

SPECIFICATIONS:

I. General

1. The final landfill cover for the Operational Landfill and Little Red Dog Quarry shall be a minimum of 1.8 m thick above the waste.
2. The bottom 1.2 m of the final cover should be Type A material, which may consist of shale, limestone, or other inorganic granular materials (e.g. beach gravel). The upper 0.6 m of the final cover shall be Type B material, which should consist of durable limestone. Refer to material specifications for details.
3. The existing waste surface at the Operational Landfill is shown on Drawing 23-306-1. Prior to placing any final cover material, the waste along the sloped section should be regraded to a 4H:1V slope as shown on Drawings 23306-2, 23306-4, 23306-5, and 23306-6 in order to minimize the quantity of imported fill. The volume of material to be regraded is approximately 9,000 cubic metres.
4. The minimum cover thickness of 1.8 m is to be met over the entire landfill area (defined as wherever waste is present) as shown on Drawing 23306-2. Around the perimeter of the landfill, there will be a transition zone where the cover thickness is gradually reduced from 1.8 m to meet the existing ground surface. There will be different types of transition zones for the Operational Landfill. At the top of the landfill, the final cover will slope at 2H:1V. At the sides and bottom of the landfill, the top surface of the final cover will slope at 3H:1V; there are also transition zones that will change from 4H:1V slope to a 3H:1V slope. At the sides and bottom of the landfill, the top surface of Type A material will slope at either 2H:1V or 3H:1V depending on location. Refer to Drawings 23306-4, 23306-5 and 23306-6 for details.
5. In order to verify the thickness of cover material placed, a survey of the regraded waste surface shall be completed prior to placement of any final cover material and at completion of construction of the final cover. The survey results after regrading shall be forwarded to the Owner for approval prior to placement of cover material.
6. Surface water drainage for the Operational Landfill consists of an upgradient interceptor ditch. The interceptor ditch shall be 0.5 m deep and drain water away from the landfill at a slope of 1% as shown on Drawing 23306-3. The interceptor ditch shall extend 50 m beyond the landfill as shown on Drawing 23-306-3. A section of the interceptor ditch is shown on Detail A (Drawing 23306-3).
7. Three thermistor strings shall be installed inside a 150 mm diameter or larger borehole drilled after construction and acceptance of the final cover. The thermistors shall be installed within 3 m of the locations shown on Drawing 23306-1. Thermistors shall be spaced at 0.5 m depth intervals within the final cover and at 1.5 m depth intervals within the waste (see Detail B on Drawing 23306-2). Non-angular sand backfill (Type C material) shall be placed around the thermistors (refer to material specifications). The thermistor strings shall not be installed until the final cover has been constructed and accepted by the owner.

II. Material Specifications

1. There are potentially up to four different materials that may be used for the final cover for the Operational Landfill, which has been separated into four zones: Zone IA, Zone IB, Zone IIA, and Zone IIB. The classification for the different materials is based on location within the cover. Zone A is the bottom 1.2 m and Zone B is the upper 0.6 m (refer to Detail B on Drawing 23306-3). The materials used for the final cover should meet the specifications outlined in Schedule 1.
2. There are potentially two different materials that may be used for the Little Red Dog (LRD) Quarry cover: LRD Zone A and LRD Zone B. The classification for the different materials is based on location within the cover. Zone A is the bottom 1.2 m and Zone B is the upper 0.6 m (refer to Drawings XXXXX-X and XXXXX-X). The materials used for the final cover should meet the specifications outlined in Schedule 2.
3. Each thermistor should have an accuracy of +/- 0.1°C. Material specifications for the backfill around the thermistors is provided in Schedule 3.

Schedule 1 - Material Specifications for Operational Landfill Cover

	Material Type	Grain Size Distribution
Zone IA	Type A: Beach Gravel, shale or limestone	Max. particle size 300 mm Max. 10% passing US sieve #200
Zone IB	Type B: Limestone	Well-graded material Max. particle size 300 mm Max. 10% passing US sieve #200
Zone IIA	Type A: Beach gravel, shale or limestone	Max. particle size 300 mm Max. 10% passing US sieve #200
Zone IIB	Type B: Limestone	Well-graded material Max. particle size 300 mm Max. 10% passing US sieve #200

Schedule 2 - Material Specifications for Little Red Dog Quarry Cover

	Material Type	Grain Size Distribution
LRD Zone A	Type A: Beach Gravel, shale or limestone	Max. particle size 300 mm Max. 10% passing US sieve #200
LRD Zone B	Type B: Limestone	Well-graded material Max. particle size 200 mm Max. 10% passing US sieve #200

Schedule 3 - Material Specifications for Thermistor Backfill

Material Type	Grain Size Distribution
Type C: Non-angular Sand	Max. particle size 2 mm Max. 20% passing US sieve #200


