Nanisivik Mine
Waste Disposal Plan

1 Introduction

The closure of Nanisivik Mine as with any mine creates a considerable amount of material that requires disposal. The purpose of the waste disposal plan ('the plan') is to identify and classify the "waste" which may include derelict equipment, contaminated soil, waste rock, demolition debris, regulated or hazardous material and to provide information on how and where the waste will be disposed of. Details of the waste rock disposal from twin lakes creek and the east adit dumps will be submitted under separate cover as per item G8 in the water license.

2 Risk Assessment

The objective of risk assessment is to estimate the level of risk to human and environmental health. The presence of a contaminant does not automatically constitute a risk. The conditions that must be met in order for a risk to exist are as follows:

- The presence of a contaminant
- The contaminant must be able to cause toxic or adverse biological effects.
- Pathways must exist by which humans, animals or plants may be exposed to the contaminants.

For the purpose of the plan, all waste will be deposited in such a way as to eliminate the pathway by which exposure to humans or the environment is possible. There are two ways to achieve this.

a) Deposit the material underground, in locations where gravity will prohibit migration of contaminants to surface openings and permafrost aggradation will effectively seal the waste in place . Surface openings will be subsequently sealed with rock fill.

b) Deposit the material into pits, cover with rock fill and finally contour to allow for surface drainage and the prevention of pooling. The natural aggradation of the permafrost will then effectively seal the waste in place.

3 Classification System

A simple classification system (see table 1) will be used to differentiate the types of waste that are to be disposed of.

Classification Table

Type of Waste	Criteria	Class
Abandoned Equipment	1 – Contains regulated materials (free phase liquids, batteries, etc.) 2 – Can be stored directly	AE1 AE2
Demolition Debris (Inert solids)	1 – Can be stored directly or burned (wood debris)	DD1
Soil	1 – Contains Metals above the SQRO 2 – Contains Hydrocarbons above the SQRO	S1 S2

(SQRO – Soil Quality Remediation Objective)

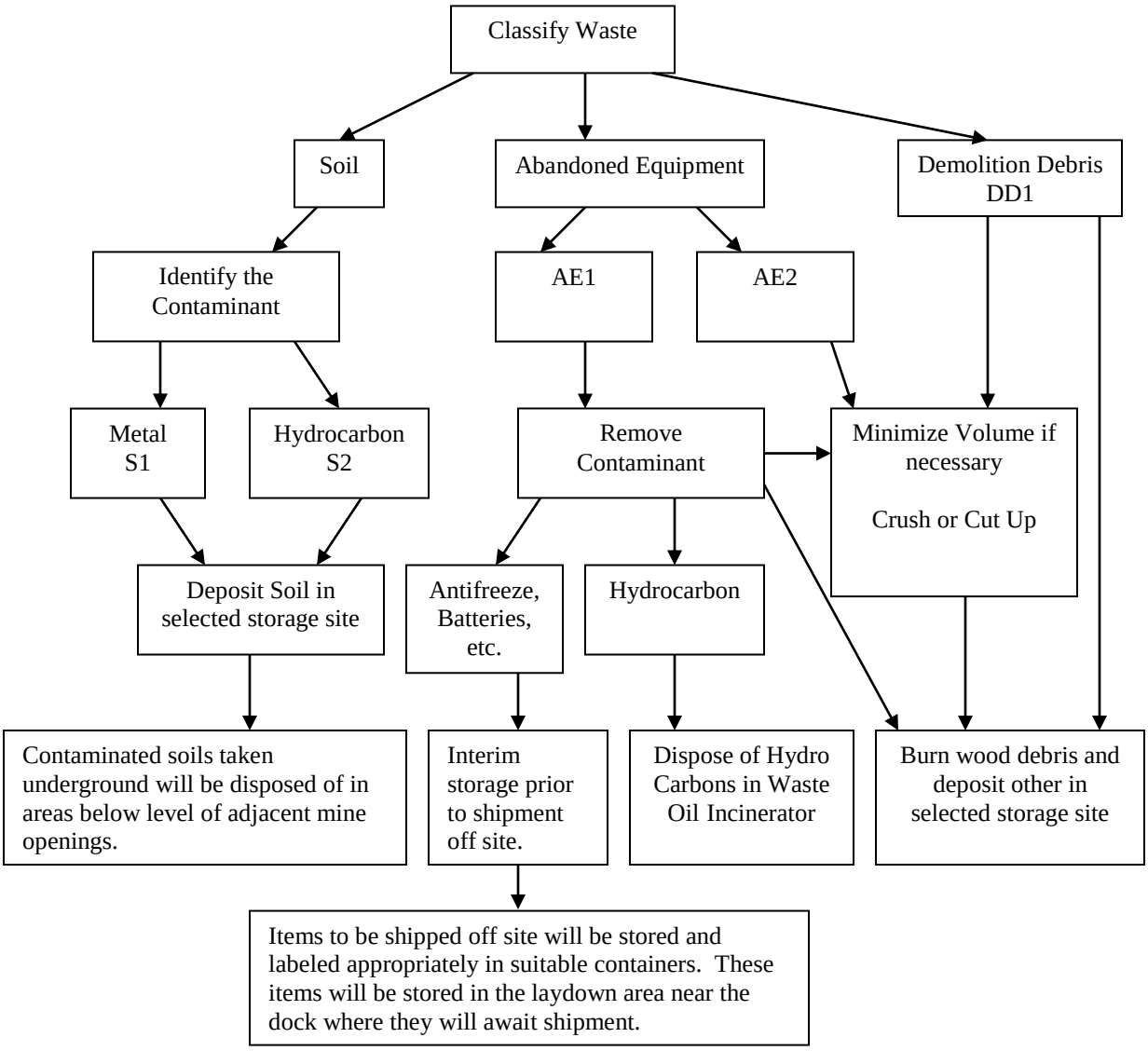
After the material is classified, an action plan for that particular material is followed and a storage location is selected. The storage location will depend on the associated risk with the particular material as well as the volume required to facilitate the disposal.

