



REGIONAL DISTRICT NORTH OKANAGAN

2021 Annual Report: Armstrong Spallumcheen Diversion and Disposal Facility

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A handwritten signature in blue ink that reads "Jim Schubert". The signature is written over a horizontal line.

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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, Splatins and Okanagan Indian Reserve, and the surrounding Electoral Area (F). The location plan is presented as part of the 2021 Environmental Monitoring Report, Attachment A.

The ASDDF was operated by GFL Environmental Inc. under a contract with the RDNO during 2021. 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 old corrugated cardboard (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 using 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 2021 was 14,166 tonnes, an approximately 10.5% increase from 2020. This total 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 (GVDDF) by the previous owner prior to 2015 has been disposed at the ASDDF since 2015.

According to 2021 census data, the population in the service area for the ASDDF (Armstrong, Spallumcheen, Enderby, Splatwin First Nation, parts of Rural Enderby (Electoral Area F), parts of the Okanagan Indian Band lands is estimated at 19,552. The per capita disposal rate in 2021 was 0.72 tonnes, a slight decrease from 2021. The likely reason for this increase is explained in the previous paragraph. It is also difficult to determine the number residents in Electoral Areas B and C, whose MSW was disposed at the ASDDF starting in 2015 and had 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 2021 per capita disposal of 0.72 tonnes per capita per year represents an improvement, but indicates that there is room for increased waste diversion in the Greater Armstrong area.

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

Table 1 - Quantities of Material Recycled or Reused from ASDDF in 2021

Material/Product	Quantity	Units
Tires	1.93	Tonnes
Wood and yard	6,122	Tonnes
Metals	578	Tonnes
Old Corrugated Cardboard	119	Tonnes
Glass	0 ¹	Tonnes
Crushable Materials	1,095	Tonnes
Refrigerated Appliances	798 ²	Units
Mattresses and Box Springs	11,345 ³	Units
Propane Tanks	2,004	Units

1 - Glass was collected and added to crushable materials onsite (and was not weighed).

2 – Quantity of refrigerated appliances of which Freon was recovered.

3 – Quantity of mattresses and box springs deconstructed and recyclable material diverted.

3. TOPOGRAPHIC MAP

See Attachment C for a topographic map and the attached topographic map is from the aerial survey performed in 2019.

4. SITE LIFE AND CLOSURE UPDATE

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 (Phase 1 closure completed in 2020/2021), 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 adjustments were completed in the spring of 2020. Final closure of the north end of the site commenced in the late summer of 2020 and was completed in 2021. The closure 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 was completed in 2020. This included upgraded road access to both ponds and an overflow mechanism from the existing pond to the new pond. When the ASDDF 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 in order to allow for the proper and careful filling of the remainder of the site, as the filling area narrows over the next few 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 review, which will be started in 2022.

6. WILDLIFE

Birds of many different species frequent the facility, but were not observed to be a hazard in 2021. 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 2021.

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 Ministry of Environment (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) was appointed and meetings were expected to begin in 2020, but were postponed due to the ongoing COVID-19 pandemic. PMWG meetings are anticipated to begin in 2022 and the RDNO plans to begin the next update of the SWMP in 2022. There were no site specific objectives for the ASDDF in the implementation plan for 2021.

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.

8. MONITORING PROGRAM

The Armstrong/Spallumcheen Diversion and Disposal Facility, 2021 Environmental Monitoring Report, dated April 2022, prepared by Regional District of North Okanagan staff, is provided in 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 2021 Annual Report.

- a) Continue with the currently established sampling program, and assess trends of exceedances and property boundary conditions.
- b) Evaluate potential trends in 2022 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. A new phytoremediation plantation was planted in early 2017 and managed by Passive Remediation Systems Ltd. The development of a new evaporation pond was completed in 2020.

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 2021 was 447,250 USG (1,693 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 213,500 litres of leachate was applied to the hybrid poplar plantation through individual emitters in 2021.

For the annual monitoring report of 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 2021 Annual Report.

1. Continue the currently established soil monitoring program at the new plantation in 2022, 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 2022 should be done at the 0-15 cm depth only and in the irrigated area of the site only.
4. Soil monitoring in fall 2022 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 2021).
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 2021).

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 2021 methane readings for the compliance wells see Table 2, and for a site map of all 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 the 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 was replaced by a number of existing surrounding probes. In 2021, VP11-17A/B were found damaged again and are planned to be repaired in 2022. VP11-3A/B were knocked over by heavy equipment, and will likely need to be abandoned. VP11-6A has a broken top cap which will be replaced in 2022.

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. At the beginning of 2020, after one year of monitoring, trends in the data had suggested that the south side vents (GW18-01, GW18-02, and GW18-03) were effective, as the adjacent vapour probes were trending towards negligible methane concentrations. At this time it was decided that an additional 3 passive vents would be installed on the east side to alleviate the pressurized LFG trapped by a confining layer near GW18-05. However, in the spring of 2020 the methane concentration in the south side vapour probes increased again and have remained elevated since. Therefore, it was determined that the passive

