



REGIONAL DISTRICT NORTH OKANAGAN

2019 Annual Report: Armstrong Spallumcheen Diversion and Disposal Facility

Ministry of Environment Operational Certificate No. MR 15284

SUBMITTED TO:

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1. INTRODUCTION

The Armstrong/Spallumcheen Diversion and Disposal Facility (ASDDF) is located within the District of Spallumcheen in the Regional District of North Okanagan (RDNO) at 3367 Powerhouse Road, approximately 2.0 km north of the center of the City of Armstrong.

The legal description of the properties on which the ASDDF is situated is Lots 4 and 5, Plan 2997; Lot 6, Plan 1847; Lot A, Plan 17833; Lot B Plan 1825 except Plan 17833; all of Section 4, Township 35; and that part of Lot 6 on Plan B1525, Plan 185; Section 5 Township 35; Kamloops (formerly Osoyoos) Division Yale District. The RDNO also owns adjacent properties: Lot 2, Plan 21202 (1901 Stardel Drive), Lot 3, Plan 21202 (1872 Stardel Drive), and Lot 1, Plan 12928 (3651 Powerhouse Road) which serve as landfill buffer.

The site, owned by the RDNO, is approximately 17.6 hectares including all nine lots and serves the communities of Armstrong, Spallumcheen, Enderby, Splotsin and Okanagan Indian Reserve, and the surrounding Electoral Area (F). The location plan is presented as part of the 2019 Environmental Monitoring Report, Attachment A.

The ASDDF was operated by GFL Environmental Inc. under a contract with the RDNO during 2019. The Scale Attendant and Inspector positions at the ASDDF were filled by RDNO staff.

The ASDDF has a maximum permitted filling rate of 80 cubic meters per day. The works authorized are a sanitary landfill and related appurtenances.

The ASDDF operates under “Summer Hours” from March 1 to November 30, Monday to Friday from 8:00 a.m. to 4:30 p.m. and Saturday and Sunday from 8:30 a.m. to 4:00 p.m., and “Winter Hours” January 1 to February 29 and from December 1 to December 31 Monday to Friday from 8:00 a.m. to 4:00 p.m. and Saturday 9:30 a.m. to 3:30 p.m. The site includes lockable entrance gates, a scale house, one vehicle scale (for both inbound and outbound traffic), and electronic weighing and reporting software (Auto Scale 2000). Customers using the facility, with the exception of customers dropping off OCC only, are required to stop at the scale house and pay the specified disposal fee based on the type and weight of material disposed. All site visitors, suppliers, consultants and contractors are required to check in and out of the site at the scale house to ensure they are familiar with the emergency, health and safety protocols and so that they are all accounted for at the end of the day.

The site has two tipping areas, one for residential self-haulers (transfer station area or Residential Drop Off [RDO] facility) with four lock block bays (40 cubic yard containers) and one for commercial haulers (landfill face). At the landfill face, the ASDDF operator pushes the refuse into small lifts and compacts the material according to RDNO operational requirements. The operator uses a steel wheel loader to push and compact the refuse on a daily basis and covers the waste using large steel plates that can be removed the next day. This conserves air space and cover material. Other daily cover and intermediate cover is a mixture of wood chips and available soil that is dug on site clay or hauled in. The contracted site operator is responsible for site cleanliness, waste transport, filling and compaction, yard waste and wood chipping, ditch cleaning and maintenance, road building and maintenance and snow plowing.

The RDNO Municipal Solid Waste Management Bylaw No. 2832, 2019, establishes fees and sets standards for the use of the ASDDF. A copy of the Bylaw is provided as Attachment B.