Storage Locations

- Landfill west of Nanisivik Town site.
- West Twin Lake Disposal Area
- Foundation of Industrial Complex
- West Open Pit
- East Open Pit
- Underground Stopes

4 Operating Procedures Flow Chart

The General operating procedures are outlined in the following flow chart:



5 Documentation

The basic information required for the deposition of waste material will be recorded on a spreadsheet for submission to the governing agencies. Examples of the information that will be recorded for solid waste from various locations are shown below.

Examples

Description: Derelict Vehicle – Chevrolet Pickup Truck
Classification: AE1
Action Required: Drain all oils for disposal in waste oil incinerator; drain all antifreeze for interim storage and shipment off site; remove battery to interim storage and shipment off site.
Storage Location: UG – West Wing Zone #1
Required Volume – 20 m3

Description : Industrial Complex Demolition Debris – Interior Walls and Floors
Classification – DD1
Action Required: Place material so as to minimize the creation of voids and fill accordingly.
Storage Location: Floor of Industrial complex
Required Volume: 3000 m3

Description : Industrial Clothes Dryer
Classification – AE2
Action Required: Crush
Storage Location: UG – Floor of Industrial Complex
Required Volume: 2 m3

Description : Soil from Oil Storage Area (warehouse Yard)
Classification – S2
Action Required: Excavate contaminated soil for disposal underground and contour area
Storage Location: UG – North Zone
Required Volume: 300 m3

Description : Residual material from the mill thickener
Classification – S1
Action Required: Clean out material during mill dismantling operation
Storage Location: West Twin Lake Disposal Area
Required Volume: 100 m3

Description : Domar Duplex (House 309 & 310)
Classification – DD1
Action Required: Bulldoze to adjacent empty lot. Reduce volume via burning. Remove debris to landfill.
Storage Location: Landfill West of Nanisivik Townsite
Required Volume: 20 m3

6 Disposal Plans

The following disposal plans deal with each site separately, starting at Strathcona Sound and working towards the Twin Lakes.

