05	11.2	7.8	9.7	3.3	5.8	11.0	3.7	8.3	1.6	2.1
CP-SU06	16.8	11.6	12.5	5.1	4.0	6.1	2.7	8.9	3.8	4.1
Average	16.2	9.4	15.6	8.2	11.1	9.4	5.6	12.5	3.8	5.3
Percent Change from Prior Year	59%	-34%	-16%	-17%	-23%	-42%	-40%	-20%	-53%	-52%
Percent Change from Fall 2013			-66%	-79%	-75%			-73%	-90%	-88%

No. of Fields over 45 ppm in 2-Foot Depth:	0	0	0	0
	Spring to Spring	Fall to Fall	Spring to Spring	Fall to Fall

Notes:

Red text indicates fields in the 2-foot depth over 45 ppm.

1. Annual percent change at the 2-foot depth is calculated from fall to fall or spring to spring.

ppm: parts per million

Table 14

2018 Liberty/H&S Bosma Dairies Application Field Soil Sample Results

Sample ID	Sample Period	Sample Date	Sample Type	Depth Interval (inches)	Nitrate (ppm)	Ammonium (ppm)	Phosphorous (ppm)	Potassium (ppm)	pH (standard units)	Electrical Conductivity (mmhos/cm)	Organic Matter (%)
LD-SU02-A-18S	Pre-Plant	5/4/2018	Primary	0 to 12	6.2	1.5 J	356	2080 J	8.4	0.4	2.4
LD-SU02-B-18S	Pre-Plant	5/4/2018	Primary	12 to 24	3.79	1.8 J	141	2724 J	9.1	0.49	0.9
LD-SU02-B-18S-D	Pre-Plant	5/4/2018	Duplicate	12 to 24	3.5	2.4 J	121	2711 J	9.1	0.5	0.7
LD-SU03-A-18S	Pre-Plant	5/11/2018	Primary	0 to 12	12.06	2.4 J	267	1448	8.1	0.3	2.7
LD-SU03-B-18S	Pre-Plant	5/11/2018	Primary	12 to 24	3.93	2.9 J	76	1555	8.7	0.36	0.8
LD-SU04-A-18S	Pre-Plant	5/11/2018	Primary	0 to 12	13.76	3 J	278	1990	8.5	0.46	2.6
LD-SU04-B-18S	Pre-Plant	5/11/2018	Primary	12 to 24	10.4	3.2	224	2248	8.9	0.6	2.0
LD-SU05-A-18S	Pre-Plant	5/1/2018	Primary	0 to 12	10.25	1.9 J	167	1017 J	8.5	0.44	2.7
LD-SU05-B-18S	Pre-Plant	5/1/2018	Primary	12 to 24	19.07	1 J	61	253 J	8.5	0.61	1.0
LD-SU05-B-18S-D	Pre-Plant	5/1/2018	Duplicate	12 to 24	19.26	3.2 U	60	228 J	8.5	0.64	1.1
LD-SU06-A-18S	Pre-Plant	5/14/2018	Primary	0 to 12	7.82	4.2	163	783	8.3	0.59	2.2
LD-SU06-B-18S	Pre-Plant	5/14/2018	Primary	12 to 24	7.4	1.7 J	48	237	8.5	1.06	0.9
LD-SU07-A-18S	Pre-Plant	5/14/2018	Primary	0 to 12	6.24	4.5	243	1121	8.4	0.44	2.1
LD-SU07-B-18S	Pre-Plant	5/14/2018	Primary	12 to 24	24.34	1.7 J	59	511	8.1	0.76	1.0
LD-SU07-B-18S-D	Pre-Plant	5/14/2018	Duplicate	12 to 24	25.25	1.7 J	58	500	8.7	0.83	0.9
LD-SU08N-A-18S	Pre-Plant	5/11/2018	Primary	0 to 12	15.26	2.9 J	325	1646	8.1	0.44	2.0
LD-SU08N-B-18S	Pre-Plant	5/11/2018	Primary	12 to 24	16.18	2.5 J	184	1518	8.5	0.61	1.4
LD-SU08N-B-18S-D	Pre-Plant	5/11/2018	Duplicate	12 to 24	16.44	2.7 J	144	1599	8.1	0.61	1.3
LD-SU08S-A-18S	Pre-Plant	6/4/2018	Primary	0 to 12	10.9	3.2 U	107	1421	7.8	0.47	2.0
LD-SU08S-B-18S	Pre-Plant	6/4/2018	Primary	12 to 24	19.62	3.2 U	29	465	8.6	0.46	0.6
LD-SU08S-B-18S-D	Pre-Plant	6/4/2018	Duplicate	12 to 24	19.69	3.2 U	26	469	8.6	0.6	0.6
LD-SU09-A-18S	Pre-Plant	4/26/2018	Primary	0 to 12	4.43	2.4 J	63	230	7.1	0.26	2.2
LD-SU09-B-18S	Pre-Plant	4/26/2018	Primary	12 to 24	2.63	2 J	36	117	7.6	0.27	1.0
LD-SU10-A-18S	Pre-Plant	4/26/2018	Primary	0 to 12	3.68	1.7 J	168	360	8.1	0.59	2.6
LD-SU10-B-18S	Pre-Plant	4/26/2018	Primary	12 to 24	15.16	1.3 J	96	218	8.1	0.72	1.4
LD-SU10-B-18S-D	Pre-Plant	4/26/2018	Duplicate	12 to 24	15.84	1.4 J	90	215	7.9	0.86	1.5
LD-SU14-A-18S	Pre-Plant	5/31/2018	Primary	0 to 12	11.9	0.9 J	93	608	8.4	0.77	2.2
LD-SU14-B-18S	Pre-Plant	5/31/2018	Primary	12 to 24	11.73	3.2 U	48	179	8.4	0.71	0.9
LD-SU16-A-18S	Pre-Plant	5/11/2018	Primary	0 to 12	7.97	7.5	126	776	7.9	0.26	2.7
LD-SU16-B-18S	Pre-Plant	5/11/2018	Primary	12 to 24	2.7	2.6 J	48	577	8.5	0.19	1.2
LD-SU17-A-18S	Pre-Plant	5/31/2018	Primary	0 to 12	1.81 U	3.2 U	73	553	8.2	0.33	1.9
LD-SU17-B-18S	Pre-Plant	5/31/2018	Primary	12 to 24	1.05 U	3.2 U	19	176	8.5	0.22	0.7
LD-SU17-B-18S-D	Pre-Plant	5/31/2018	Duplicate	12 to 24	0.64 U	3.2 U	18	169	8.5	0.25	0.6

Table 14

2018 Liberty/H&S Bosma Dairies Application Field Soil Sample Results

Sample ID	Sample Period	Sample Date	Sample Type	Depth Interval (inches)	Nitrate (ppm)	Ammonium (ppm)	Phosphorous (ppm)	Potassium (ppm)	pH (standard units)	Electrical Conductivity (mmhos/cm)	Organic Matter (%)
LD-SU02-A-18F	Post-Harvest	10/12/2018	Primary	0 to 12	13.3 J	1.8 J	369 J	2138	8.6	0.41	2.2
LD-SU02-A-18F-D	Post-Harvest	10/12/2018	Duplicate	0 to 12	13.17 J	2.2 J	376 J	2291	8.2	0.39	2.4
LD-SU02-B-18F	Post-Harvest	10/12/2018	Primary	12 to 24	7.51 J	4.1 J	81 J	3052	9.2	0.38	0.7
LD-SU02-C-18F	Post-Harvest	10/12/2018	Primary	24 to 36	10.82 J	4 J	68 J	3078	9.2	0.47	0.7
LD-SU03-A-18F	Post-Harvest	10/17/2018	Primary	0 to 12	9.57	4.7	140	1,337 J	7.9	0.41	2.5
LD-SU03-B-18F	Post-Harvest	10/17/2018	Primary	12 to 24	2.29	2 J	73	1,040 J	8.5	0.36	0.8
LD-SU03-C-18F	Post-Harvest	10/17/2018	Primary	24 to 36	1.53	1.8 J	45	1,148 J	8.6	0.35	0.9
LD-SU04-A-18F	Post-Harvest	10/17/2018	Primary	0 to 12	8.09	3.1 J	187	1,556 J	8.2	0.57	2.4
LD-SU04-B-18F	Post-Harvest	10/17/2018	Primary	12 to 24	4.31	2.6 J	161	1,746 J	8.5	0.72	1.7
LD-SU04-C-18F	Post-Harvest	10/17/2018	Primary	24 to 36	4.15	2.4 J	87	1,665 J	8.6	0.57	1.1
LD-SU05-A-18F	Post-Harvest	10/11/2018	Primary	0 to 12	41.07 J	5.3 J	127 J	1101	7.9	0.74	2.1
LD-SU05-A-18F-D	Post-Harvest	10/11/2018	Duplicate	0 to 12	44.32 J	2.9 J	127 J	1049	8.2	0.79	2.4
LD-SU05-B-18F	Post-Harvest	10/11/2018	Primary	12 to 24	41.29 J	1.1 J	35 J	182	8.4	0.92	0.8
LD-SU05-C-18F	Post-Harvest	10/11/2018	Primary	24 to 36	54.54 J	0.8 J	25 J	130	8	0.9	0.6
LD-SU06-A-18F	Post-Harvest	10/12/2018	Primary	0 to 12	10.28 J	4.5 J	124 J	931	8.1	0.81	2.3
LD-SU06-B-18F	Post-Harvest	10/12/2018	Primary	12 to 24	4.89 J	1.5 J	58 J	354	8.4	1.21	1
LD-SU06-C-18F	Post-Harvest	10/12/2018	Primary	24 to 36	7.67 J	1.4 J	20 J	109	8.5	1.19	0.8
LD-SU07-A-18F	Post-Harvest	10/17/2018	Primary	0 to 12	6.48	3.6	199	1,043 J	8.3	0.45	2.2
LD-SU07-B-18F	Post-Harvest	10/17/2018	Primary	12 to 24	35.38	1.9 J	53	505 J	8.4	0.97	0.9
LD-SU07-C-18F	Post-Harvest	10/17/2018	Primary	24 to 36	61.7	1 J	34	114 J	8.2	0.87	0.6
LD-SU08 N-A-18F	Post-Harvest	10/17/2018	Primary	0 to 12	18.17	2.4 J	346	1,640 J	7.5	0.62	3.2
LD-SU08 N-B-18F	Post-Harvest	10/17/2018	Primary	12 to 24	15.01	1.5 J	116	1,402 J	8.3	0.74	1
LD-SU08 N-C-18F	Post-Harvest	10/17/2018	Primary	24 to 36	39.76	1.7 J	84	970 J	8.4	1.1	0.6
LD-SU08 N-C-18F-D	Post-Harvest	10/17/2018	Duplicate	24 to 36	39.75	1.4 J	86	949 J	8.5	1.18	0.4
LD-SU08 S-A-18F	Post-Harvest	9/25/2018	Primary	0 to 12	10.29	3.2 U	90	1378	8.2	0.38	2
LD-SU08 S-B-18F	Post-Harvest	9/25/2018	Primary	12 to 24	22.1	3.2 U	26	342	8.7	0.47	0.7
LD-SU08 S-C-18F	Post-Harvest	9/25/2018	Primary	24 to 36	33.0	3.2 U	21	144	8.4	0.66	0.5
LD-SU08 S-C-18F-D	Post-Harvest	9/25/2018	Duplicate	24 to 36	34.55	3.2 U	19	132	8.4	0.67	0.6
LD-SU09-A-18F	Post-Harvest	10/8/2018	Primary	0 to 12	8.03	3.6	65	264	7.4	0.29	2.3
LD-SU09-B-18F	Post-Harvest	10/8/2018	Primary	12 to 24	2.24	1.6 J	34	105	8.2	0.24	1
LD-SU09-C-18F	Post-Harvest	10/8/2018	Primary	24 to 36	3.81	0.9 J	22	84	8.4	0.24	0.6
LD-SU10-A-18F	Post-Harvest	10/8/2018	Primary	0 to 12	18.86	3.2 U	145	400	7.6	0.75	2.4
LD-SU10-B-18F	Post-Harvest	10/8/2018	Primary	12 to 24	16.61	3.2 U	58	182	8.4	0.63	1
LD-SU10-B-18F-D	Post-Harvest	10/8/2018	Duplicate	12 to 24	15.63	3.2 U	56	178	8.4	0.77	1
LD-SU10-C-18F	Post-Harvest	10/8/2018	Primary	24 to 36	15.83	3.2 U	35	139	7.9	0.7	0.8
LD-SU14-A-18F	Post-Harvest	10/11/2018	Primary	0 to 12	17.17 J	2.8 J	87 J	672	8.1	0.64	2.3

Table 14

2018 Liberty/H&S Bosma Dairies Application Field Soil Sample Results

Sample ID	Sample Period	Sample Date	Sample Type	Depth Interval (inches)	Nitrate (ppm)	Ammonium (ppm)	Phosphorous (ppm)	Potassium (ppm)	pH (standard units)	Electrical Conductivity (mmhos/cm)	Organic Matter (%)
LD-SU14-B-18F	Post-Harvest	10/11/2018	Primary	12 to 24	11.24 J	4.7 J	34 J	186	8.5	0.54	0.9
LD-SU14-C-18F	Post-Harvest	10/11/2018	Primary	24 to 36	12.88 J	2.3 J	18 J	96	8.5	0.69	0.6
LD-SU16-A-18F	Post-Harvest	10/12/2018	Primary	0 to 12	8.45 J	3.4 J	111 J	661	7.9	0.28	2.3
LD-SU16-B-18F	Post-Harvest	10/12/2018	Primary	12 to 24	2.02 UJ	3 J	40 J	640	8.3	0.15	0.7
LD-SU16-C-18F	Post-Harvest	10/12/2018	Primary	24 to 36	2.37 UJ	1.1 J	27 J	340	8.1	0.13	0.6
LD-SU17-A-18F	Post-Harvest	11/2/2018	Primary	0 to 12	11.55 J	2.6 J	56	509	8.2	0.5	1.8
LD-SU17-A-18F-D	Post-Harvest	11/2/2018	Duplicate	0 to 12	9.92 J	2.3 J	54	495	8.2	0.43	1.6
LD-SU17-B-18F	Post-Harvest	11/2/2018	Primary	12 to 24	0.98 J	3.2 UJ	20	180	8.5	0.17	0.5
LD-SU17-C-18F	Post-Harvest	11/2/2018	Primary	24 to 36	1 J	3.2 UJ	8	85	8.7	0.21	0.4

Notes:

J: Estimated value.

mmhos/cm: millimhos per centimeter

ppm: parts per million

U: Result is not detected at the reported value.

Table 15

Liberty/H&S Bosma Dairies Application Field Soil Nitrate Concentrations, 2013 to 2018

	Fall 2013			Spring 2014		Fall 2014			Spring 2015		Fall 2015			Spring 2016		Fall 2016		
Field	**1-foot**	**2-foot**	**3-foot**	**1-foot**	**2-foot**	**1-foot**	**2-foot**	**3-foot**	**1-foot**	**2-foot**	**1-foot**	**2-foot**	**3-foot**	**1-foot**	**2-foot**	**1-foot**	**2-foot**	**3-foot**
LD-SU02	49.8	45.9	70.3	52.5	53.5	62.0	55.4	59.9	33.6	38.1	49.7	48.7	32.3	11.1	37.2	23.7	32.3	50.1
LD-SU03	36.4	20.8	16.4	15.2	25.3	31.0	16.2	21.4	9.9	12.9	33.8	24.0	20.8	9.1	7.6	20.9	7.5	9.9
LD-SU04	70.3	51.2	45.6	37.2	38.8	26.0	20.6	21.6	17.4	27.1	25.8	22.8	29.0	12.1	26.4	18.9	8.3	10.3
LD-SU05	83.2	84.9	97.6	40.4	45.8	52.3	73.3	80.5	23.4	59.1	59.6	49.0	22.3	5.1	24.8	23.1	27.5	48.2
LD-SU06	66.8	53.8	33.7	39.4	55.3	28.3	31.9	40.0	36.5	50.1	18.4	29.7	23.6	6.7	8.5	11.3	17.7	30.3
LD-SU07	77.8	106.8	159.0	82.3	128.8	55.9	100.2	160.2	81.4	95.0	74.1	160.5	85.9	9.0	70.4	12.7	50.4	100.8
LD-SU08 N	99.4	95.5	94.5	107.9	104.3	41.0	80.8	95.0	38.5	77.6	25.8	55.1	62.6	14.5	19.3	35.0	20.4	41.1
LD-SU08 S	63.2	66.1	66.2	46.7	52.3	50.8	39.5	55.1	16.4	18.8	35.7	38.3	52.6	12.7	33.1	39.9	30.2	39.2
LD-SU09	12.0	4.6	3.6	6.4	6.0	12.6	2.2	1.7	4.9	3.1	4.3	2.3	2.0	6.0	8.2	16.3	8.9	8.4
LD-SU10	58.9	79.9	50.7	44.6	45.8	54.7	61.9	65.6	30.2	44.8	45.0	45.9	20.3	4.9	13.9	22.0	28.5	30.5
LD-SU14	75.9	49.4	14.6	43.3	27.7	61.9	33.9	23.3	56.3	33.3	47.6	28.3	15.5	29.8	19.1	22.3	21.7	23.6
LD-SU16	67.4	29.6	24.9	71.0	29.5	46.8	38.2	26.0	19.7	18.5	32.1	12.7	15.6	5.2	11.4	14.4	5.9	7.9
LD-SU17	29.2	56.5	71.2	12.7	17.0	22.8	21.3	20.4	9.6	13.6	11.3	16.5	23.5	4.0	6.1	15.1	12.0	14.8
Average	60.8	57.3	57.6	46.1	48.5	42.0	44.3	51.6	29.1	37.8	35.6	41.1	31.2	10.0	22.0	21.2	20.9	31.9
Percent Change from Prior Year						-31%	-23%	-10%	-37%	-22%	-15%	-7%	-39%	-66%	-42%	-41%	-49%	2%
Percent Change from Fall 2013											-41%	-28%	-46%			-65%	-64%	-45%

No. of Fields over 45 ppm in 2-Foot Depth:	10	7	5	4	5	1	1
Annual Percent Change[1]:			-50%	-43%	0%	-75%	-80%
			Fall to Fall	Spring to Spring	Fall to Fall	Spring to Spring	Fall to Fall

Table 15

Liberty/H&S Bosma Dairies Application Field Soil Nitrate Concentrations, 2013 to 2018

	Spring 2017		Fall 2017			Spring 2018		Fall 2018		
Field	**1-foot**	**2-foot**	**1-foot**	**2-foot**	**3-foot**	**1-foot**	**2-foot**	**1-foot**	**2-foot**	**3-foot**
LD-SU02	6.1	12.3	6.5	7.7	11.1	6.2	3.8	13.3	7.5	10.8
LD-SU03	37.1	17.0	8.9	6.4	8.0	12.1	3.9	9.6	2.3	1.5
LD-SU04	27.1	11.1	8.0	6.4	10.7	13.8	10.4	8.1	4.3	4.2
LD-SU05	11.1	21.4	29.6	38.0	36.7	10.3	19.1	41.1	41.3	54.5
LD-SU06	15.8	14.1	12.0	9.2	14.6	7.8	7.4	10.3	4.9	7.7
LD-SU07	9.9	16.9	9.0	18.2	32.3	6.2	24.3	6.5	35.4	61.7
LD-SU08 N	37.3	28.7	22.1	16.0	25.8	15.3	16.2	18.2	15.0	39.8
LD-SU08 S	8.1	16.7	40.3	19.2	17.5	10.9	19.6	10.3	22.1	33.0
LD-SU09	3.7	2.8	14.7	7.4	6.9	4.4	2.6	8.0	2.2	3.8
LD-SU10	5.3	16.1	11.9	18.4	24.9	3.7	15.2	18.9	16.6	15.8
LD-SU14	7.2	9.5	15.8	13.7	17.2	11.9	11.7	17.2	11.2	12.9
LD-SU16	13.4	7.2	7.6	2.0	2.1	8.0	2.7	8.4	2.0	2.4
LD-SU17	3.8	5.4	11.2	4.3	4.5	1.8	1.0	11.6	1.0	1.0
Average	14.3	13.8	15.2	12.8	16.3	8.6	10.6	14.0	12.8	19.2
Percent Change from Prior Year	43%	-37%	-28%	-38%	-49%	-40%	-23%	-8%	-1%	17%
Percent Change from Fall 2013			-75%	-78%	-72%			-77%	-78%	-67%

No. of Fields over 45 ppm in 2-Foot Depth:	0	0	0	0
	Spring to Spring	Fall to Fall	Spring to Spring	Fall to Fall

Notes:

Red text indicates fields in the 2-foot depth over 45 ppm.