2. QUANTITIES DISPOSED AND DIVERTED

The quantity of Municipal Solid Waste (MSW) disposed at the ASDDF in 2019 was 13,018, essentially unchanged from 2018. This includes the small quantity of refuse transferred from the Kingfisher Transfer Station, the Cherryville Transfer Station and the Silver Star Transfer Station. There has been a significant increase in disposed tonnage at the ASDDF since 2015 which can be attributed almost entirely to a change in ownership of a local waste management company. MSW from the Electoral Areas B and C which had previously been disposed at the Greater Vernon Diversion and Disposal Facility (GVRDF) by the previous owner prior to 2015 has been disposed at the ASDDF since 2015.

According to 2016 census data, the population in the service area for the ASDDF (Armstrong, Spallumcheen, Enderby, Splatsin First Nation, parts of Rural Enderby (Electoral Area F), parts of the Okanagan Indian Band lands is estimated at 17,184. The per capita disposal rate in 2019 was 0.76 tonnes, essentially unchanged from 2018. The likely reason for this increase is explained in the previous paragraph. It is difficult to determine the number residents in Electoral Areas B and C whose MSW was disposed at the ASDDF starting in 2015 that has previously been disposed at the GVDDF. The per capita disposal rate in this area had been relatively stable for a number of years. When compared with the 1991 estimated per capita disposal rate of 1.06 tonnes per capita per year, the 2019 per capita disposal of 0.75 tonnes per capita per year represents an improvement, but indicates that there is room for increased waste diversion in the Greater Armstrong area are effective.

The quantity and types of materials diverted from the site or recycled on site are listed in the table below.

Table 1 - Quantities of Material Recycled or Reused from ASDDF in 2019

Material/Product	Quantity	Units
Tires	0	Tonnes
Wood and yard	9,638.88	Tonnes
Styrofoam	13.11 ¹	Tonnes
Metal	735.08	Tonnes
Refrigerated Appliances	663 ²	Units
Mattresses and Box Springs	5887 ³	Units
Propane Tanks	1356	Units

1 – Regional quantity sent to Blue Planet Plastics

2 – Quantity of refrigerated appliances of which Freon was recovered

3 – Regional quantity of mattresses and box springs deconstructed and recyclable material diverted

3. TOPOGRAPHIC MAP

See Attachment C for topographic map.

4. SITE LIFE AND CLOSURE UPDATE

Over the past few years, a number of different aerial and ground surveys of the ASDDF have been undertaken. In the spring of 2019, Aero Geometrics completed an aerial survey of the ASDDF. Aero Geometrics also completed an aerial survey of the ASDDF in the spring of 2018. Based on these two surveys, the airspace consumed between May 12, 2018 and May 8, 2019 was 14,483 m³. The actual airspace consumed by the landfilling of Municipal Solid Waste may vary somewhat from this number as the aerial survey also calculates the volume of other commodities present at the facility at the time the aerial survey is completed. The RDNO plans to undertake another aerial survey of the ASDDF in the spring/summer of 2020.

The most recent evaluation of the remaining site life was completed as part of the 2017 update of the Design, Operations and Closure Plan (DOCP) by GHD Consultants (GHD). This document provided an update to the Operations and Closure Plan prepared by XCG Consultants Ltd. and dated December 20, 2012 (2012 O&C Plan) and is based on recent and planned site developments and remediation activities. In the updated DOCP, GHD re-evaluated the parameters (compaction, cover ratio, etc.) and as of 2018, the facility is estimated to reach design capacity in 2025.

The DOCP update includes early closure of the northern unlined portion of the landfill that will allow the RDNO to maximize the landfill capacity and will reduce the long-term leachate generation in the unlined portion of the landfill.

Adjustments to the fill slopes on the north end of the site (the Phase 1 closure area) were made in the fall of 2019 due to overfilling. These are expected to be completed in 2020 and the closure area is expected to be filled to design elevations by September 2020 so that the Phase 1 Closure can be completed. The project includes a post closure storm water management system that will be connected to the final closure storm water system for the long term post closure period.