Dock area at Strathcona Sound

i. Ship Loader – The ship loader is the property of CanZinco Ltd. and there are negotiations taking place currently regarding the dismantling and sale of this item. If it is decided that the ship loader will be scrapped then it will be dismantled and trucked underground for disposal in the West end of the mine. The space required to store the ship loader and the conveyor ways is estimated to be 1400 m^3. This demolition debris would consist of steel, electric motors, cable, pipe, conveyor belting and concrete. Some of the soil beneath the transfer points of the structure is contaminated with metals and this will be placed in the underground mine or West Open Pit.. The amount will be confirmed as part of the phase III ESA scheduled for August 2003.

ii. Concentrate Shed – The concentrate shed is the property of CanZinco Ltd. and there are negotiations taking place currently regarding the dismantling and sale of this structure. If it is decided that the shed will be scrapped then it will be dismantled and trucked underground for disposal in the West end of the mine. The space required to store the demolition debris (siding and structural steel) from the concentrate shed is estimated to be 2200 m^3. The concrete foundation will be swept clean and remain in place. It will then be covered with 1 metre of shale and contoured to prevent pooling and to allow for drainage. The dust and dirt removed will be disposed of in the underground mine.

iii. Propane enclosure – All propane cylinders will be returned to the supplier via ship. The storage compound fencing will create a minimum amount of solid waste (estimated to be 5m^3) and will be disposed of underground.

iv. Tank Farm and related structures – The tank farm consists of 18 tanks of various sizes, a pump house, electrical shed and associated piping and ladder ways. If the tank farm is not sold to a third party then it will be decommissioned. The free phase liquids will be removed from the tanks for disposal or transfer. The tanks and related structure would then be cut into smaller pieces and hauled underground. The space required for this material is estimated to be 100 m^3. The pumps for the tank farm are housed in a trailer like structure and will generate approximately 20 m^3 of debris. The contaminated soil in the vicinity of the tank farm will be hauled underground. Any residual “slops” will be shipped south.

v. Cook House and Spill Material Shed – These wooden structures will be burned and the leftover debris (estimated 20 m^3) will be hauled to the landfill site.

vi. Fuel Pipe Line – There is approximately 4 km of 2 inch pipe that will be drained of free phase liquids prior to deposition underground. The estimated storage space required will be 25 m^3.

Summary of waste volumes for Dock Area

Area	Demolition Debris	Soils (Hydrocarbons)	Soils (metals)
Ship Loader	1400		tbd
Concentrate Shed	2200		tbd
Propane Enclosure	5	tbd	
Tank Farm	100	tbd	
Pipe Line	25	tbd	
Cook House & Spill Shed	20	tbd	
Pump House	20	tbd	
Lay down Area		tbd	
Total	3757		

tbd – to be determined by phase III environmental assessment

Warehouse Yard

i. Furniture Storage Building – This building will be dismantled and either sold or trucked underground. Wood from the interior will be reduced via incineration after the dismantling is complete. The space required to store the demolition debris (metal siding and structural steel) from the building is estimated to be 50 m^3. The concrete foundation will remain in place and be covered with shale and contoured to prevent pooling and to allow for drainage.

ii. Oxygen Acetylene Storage Area – This area is a concrete pad with a 4 foot high concrete dividing wall. The wall will be removed and hauled to the landfill. The space required to store the demolition debris will be 5 m^3 The remaining pad will remain in place and be covered with 1 metre of shale and contoured to prevent pooling and to allow for drainage.

iii. Tire and hose shed - This shed is a wooden structure. The volume will be reduced via burning and the remaining debris (ash, steel fasteners, hinges etc.) will be hauled to the landfill and will require less than 5 m^3 of space.

iv. Tires – All tires that cannot be salvaged will be stored u/g in the west end of the mine. The estimated space required to store the tires is 1250 m^3.

v. Cable – All cable that cannot be salvaged will be stored u/g in the West End of the mine. (Approximately 30 m^3)

vi. General Storage Levels – Most of the material stored in the yard will be classified as DD2 (uncontaminated solid waste that can be stored directly) if it is not sold.