1. Annual percent change at the 2-foot depth is calculated from fall to fall or spring to spring.

ppm: parts per million

Table 16

2018 George DeRuyter & Son/D&A Dairies Application Field Soil Sample Results

Sample ID	Sample Period	Sample Date	Sample Type	Depth Interval (inches)	Nitrate (ppm)	Ammonium (ppm)	Phosphorous (ppm)	Potassium (ppm)	pH (standard units)	Electrical Conductivity (mmhos/cm)	Organic Matter (%)
GDS-SU01-A-18S	Pre-Plant	5/22/2018	Primary	0 to 12	12.04	4.8	131 J	527	7.1	0.31	3.4
GDS-SU01-B-18S	Pre-Plant	5/22/2018	Primary	12 to 24	8.85	2.3 J	59 J	151	7.9	0.39	1.1
GDS-SU02-A-18S	Pre-Plant	5/21/2018	Primary	0 to 12	16.46	1.6 J	131 J	710	7.4	0.33	3.1
GDS-SU02-B-18S	Pre-Plant	5/21/2018	Primary	12 to 24	5.95	1.8 J	70 J	301	8.1	0.23	1.3
GDS-SU03-A-18S	Pre-Plant	5/22/2018	Primary	0 to 12	8.22	7.5	115 J	1076	7.4	0.39	2.6
GDS-SU03-B-18S	Pre-Plant	5/22/2018	Primary	12 to 24	2.77	2.3 J	57 J	632	7.8	0.28	1.2
GDS-SU04-A-18S	Pre-Plant	5/21/2018	Primary	0 to 12	13.39	2.4 J	294 J	1631	8	0.47	2.2
GDS-SU04-B-18S	Pre-Plant	5/21/2018	Primary	12 to 24	24.87	2.3 J	78 J	1811	8.6	0.74	0.9
GDS-SU04-B-18S-D	Pre-Plant	5/21/2018	Duplicate	12 to 24	27.06	1.5 J	77 J	1863	8.7	0.66	0.8
GDS-SU05-A-18S	Pre-Plant	5/9/2018	Primary	0 to 12	19.37	2.5 J	340	2170	8	0.99	3.1
GDS-SU05-B-18S	Pre-Plant	5/9/2018	Primary	12 to 24	32.89	2.3 J	93	2449	8.7	0.97	0.9
GDS-SU05-B-18S-D	Pre-Plant	5/9/2018	Duplicate	12 to 24	32.3	2 J	83	2569	8.8	0.91	1.0
GDS-SU06-A-18S	Pre-Plant	5/10/2018	Primary	0 to 12	10.01	2 J	124	1364	8	0.42	2.4
GDS-SU06-B-18S	Pre-Plant	5/10/2018	Primary	12 to 24	15.3	1 J	50	638	8.5	0.46	0.9
GDS-SU07-A-18S	Pre-Plant	5/10/2018	Primary	0 to 12	22.77	2.2 J	76	1232	8.1	0.71	2.4
GDS-SU07-A-18S-D	Pre-Plant	5/10/2018	Duplicate	0 to 12	22.96	2.3 J	71	1132	8.2	0.65	2.2
GDS-SU07-B-18S	Pre-Plant	5/10/2018	Primary	12 to 24	31.63	1.1 J	17	173	8.5	0.65	0.8
GDS-SU08-A-18S	Pre-Plant	5/22/2018	Primary	0 to 12	20.59	1.9 J	259 J	2139	8	0.8	2.3
GDS-SU08-B-18S	Pre-Plant	5/22/2018	Primary	12 to 24	**63.47**	3.7	66 J	1647	8.2	1.92	1.0
GDS-SU08-B-18S-D	Pre-Plant	5/22/2018	Duplicate	12 to 24	**64.86**	3.9	69 J	1715	7.9	1.66	0.8
GDS-SU09-A-18S	Pre-Plant	5/21/2018	Primary	0 to 12	10.92	2.1 J	127 J	903	7.7	0.58	2.2
GDS-SU09-B-18S	Pre-Plant	5/21/2018	Primary	12 to 24	11.05	1.7 J	41 J	328	8.3	0.62	0.9
GDS-SU10-A-18S	Pre-Plant	5/9/2018	Primary	0 to 12	8.83	2.2 J	45	678	8.3	0.27	2.2
GDS-SU10-B-18S	Pre-Plant	5/9/2018	Primary	12 to 24	11.62	1.8 J	12	145	8.1	0.33	0.8
GDS-SU11-A-18S	Pre-Plant	5/22/2018	Primary	0 to 12	14.49	2.7 J	151 J	953	7.4	0.41	3.2
GDS-SU11-B-18S	Pre-Plant	5/22/2018	Primary	12 to 24	7.79	3 J	77 J	541	7.9	0.3	1.1
GDS-SU12-A-18S	Pre-Plant	5/24/2018	Primary	0 to 12	14.97	7.3	86	909 J	7.9	0.44	2.4
GDS-SU12-B-18S	Pre-Plant	5/24/2018	Primary	12 to 24	9.65	3.7	36	431 J	8.4	0.35	0.9
GDS-SU13-A-18S	Pre-Plant	5/24/2018	Primary	0 to 12	17.33	5.4	57	747 J	7.8	0.41	2.2
GDS-SU13-B-18S	Pre-Plant	5/24/2018	Primary	12 to 24	7.5	1.8	49	336 J	8.3	0.26	1.2
GDS-SU14-A-18S	Pre-Plant	5/24/2018	Primary	0 to 12	15.62	2.9	75	577 J	7.9	0.39	1.8
GDS-SU14-B-18S	Pre-Plant	5/24/2018	Primary	12 to 24	8.22	1.4	35	226 J	8.1	0.33	0.9
GDS-SU14-B-18S-D	Pre-Plant	5/24/2018	Duplicate	12 to 24	6.98	1.3	28	196 J	8.3	0.31	0.9

Table 16

2018 George DeRuyter & Son/D&A Dairies Application Field Soil Sample Results

Sample ID	Sample Period	Sample Date	Sample Type	Depth Interval (inches)	Nitrate (ppm)	Ammonium (ppm)	Phosphorous (ppm)	Potassium (ppm)	pH (standard units)	Electrical Conductivity (mmhos/cm)	Organic Matter (%)
GDS-SU01-A-18F	Post-Harvest	10/16/2018	Primary	0–12	16.11	3.2 U	91	579	7.3	0.32	3
GDS-SU01-B-18F	Post-Harvest	10/16/2018	Primary	12–24	3.61	3.2 U	51	197	8.2	0.22	1.1 U
GDS-SU01-C-18F	Post-Harvest	10/16/2018	Primary	24-36	4.26	3.2 U	40	125	8.3	0.23	0.9 U
GDS-SU02-A-18F	Post-Harvest	10/16/2018	Primary	0–12	9.56	3.4 U	104	603	7.6	0.29	3.3
GDS-SU02-B-18F	Post-Harvest	10/16/2018	Primary	12–24	2.12	3.2 U	61	203	8.3	0.18	1.1 U
GDS-SU02-B-18F-D	Post-Harvest	10/16/2018	Duplicate	12–24	2.39	3.2 U	61	223	8.3	0.19	1.1 U
GDS-SU02-C-18F	Post-Harvest	10/16/2018	Primary	24-36	1.82 U	3.2 U	34	88	8.5	0.16	0.7 U
GDS-SU03-A-18F	Post-Harvest	10/16/2018	Primary	0–12	8.8	4.1 U	92	974	7.4	0.46	2.6
GDS-SU03-B-18F	Post-Harvest	10/16/2018	Primary	12–24	2.4	3.2 U	40	638	7.6	0.34	1.1 U
GDS-SU03-C-18F	Post-Harvest	10/16/2018	Primary	24-36	2.12	3.2 U	39	390	8.1	0.36	0.8 U
GDS-SU04-A-18F	Post-Harvest	10/22/2018	Primary	0–12	18.5	3.2 U	355	1867	7.9	0.77	2.7
GDS-SU04-A-18F-D	Post-Harvest	10/22/2018	Duplicate	0–12	19.15	4.7 U	359	1862	7.9	0.66	2.5
GDS-SU04-B-18F	Post-Harvest	10/22/2018	Primary	12–24	28.27	3.2 U	100	2083	8.5	1.02	0.8 U
GDS-SU04-C-18F	Post-Harvest	10/22/2018	Primary	24-36	66.64	3.2 U	31	1463	8.2	1.37	0.6 U
GDS-SU05-A-18F	Post-Harvest	9/28/2018	Primary	0–12	37.32	3.2 U	339	1,913	7.9	0.64	2.7
GDS-SU05-A-18F-D	Post-Harvest	9/28/2018	Duplicate	0–12	36.58	3.2 U	332	1,913	7.9	0.83	2.7
GDS-SU05-B-18F	Post-Harvest	9/28/2018	Primary	12–24	27.85	3.2 U	127	2,051	8.4	0.88	1.2 U
GDS-SU05-C-18F	Post-Harvest	9/28/2018	Primary	24-36	51.43	3.2 U	107	1,295	8.1	0.87	1.2 U
GDS-SU06-A-18F	Post-Harvest	10/1/2018	Primary	0–12	64.76	3.2 U	110	1,412	8.1	1.06	2
GDS-SU06-B-18F	Post-Harvest	10/1/2018	Primary	12–24	**62.06**	3.2 U	62	779	8.2	1.12	1.4 U
GDS-SU06-C-18F	Post-Harvest	10/1/2018	Primary	24-36	61.1	3.2 U	64	511	8.2	0.86	1.2 U
GDS-SU07-A-18F	Post-Harvest	10/1/2018	Primary	0–12	48.0	3.2 U	66	1033	8	0.76	1.8 U
GDS-SU07-A-18F-D	Post-Harvest	10/1/2018	Duplicate	0–12	48.8	3.2 U	63	1032	7.8	0.63	2.3
GDS-SU07-B-18F	Post-Harvest	10/1/2018	Primary	12–24	**56.2**	3.2 U	53	813	8.1	0.9	1.3 U
GDS-SU07-C-18F	Post-Harvest	10/1/2018	Primary	24-36	61.7	3.2 U	48	625	8.1	0.87	1.8 U
GDS-SU08-A-18F	Post-Harvest	10/18/2018	Primary	0–12	48.8	3.2 U	162	1945 J	8.2	0.75	2.5
GDS-SU08-B-18F	Post-Harvest	10/18/2018	Primary	12–24	**62.68**	3.2 U	97 J	1747 J	8.4	1.37	0.8 U
GDS-SU08-B-18F-D	Post-Harvest	10/18/2018	Duplicate	12–24	**57.45**	3.2 U	52 J	1788 J	8.3	1.45	0.7 U
GDS-SU08-C-18F	Post-Harvest	10/18/2018	Primary	24-36	89.17	3.2 U	31	745 J	8.1	1.56	0.4 U
GDS-SU09-A-18F	Post-Harvest	10/18/2018	Primary	0–12	9.4	3.2 U	77	790 J	8.1	0.47	2.1
GDS-SU09-B-18F	Post-Harvest	10/18/2018	Primary	12–24	3.47	3.2 U	33	232 J	8.4	0.44	0.7 U
GDS-SU09-C-18F	Post-Harvest	10/18/2018	Primary	24-36	5.1	3.2 U	19	80 J	8.3	0.82	0.4 U
GDS-SU10-A-18F	Post-Harvest	10/1/2018	Primary	0–12	38.97	3.2 U	30	753	8.1	0.52	1.9 U
GDS-SU10-B-18F	Post-Harvest	10/1/2018	Primary	12–24	23.95	3.2 U	15	300	8.4	0.35	1 U
GDS-SU10-C-18F	Post-Harvest	10/1/2018	Primary	24-36	18.35	3.2 U	9	179	8.5	0.39	0.7 U
GDS-SU11-A-18F	Post-Harvest	10/15/2018	Primary	0–12	10.69	4.6 U	150	806	7.5	0.42	3.1

Table 16

2018 George DeRuyter & Son/D&A Dairies Application Field Soil Sample Results

Sample ID	Sample Period	Sample Date	Sample Type	Depth Interval (inches)	Nitrate (ppm)	Ammonium (ppm)	Phosphorous (ppm)	Potassium (ppm)	pH (standard units)	Electrical Conductivity (mmhos/cm)	Organic Matter (%)
GDS-SU11-B-18F	Post-Harvest	10/15/2018	Primary	12–24	3.36	3.2 U	69	540	8.2	0.33	1 U
GDS-SU11-C-18F	Post-Harvest	10/15/2018	Primary	24-36	4.36	3.2 U	53	637	8.3	0.23	0.8 U
GDS-SU12-A-18F	Post-Harvest	10/18/2018	Primary	0–12	11.34	3.2 U	70	819 J	8.1	0.24	2.1
GDS-SU12-B-18F	Post-Harvest	10/18/2018	Primary	12–24	2.74	3.2 U	44	476 J	8.5	0.22	0.7 U
GDS-SU12-C-18F	Post-Harvest	10/18/2018	Primary	24-36	2.91	3.2 U	24	383 J	8.5	0.35	0.5 U
GDS-SU13-A-18F	Post-Harvest	10/15/2018	Primary	0–12	7.79	4.9 U	128	673	8	0.24	2.2
GDS-SU13-B-18F	Post-Harvest	10/15/2018	Primary	12–24	2.91	3.2 U	37	353	8.3	0.24	0.9 U
GDS-SU13-C-18F	Post-Harvest	10/15/2018	Primary	24-36	3.07	3.2 U	25	277	8.5	0.3	1.1 U
GDS-SU14-A-18F	Post-Harvest	10/15/2018	Primary	0–12	8.81	5.8 U	88	555	8	0.39	1.9 U
GDS-SU14-A-18F-D	Post-Harvest	10/15/2018	Duplicate	0–12	8.08	4.1 U	102	536	7.9	0.44	2.1
GDS-SU14-B-18F	Post-Harvest	10/15/2018	Primary	12–24	2.96	3.2 U	35	186	8.3	0.3	1 U
GDS-SU14-C-18F	Post-Harvest	10/15/2018	Primary	24-36	4.71	3.2 U	33	237	8	0.39	1 U

Notes:

BOLD: Values greater than 45 ppm in the 2-foot depth interval.

J: Estimated value.

mmhos/cm: millimhos per centimeter

ppm: parts per million

U: Result is not detected at the reported value.

Table 17

George DeRuyter Son/D&A Dairies Application Field Soil Nitrate Concentrations, 2013 to 2018

	Fall 2013			Spring 2014		Fall 2014			Spring 2015		Fall 2015			Spring 2016		Fall 2016		
Field	**1-foot**	**2-foot**	**3-foot**	**1-foot**	**2-foot**	**1-foot**	**2-foot**	**3-foot**	**1-foot**	**2-foot**	**1-foot**	**2-foot**	**3-foot**	**1-foot**	**2-foot**	**1-foot**	**2-foot**	**3-foot**
GDS-SU01	12.3	7.1	4.6	11.0	11.2	14.5	4.2	2.1	22.3	8.3	19.0	16.1	18.8	16.1	12.9	13.8	6.3	2.9
GDS-SU02	19.2	23.9	14.4	7.6	3.5	10.6	5.1	5.8	11.1	9.5	24.5	11.5	8.3	18.4	10.8	18.6	7.1	10.3
GDS-SU03	8.6	3.5	3.3	16.4	7.6	15.5	5.4	4.2	10.4	4.1	41.4	34.8	33.3	7.3	6.6	9.5	2.9	3.9
GDS-SU04	183.5	166.0	172.5	182.5	196.5	208.3	165.3	187.3	150.3	169.9	91.1	76.5	79.3	27.9	85.9	43.3	117.0	115.6
GDS-SU05	263.0	254.0	263.0	225.5	236.5	187.5	226.0	226.5	116.8	197.5	154.5	218.0	176.5	23.8	145.5	34.4	144.6	215.8
GDS-SU06	47.3	81.5	102.3	56.3	55.7	49.0	68.9	70.9	28.1	60.8	39.1	55.2	93.7	5.9	18.2	39.0	48.6	65.7
GDS-SU07	30.6	74.2	75.7	11.1	31.5	17.2	40.8	44.5	11.3	24.4	15.7	7.6	30.2	4.1	7.5	79.6	48.8	43.9
GDS-SU08	161.4	160.5	138.9	219.0	159.3	102.4	160.5	163.0	63.8	130.5	93.1	93.8	104.9	40.0	118.2	48.9	103.2	138.4
GDS-SU09	24.6	28.3	27.1	54.6	30.2	48.3	62.7	61.1	22.5	28.4	25.7	25.7	28.5	10.9	12.9	33.8	17.4	21.9
GDS-SU10	49.0	37.7	21.7	58.2	55.6	24.1	49.9	71.6	13.0	7.9	6.3	11.0	21.9	11.3	4.5	16.6	8.1	8.5
GDS-SU11	38.9	37.8	30.5	23.7	14.7	24.5	14.0	9.1	12.5	8.5	13.3	6.5	6.6	32.2	23.5	23.4	7.6	4.3
GDS-SU12	167.5	125.4	94.6	91.0	49.7	76.9	34.2	35.3	20.8	25.2	4.0	10.3	7.0	9.7	6.5	15.7	7.8	8.1
GDS-SU13	10.3	6.7	8.2	40.0	48.8	27.5	39.0	37.7	9.8	14.2	7.8	9.5	20.4	20.6	20.6	16.9	7.8	7.1
GDS-SU14	37.4	31.5	20.9	4.0	6.9	7.3	7.5	16.8	10.1	15.9	8.0	11.5	10.1	18.1	29.3	10.6	5.0	5.9
Average	75.3	74.2	69.8	71.5	64.8	58.1	63.1	66.9	35.9	50.4	38.8	42.0	45.7	17.6	35.9	28.9	38.0	46.6
Percent Change from Prior Year						-23%	-15%	-4%	-50%	-22%	-33%	-33%	-32%	-51%	-29%	-26%	-9%	2%
Percent Change from Fall 2013											-48%	-43%	-35%			-62%	-49%	-33%

No. of Fields over 45 ppm in 2-Foot Depth:	6	7	6	4	4	3	5
Annual Percent Change[1]:			0%	-43%	-33%	-25%	25%
			Fall to Fall	Spring to Spring	Fall to Fall	Spring to Spring	Fall to Fall

Table 17

George DeRuyter Son/D&A Dairies Application Field Soil Nitrate Concentrations, 2013 to 2018

	Spring 2017		Fall 2017			Spring 2018		Fall 2018		
Field	**1-foot**	**2-foot**	**1-foot**	**2-foot**	**3-foot**	**1-foot**	**2-foot**	**1-foot**	**2-foot**	**3-foot**
GDS-SU01	27.0	8.5	7.6	2.6	3.6	12.0	8.9	16.1	3.6	4.3
GDS-SU02	19.9	11.0	12.9	5.2	4.4	16.5	5.9	9.6	2.1	1.8
GDS-SU03	19.1	12.8	7.9	3.1	3.5	8.2	2.8	8.8	2.4	2.1
GDS-SU04	28.0	65.4	12.3	48.0	76.0	13.4	24.9	18.5	28.3	66.6
GDS-SU05	14.7	26.1	33.3	57.5	92.1	19.4	32.9	37.3	27.9	51.4
GDS-SU06	13.0	20.6	28.8	25.0	45.8	10.0	15.3	64.8	62.1	61.1
GDS-SU07	25.2	38.4	25.4	29.4	37.9	22.8	31.6	48.0	56.2	61.7
GDS-SU08	31.9	54.1	39.1	87.6	94.2	20.6	63.5	48.8	62.7	89.2
GDS-SU09	65.9	55.9	12.9	14.1	11.0	10.9	11.1	9.4	3.5	5.1
GDS-SU10	20.1	15.1	11.3	6.8	7.2	8.8	11.6	39.0	24.0	18.4
GDS-SU11	18.0	14.8	16.2	9.2	12.7	14.5	7.8	10.7	3.4	4.4
GDS-SU12	22.6	5.8	12.0	5.4	11.9	5.0	9.6	11.3	2.7	2.9
GDS-SU13	36.2	19.6	13.5	6.0	5.3	17.3	7.5	7.8	2.9	3.1
GDS-SU14	17.1	8.2	12.8	8.5	9.1	15.6	8.2	8.8	3.0	4.7
Average	25.6	25.5	17.6	22.0	29.6	13.9	17.3	24.2	20.3	26.9
Percent Change from Prior Year	46%	-29%	-39%	-42%	-36%	-46%	-32%	38%	-8%	-9%
Percent Change from Fall 2013			-77%	-70%	-58%			-68%	-73%	-61%

No. of Fields over 45 ppm in 2-Foot Depth:	3	3	1	3
Annual Percent Change[1]:	0%	-40%	-67%	0%
	Spring to Spring	Fall to Fall	Spring to Spring	Fall to Fall

Notes:

Red text indicates fields in the 2-foot depth over 45 ppm.

1. Annual percent change at the 2-foot depth is calculated from fall to fall or spring to spring.

ppm: parts per million

Table 18
2018 Cow Palace Dairy Off-Site Liquid Manure Transfers

Map Location	Farm/Facility Name	Location	Field/Sample Identifier	Liquid Manure (gallons)	Field Sample No.	Field Nitrate Concentration (ppm)[1]	Collected Depth (feet)
C1	Carpenter	NW of Price Rd./Hudson Rd., Granger, WA	Price-Hudson	740,776	CP1	15.8	2
C2		N of Carpenter Rd., between Beam Rd./N Liberty Rd., Granger, WA	Yard 24	102,176	CP2	44.2	2
C3	Steve Bangs	SW of Branch Rd./Hwy 22, Toppenish, WA	Harmon Place	766,320	CP3	28.6	2
C4		SE of Curlew Rd./Old McCoy Rd., Toppenish, WA	Snyder Place	402,318	CP4	9.1	2
C5	Zecchino	N of Satus Longhouse Rd./Totus Rd., Granger, WA	Benny-South	644,986	CP5	8.0	2
C6		Near Satus Longhouse Rd./Totus Rd., Granger, WA	Blue Gate	242,668	CP6	3.8	2
C7		NW of Satus Rd./Hwy 22, Granger, WA	Bottleneck	670,530	CP7	10.9	2
C8		N of Plank Rd./Lake Rd., Granger, WA	Dorrie's	376,774	CP8	25.4	2
C9		NW of Satus Longhouse Rd./Hwy 22, Granger, WA	Grandma's	753,548	CP9	11.3	2
C10		Sohappy Rd./Rd. 19, Toppenish, WA	Jack's	708,846	CP10	6.3	2
C11		W of Satus Longhouse Rd./Totus Rd., Granger, WA	Loveland-N	447,020	CP11	6.0	2
C12		NE of Indian Church Rd./Schuster Rd., Granger, WA	Pinky-North	453,406	CP12	17.0	2
			Pinky-South	389,546	CP13	11.0	2
C13		Satus Longhouse Rd./Totus Rd., Granger, WA	The 25	338,458	CP14	6.2	2
C14		SW of Tule Rd./Plank Rd., Granger, WA	The Island	657,758	CP15[2]	19.2	2
C15		N of Hwy 22 between Schuster Rd. and Satus Longhouse Rd., Toppenish, WA	Vanoston's	555,582	CP16	8.0	2
C16		Satus Longhouse Rd./Schuster Rd., Granger, WA	Walsey-W	510,880	CP17	4.8	2
C17	Zuniga	W of Orchardvale Rd./Blaine Rd., Zillah, WA	Orchard Vale	197,966	CP18	4.2	2
			TOTAL	**8,959,558**			

Notes:
1. Where nitrate concentrations are reported in pounds per acre, conversion to parts per million is based on a 1-foot soil bulk density of 1.25 grams per cubic centimeter, which results in a conversion factor of 3.4, typical for a lower Yakima Valley silt loam soil.
2. The Island field was sampled in Fall 2017 and planted in Spring 2018.
ppm: parts per million

Table 19
2018 Liberty/H&S Bosma Dairies Off-Site Liquid Manure Transfers

Map Location	Farm/Facility Name	Location	Field/Sample Identifier	Liquid Manure (gallons)	Field Sample No.	Field Nitrate Concentration (ppm)[1]	Collected Depth (feet)
L1	Berg	North end of Bailey Rd., Zillah, WA	Berg 23	2,586,572	LD1	8.0	2
					LD2	18.2	2
			Berg East		LD3	2.7	2
					LD4	9.8	2
			Berg House		LD5	5.7	2
					LD6	17.3	2
			Berg Northeast		LD7	2.1	2
					LD8	11.9	2
			Berg North		LD9	2.9	2
					LD10	9.3	2
			Berg Northwest		LD11	3.5	2
					LD12	12.3	2
			Berg Southeast		LD13	3.2	2
					LD14	13.9	2
			Berg Yellow House		LD15	5.7	2
					LD16	13.6	2
L2	Sandlin	2301 N Houghton Rd., Zillah, WA	Sandlin 01	739,930	LD17	15.1	2
			Sandlin 02		LD18	20.1	2
NR	Oswalt	NR	NS	3,588,000	NS	NS	NS
			TOTAL	**6,914,502**			