5. NEW INFORMATION OR PROPOSED CHANGES

A new leachate evaporation pond adjacent to the existing leachate storage pond is expected to be completed by October 2020. This includes upgraded road access to both ponds and an overflow mechanism from the existing pond to the new pond. When the landfill is closed the existing pond will be converted to a storm water collection pond and the leachate collection pump, piping and irrigation system will be reconfigured for the evaporation pond.

Plans are underway to determine which diversion materials (e.g. concrete, wood, metal) will be diverted from the ASDDF to the GVDDF starting in 2020 in order to allow for the proper and careful filling of the remainder of the site as the filling area narrows over the next five years. This activity must take into consideration public acceptance and need for wood chips for cover and crushed concrete for road and tipping pad building.

The perimeter roads as shown in the DOCP are currently under consideration for realignment due to slope adjustments and need for site drainage. The alignments will be updated in the DOCP five year reviews.

6. WILDLIFE

Birds of many different species frequent the facility, but were not observed to be a hazard in 2019. Bald eagles are intermingled with crows, ravens, sea gulls and other species. The RDNO does not have a bird management plan for this site. No incidents of bears were observed. There were no perceived hazards from wildlife at this site in 2019.

7. PROGRESS IN REDUCING WASTE STREAM

The RDNO Solid Waste Management Plan (SWMP) was updated in 2017-2018, endorsed by the Board of Directors, and submitted to the ENV for approval in June 2018. The SWMP was approved by the ENV in October 2019. The SWMP includes a plan implementation schedule for 5 years from 2018 to 2022 with objectives pertaining to organics diversion and disposal bans, and waste reduction education programs and reuse initiatives. A Plan Monitoring Working Group (PMWG) has been appointed in 2020 and will begin meeting at least once annually. There were no site specific objectives for the ASDDF in the implementation plan for 2019.

7.1 RECYCLING

The following commodities are segregated at the ASDDF and shipped off-site for recycling or are reused on-site:

- Tires: passenger and truck tires with and without rims were accepted near the RDO and recycled under the Provincial Tire Recycling Program.
- Yard and Garden Waste: yard and garden waste was stockpiled and ground by the RDNO's grinding contractor. Ground yard and garden waste was mixed with soil and used for cover.
- Wood Waste: dimensional wood waste (clean and dirty) was stockpiled at the site and ground by RDNO's grinding contractor on a regular basis prior to being used on site for cover, bio-filtration and aesthetics on finished slopes.

- Propane Tanks: various sizes of tanks (1lb to 40lb) were received and stockpiled. The tanks were removed by a contractor for recertification or recycling.
- White Goods and Other Scrap Metals: refrigeration units were decommissioned and refrigerant removed by a qualified contractor under contract before being added to the scrap metal stockpile. Scrap metal was sold to a recycling contractor. The ASDDF is a Major Appliance Recycling Roundtable (MARR) depot.
- Old Corrugated Cardboard (OCC): collected at a location adjacent to the scale house at a Recyclable Materials Drop Center. OCC was transported to a materials recovery facility (MRF) for processing and marketing.
- Glass Jars and Bottles: glass jars and bottles were collected in a small roll off container situated near the Recyclable Materials Drop Centre. This material was added to the crushable material pile, crushed and used onsite for roads and tipping pads.
- Concrete and other Crushable Material: crushable material was stockpiled and crushed for use onsite for roads and tipping pads.
- Styrofoam: waste Styrofoam was accepted from residents and businesses at a nominal charge and transferred to the GVRDF where it was densified using a RecycleTech XT-200. The 'ingots' (blocks of dense Styrofoam) were shipped to market.

8. MONITORING PROGRAM

The Armstrong/Spallumcheen Diversion and Disposal Facility, 2019 Environmental Monitoring Report, April 2020, prepared by Regional District of North Okanagan staff, is provided as Attachment A. The ground and surface water monitoring program is described and monitoring results are provided including the status of sampling points and recommendations for monitoring program improvements, where necessary. The following list provides the recommendations from the 2019 Annual Report.

