Central Darling Shire Council

Draft Wilcannia Waste Facility
Long Term Plan of Management

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1.0 Overview

The Wilcannia Waste Facility is described as lot 107 DP 820452, is located about four kilometres from the township of Wilcannia off Hood Street and serves a district population of around 800 residents. There is no accurate means of determining how much waste is received at the facility, though the quantity of waste being deposited is likely to be about 1,000 tonnes per annum based on the size of the district population. The site is not supervised, that is, there is no Council presence to oversee the operations of the facility or to collect fees nor is the site controlled, that is, gates are not shut to limit access to defined times. Previous Council endeavours to supervise and to control the site have been discontinued, principally because of resourcing constraints. The operations continue to utilise an excavation and fill method for waste disposal, together with stockpile areas for the recovery of green waste and scrap metal. Windblown litter is not being well managed. The facility occupies around 15 hectares of land and has been in operation for many years.

Robert Amaral, geotechnical engineer, has proposed two distinct phases in the future landfilling at the Wilcannia waste facility. The first phase is to continue to fill the current main excavated void with putrescible waste and general household waste, to continue to fill the current trench that is dedicated to inert waste and to fill various depressions (minor voids/trenches) about the overall site. The second phase is to investigate where traditional trench and fill methods can be undertaken as smaller excavations both in virgin ground and over previous excavations. Although the unit rate to undertake large excavations is more economical then for smaller trenches, the large voids are more difficult to control and operate compared to the smaller trenches.

It is difficult to determine what proportion of the site has been previously trenched and filled though the disturbed and waste covered nature of the overall site indicates that there may be limited opportunity to continue with this method into virgin ground and may require test pits to be excavated or investigative trenching undertaken to determine areas where future trenching can occur. Council will need to undertake its own investigations into the residual life of the landfill to confirm areas previously trenched that may or may not be suitable for re-trenching and where virgin ground can be identified.

The current excavation (main void) does have about 6 years of residual life as demonstrated in the Amaral concept designs that appear in Appendix 1 as figures 4 -11 of this Plan and a further 5 years in the minor voids/trenches (Appendix 1 figures 12 -15). Future trenching is also included into these concept designs (Appendix 1 figures 1 and16) which should enable the disposal of general waste for an indeterminable, but likely extensive, period into the future.

. At present, green waste is being stockpiled, though this material may be landfilled in the future. As an interim measure, builder's waste and general inert waste is being deposited in a separate trench in addition to the general waste disposal area (main void). A front end loader (FEL) is used to push up the waste materials which achieves minimal compaction and uses an excessive quantity of cover material when applied to the overly steep tipping face. The resulting shape of the waste mass is poor and the waste can remain uncovered for extended periods of time. .

The landfill does not have a leachate management system and therefore relies on good practices to minimise the production of leachate. Such practices include keeping the active tipping area to minimum size, diverting surface water away from the tipping face, maintaining gradients on the capped and covered areas to shed water and applying cover regularly. These measures should form part of Council's standard operating procedures for the future management of the facility.

Scrap metal is separated and placed in a number of stockpiles to be taken off site by a collection contractor. Recovered materials should be removed or processed routinely so that the stockpile is maintained at a manageable size. Fluctuations in the market value of scrap steel have an effect on the frequency of the removal of this material from site.

Changes to current practices have been identified and together with the Amaral concept designs, provide guidance for the long term management of the waste facility.

2.0 Background

Central Darling Shire Council has determined to undertake a review of the operations of its waste facilities in order to identify how the residual life of the landfill can be maximised, how improvements to current practices could be introduced, where efficiencies may be gained and risks mitigated. Council's aim is to achieve sustainable management of the waste facility that is commensurate with available resources.

Council has prepared a scope of works and engaged Robert Bailey Consulting and Robert Amaral Geotechnical (Landfill) Engineer to prepare a long term plan of management for the Wilcannia Waste Facility that will provide a final landform design, filling/staging plans, opportunities within the site for future trenching and procedures to improve operational performance and to mitigate risks.

3.0 Purpose

The purpose of this Long Term Plan of Management (LTPoM) is to provide a process with the highest probability of achieving the defined project aims. The LTPoM would address long term planning and the future design of the Wilcannia Waste Facility in considering the final landform, future landfilling opportunities within the site, activity area interrelationships, existing and future infrastructure, plant utilisation, complying with the EPA Environment Guidelines: Solid Waste Landfills (2nd edition 2016), valuing responsible environmental performance, improving existing landfill management practices and recognising resource recovery opportunities.

The primary aims of the project are:

- To put measures in place that will maximise the residual life of the landfill
- To indentify where future landfilling can be undertaken within the current site
- To restore the site to a suitable shape through planned waste placement

- To identify improvements to existing practices that will translate into cost efficiencies and provide for the realisation of these opportunities.
- To develop plans for the coordinated development of the facility over the longer term.
- To engage practices that will ensure responsible environmental performance is achieved
- To comply with the requirements of the EPA Environment Guidelines: Solid Waste Landfills (2nd edition 2016) together with other relevant legislation, regulations and codes where applicable
- To address risk
- To contribute to the development of an overarching strategic plan that will include financial modelling predicting future incomes and expenditures and will provide for the managed development of the facility over the longer term.

4.0 Operations

4.1 **Current operations for the general waste active tipping area** – general waste, including self haul and kerbside collected waste, is deposited at the active tipping area (main void) and is pushed up about three times per week using a front end loader (FEL). The tipping platform is located above the excavated void and waste material is progressively pushed into the void which is perhaps nine metres deep. Windblown litter is an issue, largely as a consequence of this procedure. The waste is not compacted and an excessive quantity of cover material is consumed when covering the waste, perhaps as much as 60% cover to 40% waste. A lot of potential cover material is being sterilised at the base of the void batters given the sloping sides and depth of the excavation. This is not a particularly efficient method of waste management and disposal.

4.2 **Proposed improvements to the operation of the general waste tipping area –** Geotechnical engineer Robert Amaral has prepared concept designs for the future operation of the current general waste disposal area (main void) as well as landfilling the minor voids and east/west trenches. Initially cover material will be won from the base of the side slopes within the existing excavated void and stockpiled for future use (see Appendix 2 figure 7). Landfilling will adopt a bottom up approach for material taken to the site by Council or contractors where access will be developed to enable vehicles to take waste materials to the floor of the current landform and off load onto a tipping platform. Waste will be pushed onto the tipping face and covered progressively. A top down approach will be adopted for domestic self haul waste where a restricted tipping platform will be established at the top of the excavation and the deposited waste pushed into the void. The size of the tipping platform will be restricted by using, barriers, barricades or mobile litter fencing. Waste will continue to be deposited in this manner until the designated landform shape has been achieved for the current tipping area (main void) before moving to the minor voids and east/west trenches and then ultimately to new trenching. Council will need to undertake its own investigations to confirm areas previously trenched that may or may not be

suitable for re-trenching and where virgin ground can be identified (see Appendix 2 figures 1and16). Mobile litter fencing can be established on three sides of the trenching to manage litter and to control access to the tipping platform

4.3 **Current operations at the active tipping area for inert waste** – Inert commercial/industrial wastes and bulky wastes are being deposited in a dedicated area separate from the general waste disposal area (main void). Some of these waste types are bulky, irregular in shape and can be difficult to manage at the tipping area. This operation simply places the waste material within a shallow excavation over virgin ground and is an inefficient use of landfill space and has sterilised potential sources of cover material. Operating multiple waste disposal areas is not considered good practice as it adds to the cost of disposal and consumes resources unnecessarily.

4.4 **Proposed improvements to the operation of the active tipping area for inert and bulky waste –**The current inert and bulky waste disposal area will be closed once a shape suitable for final capping is achieved (see Appendix 2 figures 2 and 3). All loads of bulky and inert waste will be taken to the general waste disposal area once the current trench has been filled. The existing inert and bulky waste active tipping area will then be capped and the area rehabilitated

4.5 **Existing landfill plant –** a front end loader (FEL)

4.6 **Proposed improvement to landfill plant utilisation –** A FEL will continue to be used to push up the waste material. Appendix 4 provides guidance on the placement and partial compaction of the deposited waste using the FEL and keeping the depth of waste to a maximum of 2.5 metres where the bottom up filling is proposed.

4.7 **Current site control and supervision** – The site is not supervised, that is, there is no Council presence to oversee the operation of the facility or to collect the fees nor is the site controlled, that is, gates are not shut to limit access to defined times. Previous Council endeavours to supervise and control the site have been discontinued primarily because of resourcing constraints.

4.8 **Proposed improvement to site control and supervision**– no changes are proposed to site control and supervision other than staff attending the site on a more regular basis to push up and cover the deposited waste materials. Council may consider the use of CCTV to monitor the site.

4.9 **Current Green Waste Management** – there is a separate area where self haul green waste and wood waste are stockpiled, pushed up and can be shredded as part of a service contract. Contamination is significant where plastics and metals are evident. The stockpile also includes materials such as MDF (medium density fibreboard), treated pine, particleboard and laminated timber. Shredding can be expensive and the contaminated product has little re-use value other than for use as cover material. The lesser contaminated product can be used for placement over disturbed areas to control dust and erosion for.

4.10 **Proposed improvements to green waste management** – although no change is proposed to the manner in which green waste is stockpiled, the

location may shift from time to time as the general waste disposal area changes. Having activity areas concentrated and not spread throughout the site should be an objective of the general operations of the facility. As an alternative to shredding and to save costs, when suitable plant is available, that is, larger plant with tracks such as dozer or excavator, the stockpiled green waste can be spread, larger items of contamination removed and the green waste broken up using a number of passes of the track machine. The broken up green waste can then be landfilled or placed on top of capped surfaces, depending on the quality of the finished product to control dust and erosion. It may also be used as cover as a substitute to ENM.

4.11 **Current scrap metal management -** self-haul scrap metal is stockpiled and on sold to a service contractor whereby the material is taken off site on a routine basis. The scrap metal stockpile is pushed up from time to time using the Council FEL.

4.12 **Proposed scrap metal management** – an effort should be made to ensure the scrap metal is contained to one controlled stockpile area and not allowed to spread or multiple stockpile areas develop. A collection contractor should be engaged to remove the accumulated scrap metal on a regular basis.

4.13 **Current and proposed waste concrete management** – Historically waste concrete was placed into windrows and allowed to accumulate to the point where the retained above ground concrete was excessive. A recent Waste Less Recycle More (WLRM) grant has seen these windrows flattened and covered with ENM. Currently, all receivals of waste concrete are confined to the temporary inert waste disposal area. Future loads of waste concrete should be confined to the general waste disposal area (main void) when the temporary inert waste disposal area is closed and capped (see Appendix 1 under reference to figure3). Suitable waste concrete can be utilised to form internal berms at the general waste disposal area or for access tracks where such use is appropriate.

