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## **Summit Landfill Soil Fabrication Pilot Project**

### **Year One Phase One Interim Report**

**August 2018**

Prepared For:

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## Introduction

On May 7, 2018 the City of Winnipeg, Solid Waste Services (SWS) received approval from Manitoba Sustainable Development (MSD) to commence the three year Summit Soil Fabrication pilot project, 2018-2020, examining the viability of fabricating soil with biosolids to complete the cap system at Summit Landfill. This interim report covers the initial preparation work and results from the first operational phase Year One Phase One (Y1P1). The main goals for Y1P1 were to figure out site logistics, and learn and test mixing and spreading equipment and processes.

The main findings from Y1P1 are:

- Soil fabrication at Summit Road Landfill has the capacity to accept all biosolids loads during operation
- One loader with a five yard bucket is sufficient for soil fabrication operations prior to spreading
- Windrows made of layered piles are sufficient for operations prior to spreading
- A manure spreader can adequately secondary mix and spread soil to the required depth
- Fabricated soil mixed and spread by a manure spreader met the allowable industrial criteria for soil quality based on the CCME Guidelines for the protection of Environment and Human Health.

## Operations

The biosolids receiving operation phase started on May 28<sup>th</sup>, 2018 and was completed June 22<sup>nd</sup>, 2018. Over the course of these 20 working days 3,519.5 tonnes of biosolids were received at Summit Landfill and mixed into an initial soil blend. After gaining operator experience and improving efficiency, all biosolids produced during the work week were able to be accepted in the soil fabrication process. From Monday, June 4<sup>th</sup> to Friday, June 22<sup>nd</sup>, no biosolids loads were diverted to landfill. Four loads were directed to biosolids composting as requested. Site layout and photographs from the operation can be found in Appendix A and B, respectively.

The soil blend of 1(biosolids):2(wood chips):3(sweepings) was determined by bench scale testing (Technical Memorandum Bench-Scale Soil Fabrication for Use at Summit Landfill May 11, 2018). This was implemented through loader bucket counts, starting with a 3 yard bucket and later a 5 yard bucket. Field measurements were done using yards and adjusted in approximation to cubic meters when final calculations were compiled (Appendix C) These calculations estimated that approximately 17,000 m<sup>3</sup> of material was mixed and stockpiled. Stockpiled fabricated soil volumes were measured at 15,314.35m<sup>3</sup> using a UAV volume survey conducted on June 28, 2018. This number does not include the portion that had already been mixed and spread with the manure spreader.



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### **Next Steps**

Material will be stockpiled until October 2018, when it will be spread with the manure spreader and seeded by Naturalist Services Branch. The original project plan called for secondary mixing, spreading and seeding immediately following the operational phase. Based on the bench scale test, SYLVIS recommended stockpiling the material for a period of time to allow some of the nitrogen to volatilize off. Rescheduling spreading and seeding to October also reduced weed management required in 2018, and allows for temperature stratification required for some of the native seeds to germinate in the spring. Soil samples will be taken during the spreading phase in October.

### **Environmental Results**

#### **Odour**

Biosolids odour was detected in the operating area. Odours were observed to be reduced after mixing biosolids with woodchips and street sweepings. Sweepings were used to build a 'bunker' area for the biosolids truck to dump. This three-sided bunker made it easier to pick up a bucket-load with the loader; while also reducing wind on the biosolids before it was mixed. No odours were reported at the street sweepings area (20-300m south of the soil operating area) during mixing operations.

On June 18<sup>th</sup>, a stronger ammonia odour was observed during the manure spreader trial. Winds on this day were west-north-west. Street sweepings operators reported they observed the ammonia odour on this day. No odours were detected offsite during the biosolids receiving operations.

#### **Soil**

Background soil samples of the clay cap of the Y1P1 plot, and the control plot were taken on May 7<sup>th</sup> and 8<sup>th</sup>, 2018 and analysed (Appendix D). There is considerable variation in the cap due to the clean fill that was brought to the site and used as final cover.

On June 18<sup>th</sup>, 2018 a manure spreader was used to mix and spread fabricated soil to a depth of 0.6m on designated plots. The purpose of this test was to see if this equipment could adequately secondary mix and spread fabricated soil to the required depth. On the first plot, labelled SPREAD #1 the manure spreader was loaded with layered piles mixed the day before. On the second plot labelled SPREAD #2, the manure spreader was filled with soil that had been mixed with an excavator and had been windrowed for approximately 2 weeks.

To assess the soil at this interim stage, these plots were sampled using a randomized grab sample technique. Five samples of each plot were taken and amalgamated to make one composite sample and analysed (Appendix D). Soil sample results meet the industrial standards for CCME Soil Quality Guidelines for the Protection of Environmental and Human Health. With the exception of zinc, the soil



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samples also meet the British Columbia criteria for biosolids growing media, which was used as a guide in developing the soil mix ratio. In the fall, once all the soil is spread evenly across the plot at a depth of 0.6m, soil samples will be taken to assess Y1P1 soil quality.