The non-salvaged material will be stored u/g in the West end of the mine. (approx. 100 m^3)

vii. Oil Storage area – The contaminated soil in this area will be hauled underground prior to the contouring of the warehouse yard. The volume of soil to be excavated will be determined through the phase III ESA and confirmatory sampling.

viii. After all material from the warehouse yard has been relocated, the entire area will be contoured in order to allow for surface drainage and to prevent pooling

Summary of waste volumes for Warehouse Yard

Area	Demolition Debris	Soils (Hydrocarbons)	Soils (metals)
Furniture Storage Building	80		
Tire Shed	10		
Oxygen /Acetylene Pad	10		
Tires	1250		
Cable	50		
General Storage Area	100		
Oil Storage Area	0	tbd	
Total	1500		

Industrial Complex Area

i. Industrial Complex – Negotiations regarding the dismantling and sale of the Industrial complex and its contents are currently underway. After the building is dismantled, the remaining demolition debris will consist mainly of interior walls and floors. The building foundation has multiple levels and the plan is for the concrete foundation to remain in place and the area buried and subsequently contoured. The concrete and steel debris from the interior floors and walls as well as the adjacent soils will aid in filling the voids created by the stepped foundation prior to covering with 2 metres of shale and contouring the area.

ii. DMS Building – Negotiations for the dismantling and sale of this building and its contents are currently underway. The concrete foundation will remain in place and the area will be covered and contoured.

iii. Compressor House – This building is also included in the sales negotiations. The concrete foundation may be removed to facilitate contouring of the industrial complex area and if so the concrete debris would be used to fill the voids in the adjacent foundations.

iv. Cold and Warm Storage buildings – These buildings are also included in the sales negotiations. The concrete foundations may be removed to facilitate contouring of the area and if so, the debris will be used to fill the voids in the adjacent industrial complex.

Summary of Waste volumes for Industrial Complex

Area	Demolition Debris	Soils (Hydrocarbons)	Soils (metals)
Interior Walls And Floors	3000		
Compressor House Floor	55		
Cold Storage Floor	50		
Warm Storage Floor	100		
Core Shack	5		
Miscellaneous cable/pipe etc	500		
Yard around Buildings		Tbd	tbd
Total	3710		

Town Site

i. Buildings – Useful items such as furniture, appliances, furnaces and boilers within the houses, dome, recreation center and bunkhouses will be offered to the neighboring community of Arctic Bay in a manner yet to be determined. If it is determined that no future use for the houses and related infrastructure within the town site exists then structures will be bulldozed and subsequently burned. The remaining debris will be hauled to the landfill. Any contaminated soil will be disposed of in the underground stopes of the mine. Most of the structures are made of wood and will create a modest amount of debris after burning. Approximately 2500 m^3 of storage space is required. Home heating fuel tanks will be drained prior to disposal in the underground mine. Other miscellaneous debris such as buried service lines and pipes that are encountered during remediation will be disposed of in the landfill, underground mines or open pits.

Summary of Waste volumes for the Nanisivik Town Site

Area	Demolition Debris	Soils (Hydrocarbons)	Soils (metals)
Houses	1500		
Dome	100		
Recreation Center	1000		
Pamo building	500		
Bunk House	500		
Carpenter Shop/Town Warehouse	500		
Miscellaneous	500	tbd	tbd
Total	4600		

Stol Port

i. General Area – All material from this area will be hauled to the landfill. There are two small structures and several satellite dishes that will require approximately 20 m^3 of storage volume. Any contaminated soils will be removed to the underground mine.

Twin Lakes

i. Pipe Line – The tailings pipe line will be dismantled and incorporated into the fill required on the surface cell prior to the placement of the engineered cover. There is approximately 6 km of polyethylene tailings pipe and 4 km of polyethylene water pipe. The space required to store the pipe is approximately 1000 m^3.

ii. Storage Shed - The small wooden shed will be burned and will create very little demolition debris which will be disposed of underground.

iii. Pump Houses – The pump houses and non-salvaged equipment will be dismantled and stored in the West end of the underground mine. The required space is approximately 75 m^3.

Mobile Equipment

The number of vehicles that will be abandoned has not yet been determined. Vehicles will be driven underground to their selected storage area, where the oils will be drained for disposal in the waste oil incinerator, the battery will be removed and the antifreeze will be drained for interim storage prior to shipment off site. The table below indicates the approximate volumes of the fleet of vehicles currently on site.