4.14 **Asbestos and Deceased animals disposal** –Asbestos is currently disposed of within a dedicated trench however there is no supervision on site to ensure asbestos is correctly deposited. Therefore Council relies on those wanting to dispose of asbestos to act responsibly. The information contained on Council's website states " *Any wastes containing or potentially containing asbestos are classified as asbestos waste and must be disposed of properly, according to NSW legislation and relevant guidelines. There are significant penalties that apply if legislation isn't adhered to, including illegal dumping of asbestos and placing into kerbside bins. Furthermore, improper handling and disposal of this material can put you, others and the environment at risk".* There is a download on the website that provides guidance on the correct means of disposing of asbestos. The Waste Regulations require final depth of soil above the asbestos should be 1 metre as prescribed in the Waste Regulations (2014) (see Appendix 5) and cover applied at the end of each day to a depth of 0.5 metres. Council should develop an asbestos policy and require advanced notice of a person's intention to dispose of asbestos in order that plant can be on site to assist with the correct means of unloading asbestos if required and to apply the ENM cover in accordance with the Waste Regulations. Equally Council should develop a procedure for the

management of deceased animals A feature of the long term plan of management is to rationalise the number of waste disposal activity areas and to concentrate the operations rather than have them spread throughout the facility. Decreased animals could be placed at the toe of the lower level advancing face of the general waste disposal area and covered with general waste. Adopting this approach will be a decision for Council's supervisor given the site is not controlled nor supervised

4.15 **Litter-** litter is an issue about the site and the likely source is self haul general waste deposited on the tipping platform at the top of the excavated void. Mobile litter fences should be procured and positioned near to the active tipping area to prevent the spread of windblown litter and to restrict the size of the tipping platform. (see Appendix 6) A program should be established whereby the accumulated litter is collected routinely and then landfilled

5.0 Landform Concept Design

Final landform design and filling/staging plans have been prepared for the future development of the Wilcannia waste facility and these appear as –

- Notes to Accompany Design Drawings in Appendix 1,
- Guide to Site Capacity in Appendix 1,
- Concept Designs in Appendix 2.

This suite of documents provides information on the development of the landfill for future decades and offers guidance for the orderly progression of the landfilling operations. Each sub stage is essentially a building block that in total combination will deliver the final landform. It will be most important that the design is followed in order to deliver the desired outcomes. This may require periodical examination by an external party (surveyor, geotechnical engineer) to confirm the landfilling works are progressing in keeping with the adopted designs.

Council should also be aware that operating a landfill effectively and in keeping with the EPA Guidelines requires skilled plant operators, correct plant, an understanding of grades, reduced levels, waste placement, surface water management, covering and compaction. Council staff who have been given the responsibility to oversee the operation of the facility and contractors who may be engaged to perform specific tasks should be trained accordingly and be familiar with the designs and the principles supporting those designs

6.0 Acts and Policies Associated with the Project

- Protection of the Environment Operations Act 1997
- Protection of the Environment Operations (Waste) Regulation 2014
- EPA Environmental Guidelines: Solid Waste Landfills (2nd edition 2016)

- Environmental Planning and Assessment Act 1979
- Environmental Planning and Assessment Regulation 2000
- Infrastructure SEPP 2007

7.0 Delivery

Desired Outcomes -

- The Wilcannia waste facility will be developed in a planned and co-ordinated manner.
- The project will deliver the stated aims
- Risk will be managed
- Regulatory agencies gain confidence in Council's management processes
- Succession planning is achieved
- Landfill void space will be maximised
- Residual life of the landfill will be optimised
- Long term planning prevents re-work resulting in corresponding savings
- Budgets can be developed for the capital works and programmed for delivery.

Key Actions to deliver the desired outcomes

Sequencing – Broadly speaking, win cover material from the inner side slopes of the current general waste disposal area (main void), modify the access to achieve a bottom to top approach for Council and contractors and a top down approach for self haul domestic waste. Continue landfilling of the main void until filling is completed to finished height and final capping applied and then move landfilling to the minor voids and east/west trenches. Concurrently, continue to have inert waste taken to the temporary inert waste disposal area until a final shape is achieved and the area can be capped. Direct all further inert waste to the general waste disposal area. Undertake site testing to determine where future trenching can occur. Determine access to the area identified for future trenching and prepare the first trench to coordinate with the completion of the existing general waste disposal area (minor voids and east/west trenches). Establish mobile litter fences to three sides of the waste disposal trench

1. Milestone 1 – Complete landfilling of the current general waste disposal area (main void), the minor voids and east/west trenches to achieve the landform design and undertake the final capping.

Key Tasks

- Construct vehicular access to the base of the existing excavation (main void)
- Win cover material from the inner side slopes of the excavation and stockpile this material for future use as cover.
- Establish a tipping platform and tipping face at the floor of the excavation.
- Establish a restricted tipping platform at the top of the excavation
- Collect litter from about the site and establish litter fences near to the tipping platform at the top of the excavation

- Place and cover waste in 2 to 2.5 metre lifts at the floor of the excavation until the final height is achieved.
- Push domestic self haul waste into the excavation from the top tipping platform
- Once the major void is filled, move landfilling to the minor voids and east/west trenches until the minor voids and trenches have been filled
- Undertake site testing to determine where future trenching can occur
- Prepare the first trench for the acceptance of general waste and establish litter fencing and tipping platform
- Develop suitable vehicular access to the new general waste disposal trench.
- Apply final capping to the completed general waste disposal areas.

Milestone 2 – Complete the inert waste disposal area

- Discontinue landfilling inert waste once the design final shape is achieved.
- Cap the existing inert waste disposal area.
- Direct all inert waste to the general waste disposal area.

Milestone 3 – Prepare an asbestos management policy

Cost Estimates - Figures provided below for the likely cost of works required to achieve the milestones are cost estimates only and may well vary depending on a range of circumstances. The purpose of the estimates is to provide inputs for the financial model that has been developed in the overarching Strategic Plan. The Strategic Plan has been prepared to provide direction for the future management of all of Council's waste facilities.

Milestone 1

Key tasks in preparing and undertaking landfilling of the current general waste disposal area (main void), the minor voids and east/west trenches to achieve the landform design and undertake the final capping.

Year 1 $15,000 (capital cost) Note – the site testing and establishment of new trenching will occur outside of the 10 year financial model

Milestone 2

Cap the existing inert waste disposal area **Year 1 $8,000** (capital cost)

Milestone 3

Prepare an asbestos management policy (in house)

9.0 Appendices

Appendix 1- Notes to Accompany Design Drawings

NOTES FOR INCLUSION WITH LANDFILL DESIGN DRAWINGS 20205w

GENERAL

There are a number of issues/circumstances which have an impact on the design of the Wilcannia Landfill as discussed in more detail in the main text of this LTPoM:

* an existing relatively large void with gently sloping side batters (1V:3H to 1V:5H)

* small size of the waste generating community

* remote location

* unlimited access to an unmanned site

* limited available on site heavy equipment

* limited on site pushing of waste into void (2 days/week)

* advantageous low permeability geologic soil profile

* advantageous evaporation to rainfall ratio (at least 6:1)

Using limited size trenches of limited depth can be an effective landfilling method in the absence of large earth moving equipment and purpose built compactors.

On the other hand, the filling of large, deep voids cannot be effectively carried out in the absence of such equipment.

The existing main void at Wilcannia was dug using large earth moving equipment with batters ranging from about 3H:1V to 5H:1V.

The subsequent filling of this main void to the surrounding general ground surface level of about RL 78 will sterilise a large volume of potential soil cover.

Because the filling of the void will be carried out by a rubber tyred front end loader (FEL) with occasional assistance from external heavy equipment, significantly more soil will need to be used to allow the FEL and subsequent waste delivery vehicles (including domestic vehicles) to traffic its surface.

The design of the filling of the main void is based on an effort to retrieve some of the virgin soil in the void batters and to quickly raise its level to about RL 76 which will then be able to be filled using the FEL in a more conventional way.

The ultimate aim is to fill all the larger existing voids and hollows across the site to an overall level of about RL 78 before reverting to a conventional trench and fill method which is more appropriate to smaller sites with limited equipment.

The following conceptual design details attempt to take account of these issues and do not always follow the NSW EPA Guidelines for Landfills but can be technically supported/defended as is allowed for and accepted by the EPA for small, remote communities which are in favourable geological and climatic locations.

At this site, in particular, I have not followed the basic principle of always filling from upstream to downstream in every Stage of filling to limit the extent of run on surface water entering the waste.

This is feasible at this site since the opportunity for leachate production is severely limited by the low annual rainfall and what leachate does develop during significant rare rainfall events can be readily contained on site by the low permeability soil profile.

The actual waste filling process will be somewhat inhibited due to the reliance on a front end loader (FEL) to carry out all the pushing, spreading, compacting and covering activities but should be capable of doing this by a variety of approaches discussed herein with the occasional use of a piece of larger equipment (bulldozer. excavator and the like).

FIGURE 1 SITE SURVEY PLAN (DECEMBER 2020)

Council has provided an up to date 0.5m contour plan of the site which is reproduced herein as **Figure 1.**

FIGURE 2 CONSTRUCTION AND DEMOLITION PIT

The area of interest within the contour plan provided by Council is noted on **Figure 1** and has been reproduced herein as Figure 2 with simplified contours, excluding local stockpiles and the like.

FIGURE 3 C&D PIT FILLING PLAN

This figure illustrates the current C&D pit following closure.

Essentially the current filling practice should be maintained with all incoming C&D material being dumped at the pit edge, then pushed by the FEL into the pit area, tamping down with

the FEL, adding locally available soil/concrete/other hard, small material to allow access and over-riding by the FEL and, finally, track rolling with a heavier piece of equipment before covering with 600mm of soil.

FIGURE 4 CURRENT FILLING AREA

This figure illustrates the existing main void and general waste filling area.

Its location in relation to the whole site is shown on **Figure 1.**

FIGURE 5 MAIN VOID FILLING PLAN (STAGE 1A)

This figure illustrates the completion of the Stage 1A filling whereby waste has been pushed progressively to the southwest over a leading face of 2m depth.

Where practicable, larger waste matter (cobbles, concrete, timber, demolition material and the like) should be end dumped or pushed over the leading face first, followed by smaller household refuse, fine green waste, paper, cardboard and the like and, where necessary, soil to allow the FEL to traffic the surface and provide some compactive effort.

An access to the Stage 1A filling area from the northern corner of the void is shown on **Figure 5.** This was suggested by John Stevenson on site during our site visit and is considered entirely appropriate as the current disposal batter is 6m deep and cannot be properly controlled using the FEL.

If this alternate access is used by waste collection trucks and professional Contractors using larger vehicles the Stage 1A area can be raised by 2m as illustrated with domestic vehicles continuing to use the upper disposal area. This will necessitate the FEL removing the waste from the toe of the small vehicle disposal batter and reaching up with its bucket to drag down as much of this material as practicable from the waste face.

Occasionally it may be necessary to hire the available bulldozer or excavator from the local Contractor to spread, break up and track roll the waste to provide reasonable access for Council and private vehicles.

Where appropriate, gravel, cobbles, boulders, concrete and other hard materials located across the balance of the adjoining land where legacy stockpiles of waste exist should be utilised to assist in developing an accessible working surface.

This figure also includes the recommended placement of access barriers (soil, logs, other) to restrict the drop off area for small vehicles to reduce the spread of waste placement. The location and type of barriers used should be a field decision based on local experience, available materials and local behaviour but is aimed at having incoming waste placed at the most convenient location from a landfilling perspective.