Notes:
1. Where nitrate concentrations are reported in pounds per acre, conversion to parts per million is based on a 1-foot soil bulk density of 1.25 grams per cubic centimeter, which results in a conversion factor of 3.4, typical for a Lower Yakima Valley silt loam soil.
NR: Not reported.
NS: No sample recorded.
ppm: parts per million

Table 20
2018 George DeRuyter & Son/D&A Dairies Off-Site Liquid Manure Transfers

Map Location	Farm/Facility Name	Location	Field/Sample Identifier	Liquid Manure (gallons)	Field Sample No.	Field Nitrate Concentration (ppm)[1]	Collected Depth (feet)
D1	Oswalt #1	Chambers Rd./Hwy 22, Granger, WA	Home 12	391,500	GDS1[2]	17.7	2
			Smith 17		GDS2[2]	28.9	2
D2	Oswalt #2	Indian Church Rd./Hwy 22, Granger, WA	Wiese 25	1,759,500	GDS3[2]	18.7	2
			Wiese 43		GDS4[2]	9.3	2
D3	Winkler	Zillah Dr./Eagle Peak Rd., Granger, WA	East Pivot-S	2,322,000	GDS5[3]	26.3	2
			West CP-COR		GDS6	16.5	2
			West CP-N		GDS7	27.8	2
			West CP-S		GDS8	19.0	2
D4	El Rancho	SE of Progressive Rd./South Wapato Rd., Wapato, WA	Progressive 01	724,500	GDS9	24.5	2
			Progressive 02	1,062,000	GDS10	14.0	2
D5	Groeneweg	SW of Pipeline Rd./Kellum Rd., Granger, WA	Barney	234,000	GDS11[4]	**94.6**	2
D6		NW of Pipeline Rd./Independence Rd., Granger, WA	Pipeline		GDS12[4]	**82.0**	2
D7		NE of Price Rd./Independence Rd., Granger, WA	Fox	360,000	GDS13	42.0	2
D8		SE of Pipeline Rd./Reeves Rd., Granger, WA	Reeves	139,500	GDS14[4]	**62.7**	2
			Reeves #2	117,000	GDS15	41.8	2
			TOTAL	**7,110,000**			

Notes:
1. Where nitrate concentrations are reported in pounds per acre, conversion to parts per million is based on a 1-foot soil bulk density of 1.25 grams per cubic centimeter, which results in a conversion factor of 3.4, typical for a Lower Yakima Valley silt loam soil.
2. Oswalt fields were sampled in fall 2017 and planted in spring 2018.
3. Per Nutrien Ag Solutions analytical methods, where nitrate concentrations are reported in pounds per acre, conversion to parts per million results in a conversion factor of 3.2.
4. The contractor applied nutrients to the field prior to receiving soil sampling results showing nitrate concentrations greater than 45 ppm. The application process was reviewed with the contractor, potential impacts from the overapplication were discussed, and remedial actions are in place for the 2019 grow season.
BOLD: concentration more than 45 ppm
ppm: parts per million

Table 21

2018 Cow Palace Dairy Off-Site Solid Manure Transfers

Map Location	Solid Manure (tons)[1]	Field Sample No.	Nitrate Concentration (ppm)[2]	Collected Depth (feet)
C1[3]	8,884	--	--	--
TOTAL[4]	**8,884**			

Notes:

1. Includes separator solids and unfinished compost.
2. Where nitrate concentrations are reported in pounds per acre, conversion to parts per million is based on a 1-foot soil bulk density of 1.25 grams per cubic centimeter, which results in a conversion factor of 3.4, typical for a Lower Yakima Valley silt loam soil.
3. Location outside map extents.
4. During 2018, approximately 105,313 tons of wet manure solids were used to manufacture finished compost.

-- : Not applicable; location is not within the boundary of the Dairies.

ppm: parts per million

Table 22

2018 Liberty/H&S Bosma Dairies Off-Site Solid Manure Transfers

Map Location	Solid Manure (tons)[1]	Field Sample No.	Nitrate Concentration (ppm)[2]	Collected Depth (feet)
--	0	--	--	--
TOTAL[3]	**0**			

Notes:

1. Includes separator solids and unfinished compost.
2. Where nitrate concentrations are reported in pounds per acre, conversion to parts per million is based on a 1-foot soil bulk density of 1.25 grams per cubic centimeter, which results in a conversion factor of 3.4, typical for a Lower Yakima Valley silt loam soil.
3. During 2018, approximately 17,702 tons of wet manure solids were used to manufacture finished compost.

ppm: parts per million

Table 23

2018 George DeRuyter & Son/D&A Dairies Off-Site Solid Manure Transfers

Map Location	Solid Manure (tons)[1]	Field Sample No.	Nitrate Concentration (ppm)[2]	Collected Depth (feet)
--	0	--	--	--
TOTAL[3]	**0**			

Notes:

1. Includes separator solids and unfinished compost.
2. Where nitrate concentrations are reported in pounds per acre, conversion to parts per million is based on a 1-foot soil bulk density of 1.25 grams per cubic centimeter, which results in a conversion factor of 3.4, typical for a Lower Yakima Valley silt loam soil.
3. During 2018, approximately 799 tons of wet manure solids were used to manufacture finished compost.

-- : Not applicable.

ppm: parts per million

Table 24
2018 Off-Site First-Party Compost Sales

Map Location	Dairy	Compost Sale (tons)	Groundwater Nitrate Concentration >10 mg/L[1]
C1	Cow Palace Dairy	4,884	No[2]
D1	George DeRuyter & Son/D&A Dairies	400	--
--	Liberty/H&S Bosma Dairies	0	--

Notes:

1. Yes/No determined based on most recent data collected under the Administrative Order on Consent.

2. Indeterminate

-- : Not applicable; location is not within the boundary of the Dairies.

mg/L: milligram per liter

Figures

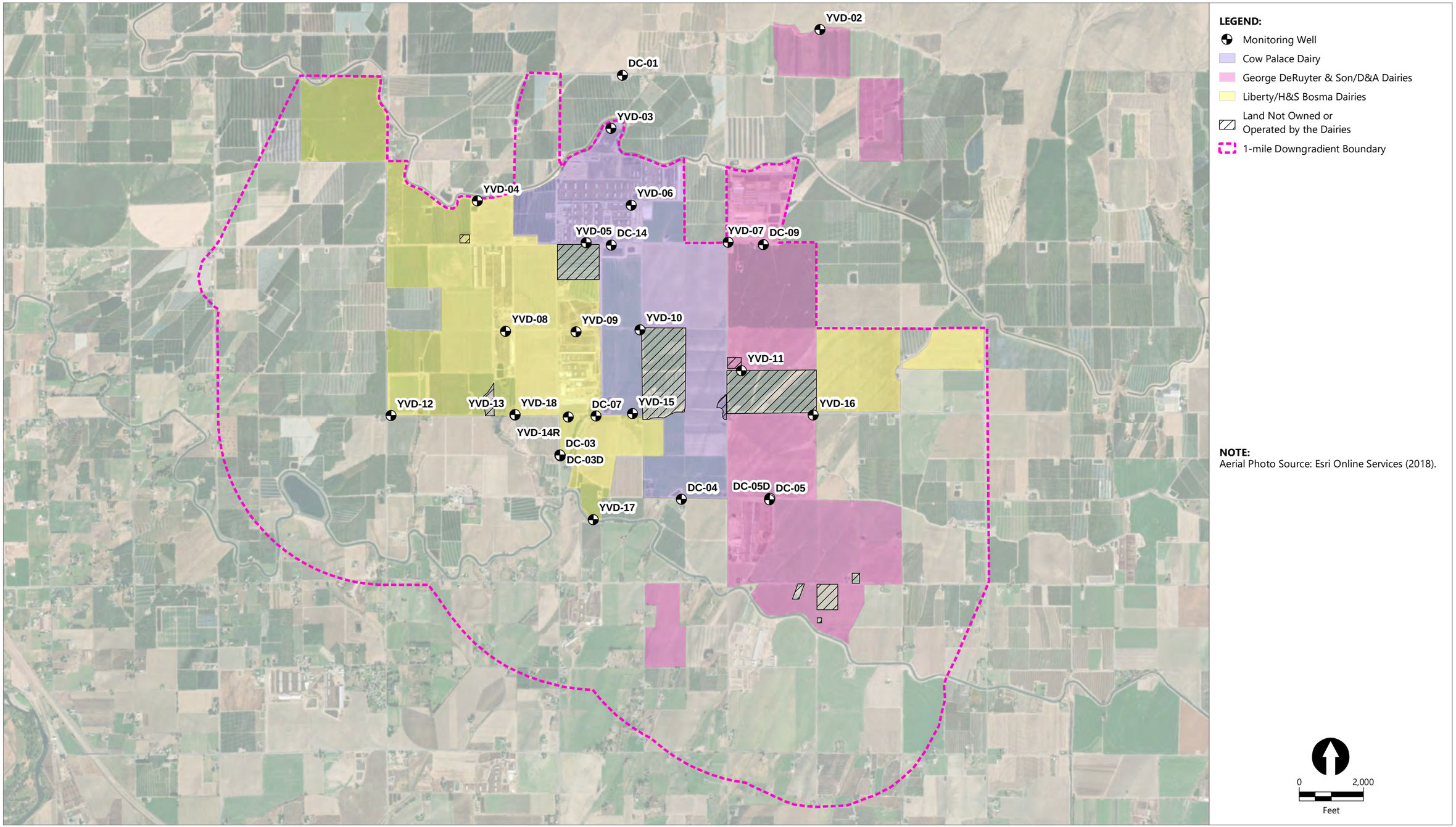

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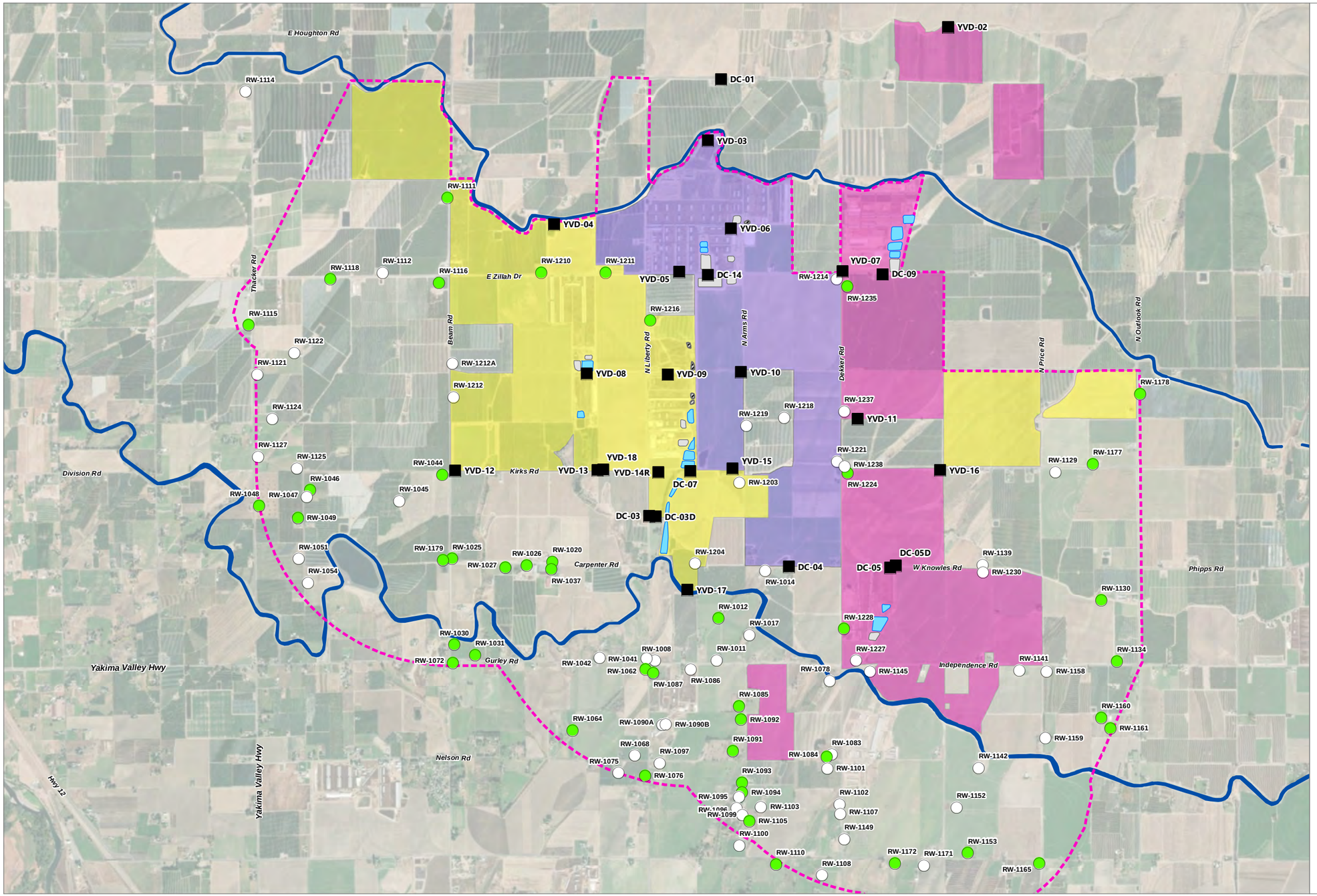
Figure 1
Dairy Locations and Monitoring Well Network
2018 Annual Report
Yakima Valley Dairies



LEGEND:

- AOC Monitoring Wells
- Residential Wells Sampled as part of the AOC

2013 Residential Well Nitrate Results

- <10 mg/L
- >10 mg/L

Dairies

- Cow Palace 1 and 2 Dairy
- George Dairy/D&A Dairy
- Liberty/Bosma Dairy
- Lagoon to be Lined or Abandoned after January 2020
- Lagoon Lined (as of December 2019)
- Abandoned Lagoon
- 1-mile Downgradient Boundary

NOTES:

1. Aerial Photo Source: Esri
2. Dairy boundaries are taken from Figure 2B of the Groundwater Monitoring Data Report (May 31, 2016) and Figure 1 of the 2015 Post-Harvest Dairy Application Field Reports for the respective dairies (January 2016).
3. Residential well nitrate concentrations are based on one round of sampling at residential wells conducted in May through September 2013.
4. AOC and groundwater nitrate concentrations are the average results from 2018 monitoring events.
5. Dairy properties shown here include application fields as well as owned properties.

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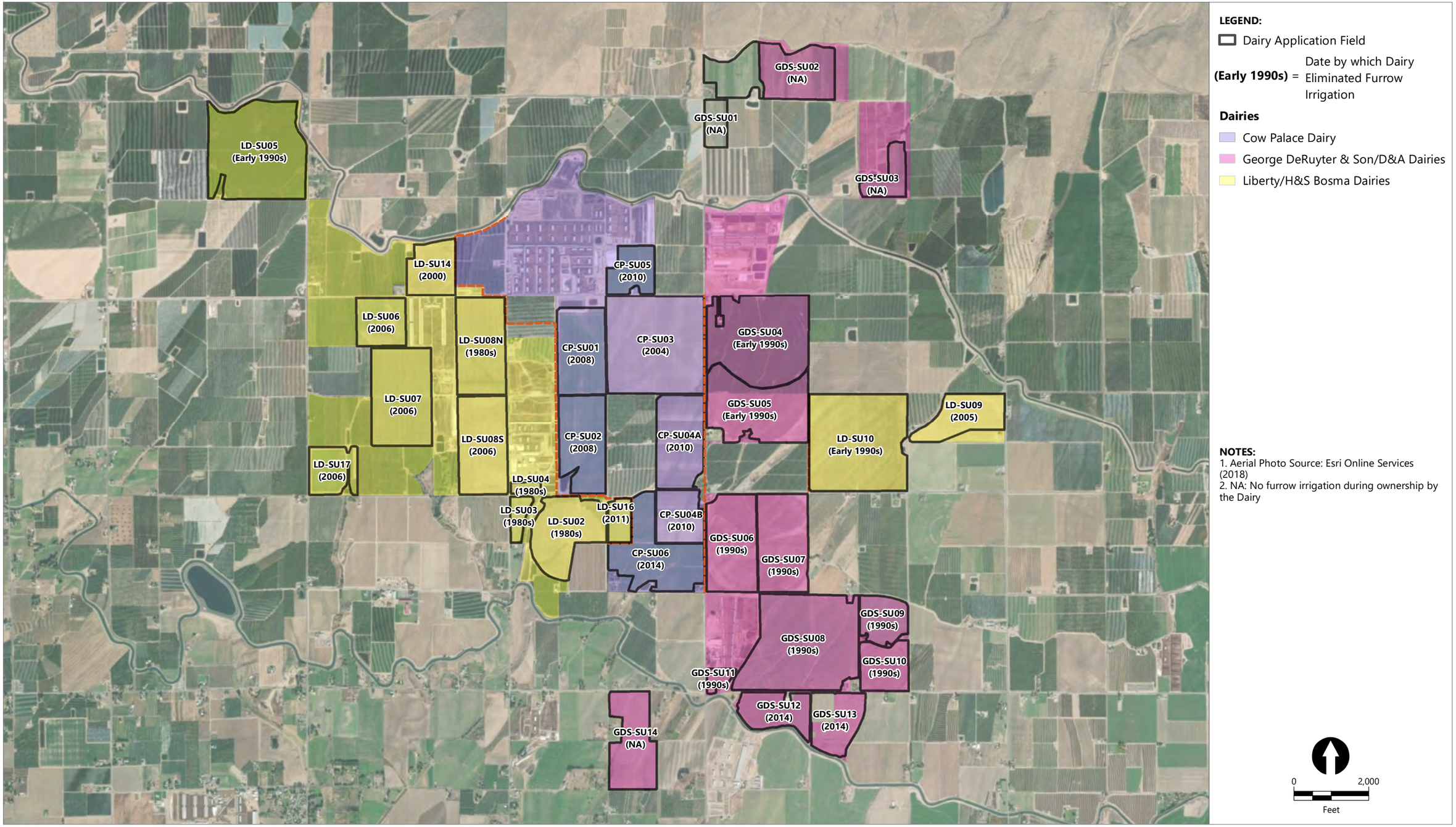
ANCHOR QEA

Figure 2
Residential Well Sampling Locations
2018 Annual Report
Yakima Valley Dairies



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Filepath: \\orcas\gis\Jobs\PerkinsCoie_0996\YakimaDairies\Maps\AnnualRept_2018\AQ_YVD_Fig03_ApplicationFieldLocations.mxd

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Figure 3
Summary of Field Irrigation Changes
2018 Annual Report
Yakima Vally Dairies