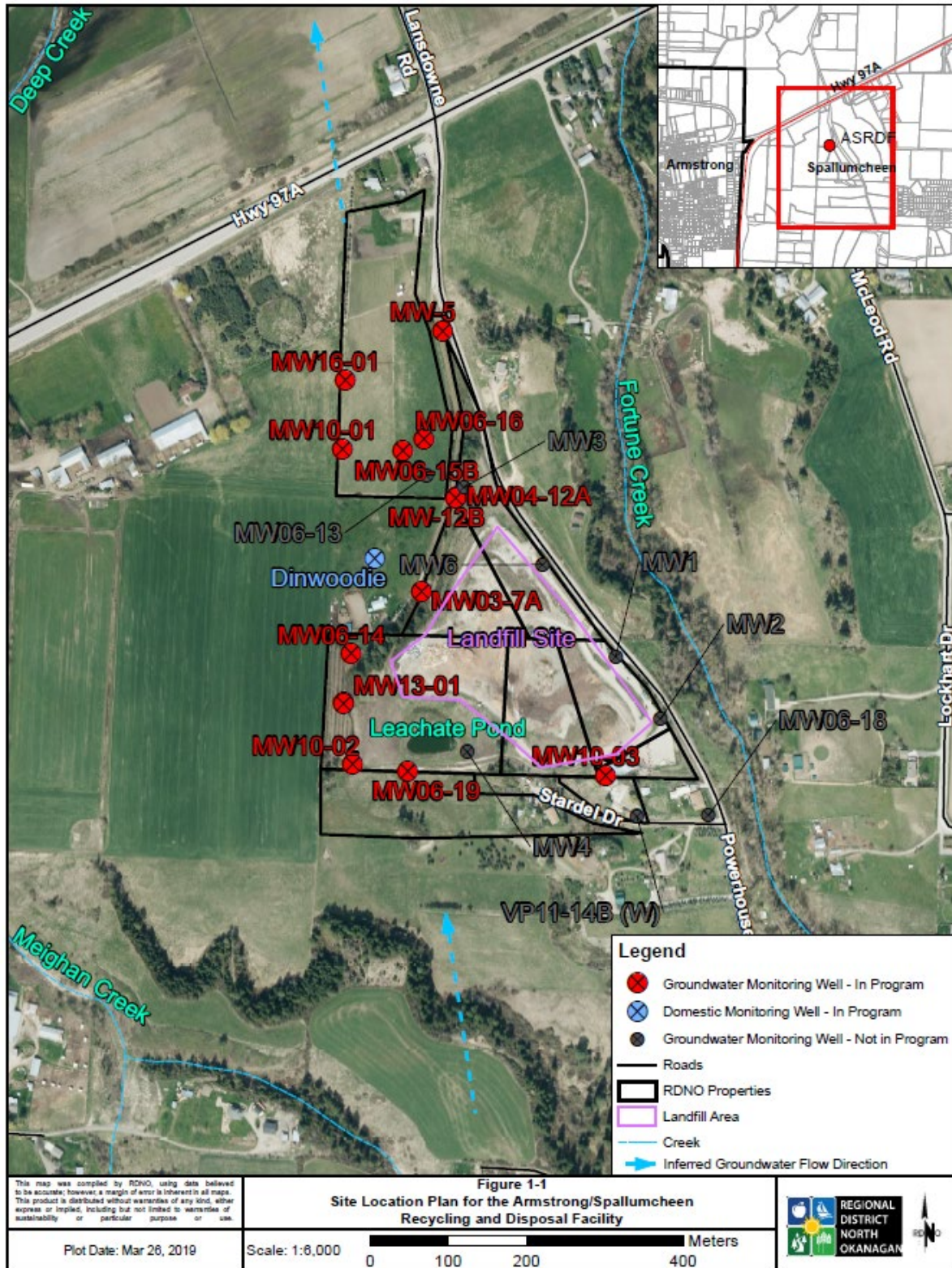
vent system is not appropriate for this site. Further options for migration mitigation were investigated in 2020 and it was concluded that a landfill gas collection system and flare would be the most beneficial for this site and active landfill gas collection options are currently being investigated. The results of the quarterly monitoring events are included in Table 3 below. Monitoring wells without data were inaccessible at the time of testing either due to damage or a high water table. Due to changing roles at the District no monitoring well data was collected in June and September of 2021.

**Table 2
Summary of CH₄ Percentages from Landfill Gas Compliance Monitoring Wells in 2021**

Gas Well ID	March 2021	June 2021	September 2021	December 2021	
VP10-1	0.0	-	-	0.0	
VP10-2	0.0	-	-	0.0	
VP11-3A	0.0	-	-	0.0	
VP11-3B	0.0	-	-	0.0	
VP11-4	0.0	-	-	0.0	
VP11-10	-	-	-	-	
VP11-11A	0.0	-	-	0.0	
VP11-11B	0.0	-	-	-	
VP11-13A	0.0	-	-	0.0	
VP11-13B	0.0	-	-	0.0	
VP11-14A	0.0	-	-	0.0	
VP11-14B	0.0	-	-	0.0	
VP11-15A	0.0	-	-	0.0	
VP11-15B	0.0	-	-	0.0	
VP11-16A	0.0	-	-	0.0	
VP11-16B	0.0	-	-	0.0	
VP17-01S	11.7	-	-	25.9	
VP17-01D	52.8	-	-	58.3	
VP17-02	73.0	-	-	66.5	

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

FIGURE 1 - Site Map of Landfill Gas Monitoring Wells in 2021



11. FINANCIAL

Approximately \$9,180 (not including any RDNO staff time for sampling, analysis and reporting) was spent on environmental monitoring at the Armstrong/Spallumcheen Diversion and Disposal Facility in 2021. The Phase one closure costs (for the capping and closure of the north end of the ASDDF landfill site), were approximately \$341,270.

Total operation and maintenance expenditures at the ASDDF during 2021 were \$974,060.

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 2021 was approximately \$12,954,000. It is projected that the annual contribution to the Statutory Closure Reserve for 2022 will be approximately \$1,579,000.