FIGURE 6 MAIN VOID FILLING PLAN (STAGE 1B)

Figure 6 illustrates the completion of the sub-stages 1A and 1B areas.

The Stage 1B filling should proceed in the same manner as the Stage 1A area, advancing the 2m deep waste face in a north westerly direction using the FEL.

The collection and removal of waste pushed over the small vehicle waste face will require the FEL to travel a greater distance.

FIGURE 7 RETRIEVAL OF SOIL FROM MAIN VOID BATTERS

In order to obtain additional soil cover and void space it is recommended that the relatively flat batters be cut back at 1:1 and be stockpiled adjacent to the void for future use as shown on this figure.

The movement of equipment across the in place covered waste (150mm) will provide much needed compaction and some of the excavated soil can be used to improve trafficability of the waste surface.

FIGURE 8 MAIN VOID FILLING PLAN (STAGE 1C)

This figure illustrates the raising of the landfill surface by about 2m over the completed Stage 1A and 1B areas.

This figure assumes that there will still be two dumping areas: small vehicles as shown from RL 78 and heavy vehicles from the 1A filling area at RL 76.

With improvements to the heavy vehicle access track it may be feasible to have all vehicles drop their waste directly onto the lower area.

FIGURE 9 MAIN VOID FILLING PLAN (STAGE 1D)

This figure shows the landfill level at the completion of Stage 1D.

FIGURE 10 RETRIEVAL OF SOIL FROM MAIN VOID BATTERS

At this point a considerable volume of virgin soil can be retrieved from the gently sloping batters as shown on this figure.

The removal of this soil will provide an extensive 2m deep filling area as shown.

The excavated soil should be stockpiled close to the main void for later use.

FIGURE 11 MAIN VOID FILLING PLAN (STAGES 1E,1F,1G AND 1H)

This figure illustrates Stages 1E, 1F, 1G and 1H at completion of filling of the main void.

The final filling of the main void should be divided into sub-stages so that filling is carried out within contained/bunded zones.

Starter bunds about 1m high will be sufficient to separate the waste from unfilled areas and allow adequate segregation of leachate and clean rainwater, provided that waste is not allowed to spill over the top of the containing soil bunds.

The depth of the waste filling across these stages will vary from 2m to 3m.

A “final“ soil cover of 600mm should be used across this area.

At a future point in time this area will likely be overtopped at which time this cover should be largely removed prior to the placement of additional waste.

FIGURE 12 EXCAVATION PLAN FOR MINOR VOID

This existing relatively shallow and gently sloping depression/void should be excavated as shown to provide a 2m deep filling area with the excavated soil stockpiled adjacent for use as cover.

FIGURE 13 STAGE 1A FILLING PLAN FOR MINOR VOID

This figure illustrates a partially completed Stage 1A of this void.

A temporary soil bund (1m) should be placed across its middle as shown to separate waste from the unused area so that any collected rain water can be removed to the environment from the area containing no waste.

To control the dumping of waste at one end of the void, soil bunds should be placed around the balance of the void which can later be pushed over the waste as a final cover.

FIGURE 14 STAGE 1B FILLING PLAN FOR MINOR VOID

This figure illustrates the completed Stage 1A and 1B filling of the minor void.

FIGURE 15 FILLING EXISTING TRENCHES

Two significant trenches/hollows exist between areas of previous filling as shown on **Figure 15.**

These trenches are about 1.5m deep and may be readily filled progressively from either their ends or sides by pushing waste into them with the FEL, mixing in soil, cobbles, concrete and the like to provide a firm base on which to allow the FEL and/or imported heavier equipment to track roll before final cover is placed.

Once complete, the major voids, depressions and trenches will have been filled and the site leaving it at about a uniform RL 78 or so.

Where possible all existing local stockpiles of old waste, concrete, metal and the like should be picked up by the FEL and added to the waste stream to improve access for the FEL and other equipment/small vehicles.

ESTIMATED LIFE OF LANDFILL

TABLE 1

Stage	**Void Capacity (m3)**	**Cover * Required (m3)**	**Net Void (m3)**	**Life ** (years)**
C&D PIT	Reserved for current demolition project			
Main Void Stage 1A	400	120	280	0.3
Main Void Stage 1B	450	135	315	0.35
Main Void Stage 1C	1,000	300	700	0.78
Main Void Stage 1D	880	260	620	0.69
Main Void Stage 1E	1,500	450	1,050	1.17
Main Void Stage 1F	1,500	450	1,050	1.17
Main Void Stage 1G	1,450	435	1,015	1.13
Main Void Stage 1H	750	225	725	0.81
Minor Void Stage 1A	1,300	390	910	1.01
Minor Void Stage 1B	1,350	405	945	1.05
West Trench	2,250	675	1,575	1.75
East Trench	2,230	670	1,560	1.73
Totals	15,060	4,515	10,545	11.7

* assumed 30% ** assumed 900m3 / year

FIGURE 16 FUTURE TRENCH FILLING PLAN

Figure 16 illustrates a plan view of a 50m x 10m trench with a maximum depth of 2m prior to filling and after filling.

The maximum capacity of this trench is about 700m3, assuming a soil usage to void ratio of 0.3.

Each trench would therefore last about 9 months assuming an annual waste stream of 1,000m3.

The location of all past areas of waste filling is not known and it is likely the case that there are significant areas of the site which have not been filled.

It is recommended that after the site has been regularised as discussed above (approximately 12 years) that a trench landfill system be adopted starting at a selected location (suggested T1/T2 area shown on Figure 1) and progressively moving in 1m steps to the southwest.

An excavator will be needed every 9 months or so to dig a 50m x 20m wide trench to a depth not exceeding 2m and less than 2m when waste is encountered.

The excavated soil should be placed around three sides of the trench to limit access and filling to one open end where the FEL can push waste into the trench and progressively advance the fill face as illustrated in Appendix 4.

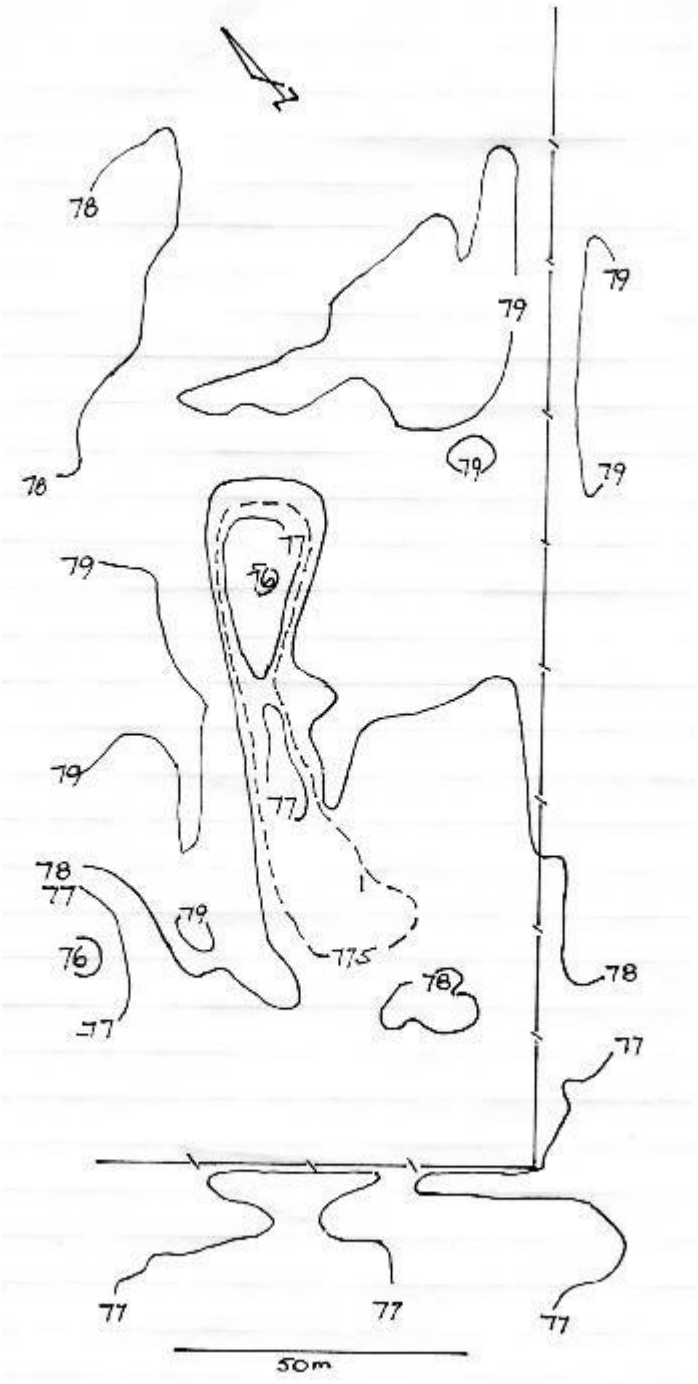
In this way the site can be systematically excavated and filled without sterilising large volumes of soil.

With time and experience, it may prove better to excavate a wider trench to better accommodate the incoming waste volume of dumped material. The more regular times of clearing the waste dumping areayuk, the less area is needed clear the waste.