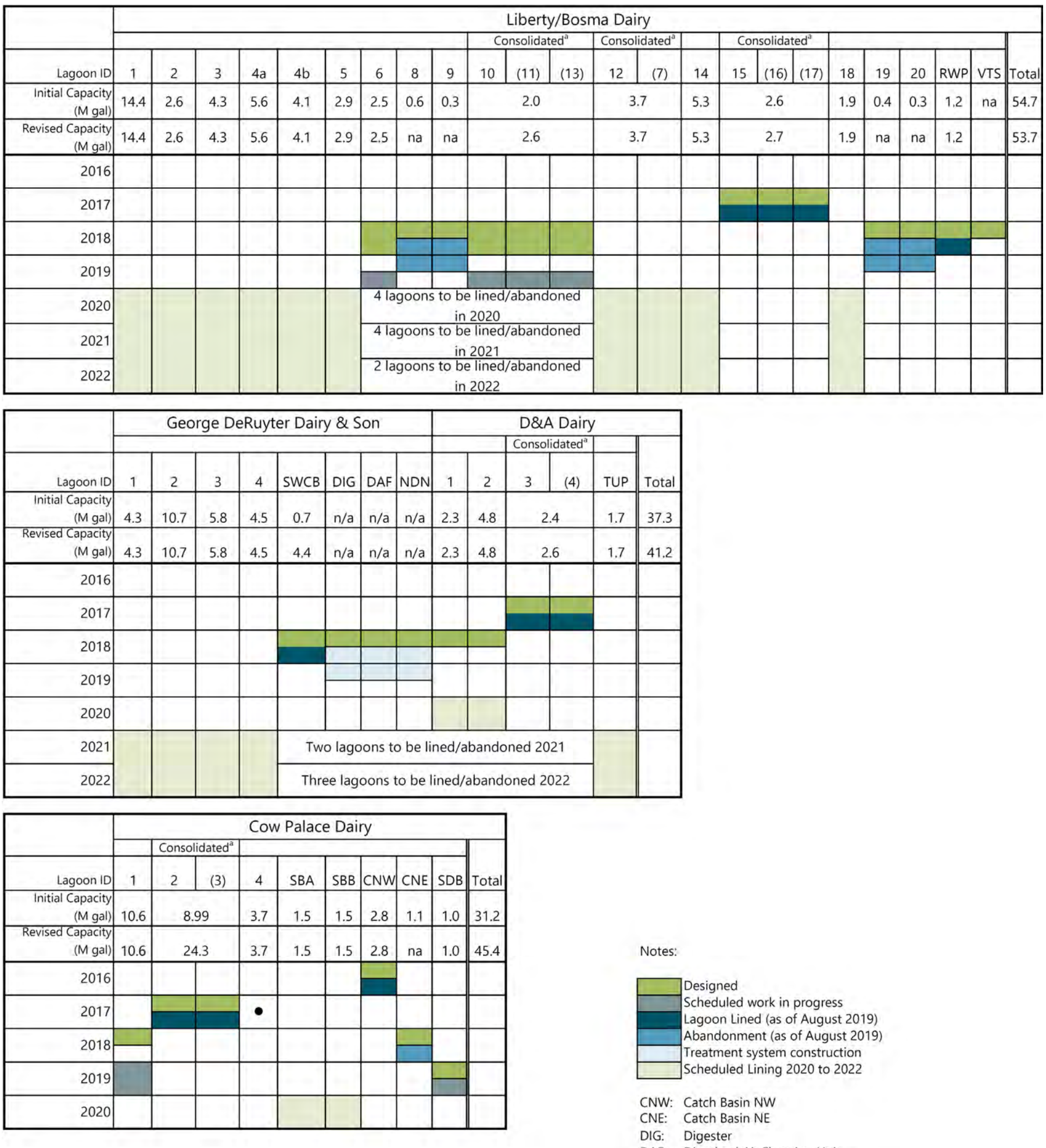

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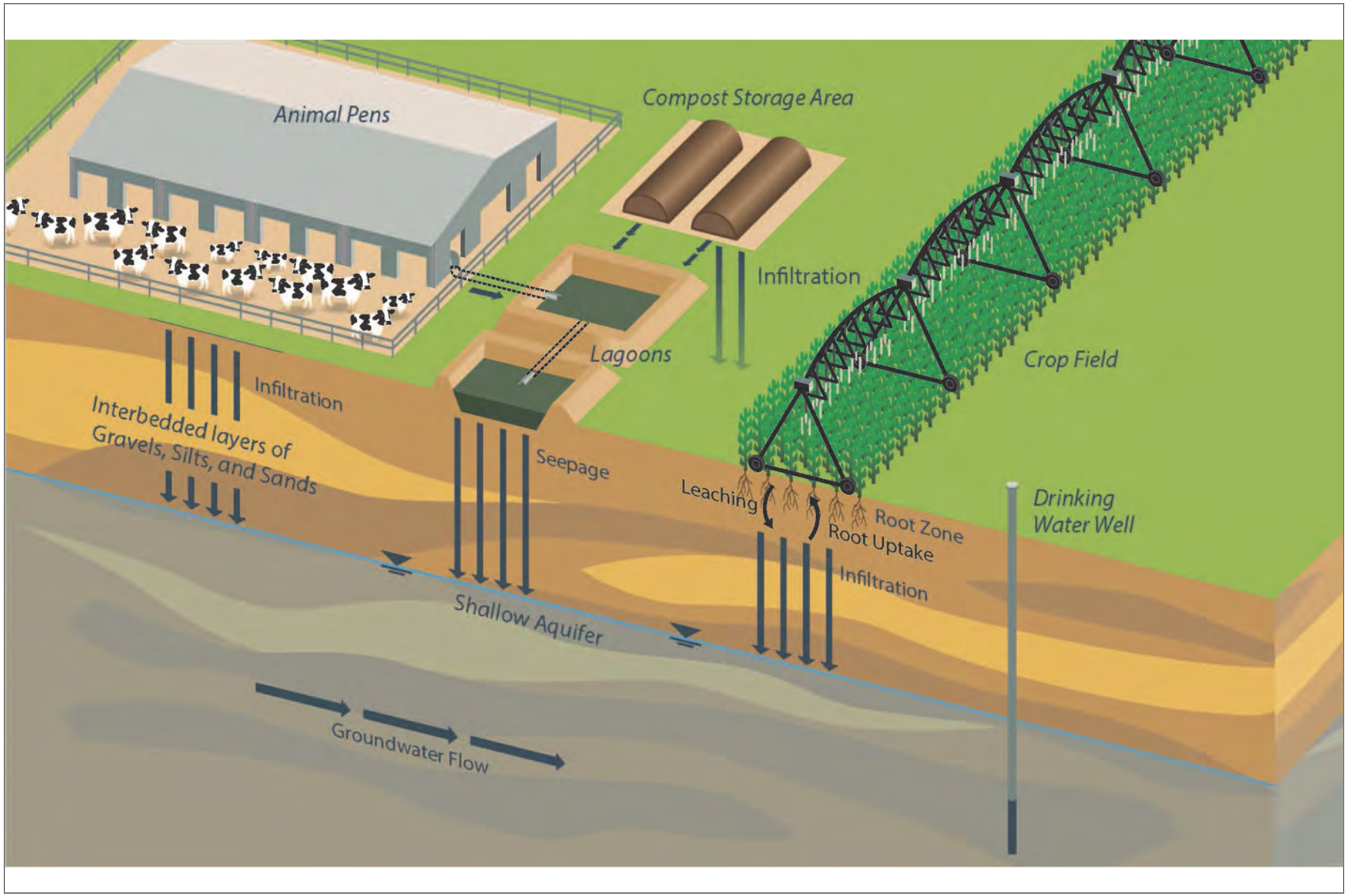
Figure 4
Progress of Lagoon Lining and Abandonments
2018 Annual Report
Yakima Valley Dairies



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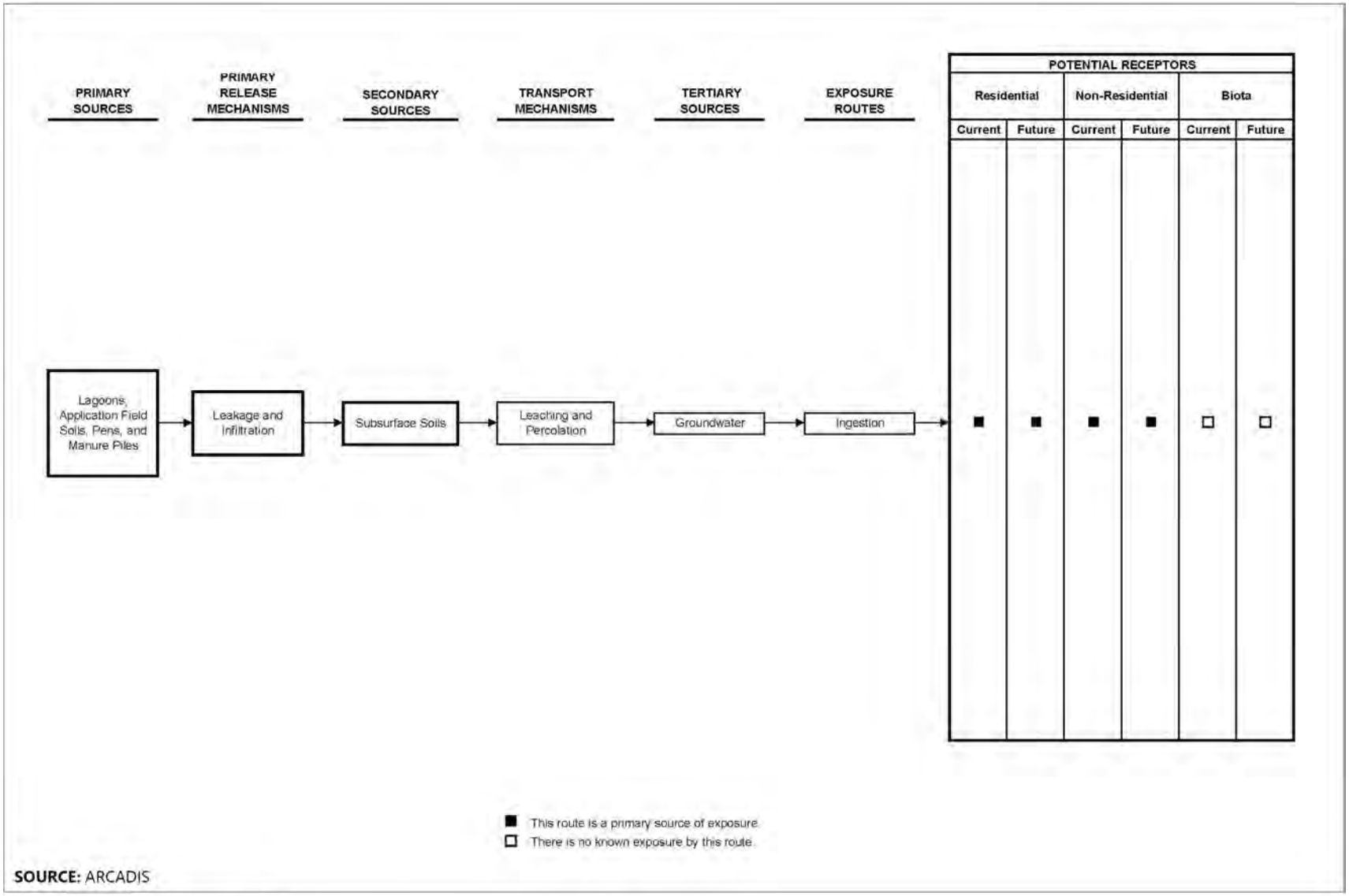
ANCHOR QEA

Figure 5
Conceptual Site Model
2018 Annual Report
Yakima Valley Dairies



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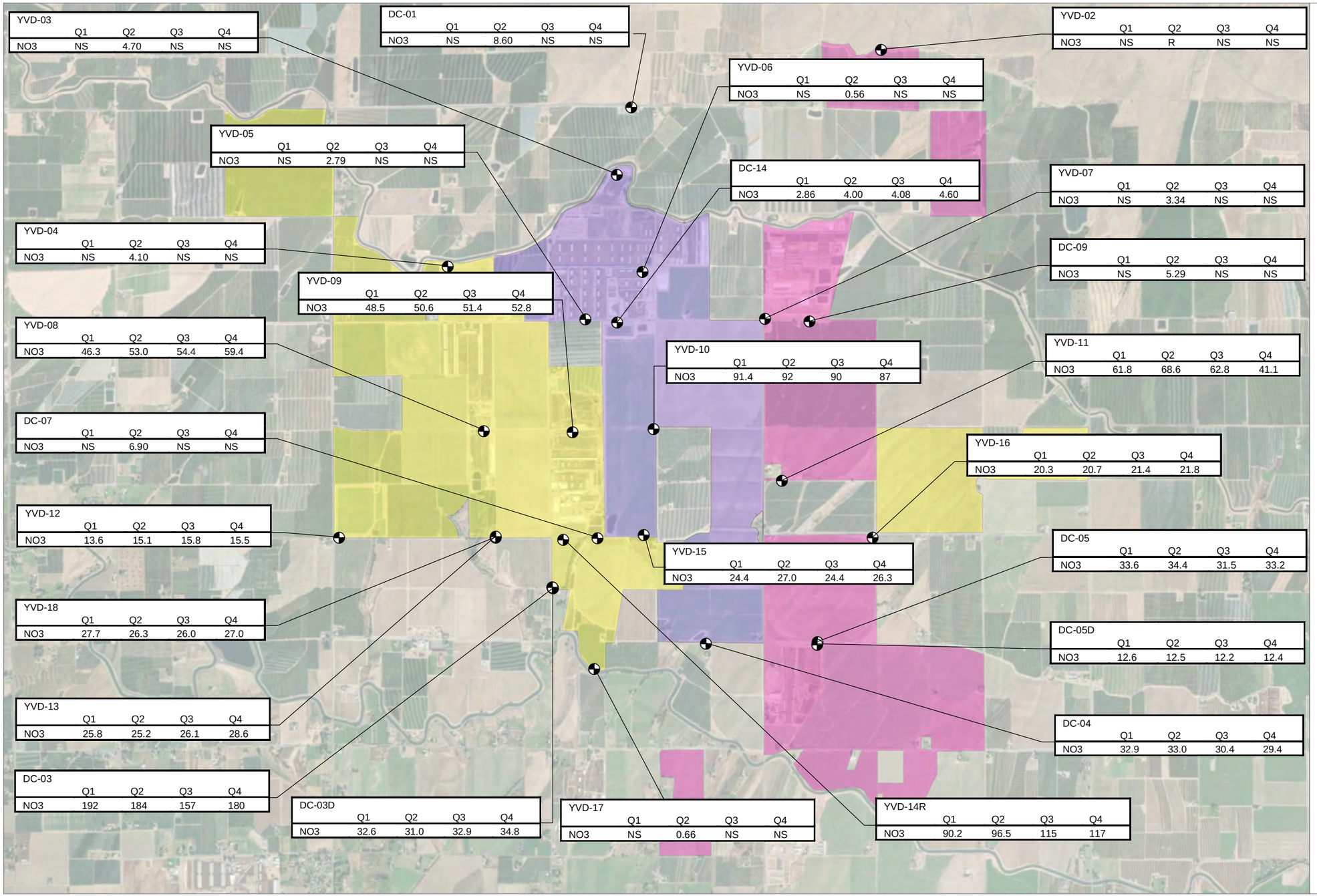
ANCHOR QEA

Figure 6
Conceptual Site Model Flow Chart
2018 Annual Report
Yakima Valley Dairies



LEGEND:

- Monitoring Well
- Cow Palace Dairy
- George DeRuyter & Son/D&A Dairies
- Liberty/H&S Bosma Dairies

NOTES:

1. All concentrations are in milligrams per liter (mg/L).
2. Analytical results are for samples collected quarterly during 2018.
3. NO3 = nitrate as nitrogen
4. Qualifiers and notations:
R: The sample results are rejected as unusable. The compound may or may not be present in the sample.
NS: Not sampled.
5. Aerial Photo Source: Esri Online Services (2018).

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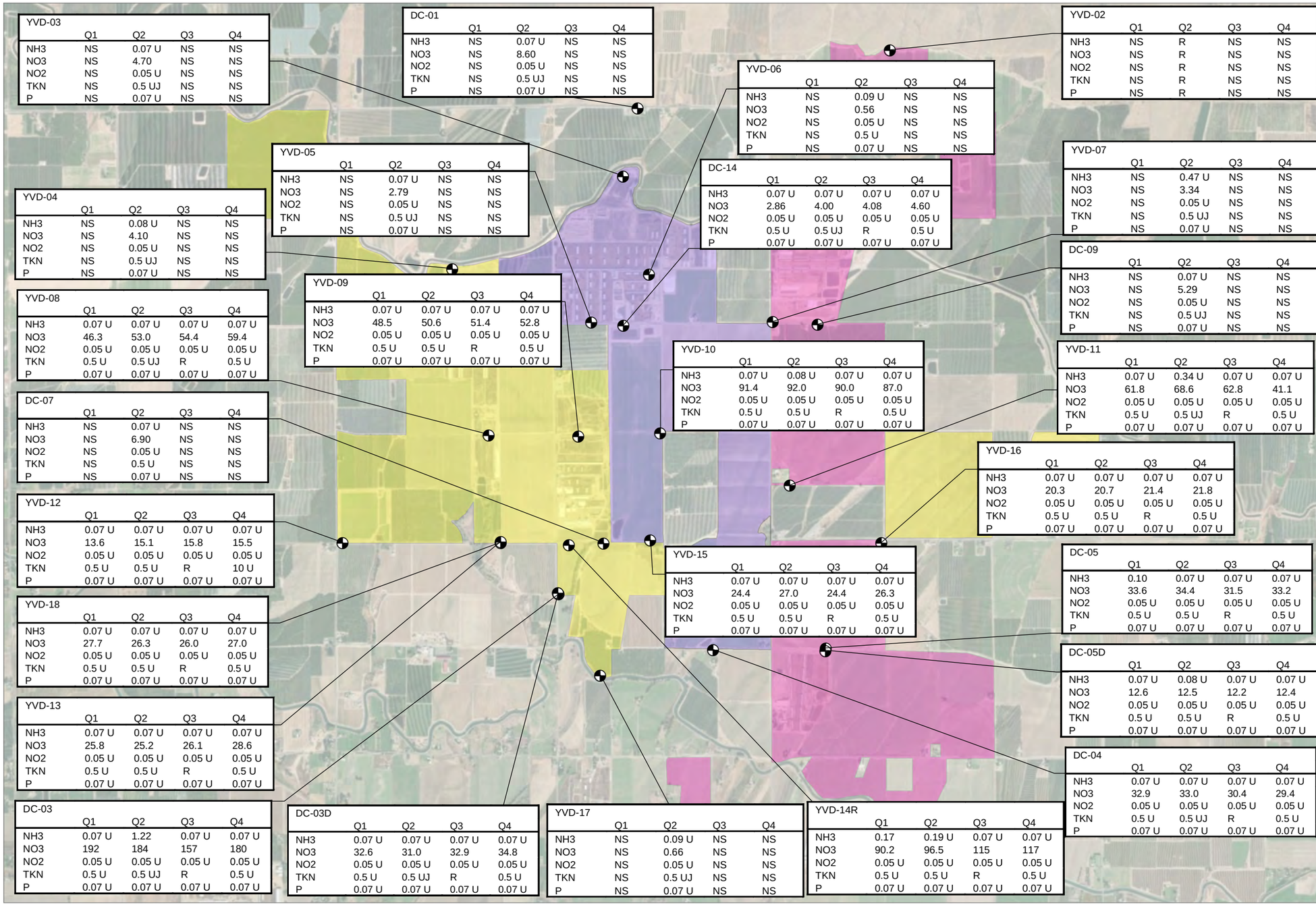
ANCHOR QEA

Figure 7
2018 Groundwater Nitrate Concentrations
2018 Annual Report
Yakima Valley Dairies



YVD-03

	Q1	Q2	Q3	Q4
NH3	NS	0.07 U	NS	NS
NO3	NS	4.70	NS	NS
NO2	NS	0.05 U	NS	NS
TKN	NS	0.5 UJ	NS	NS
P	NS	0.07 U	NS	NS

DC-01

	Q1	Q2	Q3	Q4
NH3	NS	0.07 U	NS	NS
NO3	NS	8.60	NS	NS
NO2	NS	0.05 U	NS	NS
TKN	NS	0.5 UJ	NS	NS
P	NS	0.07 U	NS	NS

YVD-02

	Q1	Q2	Q3	Q4
NH3	NS	R	NS	NS
NO3	NS	R	NS	NS
NO2	NS	R	NS	NS
TKN	NS	R	NS	NS
P	NS	R	NS	NS

YVD-06

	Q1	Q2	Q3	Q4
NH3	NS	0.09 U	NS	NS
NO3	NS	0.56	NS	NS
NO2	NS	0.05 U	NS	NS
TKN	NS	0.5 U	NS	NS
P	NS	0.07 U	NS	NS

YVD-05

	Q1	Q2	Q3	Q4
NH3	NS	0.07 U	NS	NS
NO3	NS	2.79	NS	NS
NO2	NS	0.05 U	NS	NS
TKN	NS	0.5 UJ	NS	NS
P	NS	0.07 U	NS	NS

DC-14

	Q1	Q2	Q3	Q4
NH3	0.07 U	0.07 U	0.07 U	0.07 U
NO3	2.86	4.00	4.08	4.60
NO2	0.05 U	0.05 U	0.05 U	0.05 U
TKN	0.5 U	0.5 UJ	R	0.5 U
P	0.07 U	0.07 U	0.07 U	0.07 U

YVD-07

	Q1	Q2	Q3	Q4
NH3	NS	0.47 U	NS	NS
NO3	NS	3.34	NS	NS
NO2	NS	0.05 U	NS	NS
TKN	NS	0.5 UJ	NS	NS
P	NS	0.07 U	NS	NS

YVD-04

	Q1	Q2	Q3	Q4
NH3	NS	0.08 U	NS	NS
NO3	NS	4.10	NS	NS
NO2	NS	0.05 U	NS	NS
TKN	NS	0.5 UJ	NS	NS
P	NS	0.07 U	NS	NS

DC-09

	Q1	Q2	Q3	Q4
NH3	NS	0.07 U	NS	NS
NO3	NS	5.29	NS	NS
NO2	NS	0.05 U	NS	NS
TKN	NS	0.5 UJ	NS	NS
P	NS	0.07 U	NS	NS

YVD-09

	Q1	Q2	Q3	Q4
NH3	0.07 U	0.07 U	0.07 U	0.07 U
NO3	48.5	50.6	51.4	52.8
NO2	0.05 U	0.05 U	0.05 U	0.05 U
TKN	0.5 U	0.5 U	R	0.5 U
P	0.07 U	0.07 U	0.07 U	0.07 U

YVD-08

	Q1	Q2	Q3	Q4
NH3	0.07 U	0.07 U	0.07 U	0.07 U
NO3	46.3	53.0	54.4	59.4
NO2	0.05 U	0.05 U	0.05 U	0.05 U
TKN	0.5 U	0.5 UJ	R	0.5 U
P	0.07 U	0.07 U	0.07 U	0.07 U

YVD-10

	Q1	Q2	Q3	Q4
NH3	0.07 U	0.08 U	0.07 U	0.07 U
NO3	91.4	92.0	90.0	87.0
NO2	0.05 U	0.05 U	0.05 U	0.05 U
TKN	0.5 U	0.5 U	R	0.5 U
P	0.07 U	0.07 U	0.07 U	0.07 U

YVD-11

	Q1	Q2	Q3	Q4
NH3	0.07 U	0.34 U	0.07 U	0.07 U
NO3	61.8	68.6	62.8	41.1
NO2	0.05 U	0.05 U	0.05 U	0.05 U
TKN	0.5 U	0.5 UJ	R	0.5 U
P	0.07 U	0.07 U	0.07 U	0.07 U

DC-07

	Q1	Q2	Q3	Q4
NH3	NS	0.07 U	NS	NS
NO3	NS	6.90	NS	NS
NO2	NS	0.05 U	NS	NS
TKN	NS	0.5 U	NS	NS
P	NS	0.07 U	NS	NS

YVD-16

	Q1	Q2	Q3	Q4
NH3	0.07 U	0.07 U	0.07 U	0.07 U
NO3	20.3	20.7	21.4	21.8
NO2	0.05 U	0.05 U	0.05 U	0.05 U
TKN	0.5 U	0.5 U	R	0.5 U
P	0.07 U	0.07 U	0.07 U	0.07 U

YVD-12

	Q1	Q2	Q3	Q4
NH3	0.07 U	0.07 U	0.07 U	0.07 U
NO3	13.6	15.1	15.8	15.5
NO2	0.05 U	0.05 U	0.05 U	0.05 U
TKN	0.5 U	0.5 U	R	10 U
P	0.07 U	0.07 U	0.07 U	0.07 U

YVD-15

	Q1	Q2	Q3	Q4
NH3	0.07 U	0.07 U	0.07 U	0.07 U
NO3	24.4	27.0	24.4	26.3
NO2	0.05 U	0.05 U	0.05 U	0.05 U
TKN	0.5 U	0.5 U	R	0.5 U
P	0.07 U	0.07 U	0.07 U	0.07 U

DC-05

	Q1	Q2	Q3	Q4
NH3	0.10	0.07 U	0.07 U	0.07 U
NO3	33.6	34.4	31.5	33.2
NO2	0.05 U	0.05 U	0.05 U	0.05 U
TKN	0.5 U	0.5 U	R	0.5 U
P	0.07 U	0.07 U	0.07 U	0.07 U

YVD-18

	Q1	Q2	Q3	Q4
NH3	0.07 U	0.07 U	0.07 U	0.07 U
NO3	27.7	26.3	26.0	27.0
NO2	0.05 U	0.05 U	0.05 U	0.05 U
TKN	0.5 U	0.5 U	R	0.5 U
P	0.07 U	0.07 U	0.07 U	0.07 U

DC-05D

	Q1	Q2	Q3	Q4
NH3	0.07 U	0.08 U	0.07 U	0.07 U
NO3	12.6	12.5	12.2	12.4
NO2	0.05 U	0.05 U	0.05 U	0.05 U
TKN	0.5 U	0.5 U	R	0.5 U
P	0.07 U	0.07 U	0.07 U	0.07 U

YVD-13

	Q1	Q2	Q3	Q4
NH3	0.07 U	0.07 U	0.07 U	0.07 U
NO3	25.8	25.2	26.1	28.6
NO2	0.05 U	0.05 U	0.05 U	0.05 U
TKN	0.5 U	0.5 U	R	0.5 U
P	0.07 U	0.07 U	0.07 U	0.07 U

DC-04

	Q1	Q2	Q3	Q4
NH3	0.07 U	0.07 U	0.07 U	0.07 U
NO3	32.9	33.0	30.4	29.4
NO2	0.05 U	0.05 U	0.05 U	0.05 U
TKN	0.5 U	0.5 UJ	R	0.5 U
P	0.07 U	0.07 U	0.07 U	0.07 U

DC-03

	Q1	Q2	Q3	Q4
NH3	0.07 U	1.22	0.07 U	0.07 U
NO3	192	184	157	180
NO2	0.05 U	0.05 U	0.05 U	0.05 U
TKN	0.5 U	0.5 UJ	R	0.5 U
P	0.07 U	0.07 U	0.07 U	0.07 U

DC-03D

	Q1	Q2	Q3	Q4
NH3	0.07 U	0.07 U	0.07 U	0.07 U
NO3	32.6	31.0	32.9	34.8
NO2	0.05 U	0.05 U	0.05 U	0.05 U
TKN	0.5 U	0.5 UJ	R	0.5 U
P	0.07 U	0.07 U	0.07 U	0.07 U

YVD-17

	Q1	Q2	Q3	Q4
NH3	NS	0.09 U	NS	NS
NO3	NS	0.66	NS	NS
NO2	NS	0.05 U	NS	NS
TKN	NS	0.5 UJ	NS	NS
P	NS	0.07 U	NS	NS

YVD-14R

	Q1	Q2	Q3	Q4
NH3	0.17	0.19 U	0.07 U	0.07 U
NO3	90.2	96.5	115	117
NO2	0.05 U	0.05 U	0.05 U	0.05 U
TKN	0.5 U	0.5 U	R	0.5 U
P	0.07 U	0.07 U	0.07 U	0.07 U

LEGEND:

- Monitoring Well
- Cow Palace Dairy
- George DeRuyter & Son/D&A Dairies
- Liberty/H&S Bosma Dairies

NOTES:

1. All concentrations are in milligrams per liter (mg/L).
2. Analytical results are for samples collected quarterly during 2018.
3. Qualifiers and notations:
U: The compound was analyzed for but not detected. The associated value is the compound reporting limit or the compound is considered non-detect at the listed value due to associated blank contamination.
UJ: The compound was not detected above the reported sample reporting limit; however, the reported limit is approximate and may or may not represent the actual limit of quantitation.
R: The sample results are rejected as unusable. The compound may or may not be present in the sample.
NS: Not sampled.
4. NH3 = ammonia as nitrogen
NO3 = nitrate as nitrogen
NO2 = nitrite as nitrogen
TKN = total Kjeldahl nitrogen
P = phosphorus
5. Aerial Photo Source: Esri Online Services (2018).