III. Placement and Compaction

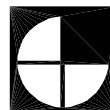
1. Type A material shall be placed and spread in 600 mm thick lifts +/- 50 mm. Type B material shall be placed and spread in 300 mm thick lifts +/- 25 mm.
2. Placement of the final cover material (Type A and Type B) shall be completed such that void spaces are not created. Where void spaces are created (e.g. collection of large particles placed together), they should be removed by breaking of the large particles, regrading, excavating or other means necessary before compacting.
3. After spreading, each lift shall be compacted with a minimum of 4 passes using a minimum 5 ton compactor in vibration mode (if the compactor onsite is operational). If the compactor is not operational, each lift shall be compacted using 4 passes of the tracks of the equipment used to spread the material (Caterpillar D8 or equivalent). The area compacted shall be 100 % of each lift, including the 4H:1V section of the Operational Landfill. Each successive pass of the compaction equipment shall be completed perpendicular to the previous pass.
4. Placement of the successive lift may not be started in any area until adequate compaction is completed on the lower lift in that area.

IV. Quality Control and Testing

1. Prior to placement of any Type A or Type B cover material, a grain size analysis (ASTM C136-01 or Canadian Standards Association equivalent) shall be completed on the material to ensure it meets the material specifications. Additional tests should be completed at a frequency of one per 10,000 cubic metres of material placed.
2. The surveys prior and after placement of final cover shall include sufficient points (elevation shots and horizontal control) to ensure the minimum cover thickness is achieved for both the Operational Landfill and LRD cover. The survey points should have an accuracy of +/- 0.01 m. The total cover thickness at each point shall be calculated by subtracting the original elevation (after regrading the waste) from the final elevation. If the total thickness of the cover is calculated to be less than 1.80 m, then additional Type B material shall be placed on the cover to meet the required 1.80 m thickness. The placement of the additional material shall extend to the nearest point that meets the required thickness. New elevation shots are required until the minimum 1.80 m cover thickness is met at all survey locations. The survey results are to be approved by the Owner before installation of the thermistor strings.
3. a) Plate load tests should be completed on each lift to verify that adequate compaction has been achieved. b) The plate load tests should be completed at a frequency of one test for every 5,000 square metres. A minimum 25 mm thick, round steel plate with an area of 0.0929 square metres (1 square foot) (diameter of plate = 0.344 m) shall be placed on the surface of the compacted cover material. The edge of the plate should be flat not rounded. Prior to starting the test, the surface of the test location (over an area with a diameter of 0.6 m) shall be groomed smooth using the steel plate. c) A force of 13.3 kN (3,000 lbs) shall be applied to the plate (located in the center of the smooth area) in a manner that the load reaches the soil as a static load, without impact, fluctuation or eccentricity. The load shall be applied for a period of 5 minutes. The plate shall be removed without disturbing the soil around the edge of the plate. The displacement of the soil shall be measured at four equidistant locations along the edge of the test area to the nearest 1 mm. All four displacement measurements at each test location should be recorded as well as the average displacement. The average displacement shall not exceed 10.0 mm for any test. e) For each test location, the following information shall be recorded: date, time, material type, lift number, location (co-ordinates or shown on a plan drawing), applied load, the four displacement measurements, the average displacement, pass/fail compaction requirement. f) If a plate load test fails, the area between passing plate load tests should be recompacted and retested until the compaction standard is achieved. g) All test results are to be forwarded to the Owner for review and approval after each lift is tested and before subsequent lifts are placed.
4. Prior to installation of the thermistors, a grain size analysis (ASTM C117-95 Procedure A or Canadian Standards Association equivalent) shall be completed on the material to ensure it meets the material specifications.

LIST OF DRAWINGS	
DWG. No.	TITLE
DRAWING 23306 – 0	SPECIFICATIONS
DRAWING 23306 – 1	OPERATIONAL LANDFILL – EXISTING TOP OF WASTE AND GROUND SURFACE (SPRING 2003)
DRAWING 23306 – 2	OPERATIONAL LANDFILL – TOP OF WASTE AFTER REGRADING
DRAWING 23306 – 3	OPERATIONAL LANDFILL – TOP OF FINAL COVER
DRAWING 23306 – 4	OPERATIONAL LANDFILL – SECTIONS S–1, S–2, 5, 8 & 10
DRAWING 23306 – 5	OPERATIONAL LANDFILL – SECTIONS 13, 15, 18 & 20
DRAWING 23306 – 6	OPERATIONAL LANDFILL – SECTIONS 22, 23, 24 & 25

<div>DRAWING INFORMATION:</div> <div>REVIEWED BY: HC/PM</div> <div>DRAWN BY: CPW/NT0</div> <div>DATE ISSUED: MAY 27, 2003</div> <div>PROJECT NUMBER: 23–306</div> <div>FILE NAME: 23306–D1–07R2.DWG</div> <div>REVISION: 2</div>	<div>ISSUED FOR CONSTRUCTION</div> <div></div>
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OPERATIONAL LANDFILL COVER DESIGN POLARIS MINE, NUNAVUT	
<div><div></div><div>teckcominco</div></div>	
<div> Gartner Lee</div>	<div>Drawing No. 23306-0</div>