Appendix 2 – Design Concept Figures 1 to 16

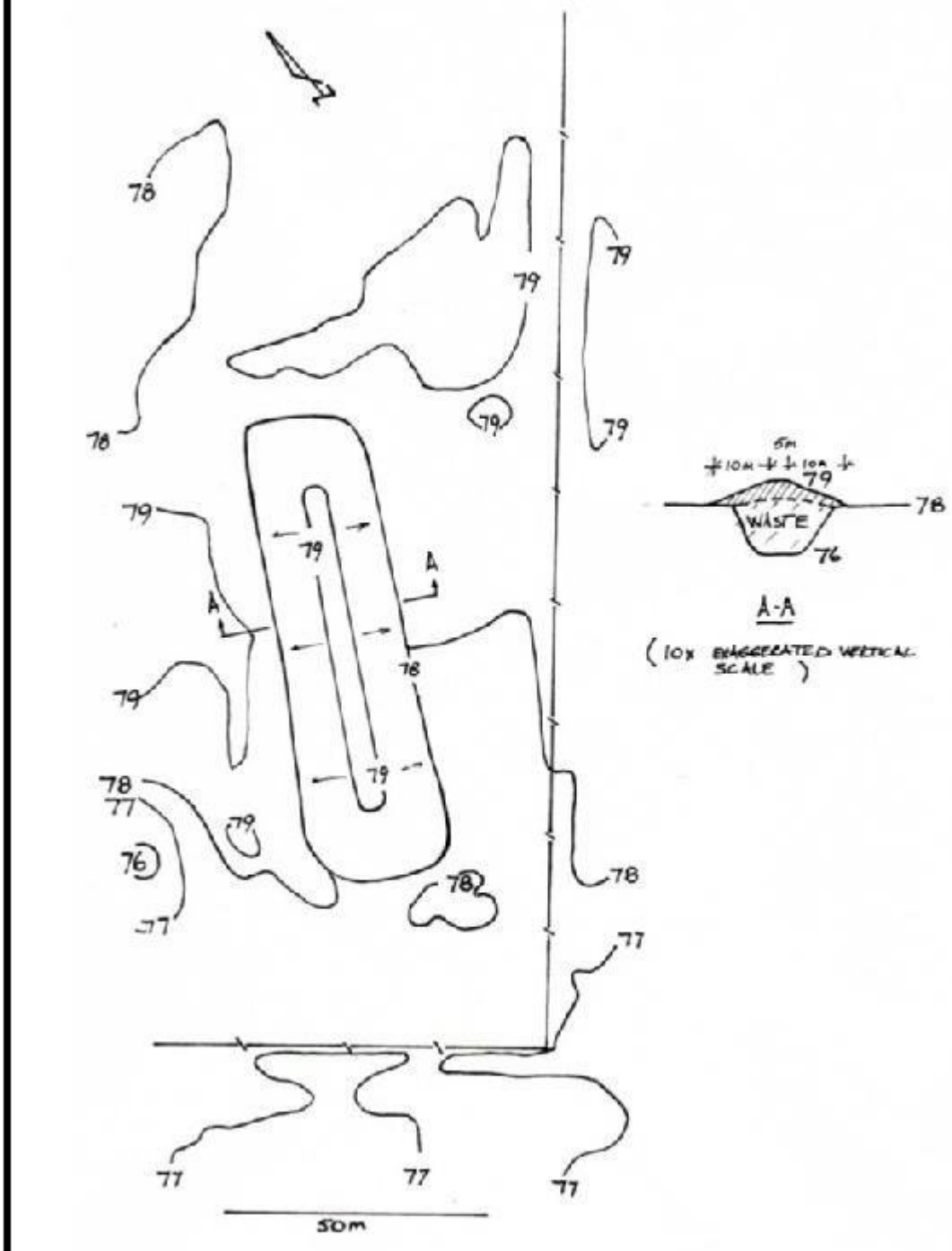
Figure 1

CONSTRUCTION AND DEMOLITION PIT | **FIGURE 2**

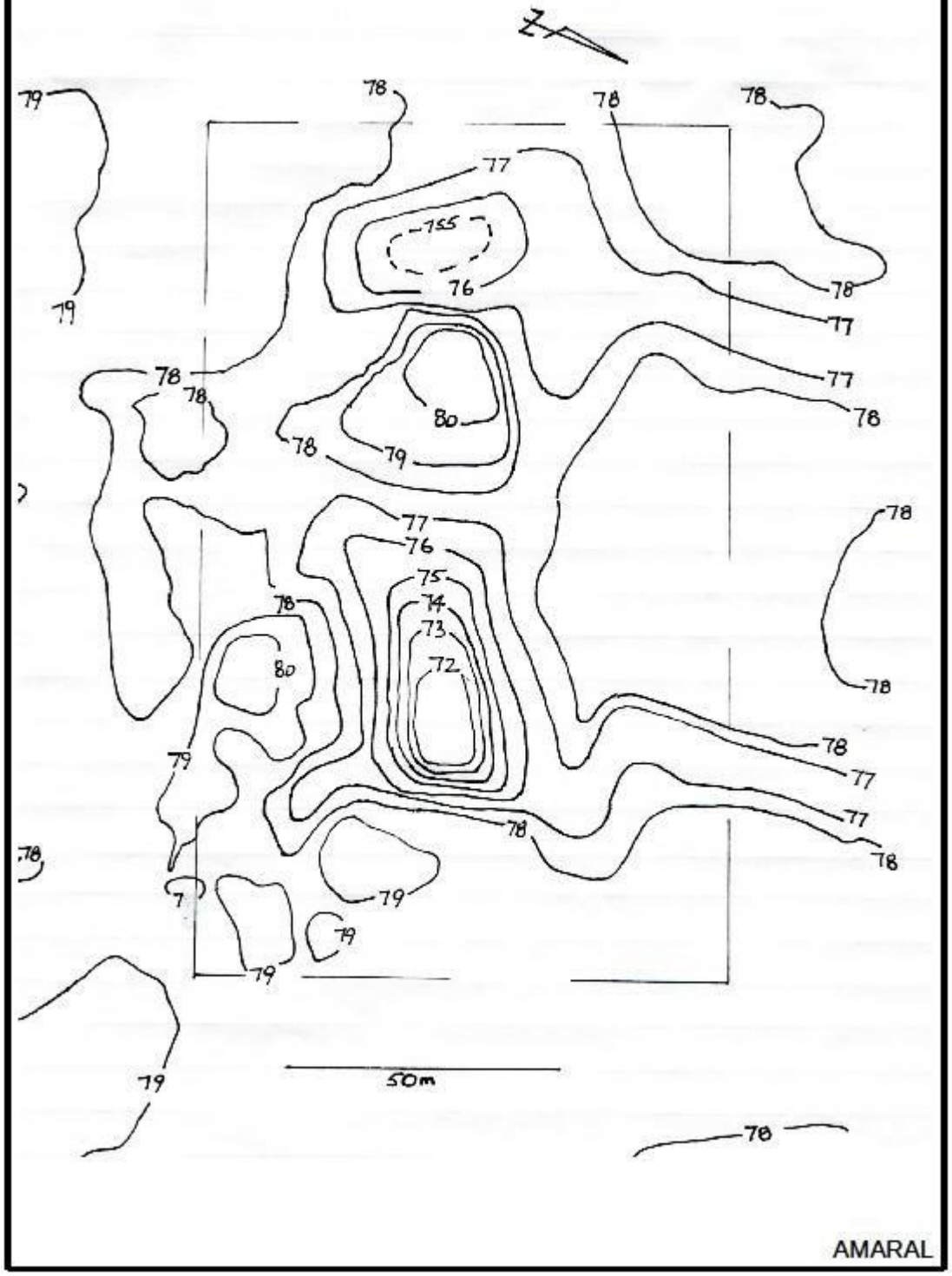


AMARAL

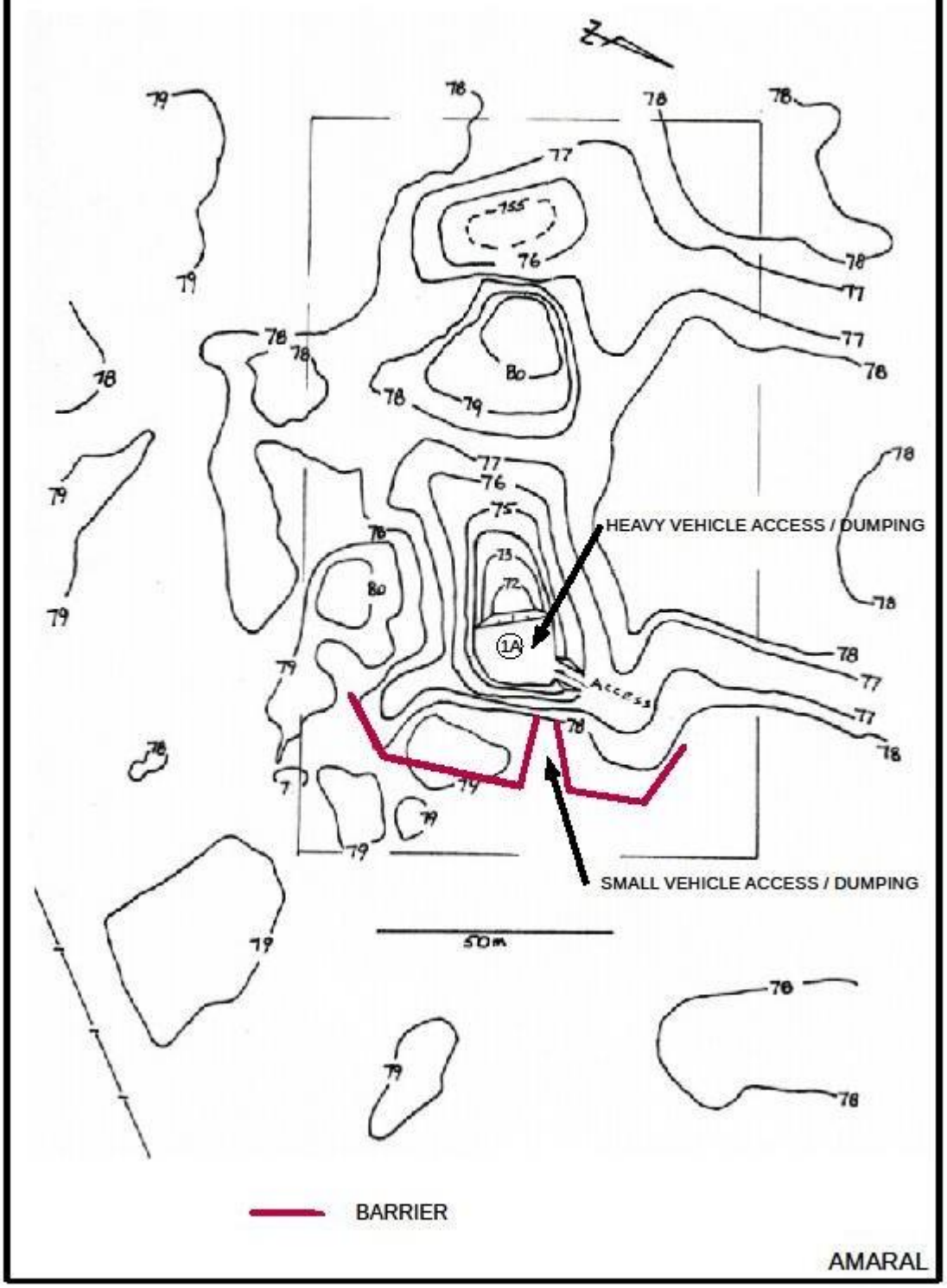