Vehicle	**Volume m^3**	**Quantity**	**Total m^3**
Underground Dump Trucks	95	9	855
Ford 9000 Dump Trucks	60	3	180
966 Loaders	80	5	400
980 Loaders	100	4	240
D-8 Bull Dozers	90	2	180
Scoops	75	1	75
Excavator	100	1	100
D-4 Bull Dozer	50	1	50
Rock Bolters	100	3	300
Jumbo Drills	90	3	270
Utility vehicles	75	6	300
Pick up Trucks	20	20	400
Miscellaneous Vehicles	80	10	800
Total			**4150 m3**

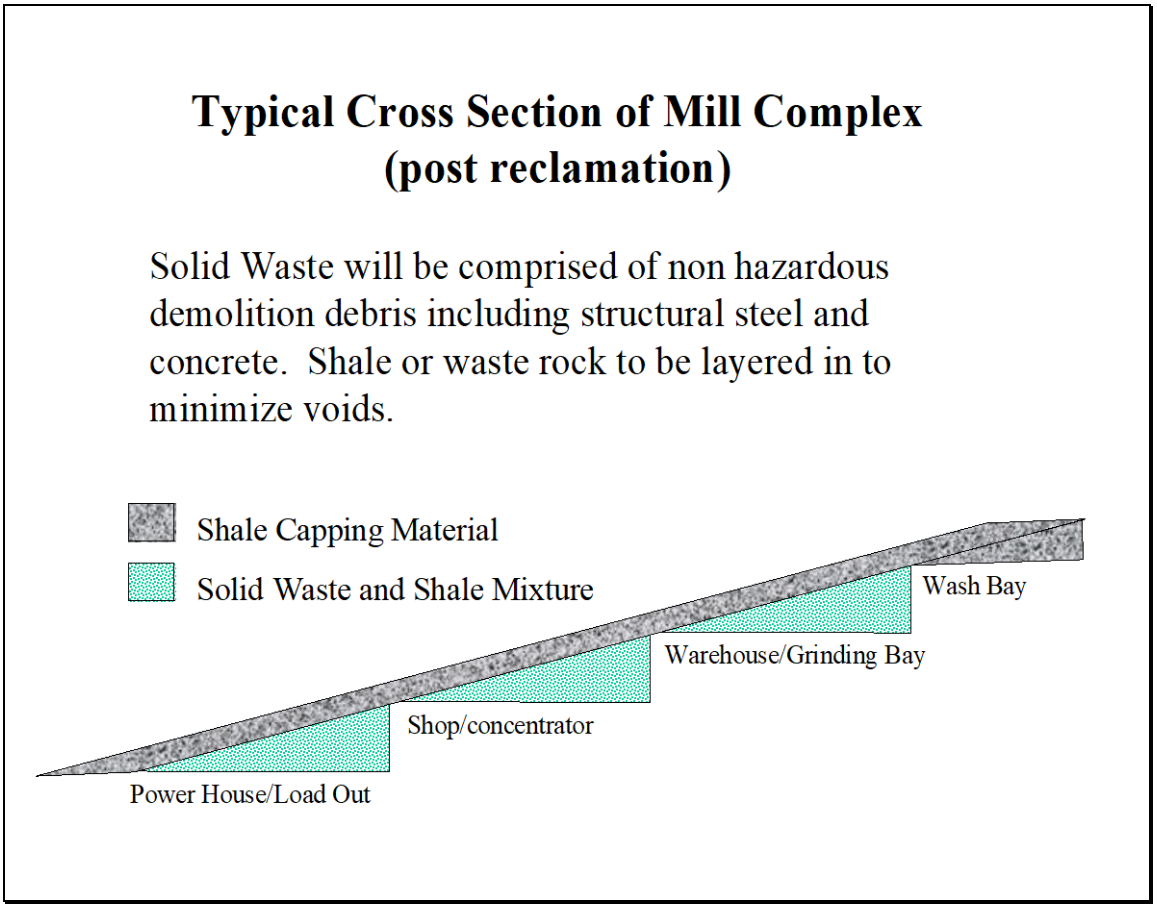
7 Placement Methods

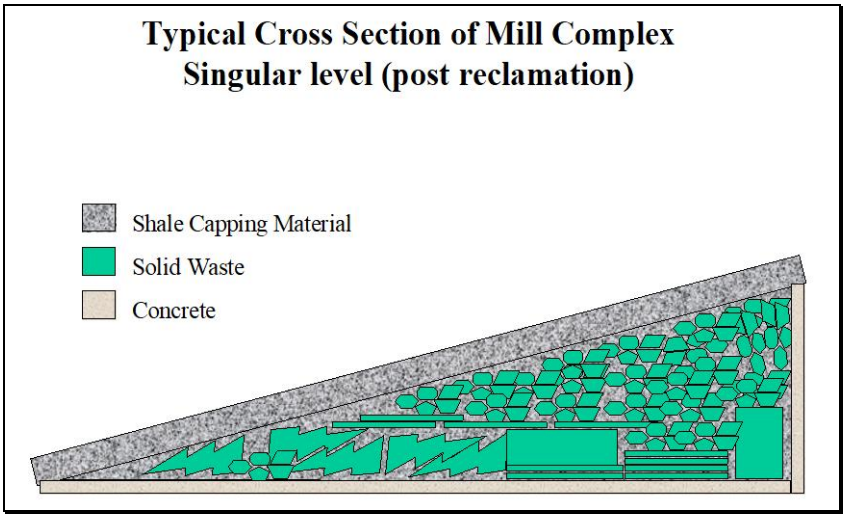
Demolition debris and abandoned equipment volume will be reduced as much as possible prior to being placed in a storage location. This will minimize the number of trips and will better facilitate the loading of haulage trucks. The large amount of space available underground (volumes are described in the following section) will make it possible to avoid handling the material more than once. In most cases trucks will dump directly into the allotted storage area and no further handling will be required. In areas where the height is limited, the material will be pushed up so that 60 to 75 percent of the space is utilized.