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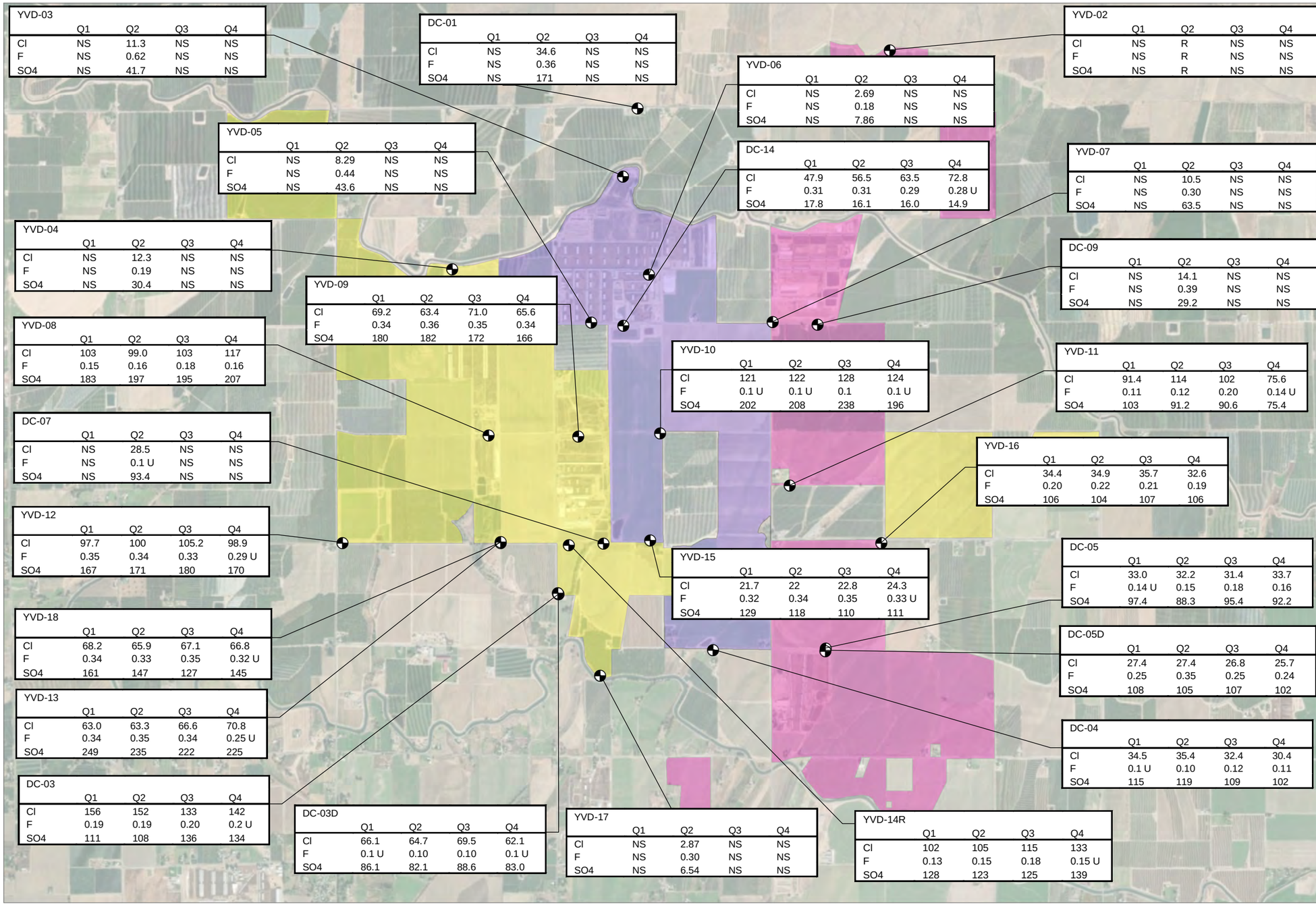
Figure 8
2018 Groundwater Nutrient Concentrations
2018 Annual Report
Yakima Valley Dairies



YVD-03	Q1	Q2	Q3	Q4
Cl	NS	11.3	NS	NS
F	NS	0.62	NS	NS
SO4	NS	41.7	NS	NS

DC-01	Q1	Q2	Q3	Q4
Cl	NS	34.6	NS	NS
F	NS	0.36	NS	NS
SO4	NS	171	NS	NS

YVD-02	Q1	Q2	Q3	Q4
Cl	NS	R	NS	NS
F	NS	R	NS	NS
SO4	NS	R	NS	NS

YVD-06	Q1	Q2	Q3	Q4
Cl	NS	2.69	NS	NS
F	NS	0.18	NS	NS
SO4	NS	7.86	NS	NS

YVD-05	Q1	Q2	Q3	Q4
Cl	NS	8.29	NS	NS
F	NS	0.44	NS	NS
SO4	NS	43.6	NS	NS

DC-14	Q1	Q2	Q3	Q4
Cl	47.9	56.5	63.5	72.8
F	0.31	0.31	0.29	0.28 U
SO4	17.8	16.1	16.0	14.9

YVD-07	Q1	Q2	Q3	Q4
Cl	NS	10.5	NS	NS
F	NS	0.30	NS	NS
SO4	NS	63.5	NS	NS

YVD-04	Q1	Q2	Q3	Q4
Cl	NS	12.3	NS	NS
F	NS	0.19	NS	NS
SO4	NS	30.4	NS	NS

DC-09	Q1	Q2	Q3	Q4
Cl	NS	14.1	NS	NS
F	NS	0.39	NS	NS
SO4	NS	29.2	NS	NS

YVD-09	Q1	Q2	Q3	Q4
Cl	69.2	63.4	71.0	65.6
F	0.34	0.36	0.35	0.34
SO4	180	182	172	166

YVD-08	Q1	Q2	Q3	Q4
Cl	103	99.0	103	117
F	0.15	0.16	0.18	0.16
SO4	183	197	195	207

YVD-10	Q1	Q2	Q3	Q4
Cl	121	122	128	124
F	0.1 U	0.1 U	0.1	0.1 U
SO4	202	208	238	196

YVD-11	Q1	Q2	Q3	Q4
Cl	91.4	114	102	75.6
F	0.11	0.12	0.20	0.14 U
SO4	103	91.2	90.6	75.4

DC-07	Q1	Q2	Q3	Q4
Cl	NS	28.5	NS	NS
F	NS	0.1 U	NS	NS
SO4	NS	93.4	NS	NS

YVD-16	Q1	Q2	Q3	Q4
Cl	34.4	34.9	35.7	32.6
F	0.20	0.22	0.21	0.19
SO4	106	104	107	106

YVD-12	Q1	Q2	Q3	Q4
Cl	97.7	100	105.2	98.9
F	0.35	0.34	0.33	0.29 U
SO4	167	171	180	170

YVD-15	Q1	Q2	Q3	Q4
Cl	21.7	22	22.8	24.3
F	0.32	0.34	0.35	0.33 U
SO4	129	118	110	111

DC-05	Q1	Q2	Q3	Q4
Cl	33.0	32.2	31.4	33.7
F	0.14 U	0.15	0.18	0.16
SO4	97.4	88.3	95.4	92.2

YVD-18	Q1	Q2	Q3	Q4
Cl	68.2	65.9	67.1	66.8
F	0.34	0.33	0.35	0.32 U
SO4	161	147	127	145

DC-05D	Q1	Q2	Q3	Q4
Cl	27.4	27.4	26.8	25.7
F	0.25	0.35	0.25	0.24
SO4	108	105	107	102

YVD-13	Q1	Q2	Q3	Q4
Cl	63.0	63.3	66.6	70.8
F	0.34	0.35	0.34	0.25 U
SO4	249	235	222	225

DC-04	Q1	Q2	Q3	Q4
Cl	34.5	35.4	32.4	30.4
F	0.1 U	0.10	0.12	0.11
SO4	115	119	109	102

DC-03	Q1	Q2	Q3	Q4
Cl	156	152	133	142
F	0.19	0.19	0.20	0.2 U
SO4	111	108	136	134

DC-03D	Q1	Q2	Q3	Q4
Cl	66.1	64.7	69.5	62.1
F	0.1 U	0.10	0.10	0.1 U
SO4	86.1	82.1	88.6	83.0

YVD-17	Q1	Q2	Q3	Q4
Cl	NS	2.87	NS	NS
F	NS	0.30	NS	NS
SO4	NS	6.54	NS	NS

YVD-14R	Q1	Q2	Q3	Q4
Cl	102	105	115	133
F	0.13	0.15	0.18	0.15 U
SO4	128	123	125	139

LEGEND:

- Monitoring Well
- Cow Palace Dairy
- George DeRuyter & Son/D&A Dairies
- Liberty/H&S Bosma Dairies

NOTES:

1. All concentrations are in milligrams per liter (mg/L).
2. Analytical results are for samples collected quarterly during 2018.
3. Qualifiers and notations:
U: The compound was analyzed for but not detected. The associated value is the compound reporting limit or the compound is considered non-detect at the listed value due to associated blank contamination.
R: The sample results are rejected as unusable. The compound may or may not be present in the sample.
NS: Not sampled.
4. Cl = chloride
F = fluoride
SO4 = sulfate
5. Aerial Photo Source: Esri Online Services (2018).

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Feet

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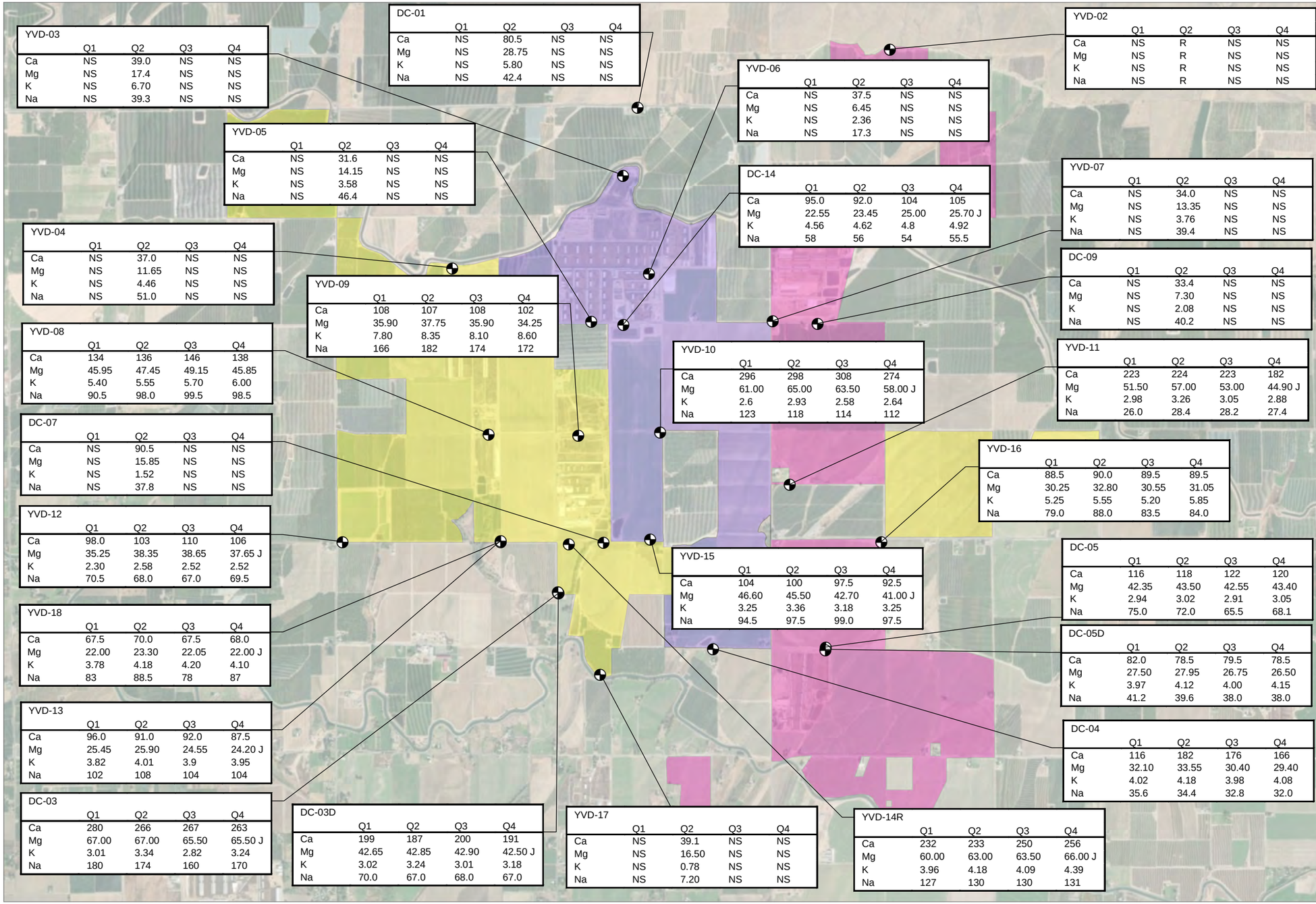
Figure 9
2018 Groundwater Anion Concentrations
2018 Annual Report
Yakima Valley Dairies



DC-01

	Q1	Q2	Q3	Q4
Ca	NS	80.5	NS	NS
Mg	NS	28.75	NS	NS
K	NS	5.80	NS	NS
Na	NS	42.4	NS	NS

YVD-03

	Q1	Q2	Q3	Q4
Ca	NS	39.0	NS	NS
Mg	NS	17.4	NS	NS
K	NS	6.70	NS	NS
Na	NS	39.3	NS	NS

YVD-05

	Q1	Q2	Q3	Q4
Ca	NS	31.6	NS	NS
Mg	NS	14.15	NS	NS
K	NS	3.58	NS	NS
Na	NS	46.4	NS	NS

YVD-04

	Q1	Q2	Q3	Q4
Ca	NS	37.0	NS	NS
Mg	NS	11.65	NS	NS
K	NS	4.46	NS	NS
Na	NS	51.0	NS	NS

YVD-09

	Q1	Q2	Q3	Q4
Ca	108	107	108	102
Mg	35.90	37.75	35.90	34.25
K	7.80	8.35	8.10	8.60
Na	166	182	174	172

YVD-08

	Q1	Q2	Q3	Q4
Ca	134	136	146	138
Mg	45.95	47.45	49.15	45.85
K	5.40	5.55	5.70	6.00
Na	90.5	98.0	99.5	98.5

DC-07

	Q1	Q2	Q3	Q4
Ca	NS	90.5	NS	NS
Mg	NS	15.85	NS	NS
K	NS	1.52	NS	NS
Na	NS	37.8	NS	NS

YVD-12

	Q1	Q2	Q3	Q4
Ca	98.0	103	110	106
Mg	35.25	38.35	38.65	37.65 J
K	2.30	2.58	2.52	2.52
Na	70.5	68.0	67.0	69.5

YVD-18

	Q1	Q2	Q3	Q4
Ca	67.5	70.0	67.5	68.0
Mg	22.00	23.30	22.05	22.00 J
K	3.78	4.18	4.20	4.10
Na	83	88.5	78	87

YVD-13

	Q1	Q2	Q3	Q4
Ca	96.0	91.0	92.0	87.5
Mg	25.45	25.90	24.55	24.20 J
K	3.82	4.01	3.9	3.95
Na	102	108	104	104

DC-03

	Q1	Q2	Q3	Q4
Ca	280	266	267	263
Mg	67.00	67.00	65.50	65.50 J
K	3.01	3.34	2.82	3.24
Na	180	174	160	170

DC-03D

	Q1	Q2	Q3	Q4
Ca	199	187	200	191
Mg	42.65	42.85	42.90	42.50 J
K	3.02	3.24	3.01	3.18
Na	70.0	67.0	68.0	67.0

YVD-17

	Q1	Q2	Q3	Q4
Ca	NS	39.1	NS	NS
Mg	NS	16.50	NS	NS
K	NS	0.78	NS	NS
Na	NS	7.20	NS	NS

YVD-14R

	Q1	Q2	Q3	Q4
Ca	232	233	250	256
Mg	60.00	63.00	63.50	66.00 J
K	3.96	4.18	4.09	4.39
Na	127	130	130	131

YVD-06

	Q1	Q2	Q3	Q4
Ca	NS	37.5	NS	NS
Mg	NS	6.45	NS	NS
K	NS	2.36	NS	NS
Na	NS	17.3	NS	NS

DC-14

	Q1	Q2	Q3	Q4
Ca	95.0	92.0	104	105
Mg	22.55	23.45	25.00	25.70 J
K	4.56	4.62	4.8	4.92
Na	58	56	54	55.5

YVD-10

	Q1	Q2	Q3	Q4
Ca	296	298	308	274
Mg	61.00	65.00	63.50	58.00 J
K	2.6	2.93	2.58	2.64
Na	123	118	114	112

YVD-15

	Q1	Q2	Q3	Q4
Ca	104	100	97.5	92.5
Mg	46.60	45.50	42.70	41.00 J
K	3.25	3.36	3.18	3.25
Na	94.5	97.5	99.0	97.5

YVD-02

	Q1	Q2	Q3	Q4
Ca	NS	R	NS	NS
Mg	NS	R	NS	NS
K	NS	R	NS	NS
Na	NS	R	NS	NS

YVD-07

	Q1	Q2	Q3	Q4
Ca	NS	34.0	NS	NS
Mg	NS	13.35	NS	NS
K	NS	3.76	NS	NS
Na	NS	39.4	NS	NS

DC-09

	Q1	Q2	Q3	Q4
Ca	NS	33.4	NS	NS
Mg	NS	7.30	NS	NS
K	NS	2.08	NS	NS
Na	NS	40.2	NS	NS

YVD-11

	Q1	Q2	Q3	Q4
Ca	223	224	223	182
Mg	51.50	57.00	53.00	44.90 J
K	2.98	3.26	3.05	2.88
Na	26.0	28.4	28.2	27.4

YVD-16

	Q1	Q2	Q3	Q4
Ca	88.5	90.0	89.5	89.5
Mg	30.25	32.80	30.55	31.05
K	5.25	5.55	5.20	5.85
Na	79.0	88.0	83.5	84.0

DC-05

	Q1	Q2	Q3	Q4
Ca	116	118	122	120
Mg	42.35	43.50	42.55	43.40
K	2.94	3.02	2.91	3.05
Na	75.0	72.0	65.5	68.1

DC-05D

	Q1	Q2	Q3	Q4
Ca	82.0	78.5	79.5	78.5
Mg	27.50	27.95	26.75	26.50
K	3.97	4.12	4.00	4.15
Na	41.2	39.6	38.0	38.0

DC-04

	Q1	Q2	Q3	Q4
Ca	116	182	176	166
Mg	32.10	33.55	30.40	29.40
K	4.02	4.18	3.98	4.08
Na	35.6	34.4	32.8	32.0

LEGEND:

- Monitoring Well
- Cow Palace Dairy
- George DeRuyter & Son/D&A Dairies
- Liberty/H&S Bosma Dairies

NOTES:

1. All concentrations are in milligrams per liter (mg/L).
2. Analytical results are for samples collected quarterly during 2018.
3. Ca = calcium
Mg = magnesium
K = potassium
Na = sodium
4: J: the compound was positively identified; however, the associated numerical value is an estimated concentration.
R: The sample results are rejected as unusable. The compound may or may not be present in the sample.
NS: Not sampled.
5. Aerial Photo Source: Esri Online Services (2018).