C &D PIT FILLING PLAN	FIGURE 3



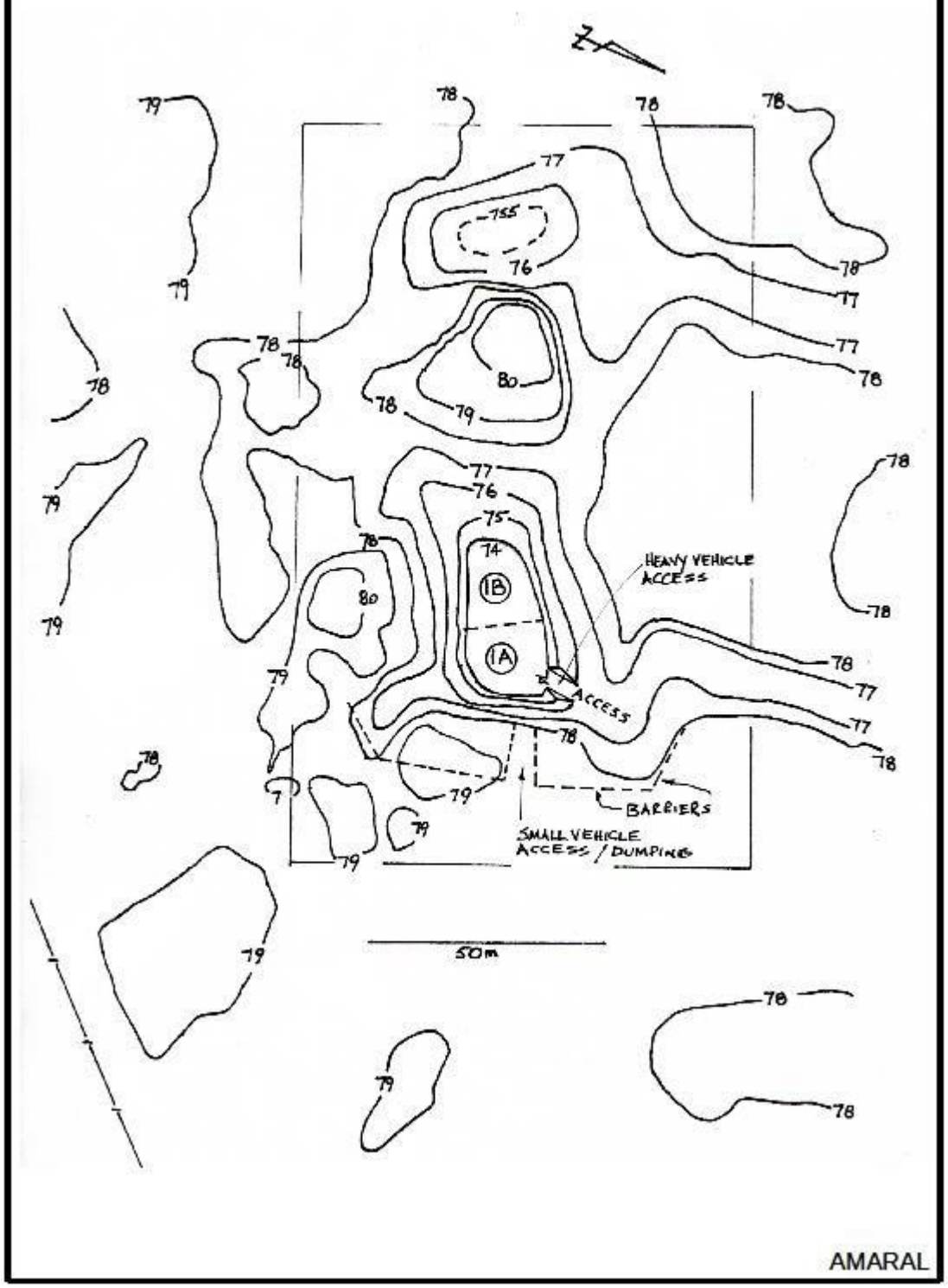
CURRENT FILLING AREA (2019)	FIGURE 4



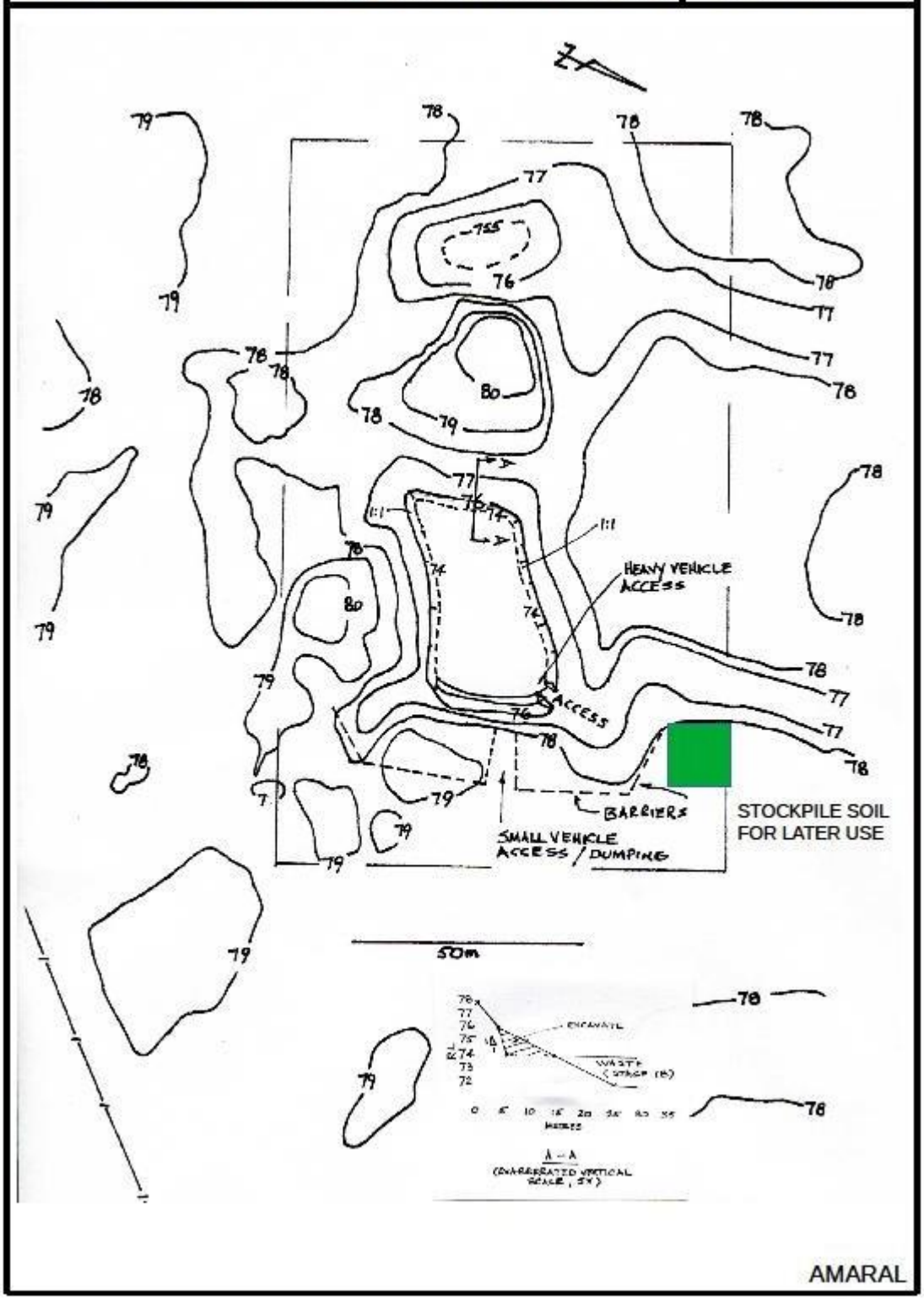
MAIN VOID FILLING PLAN (STAGE 1A)	FIGURE 5