### **Surface Water**

The project is located within the boundaries of the Summit Road Landfill leachate and surface water collection and containment system. Surface water was not sampled around the windrow stockpiles. Surface water will be sampled after the material is spread and seeded. The first samples will be taken in spring of 2019.

It was observed that the stockpiled material has high water retention capacity. There were some puddles between the windrows after heavy rain, but these did not last long. It was observed that there were areas of the clay cap in the operating area with high infiltration rates and some low spots stayed wet the entire operational period. These observations underscored the need for a complete cap system with top soil and vegetative cover to better manage precipitation.

### **Vectors**

No vectors were observed during the operational phase.

### **Dust, noise, nuisance**

There were no dust, noise or nuisance concerns during operations.

### **Site Security and Safety**

Safe Work Procedures were reviewed every week with staff and followed at Summit. All personnel onsite were required to wear appropriate PPE, this included safety glasses and florescent rain jackets when appropriate to mitigate any weather hazards.

The site is fully fenced; with two signs indicating that only authorized personnel are allowed onsite, a sign set up before the soil fabrication area indicating that biosolids are presents and a muster point sign located at a low, paved and easily accessible location. An attendant was stationed at the gate during operating hours. The Emergency Response Guidelines were implemented seven times:

- Two instances of severe weather;
- Four unauthorised intrusions; and,
- One hydraulic fluid spill.

None of the incidents required emergency responders and were all handled by staff on site.



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### **Year One Phase Two (Y1P2)**

Y1P1 will take place from November 5 to November 30, 2018. Based on results from Y1P1 and continued research, one loader with a five yard bucket will be used to make layered pile windrows. City staff and equipment may be used. Windrows may be placed to allow for secondary mixing by a windrow turner. Seeding will take place in spring of 2019. This overall approach is anticipated to reduce costs compared to Y1P1.

### **Regulatory Approval**

Approval to proceed with the Summit Soil Fabrication Pilot Project under the Exemption Clause (6) of the *Classes of Development Regulation* was received on May 7, 2018. In accordance with this approval:

- Notice was given to MSD five days before the commencement and five days before the end of the operational phase
- The quantity of biosolids in the operational phase did not exceed 4,000 m<sup>3</sup>
- Biosolids were mixed with feedstocks each day received, and no biosolids were stockpiled overnight
- Site access was limited to authorized persons, with signage delineating soil fabrication areas
- Surface water and vectors were managed on site

A more detailed list of general requirements may be found in Appendix E.

APPENDIX A - AERIAL SURVEY SOIL FABRICATION PROJECT



JULY 28TH, 2018



**Appendix B – Photos Soil Fabrication Project  
Phase 1 Year 1 - May 28<sup>th</sup>, 2018 to June 22<sup>nd</sup>, 2018**

First load of biosolids delivered to site (May 22<sup>th</sup>, 2018):



Preliminary mix of three feedstocks done with loader:



Loader creating a layered pile:



Aerial Photo taken June 11<sup>th</sup>, 2018 of the excavator mixing layered piles:



Aerial of entire site June 11<sup>th</sup>, 2018 – Midway point.:



Side view of site June 12<sup>th</sup>, 2018:



Manure  
spreader test  
June 18<sup>th</sup>,  
2018:



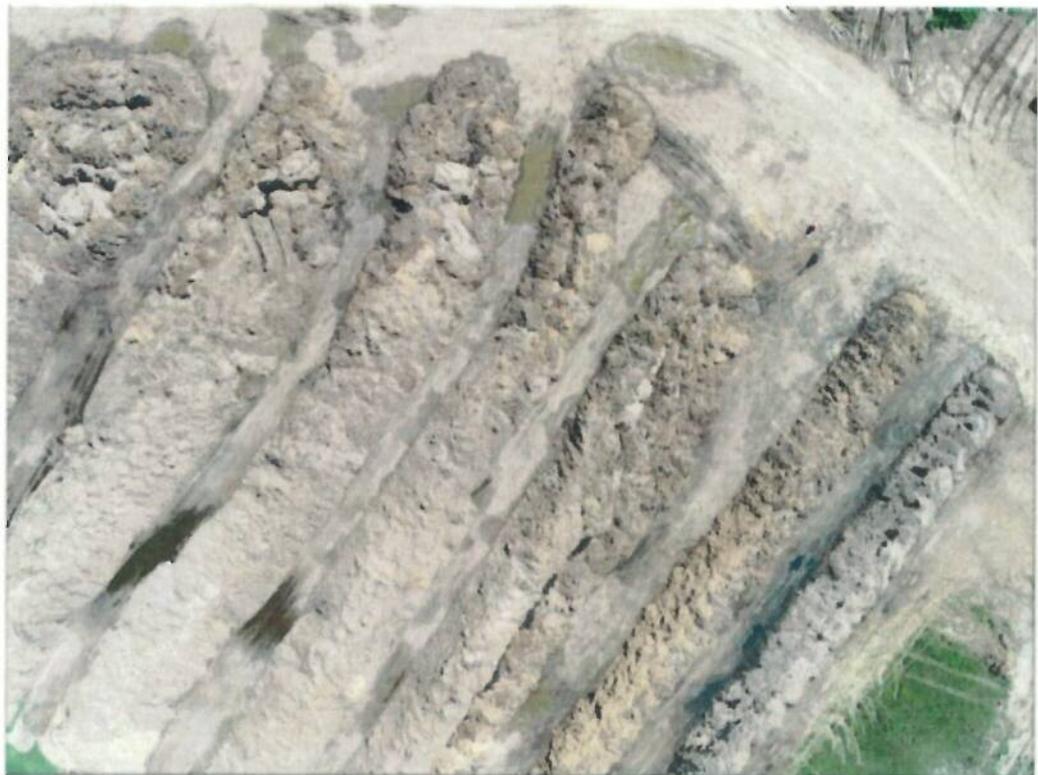
Layered piles  
mixed with  
the manure  
spreader:



Naturalist  
Services  
seeded  
sections on  
spread soil:



Aerial of  
completed  
windrows  
after a  
rainfall:



Aerial of Site June 28<sup>th</sup> at end of project:



Sample No.	Date	Parameter													
		Location (EPA ID)	Moisture	Organic Matter	pH (1:1 Extract)	Total Organic Carbon	C:N Ratio	Available Nitrogen	Available Phosphorus	Available Potassium	Available Molybdenum	Total Nitrate Nitrogen	Total Organic Carbon	Conductivity (Sat. Paste)	% Saturated
		%	%	%	pH units	%		mg/kg	mg/kg	mg/kg	mg/kg	%	ds/m	%	mg/kg
Background	5/8/2018	3.6	15.3	3.1	6.5	0.121	3.08	25.29	1.4	5.4	319	38.3	0.087	65.5	
SS.18.1.1 (Plot 1)	5/7/2018	4.2	18.6	3.6	6.59	0.126	2.97	21.94	1.7	6.4	290	131	1.61	83.3	
SS.18.1.2 (Plot 2)	5/7/2018	3.2	11.1	2.8	6.44	0.11	2.73	24.82	1.1	2.9	302	64	0.058	80.6	
SS.18.1.3 (Plot 3)	5/8/2018	3.1	14.8	2.7	6.38	0.086	2.78	28.75	1.5	3.7	203	196	1.56	65.4	50
SS.18.1.4 (Plot 4)	5/8/2018	3	13.2	2.6	6.7	0.058	3.08	31.43	1.3	4.8	254	36.8	0.778	64.3	6.6
SPREAD #1 (Reservoir)	6/18/2018	7.5	25.7	6.1	N/A	0.347	6.58	18.85	1.1	125	540	444	6.85	83	0.0853
SPREAD #2 (Reservoir)	6/18/2018	6.3	18.6	5.2	N/A	0.278	6.37	22.83	1.45	101	460	389	7.16	55	0.101

Aluminum (Al)	Antimony (Sb)	Arsenic (As)	Barium (Ba)	Beryllium (Be)	Bismuth (Bi)	Iron (Fe)	Cadmium (Cd)	Cobalt (Co)	Copper (Cu)	Lead (Pb)	Manganese (Mn)	Mercury (Hg)	Molybdenum (Mo)	Nickel (Ni)	Phosphorus (P)	Potassium (K)	Selenium (Se)	Silver (Ag)	Sodium (Na)	Strontium (Sr)	Thallium (Tl)	Tin (Sn)	Zinc (Zn)	Vanadium (V)	Uranium (U)	Thorium (Th)	Total (T)		
																												mg/kg	mg/kg
13600	0.33	4.36	138	0.59	0.155	18.4	30400	19.4	18000	18.4	30400	353	0.62	24.4	420	2710	<0.50	<0.10	267	64	0.18	<5.0	119	0.818	41.6	56			
15400	0.44	5.97	141	0.65	0.182	24.8	26500	24.8	18000	24.8	26500	392	0.74	28.8	470	3040	<0.50	<0.10	338	63.9	0.22	<5.0	139	0.964	45.7	80			
16500	0.53	5.79	161	0.7	0.181	36.9	28100	36.9	20000	36.9	28100	410	0.66	27.8	470	3220	<0.50	<0.10	384	70.1	0.22	<5.0	165	0.985	48.8	77			
14400	0.44	5.29	152	0.6	0.183	23.7	33800	23.7	17400	23.7	33800	362	0.67	25.6	480	2650	<0.50	<0.10	360	73.9	0.2	<5.0	157	1.13	44	82			
13000	0.41	4.74	132	0.57	0.148	20.6	34000	20.6	16500	20.6	34000	340	0.75	24.3	410	2800	<0.50	<0.10	322	68.9	0.18	<5.0	148	0.86	36.9	65			
3600	0.72	1.08	55	0.14	1.06	14.3	36400	14.3	11000	14.3	36400	104	2.01	15.4	2000	1100	<0.50	0.63	460	56.4	<0.10	<5.0	23.6	1.29	13	213			
8940	0.64	3.36	88.1	0.31	0.9	69.4	37000	69.4	12000	69.4	37000	244	1.46	17	1100	1700	<0.50	0.42	576	62.9	<0.10	<5.0	90.7	1.23	23.2	149			

\* Above Agricultural Guidelines  
 \* Detection Limit Based Dilution required due to high concentration of test analyte(s)