8 Available storage space

Industrial Complex

The floor of the industrial complex will provide approximately 9000 cubic metres of storage area for demolition debris. After the area is filled, the area will be covered with approximately 2 metres of shale.

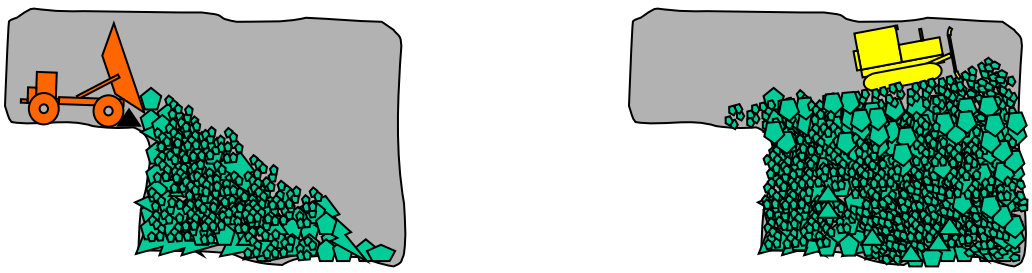




Underground Mine and Open Pits

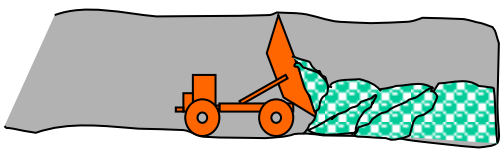
Several areas in the mine have been identified as potential storage areas. (see maps on following pages) The areas selected for storage are in close proximity to the main haulage roads. 435,000 cubic metres of space have been identified for the storage of waste. This includes 120,000 cubic metres in the open pits and 315,000 cubic metres underground. Since there is far more capacity than is required for the identified solid waste (18,800 cubic metres) and waste rock (110,000 cubic metres), the plan will be to use less storage sites but attempt to utilize 60 to 75 percent of those locations selected for waste deposition.

Typical cross sections of waste deposited in a benched storage area.