MAIN VOID FILLING PLAN (STAGE 1B) | **FIGURE 6**



RETRIEVAL OF SOIL FROM MAIN VOID BATTERS | **FIGURE 7**



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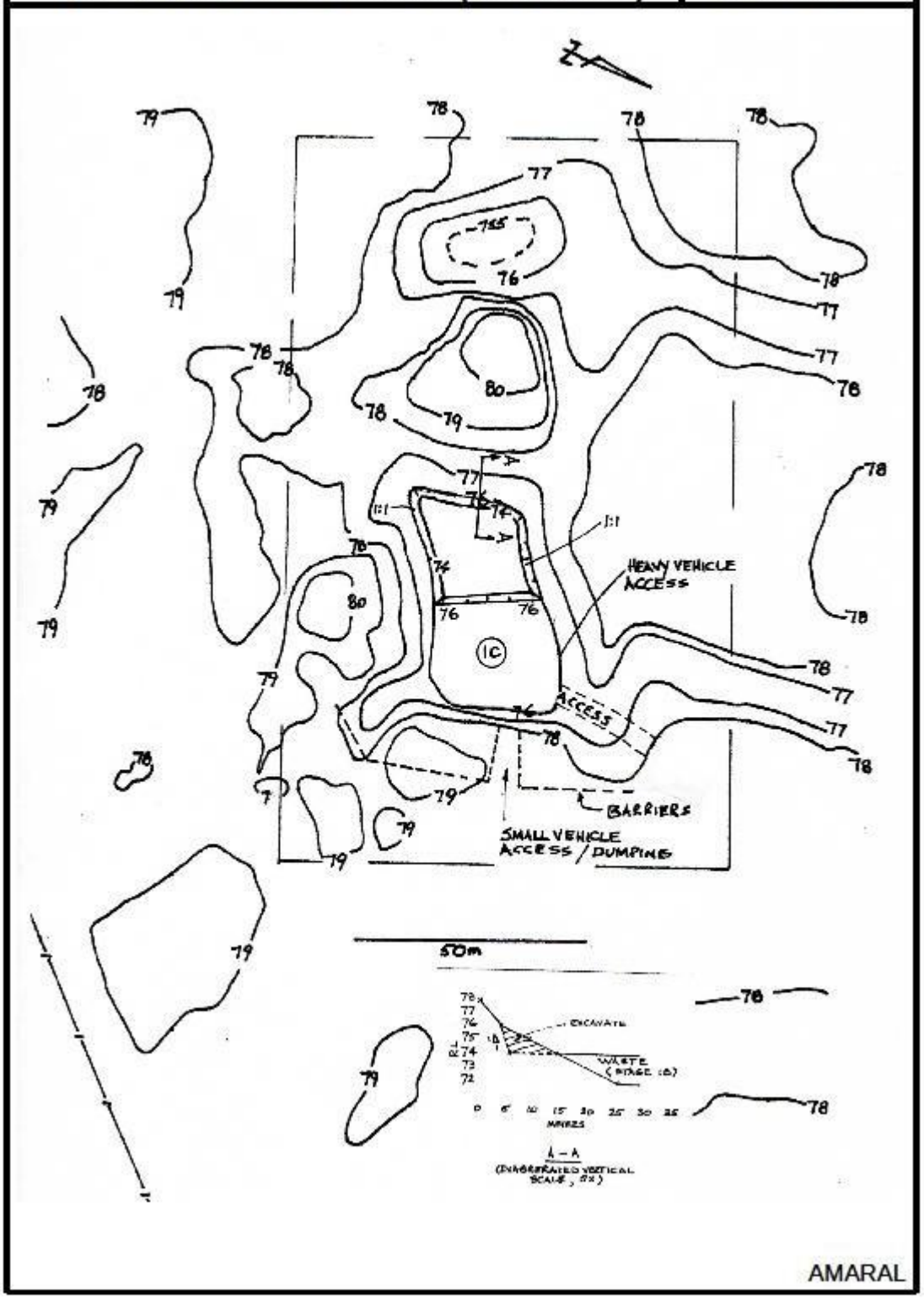
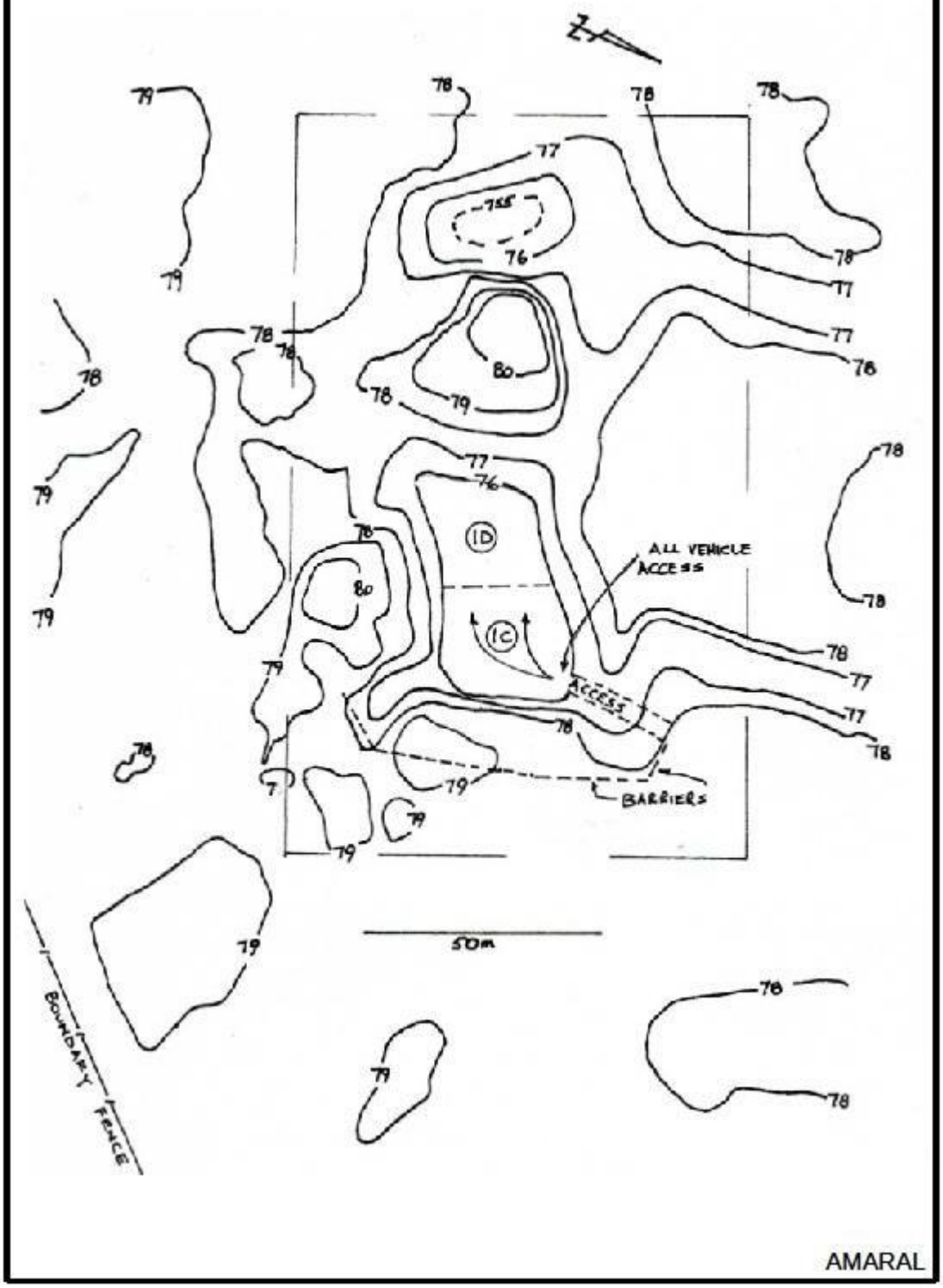
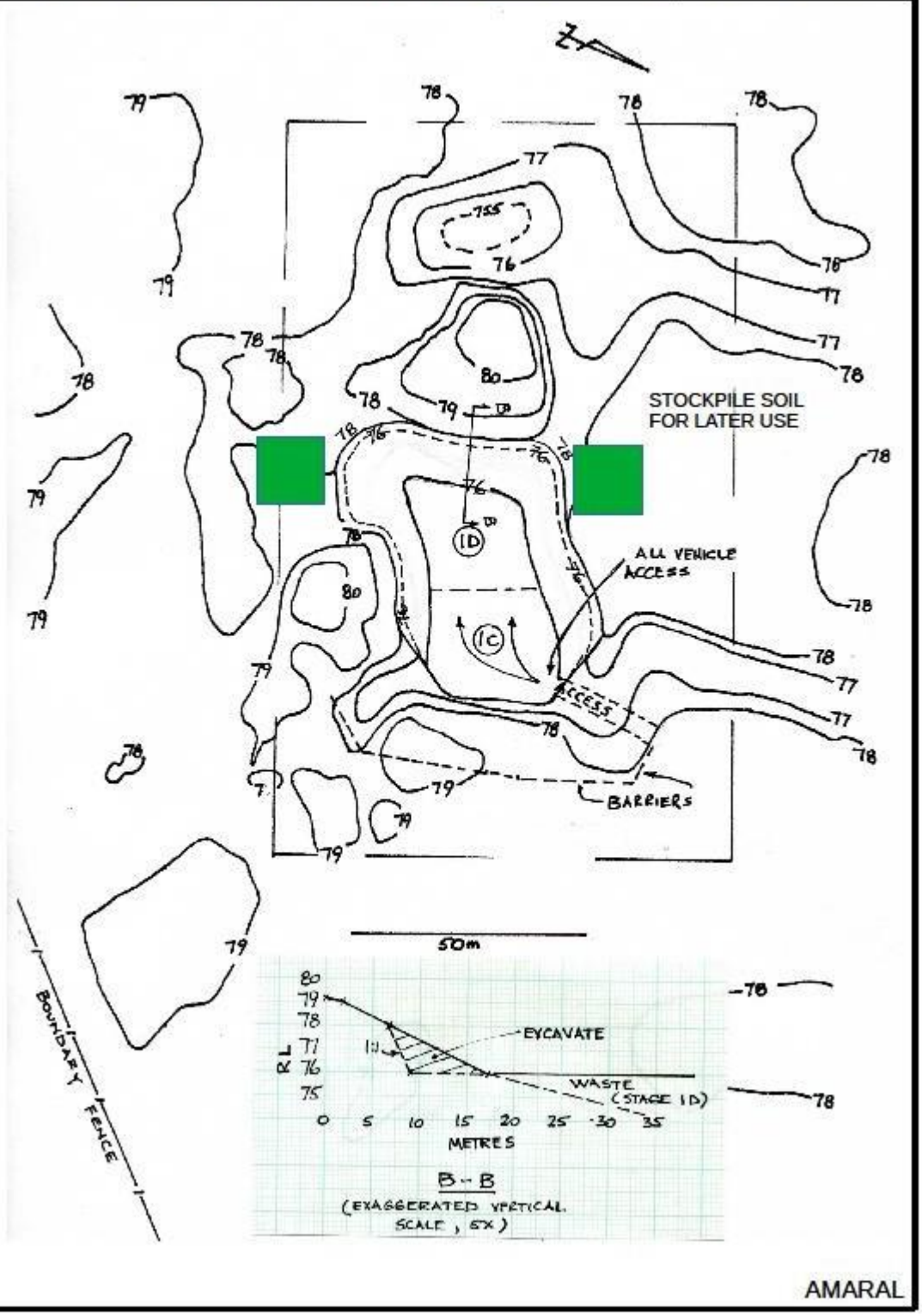
MAIN VOID FILLING PLAN (STAGE 1C) | **FIGURE 8**