- a) Continue with the currently established sampling program, and assess trends of exceedances and property boundary conditions.
- b) Evaluate potential trends in 2020 for Boron, Cadmium, Chloride, Conductivity, Magnesium, Manganese, Nitrate, Selenium, Sodium, Sulphate, TDS, and Uranium.
- c) Assess and report on the leachate migration mitigation measures undertaken to manage and control the leachate plumes around the ASDDF.

9. LEACHATE MANAGEMENT

As decided in 2016 a combination of evaporation and phytoremediation has been chosen as the best method to manage leachate generated at the ASDDF due to its low long-term capital and operational costs and its sustainability for both the active and post-closure life of the landfill. Also,

the RDNO has experience for the last 10 years with managing a phytoremediation program at the site. The development of a new evaporation pond is underway. A new phytoremediation plantation was planted in early 2017.

A Sure pump was used to maintain an operational depth of 0.3 m above the top of the sump elevation in Cell 5. The amount of leachate pumped from the base of the landfill in 2019 was 260,392 USG (985 m³).

The leachate storage pond has a finite storage capacity and fills with precipitation as well as leachate. In order to manage the level in the leachate pond, the leachate has been used to water a plantation of hybrid poplar trees. Irrigation with leachate is authorized in the OC. The new hybrid poplar plantation was planted in 2017 to evapotranspire the leachate and to store any contaminants in the root nodules. The plantation consists of almost 500 trees, over an area of 7,500 m². A total of approximately 1,234,044 litres of leachate was applied to the hybrid poplar plantation through individual emitters in 2019.

For the annual monitoring report for the plantation soils please see Attachment D.

The following list provides the recommendations for the watering and monitoring of the Poplar Tree Plantation for the 2019 Annual Report.

1. Continue the currently established soil monitoring program at the new plantation in 2020, as follows:
2. Soil monitoring should be conducted twice during the irrigation season – prior to startup in the spring and after shutdown in the fall.
3. Spring soil monitoring in 2020 should be done at the 0-15 cm depth only and in the irrigated area of the site only.
4. Soil monitoring in fall 2020 should be done at 0-15 cm, 15-45 cm and 45-90 cm depths on irrigated and non-irrigated areas of the property. It should be done as 8 subsamples at the 0-15 cm depth and 4 subsamples at the 15-45 and 45-90 cm depths.
5. Analyze the shallow soil samples (0-15 cm depth) in spring and fall for Nitrate-N, ammonium-N, P, K, Ca, Mg, S, Na, Cl, B, Mn, Zn, Cu and Fe, CSR trace elements, and quality parameters: Sodium Absorption Ratio (SAR), pH and conductivity (same parameters as in 2019).
6. Analyze the deep soil samples (15-45 and 45-90 cm depths) for nitrate-N, sulphate-S, conductivity, pH, chloride and SAR (same parameters as in 2019).
7. Sample non-leachate irrigated poplar tree tissues for comparison to the leachate irrigated plantation tissue analysis performed in 2019.

10. LANDFILL GAS MANAGEMENT

In accordance with the OC and the Landfill Gas Mitigation Plan all probes at the ASDDF were sampled and results recorded. For a summary of 2019 methane readings for the compliance wells see Table 2, and for a site map of the Landfill Gas monitoring wells and passive vents see Figure 1. Table 2 shows the results of the compliance monitoring wells quarterly in percent methane.

Wells shown without data had water levels that were too high for gas sampling, or were damaged, at time of monitoring. The monitoring wells with methane detected continue to show similar levels to the previous year. In 2019, vapour probes VP11-17A, VP11-17B, VP11-6A, VP11-14A and VP11-14B were repaired and added back into the monitoring program. VP11-6B was not able to be repaired as it had been damaged by subsurface ground movement and was therefore decommissioned. This probe was not a compliance well and is replaced by a number of existing surrounding probes.