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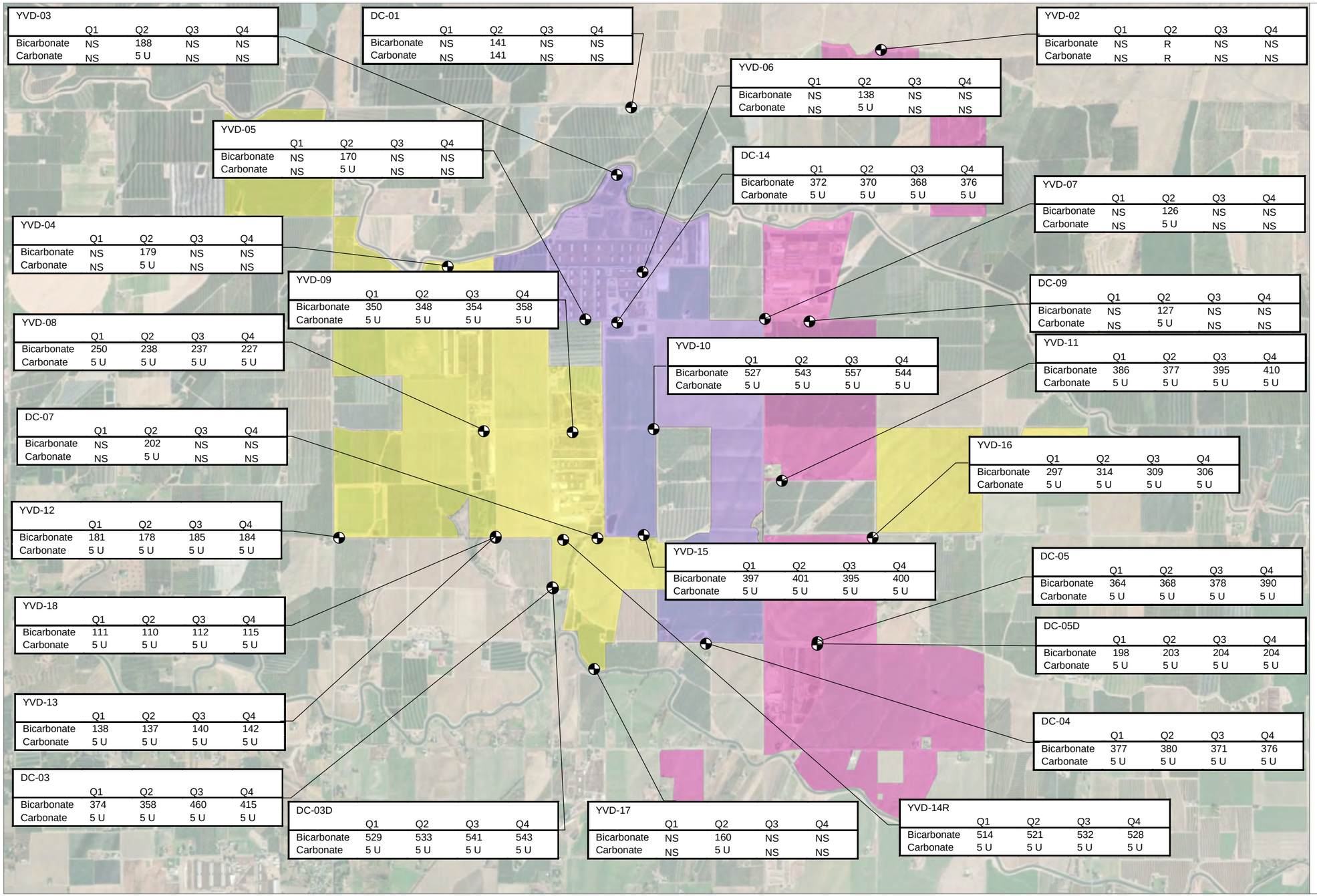
Figure 10
2018 Groundwater Metals Concentrations
2018 Annual Report
Yakima Valley Dairies



LEGEND:

- Monitoring Well
- Cow Palace Dairy
- George DeRuyter & Son/D&A Dairies
- Liberty/H&S Bosma Dairies

NOTES:

1. All concentrations are in milligrams per liter (mg/L).
2. Analytical results are for samples collected quarterly during 2018.
3. Qualifiers and notations:
U: The compound was analyzed for but not detected. The associated value is the compound reporting limit or the compound is considered non-detect at the listed value due to associated blank contamination.
R: The sample results are rejected as unusable. The compound may or may not be present in the sample.
NS: Not sampled.
4. Bicarbonate = bicarbonate as CaCO3
Carbonate = calcium carbonate as CaCO3
5. Aerial Photo Source: Esri Online Services (2018).

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Figure 11
2018 Groundwater Alkalinity Concentrations
2018 Annual Report
Yakima Valley Dairies

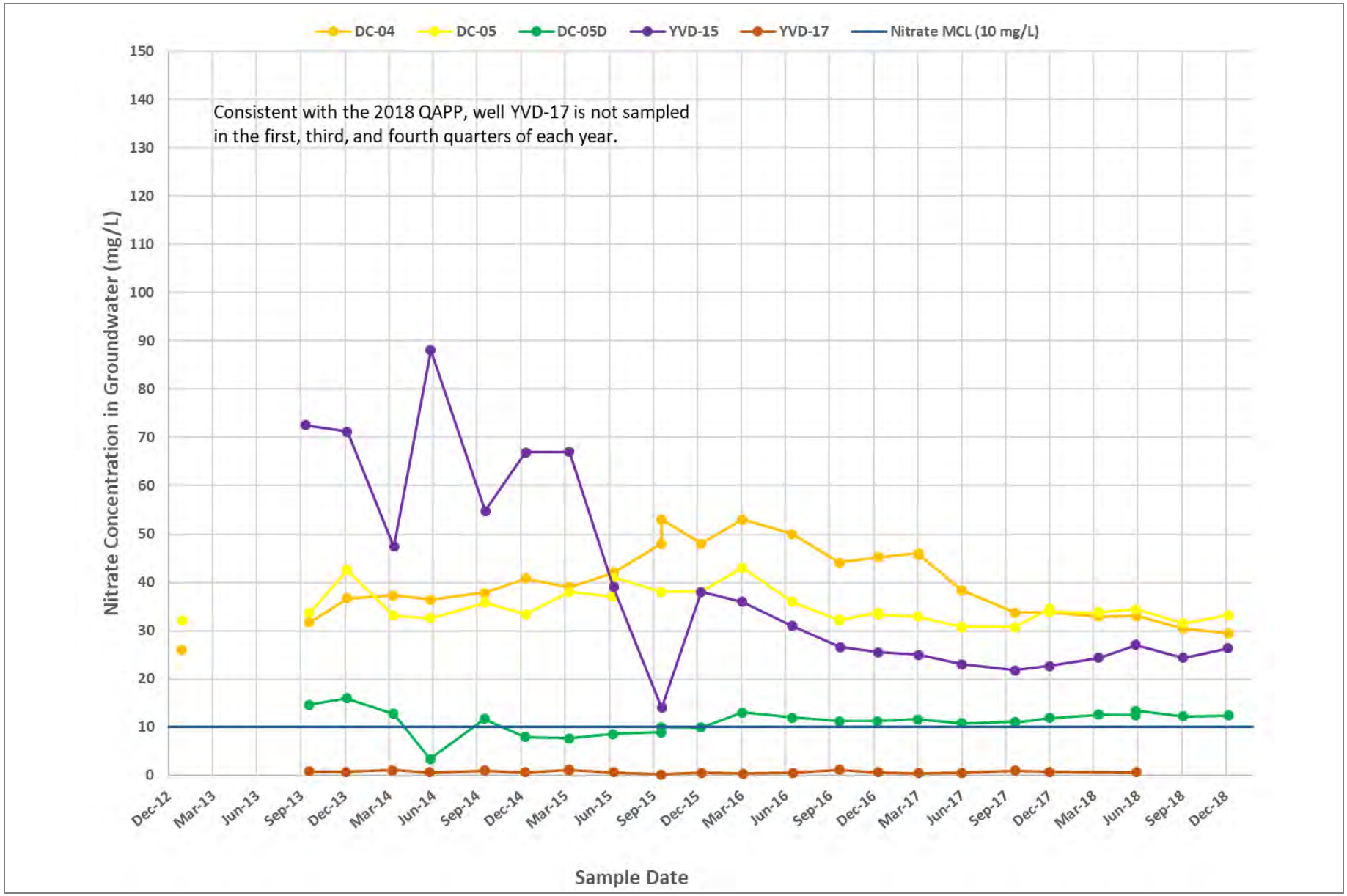

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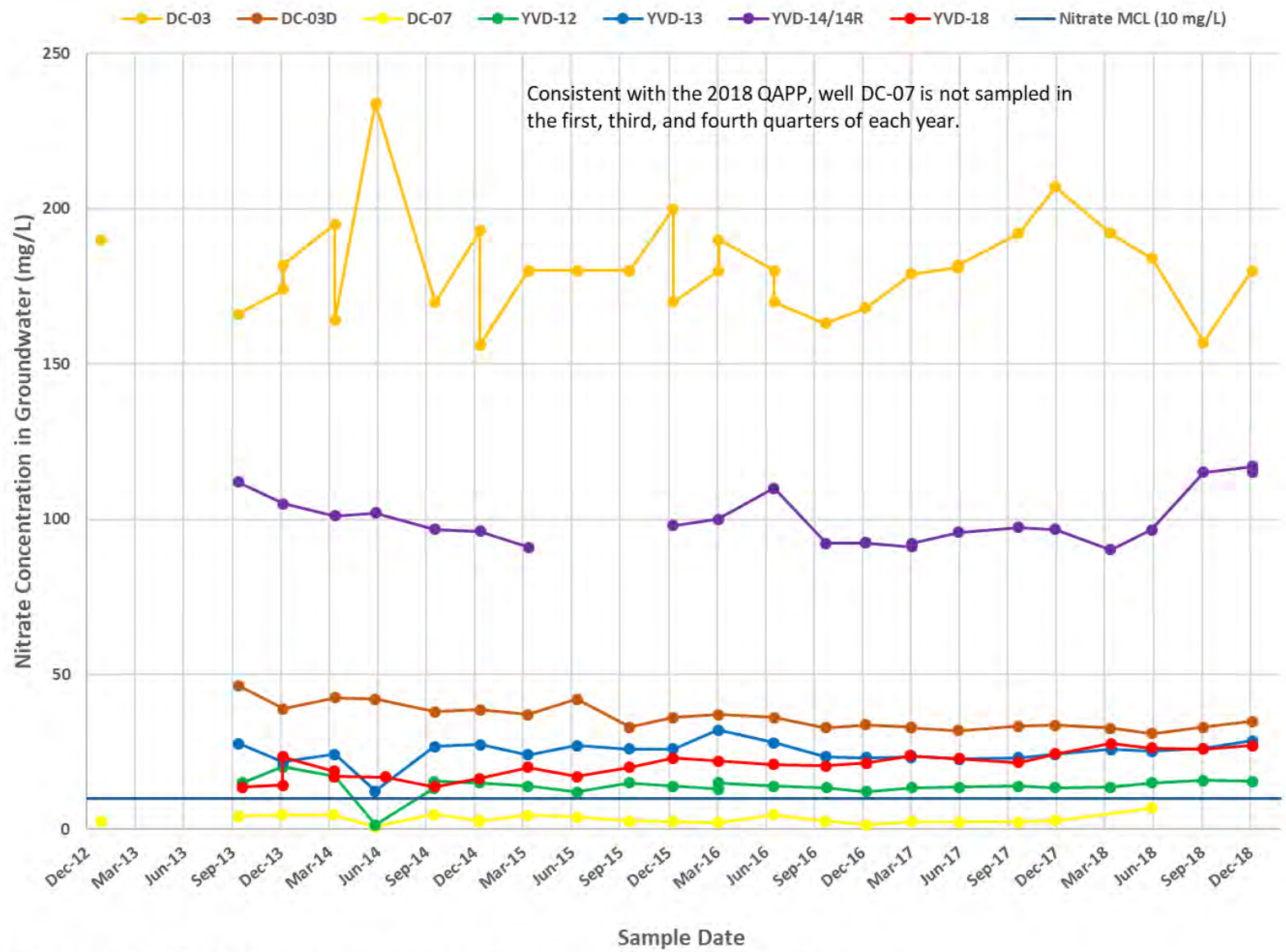
Figure 12

Groundwater Nitrate Concentrations – East Downgradient Monitoring Wells, 2013 to 2018

2018 Annual Report
Yakima Valley Dairies



Note: In December 2015, well YVD-14R was installed approximately 20 feet to the west of well YVD-14, which was decommissioned.

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Figure 13

Groundwater Nitrate Concentrations – West Downgradient Monitoring Wells, 2013 to 2018

2018 Annual Report
Yakima Valley Dairies

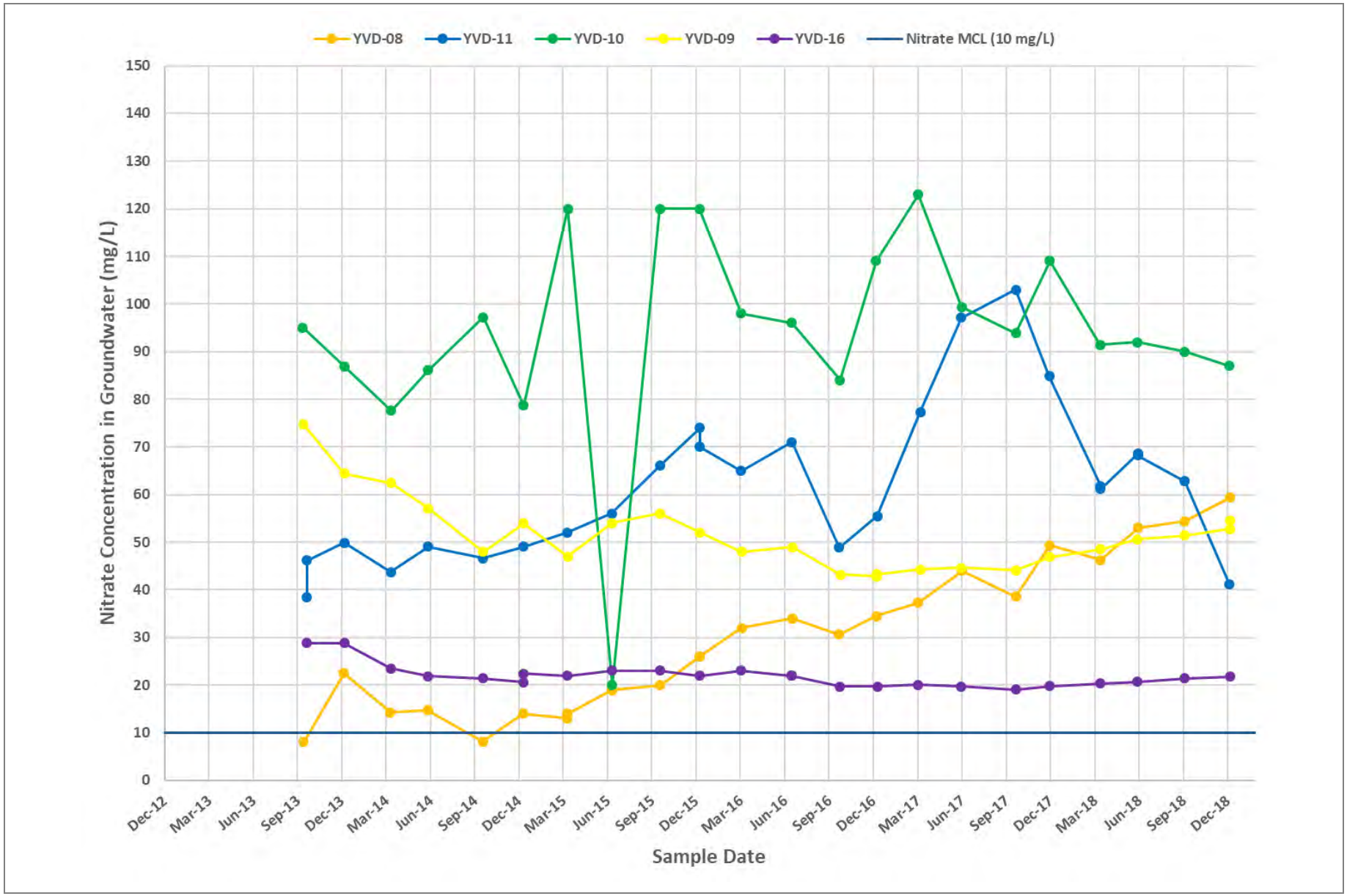

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Figure 14

Groundwater Nitrate Concentrations – Central Monitoring Wells, 2013 to 2018

2018 Annual Report
Yakima Valley Dairies

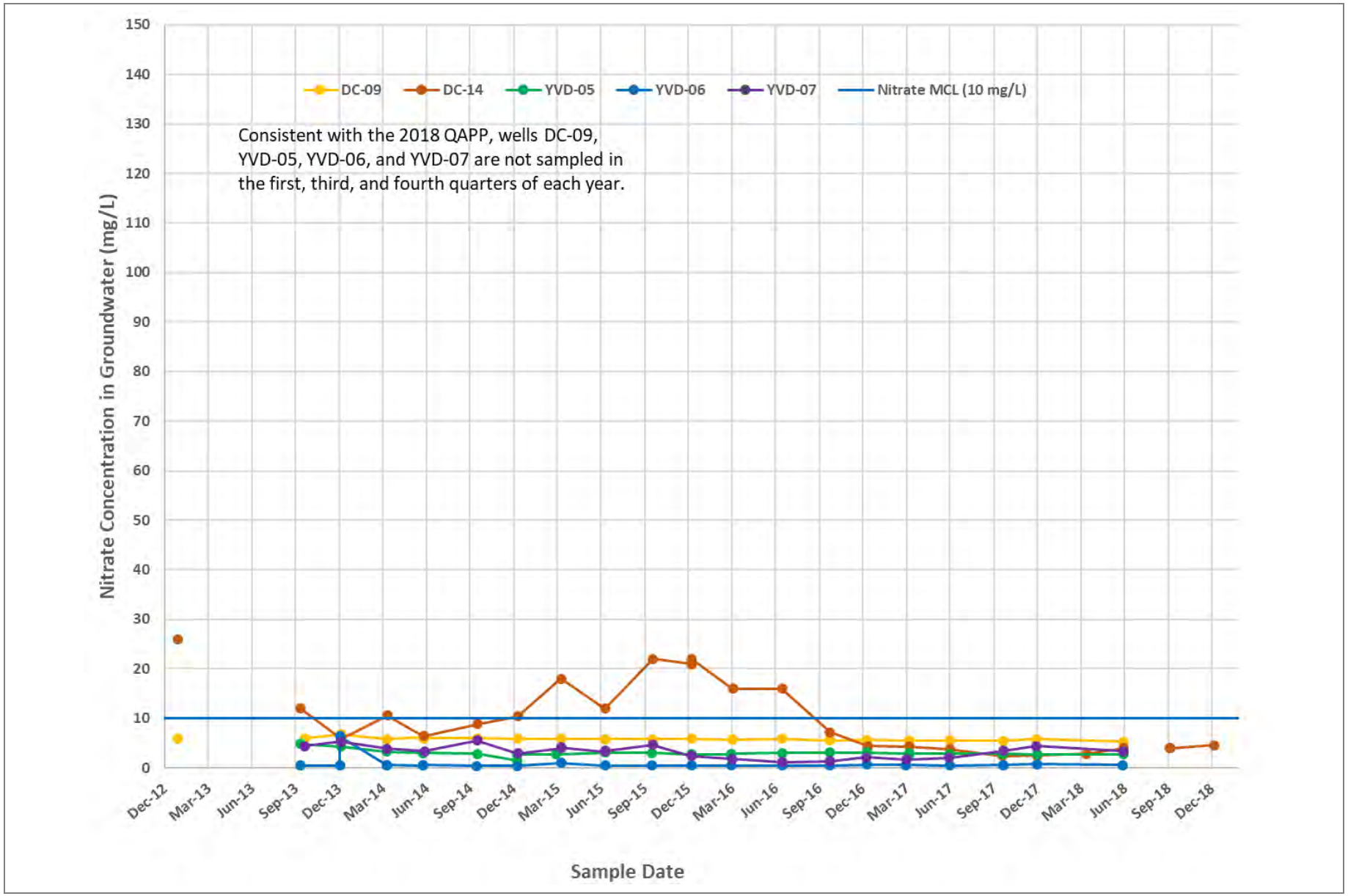

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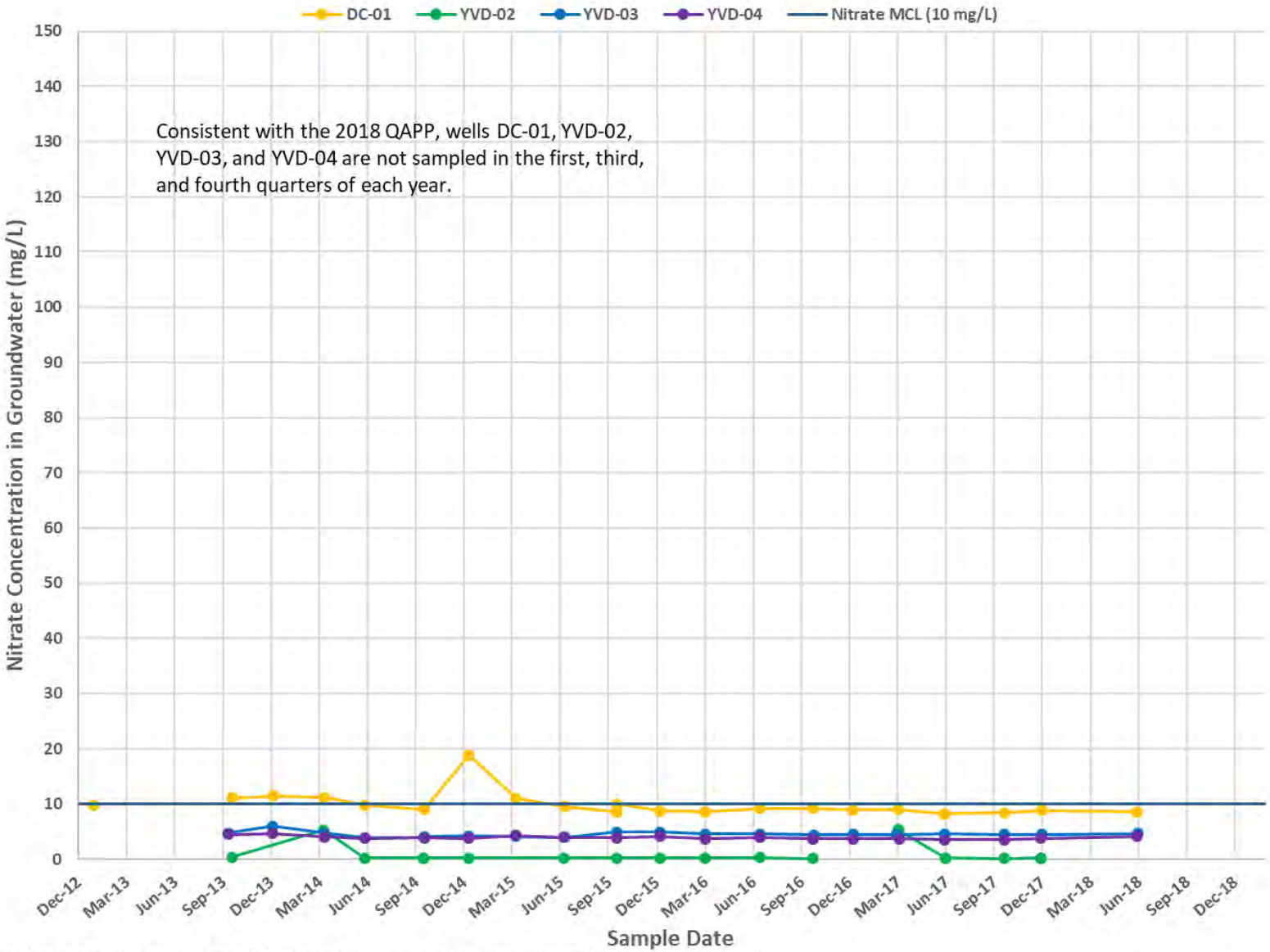
Figure 15

Groundwater Nitrate Concentrations – Northern Monitoring Wells, 2013 to 2018

2018 Annual Report
Yakima Valley Dairies



Note: There was insufficient flow at well YVD-02 to collect a groundwater sample during the Fourth Quarter 2016 event.