MAIN VOID FILLING PLAN (STAGE 1D) | **FIGURE 9**



RETRIEVAL OF SOIL FROM MAIN VOID BATTERS | **FIGURE 10**



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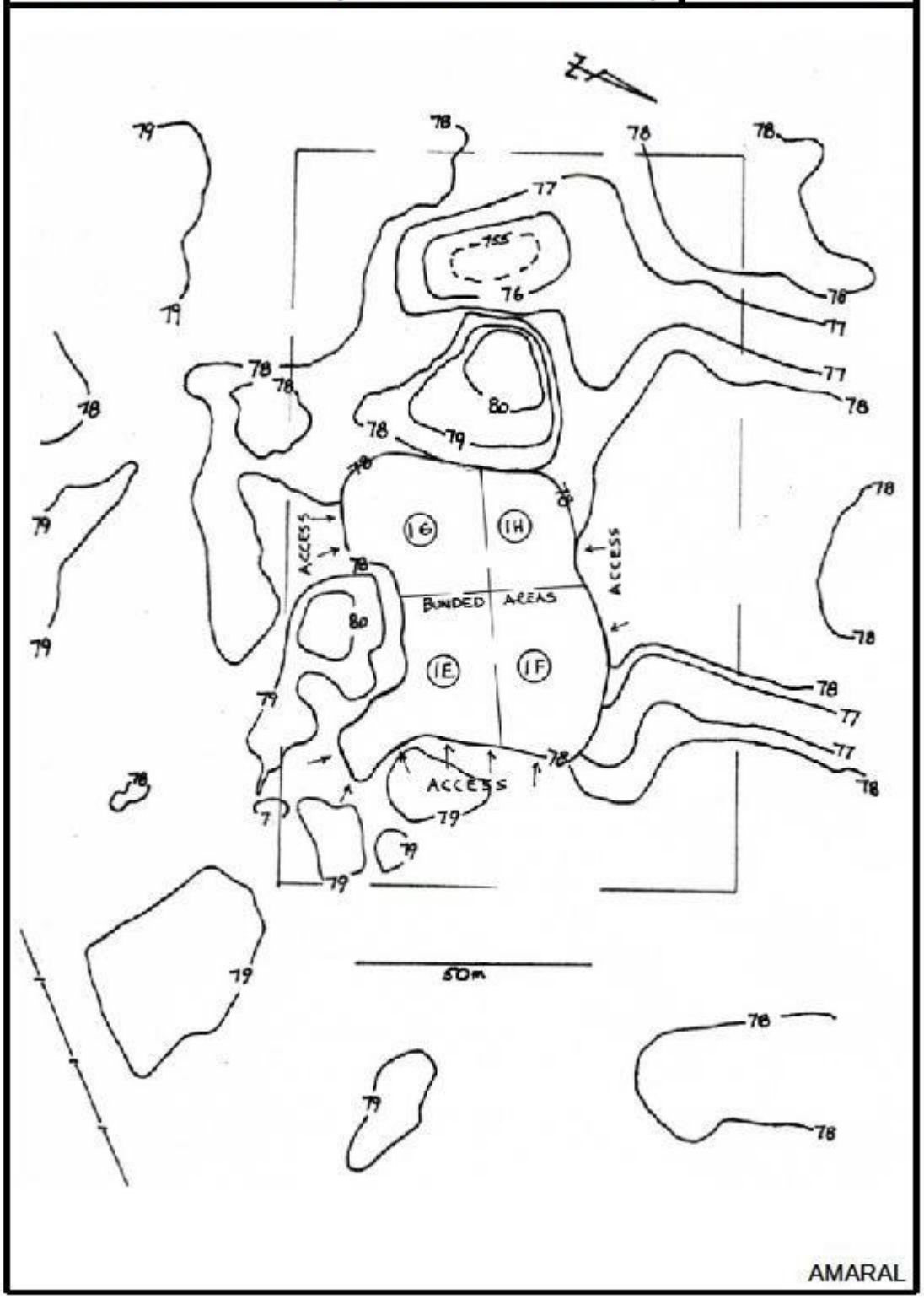
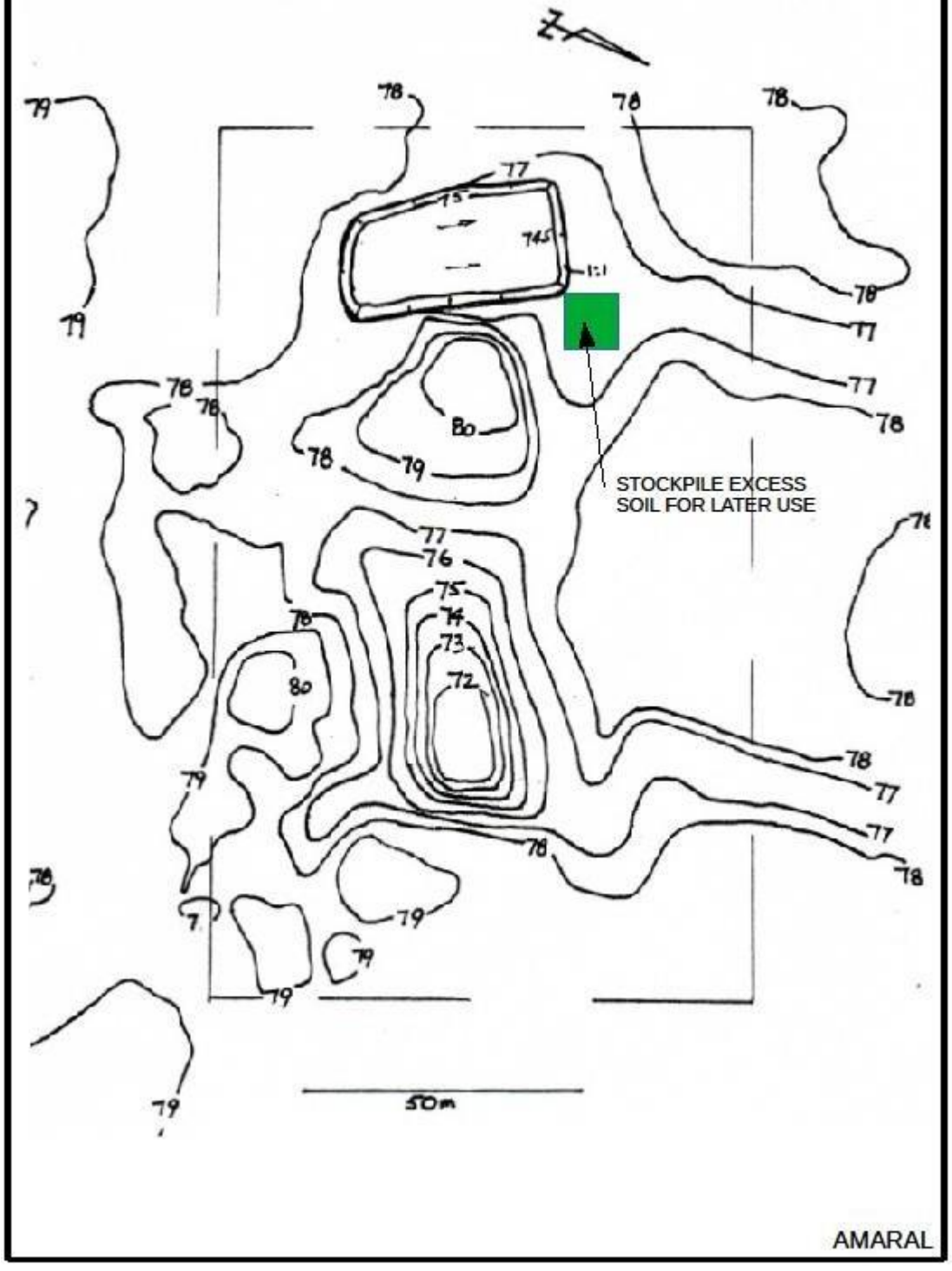
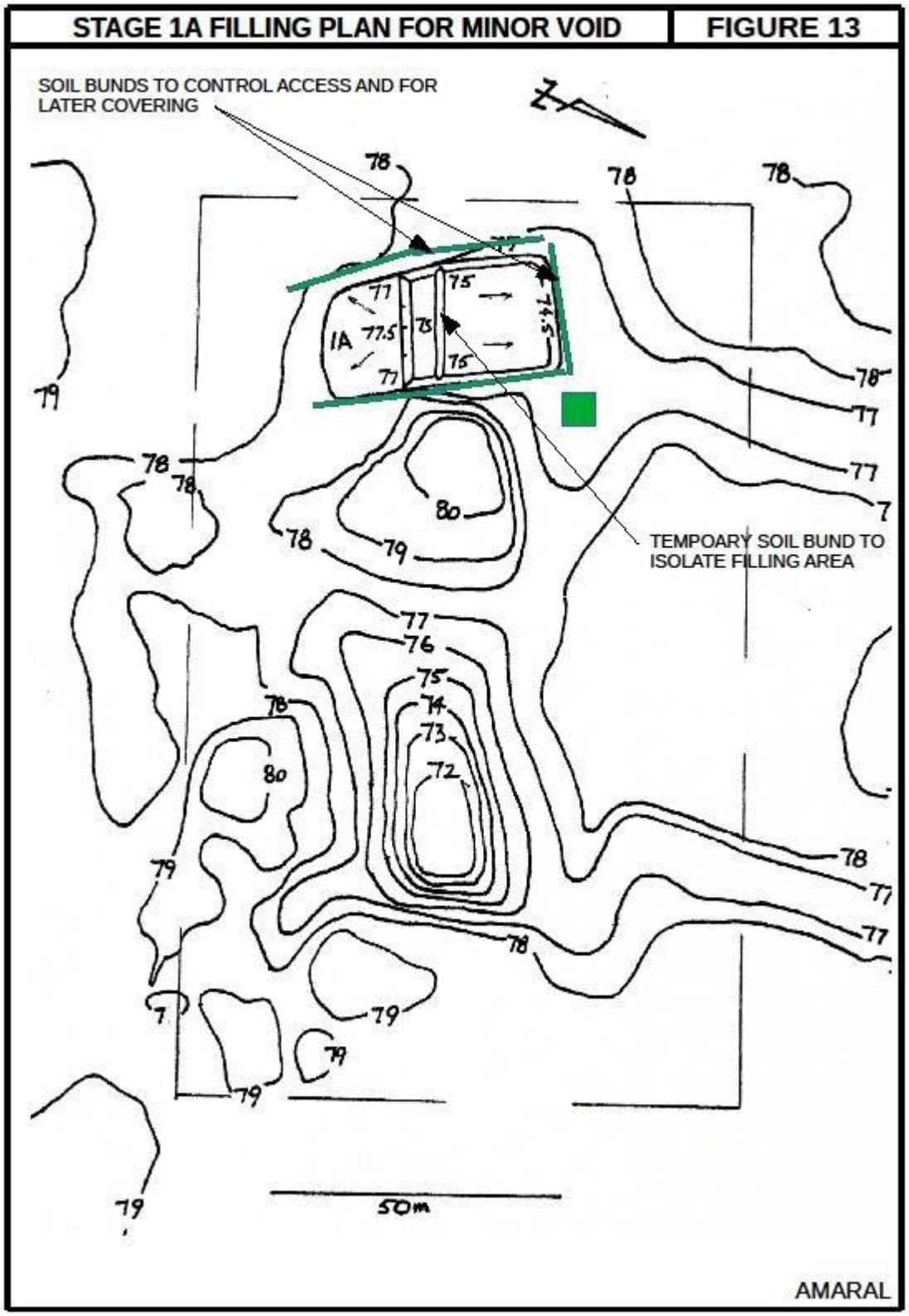
MAIN VOID FILLING PLAN (STAGES 1E,1F,1G AND 1H) | **FIGURE 11**



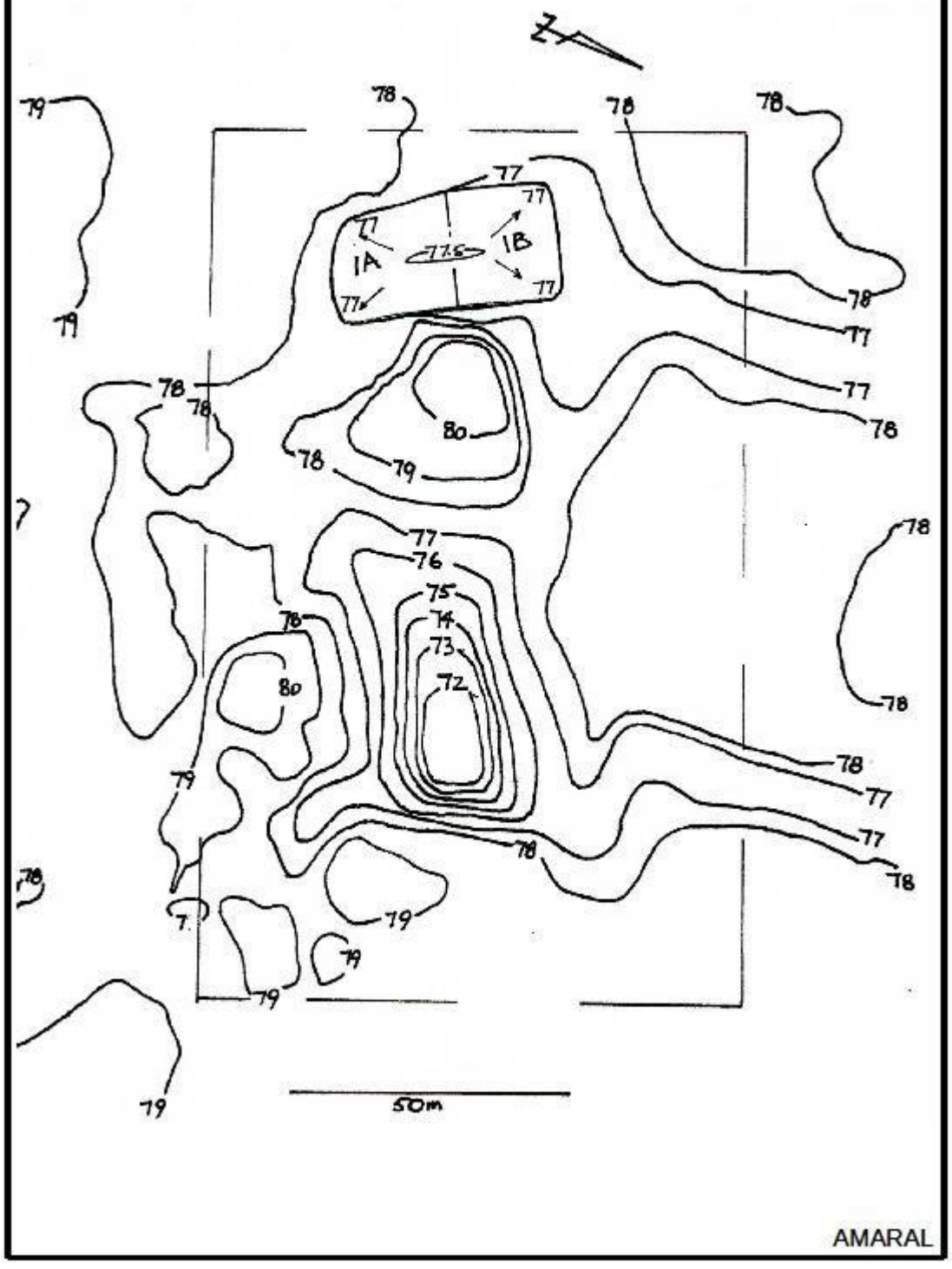
EXCAVATION PLAN FOR MINOR VOID | **FIGURE 12**