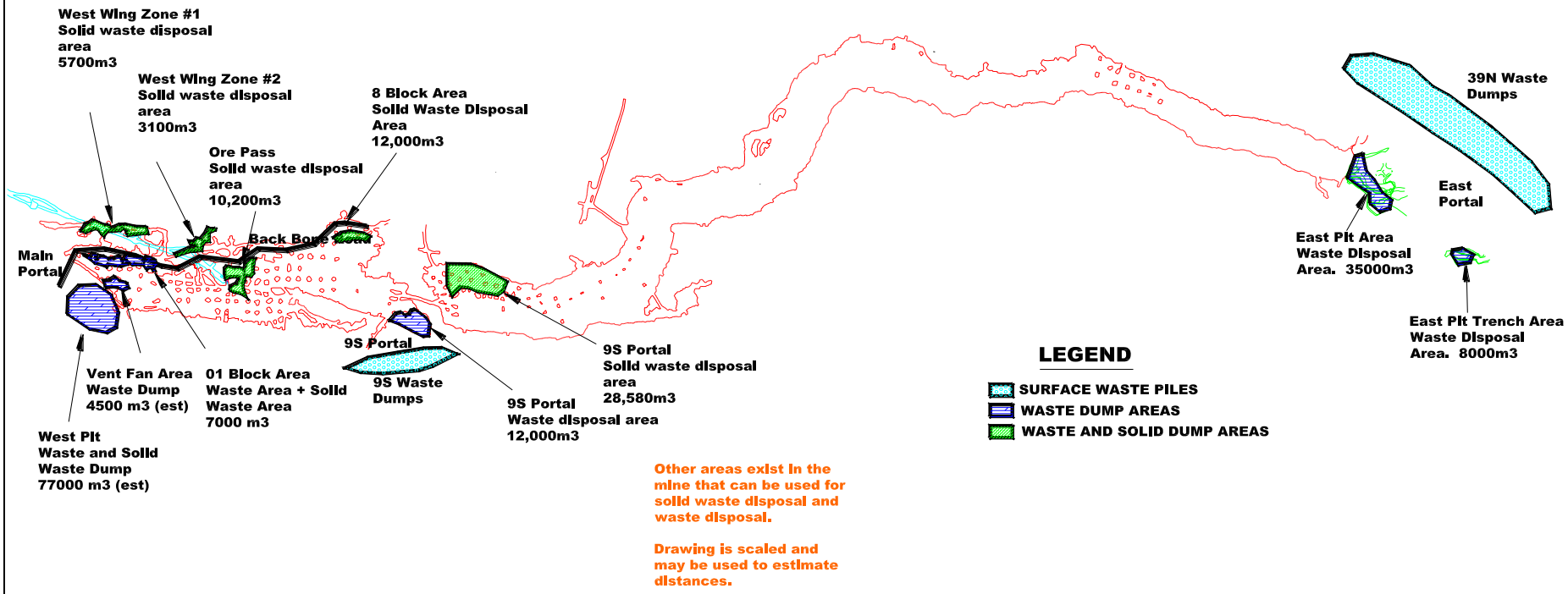
Approximately 75 percent of the storage area can be utilized if the material is pushed in with a D-8 Bulldozer.