In late 2018, six landfill gas passive vents (GW18-01, GW18-02, GW18-03, GW18-04, GW18-05, and GW18-06) were installed to mitigate the lateral movement of landfill gas by passively venting gas and relieving pressure in the waste. These passive wells are also monitored monthly. The results of the quarterly monitoring events in 2019 are included in Table 3 below, and all monthly data as Attachment E. After one year of monitoring, trends in data suggest that south side gas vents (GW18-01, GW18-02, and GW18-03) are effective, such that adjacent vapour probes are trending towards negligible methane concentrations and pressures. On the east side, GW18-05 has been found to be in an area of pressurized LFG. The elevated pressures at GW18-05 are an indicator that LFG is trapped by a confining layer. The nearby vapour probes show consistent methane concentrations and pressures greater than 0, suggesting that LFG migration is present in this area. Therefore, an additional three passive vents and another vapour probe are planned to be installed in the area of GW18-05 in 2020.

**Table 2
Summary of CH₄ Percentages from Landfill Gas Compliance Monitoring Wells in 2019.**

Gas Well ID	March 2019	June 2019	September 20189	December 2019
VP10-1	-	0.0	0.0	0.0
VP10-2	0.0	0.0	0.0	0.0
VP11-3A	0.0	0.0	0.0	0.0
VP11-3B	0.0	0.0	0.0	0.0
VP11-4	0.0	0.0	0.0	0.0
VP11-10	0.0	0.0	0.0	0.0
VP11-11A	0.0	0.0	0.0	0.0
VP11-11B	0.0	0.0	0.0	0.0
VP11-13A	0.0	0.0	0.0	0.0
VP11-13B	0.0	0.0	0.0	0.0
VP11-14A	-	-	0.0	0.0
VP11-14B	-	-	0.0	0.0
VP11-15A	0.0	0.0	0.0	0.0
VP11-15B	0.0	0.0	0.0	0.0
VP11-16A	0.0	0.9	0.0	0.0
VP11-16B	0.0	0.0	0.0	0.0
VP17-01S	21.1	26.6	38.0	11.1
VP17-01D	10.7	60.8	60.7	52.0
VP17-02	68.7	63.4	52.8	67.8

Table 3
Summary of CH4 Percentages from Landfill Gas Passive Vents in 2019.

Passive Vent ID	March 2019	June 2019	September 2019	November 2019
GW18-01	61.9	62.2	61.8	62.2
GW18-02	63.4	64.2	64.6	64.4
GW18-03	61.7	60.5	55.4	60.2
GW18-04	0.2	6.2	23.3	59.7
GW18-05	59.7	61.4	53.9	62.6
GW18-06	59.6	60.3	59.3	59.0

The 2011 *Landfill Gas Management and Contingency Response Plan* was followed as outlined.