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Figure 16

Groundwater Nitrate Concentrations – Upgradient Monitoring Wells, 2013 to 2018

2018 Annual Report
Yakima Valley Dairies

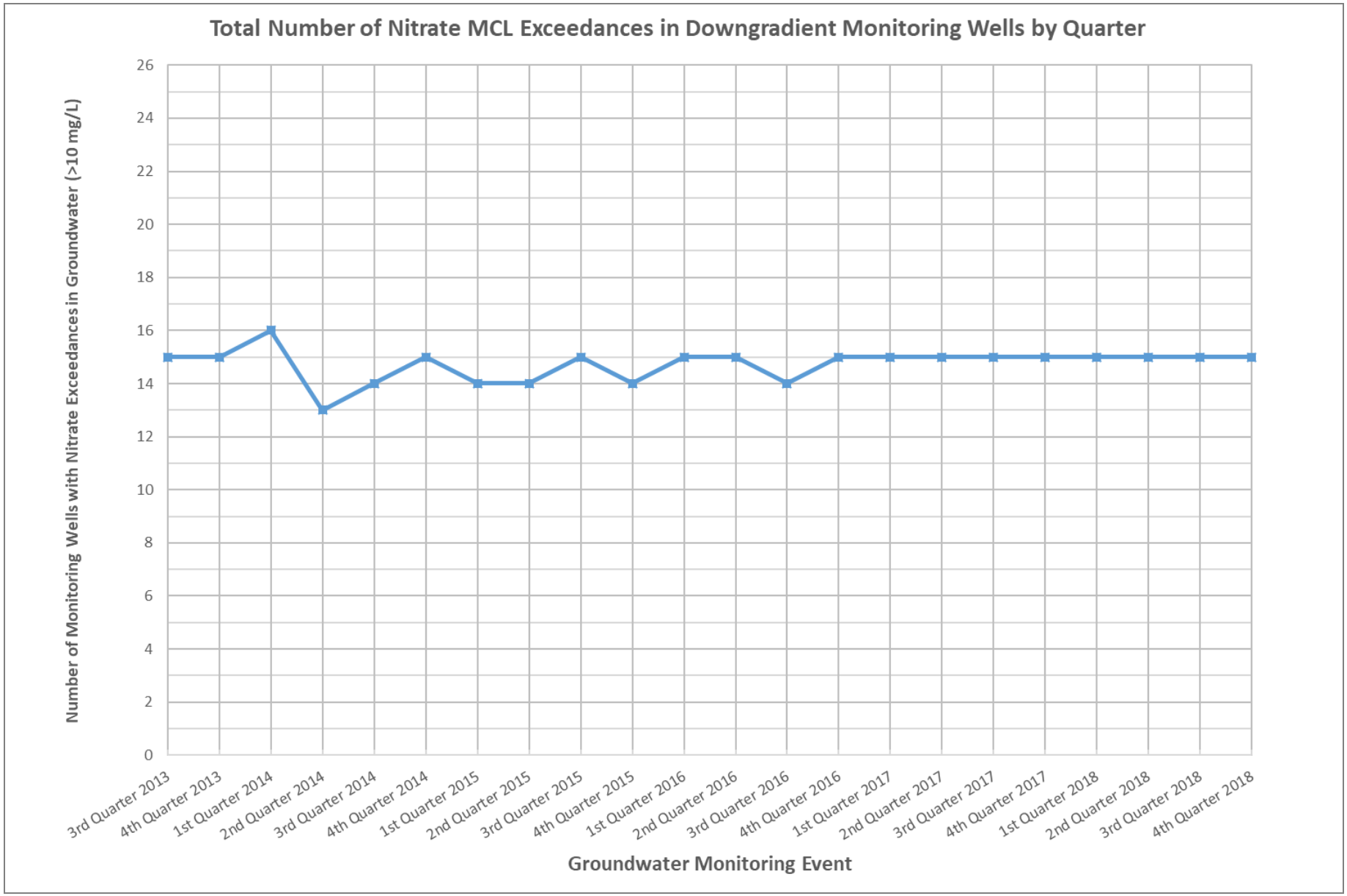

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Figure 17

Groundwater Nitrate MCL Exceedances in Downgradient Monitoring Wells, 2013 to 2018

2018 Annual Report
Yakima Valley Dairies

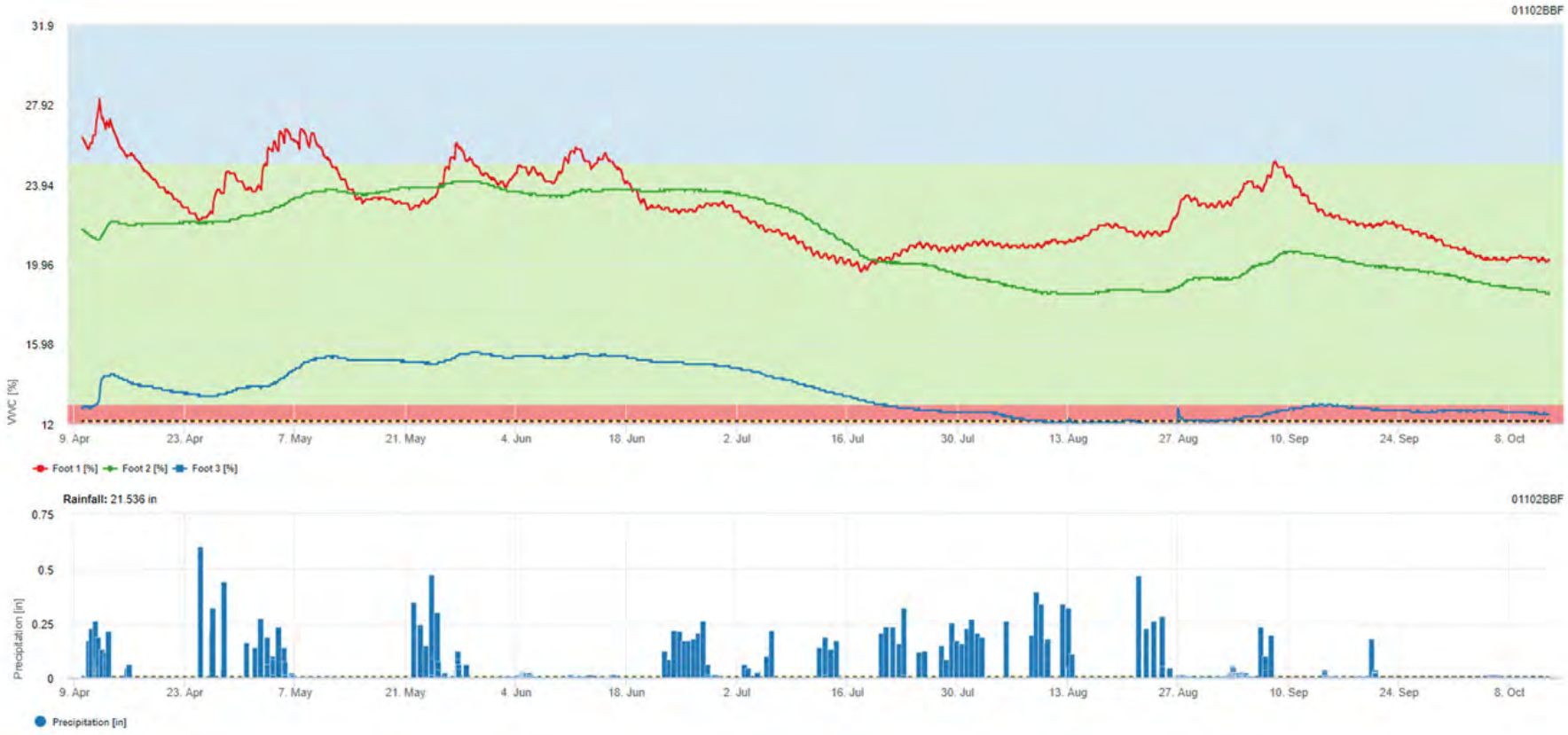

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Figure 18
Moisture Sensor Data – Example
2018 Annual Report
Yakima Valley Dairies

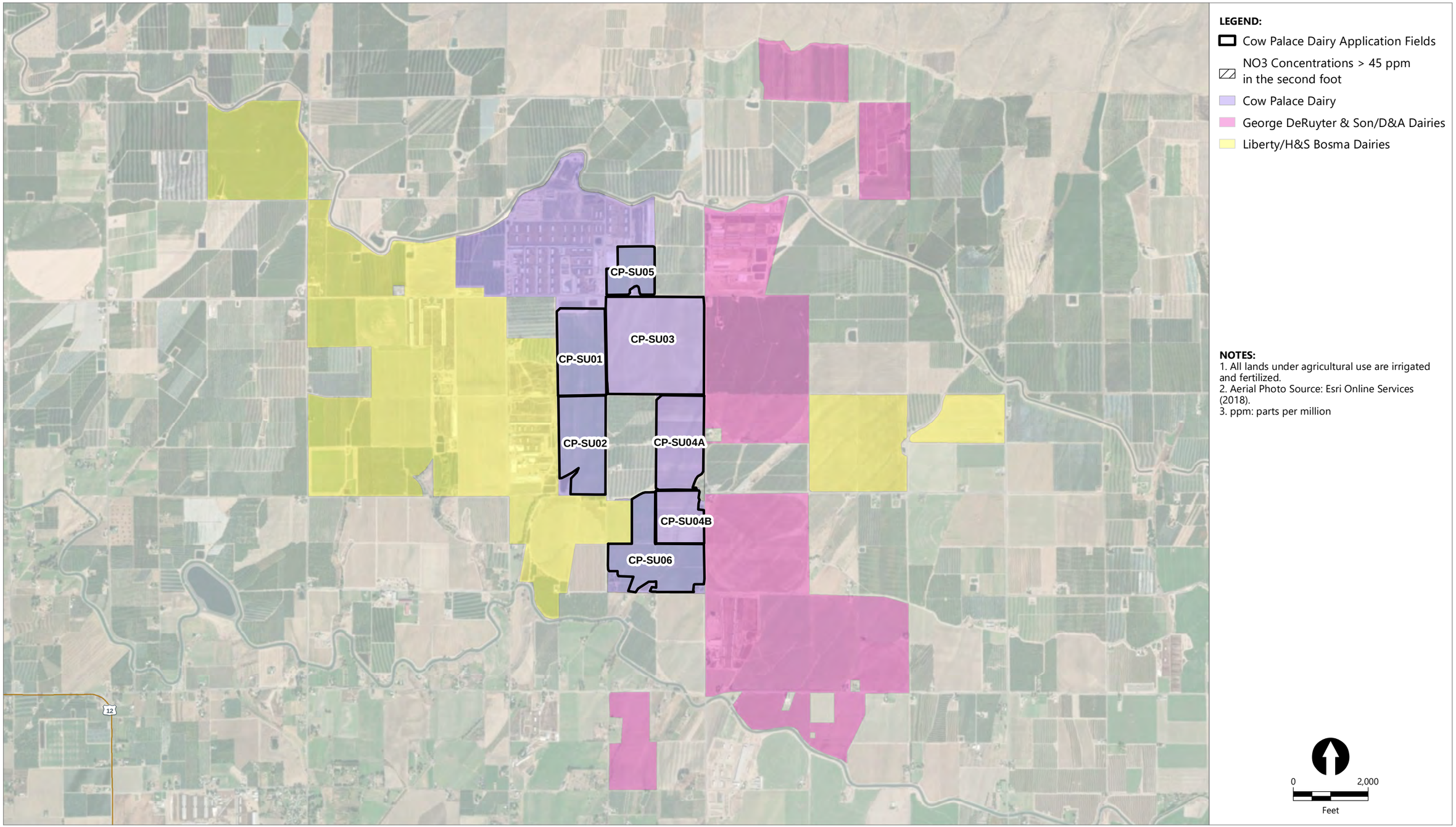

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Figure 19
2018 Cow Palace Dairy Application Field Nitrate Exceedances in the Second Foot
2018 Annual Report
Yakima Valley Dairies

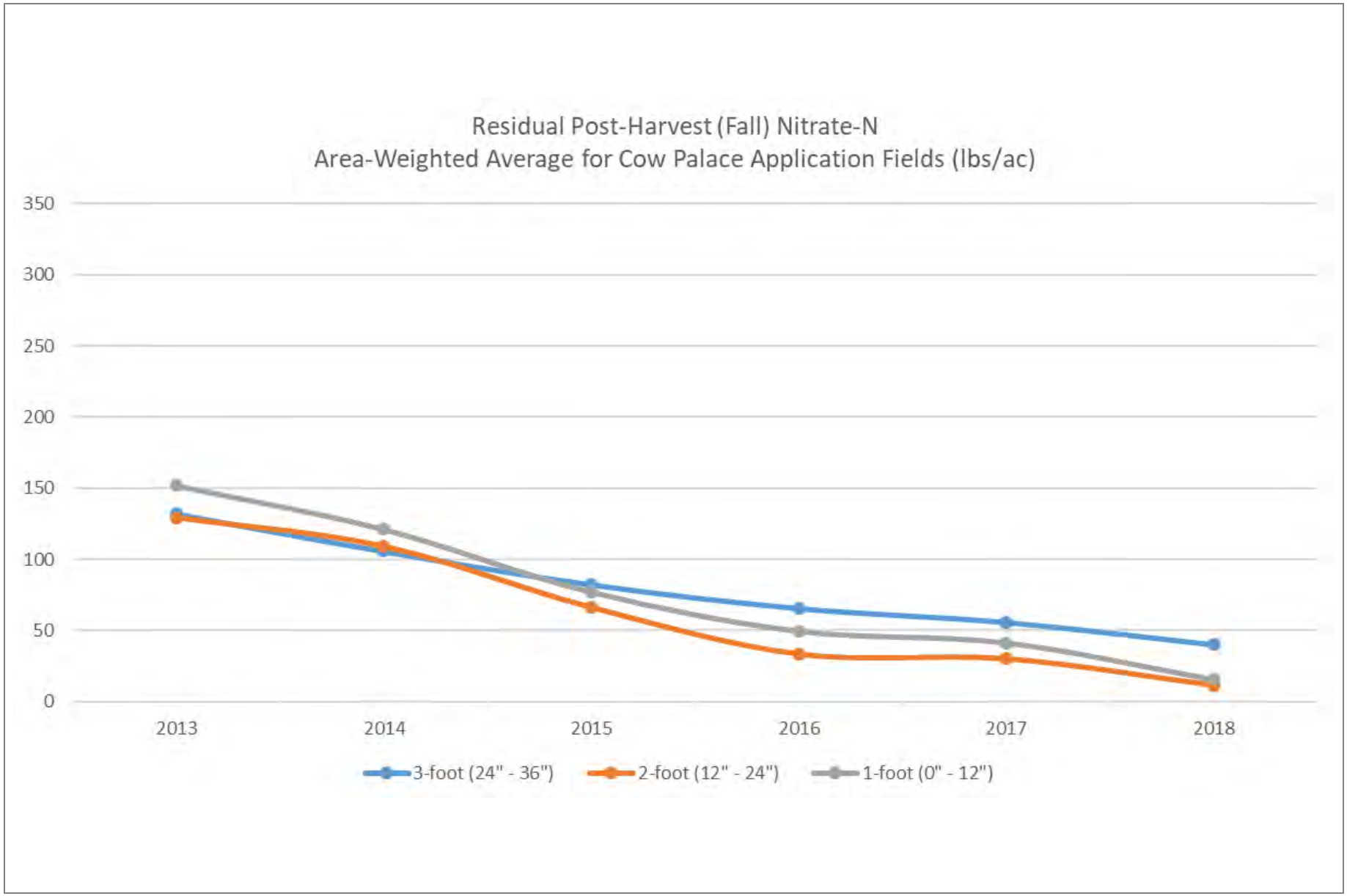

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Figure 20
Trends in Post-Harvest Nitrate Concentrations in Cow Palace Dairy Application Fields Expressed as Area-Weighted Concentrations

2018 Annual Report
Yakima Valley Dairies

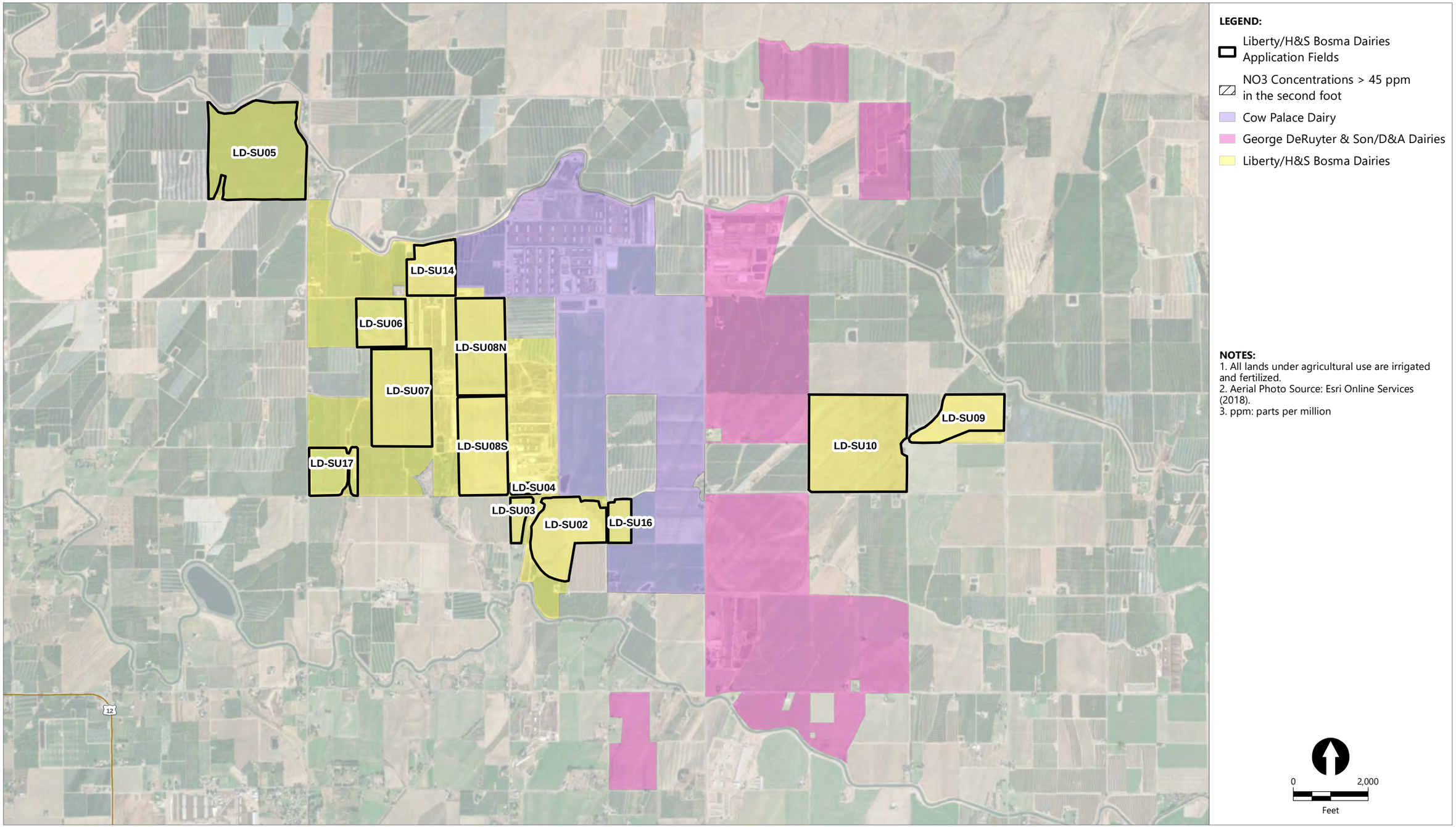

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Figure 21
2018 Liberty/H&S Bosma Dairies Application Field Nitrate Exceedances in the Second Foot
2018 Annual Report
Yakima Valley Dairies