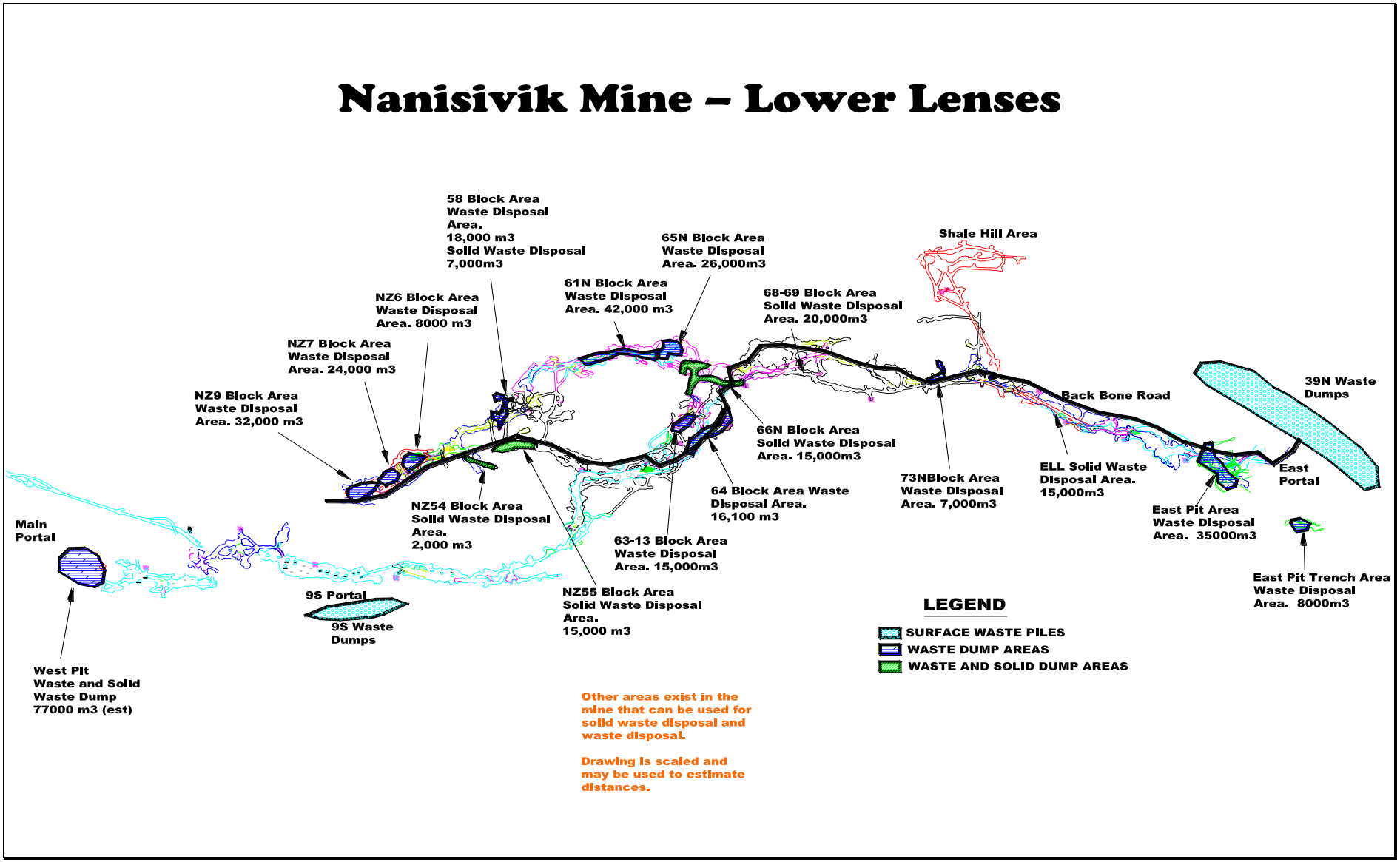
Typical cross section of demolition debris deposited in a drift storage area



Approximately 40 percent of the storage area can be utilized

Nanisivik Mine – Main Lens




Nanisivik Mine – Lower Lenses
58 Block Area Waste Disposal Area. 18,000 m3 Solid Waste Disposal 7,000m3
65N Block Area Waste Disposal Area. 26,000m3
61N Block Area Waste Disposal Area. 42,000 m3
NZ6 Block Area Waste Disposal Area. 8000 m3
NZ7 Block Area Waste Disposal Area. 24,000 m3
NZ9 Block Area Waste Disposal Area. 32,000 m3
68-69 Block Area Solid Waste Disposal Area. 20,000m3
Shale Hill Area
39N Waste Dumps
Back Bone Road
66N Block Area Solid Waste Disposal Area. 15,000m3
73NBlock Area Waste Disposal Area. 7,000m3
ELL Solid Waste Disposal Area. 15,000m3
East Portal
East Pit Area Waste Disposal Area. 35000m3
64 Block Area Waste Disposal Area. 16,100 m3
NZ54 Block Area Solid Waste Disposal Area. 2,000 m3
63-13 Block Area Waste Disposal Area. 15,000m3
Main Portal
9S Portal
9S Waste Dumps
NZ55 Block Area Solid Waste Disposal Area. 15,000 m3
East Pit Trench Area Waste Disposal Area. 8000m3
West Pit Waste and Solid Waste Dump 77000 m3 (est)
LEGEND
SURFACE WASTE PILES
WASTE DUMP AREAS
WASTE AND SOLID DUMP AREAS
Other areas exist in the mine that can be used for solid waste disposal and waste disposal.
Drawing is scaled and may be used to estimate distances.