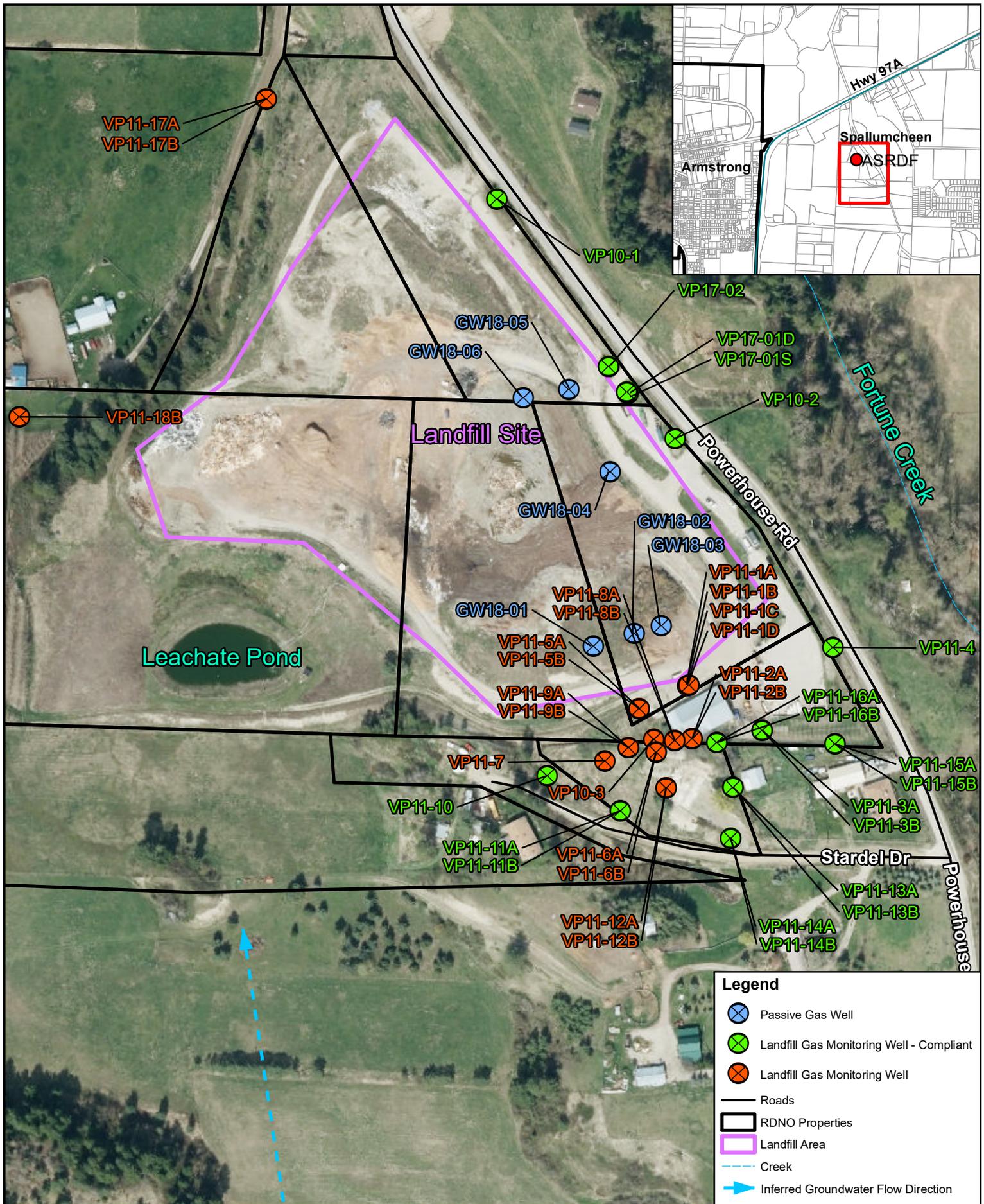


Figure 1-1
Site Location Plan for the Armstrong/Spallumcheen
Recycling and Disposal Facility

Plot Date: Feb 21, 2019

Scale: 1:2,500



This map was compiled by RDNO, using data believed to be accurate; however, a margin of error is inherent in all maps. This product is distributed without warranties of any kind, either express or implied, including but not limited to warranties of sustainability or particular purpose or use.

11. FINANCIAL

Approximately \$17,928 was spent on environmental monitoring at the Armstrong/Spallumcheen Diversion and Disposal Facility in 2019.

Total operation and maintenance expenditures at the ASDDF during 2019 were \$929,847.75.

A Statutory Closure Reserve was established in 2010 for closure and post closure costs at all RDNO Diversion and Disposal Facilities. The balance in the Statutory Closure Reserve at the end of 2019 was approximately \$10,413,000. The annual contribution to the Statutory Closure Reserve for 2019 will be \$18/tonne of material disposed at all RDNO Diversion and Disposal Facilities in 2019. It is estimated that this amount will be approximately \$827,000 which will bring the reserve balance to approximately \$11,124,000.

It is estimated that the annual contribution to the Statutory Closure Reserve for 2020 will be close to \$870,000 based on current and projected disposed tonnages.