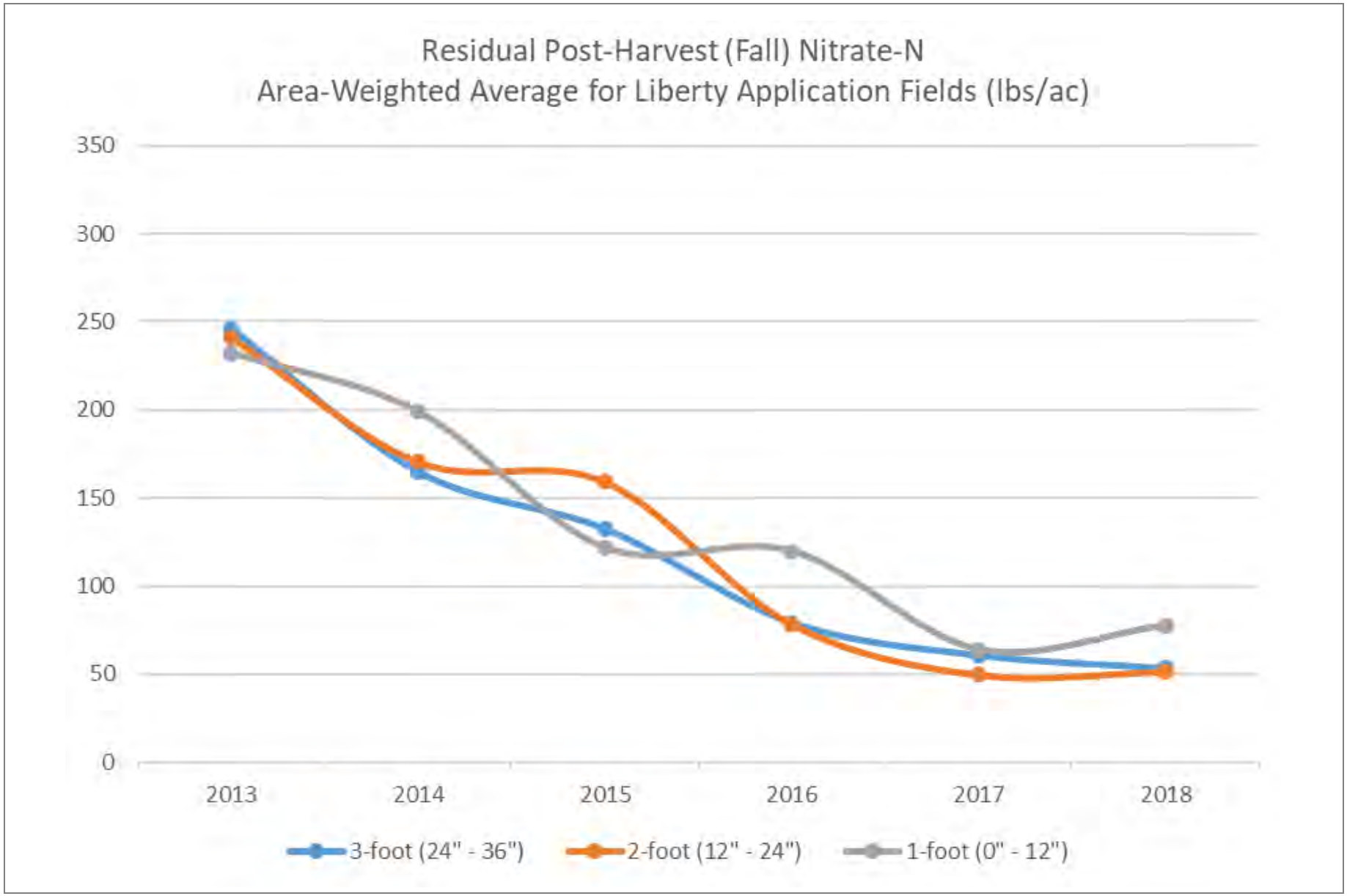

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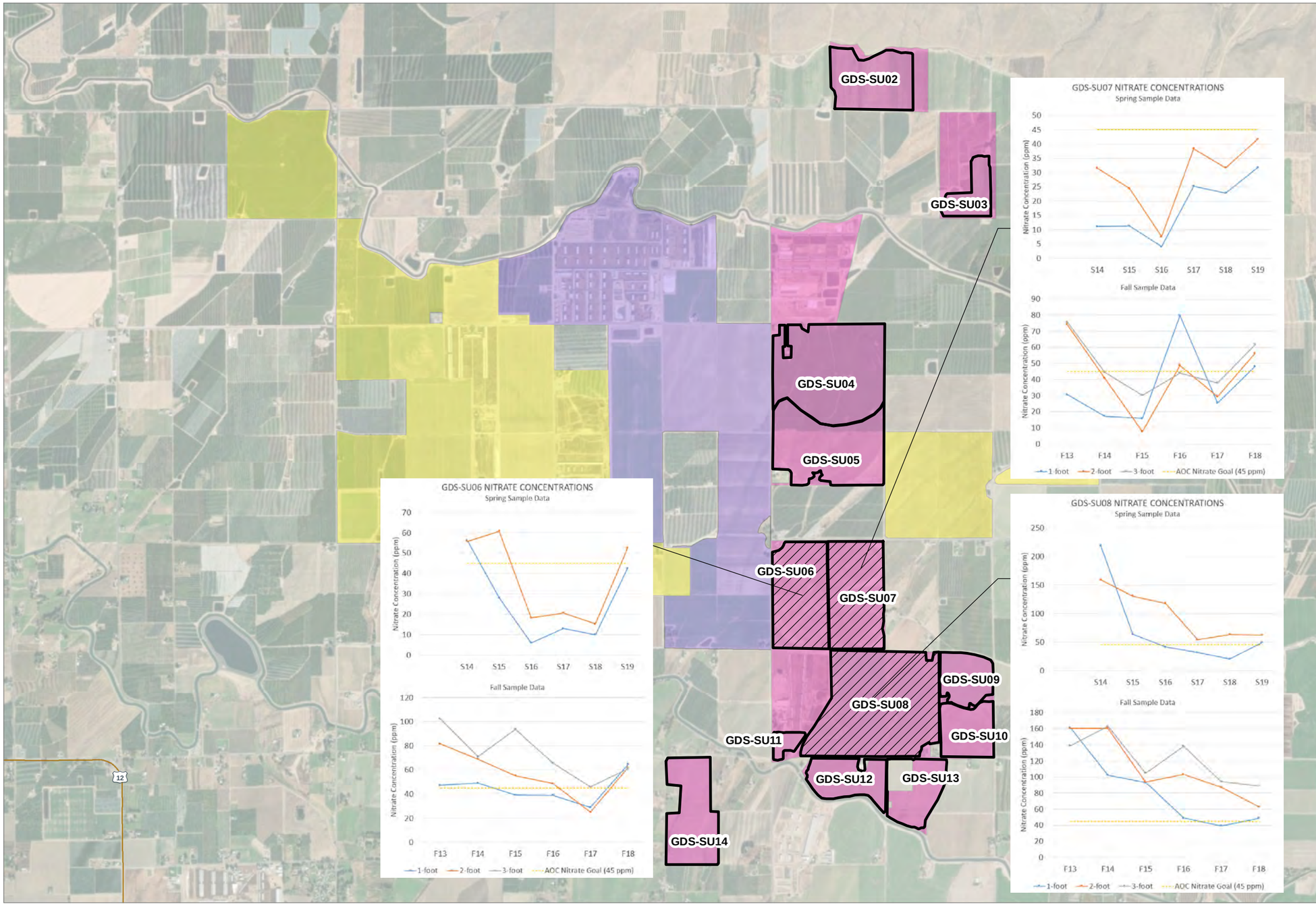
Figure 22

Trends in Post-Harvest Nitrate Concentrations in Liberty/H&S Bosma Dairies Application Fields Expressed as Area-Weighted Concentrations

2018 Annual Report
Yakima Valley Dairies



LEGEND:

- George DeRuyter & Son/D&A Dairies Application Fields
- NO3 Concentrations > 45 ppm in the second foot
- Cow Palace Dairy
- George DeRuyter & Son/D&A Dairies
- Liberty/H&S Bosma Dairies

NOTES:
1. All lands under agricultural use are irrigated and fertilized.
2. Aerial Photo Source: Esri Online Services (2018).
3. ppm: parts per million

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Figure 23
2018 George DeRuyter & Son/D&A Dairies Application Field Nitrate Exceedances in the Second Foot
2018 Annual Report
Yakima Valley Dairies

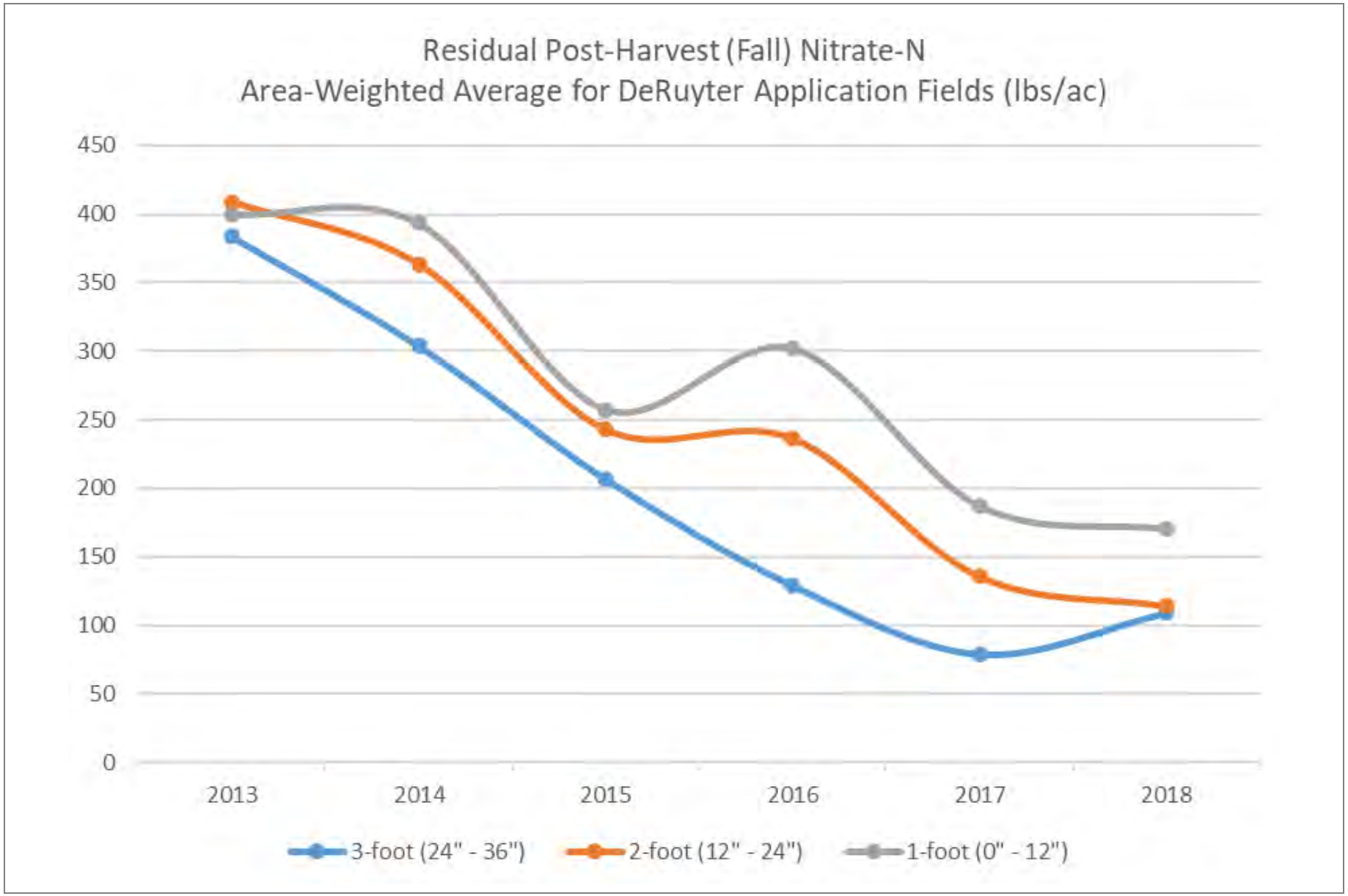

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Figure 24
Trends in Post-Harvest Nitrate Concentrations in George DeRuyter & Son/D&A Dairies Application Fields Expressed as Area-Weighted Concentrations

2018 Annual Report
Yakima Valley Dairies

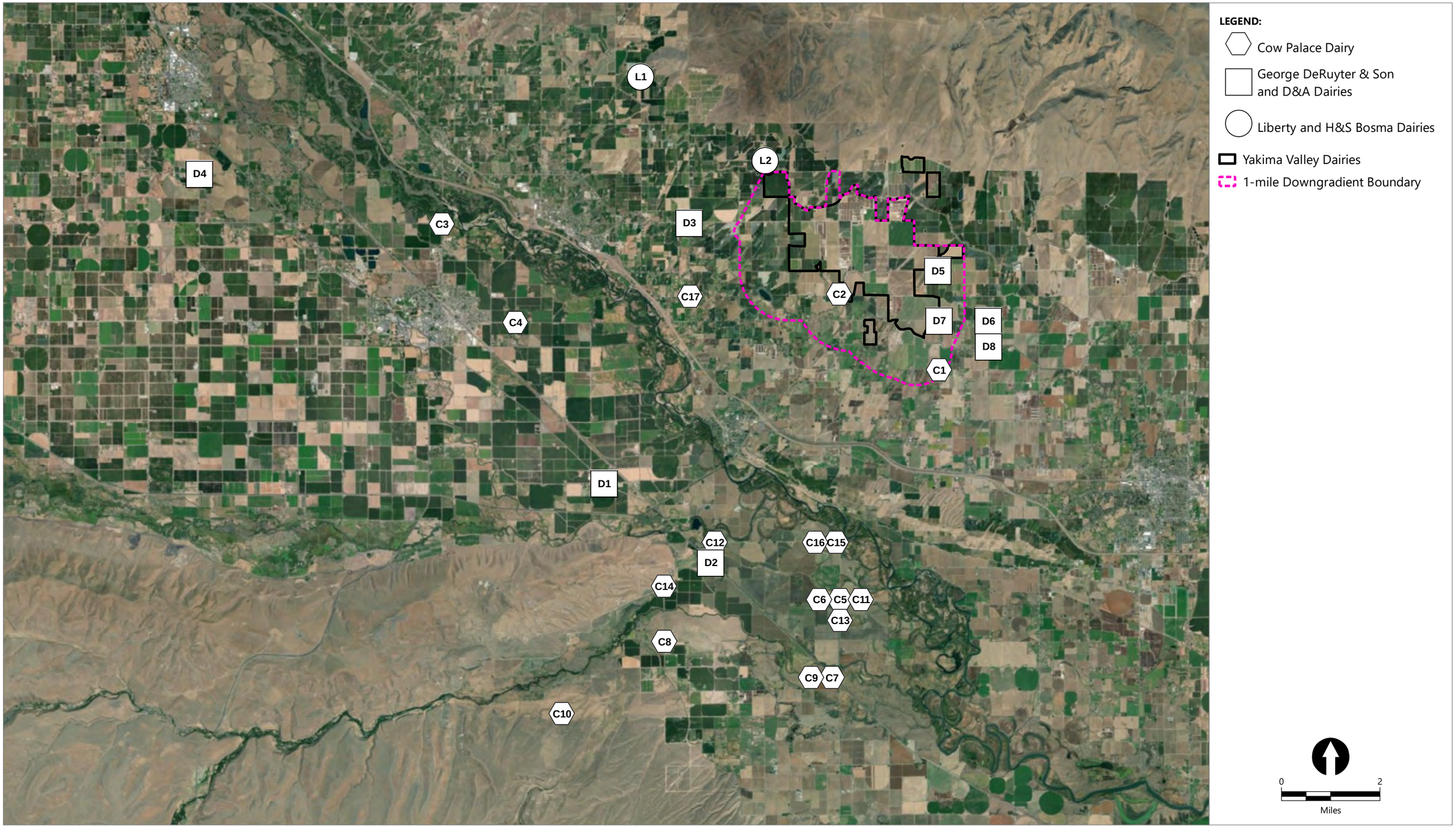

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Figure 25
2018 Off-Site Liquid Manure Transfer Locations
2018 Annual Report
Yakima Valley Dairies

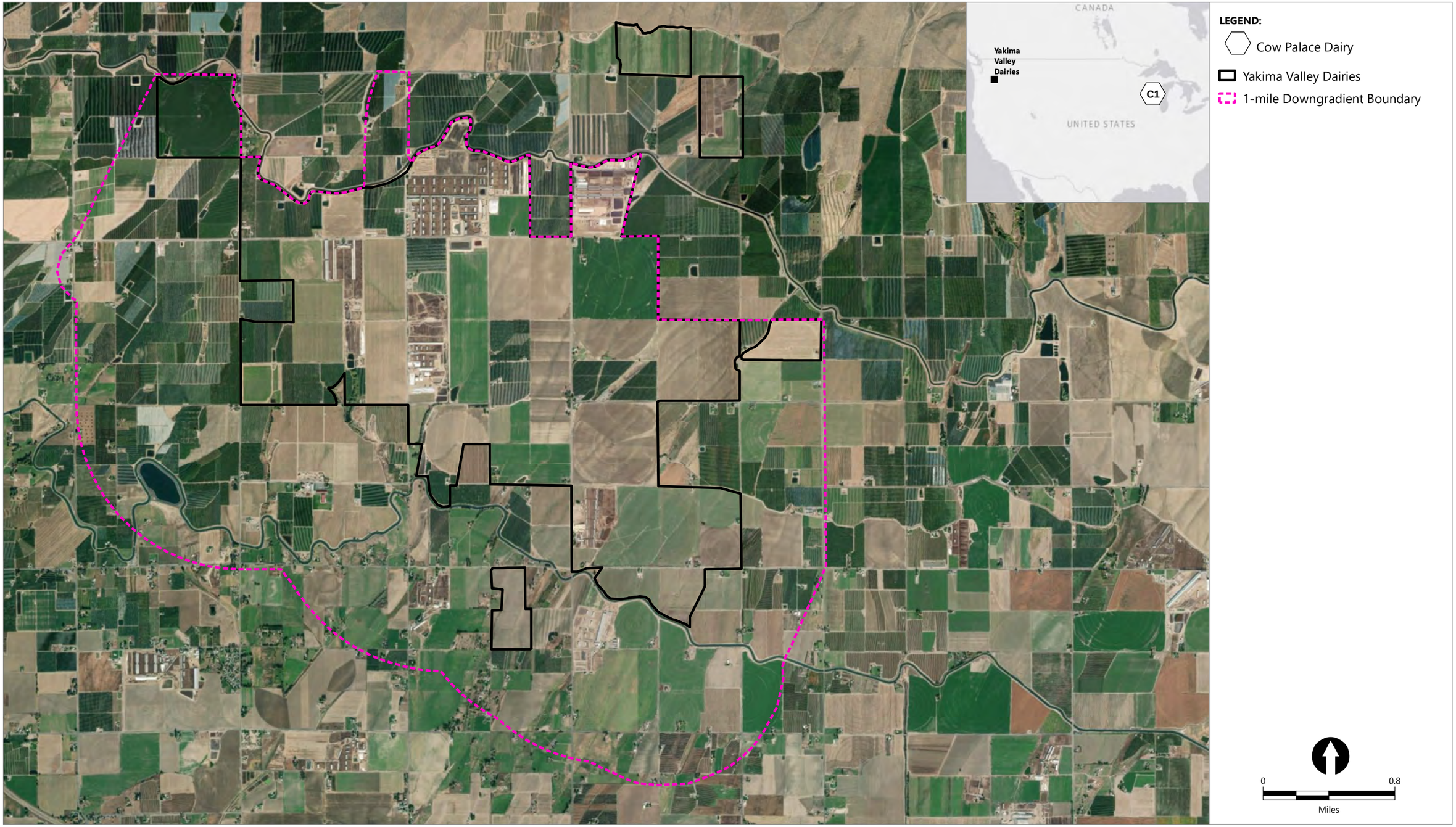

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Figure 26
2018 Off-Site Solid Manure Transfer Locations
2018 Annual Report
Yakima Valley Dairies

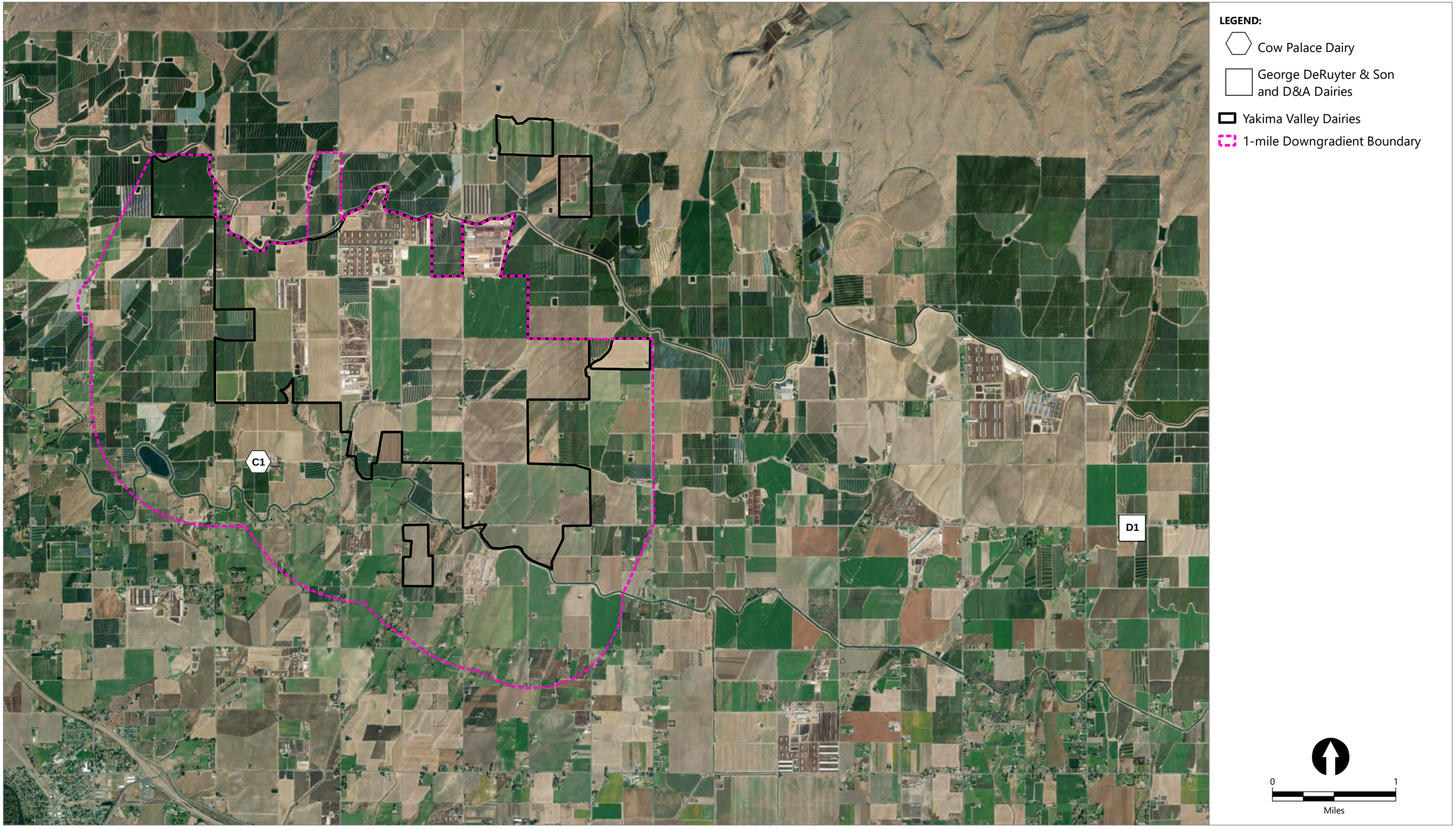

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Figure 27
2018 Off-Site First-Party Compost Sales
2018 Annual Report
Yakima Valley Dairies