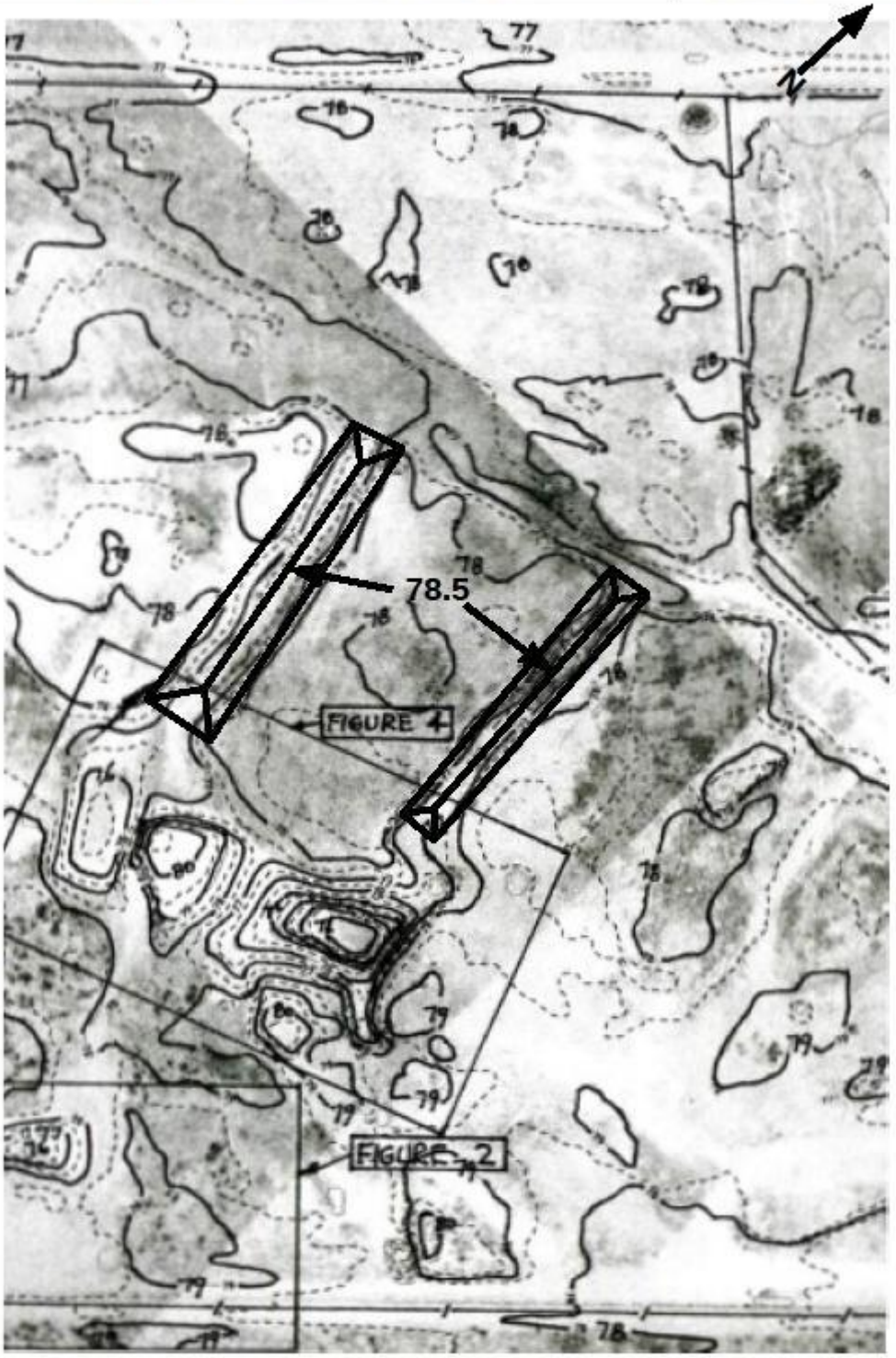
STAGE 1A FILLING PLAN FOR MINOR VOID | FIGURE 13



STAGE 1B FILLING PLAN FOR MINOR VOID | **FIGURE 14**



FILLING EXISTING TRENCHES	FIGURE 15



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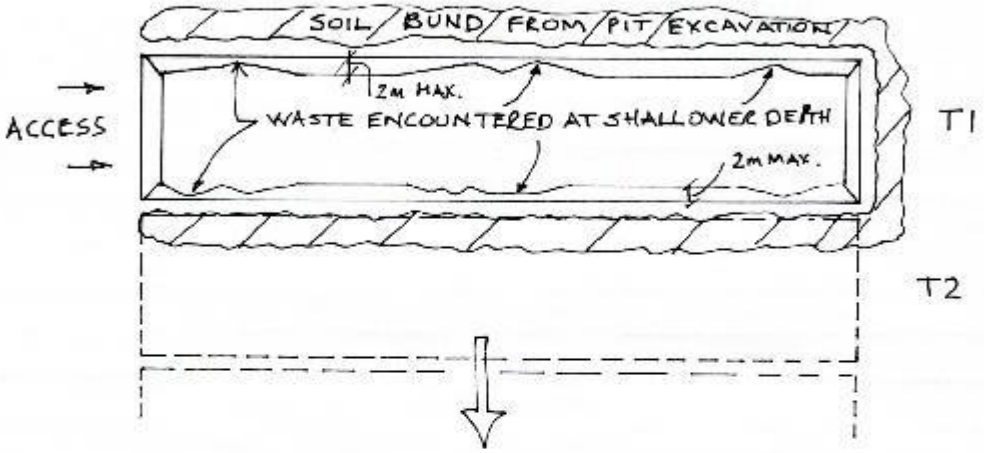
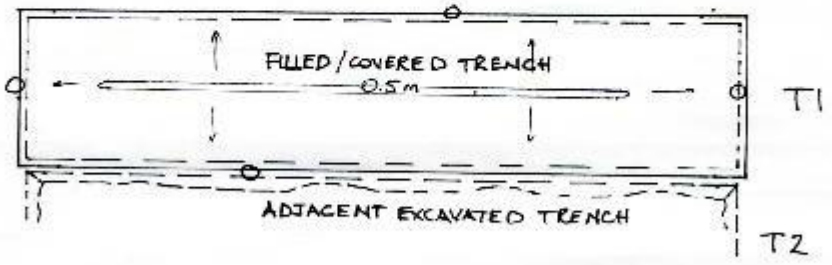
FUTURE TRENCH FILLING PLAN	FIGURE 16

EXCAVATION OF TRENCH



FINAL COVERING OF TRENCH



POSSIBLE STARTING POINT FOR TRENCH EXCAVATIONS ARE SHOWN ON FIGURE 1

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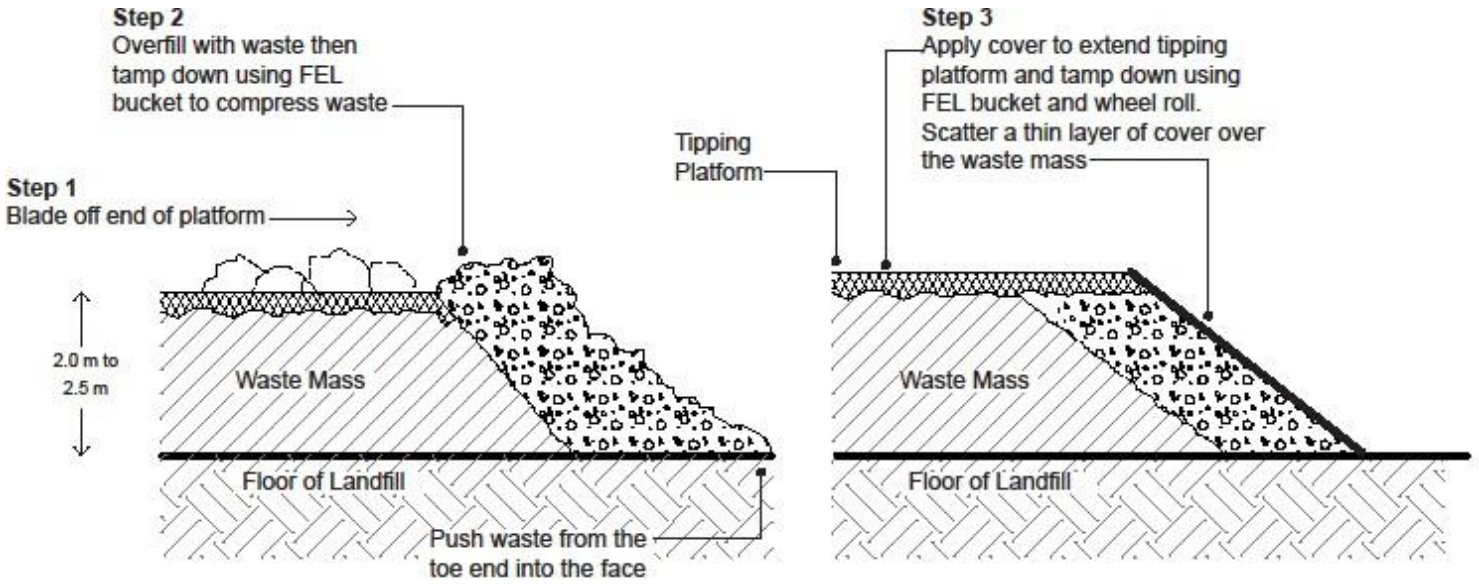
Appendix 3 - Aerial Site Plan

Appendix 4 – Waste Placement Technique



Note – Tamp down the exposed waste with the FEL bucket from the top and then, if accessible, from the toe area push any loose waste into the leading face. Then tamp in the exposed waste with the FEL bucket. Scatter some soil over the leading face from the top (and from the bottom, if accessible) after tamping is completed. This will save cover material and reduce windblown litter

WASTE PLACEMENT TECHNIQUE USING FEL ONLY

Appendix 5 - Protection of the Environment Operations (Waste) Regulation 2014

80 Disposal of asbestos waste
(cf clause 42(4) of 2005 Reg)

(1) (Repealed)

(2) When a person delivers asbestos waste to a landfill site, the person must inform the occupier of the landfill site that the waste contains asbestos.

(3) The following persons must ensure that when a person unloads or disposes of asbestos waste at a landfill site (regardless of whether the site is subject to an environment protection licence) no dust is generated from the waste—

(a) the person unloading or disposing of the asbestos waste,

(b) The occupier of the landfill site.

(4) Subject to any alternative cover conditions provided in an environment protection licence held by the occupier or approved in writing by the EPA, the occupier of a landfill site must ensure that asbestos waste disposed of at the site is covered with virgin excavated natural material—

(a) initially (at the time of disposal), to a depth of at least 0.15 metre, and

(b) at the end of each day's operation, to a depth of at least 0.5 metre, and

(c) finally, to a depth of at least 1 metre (in the case of bonded asbestos material or asbestos-contaminated soils) or 3 metres (in the case of friable asbestos material) beneath the final land surface of the landfill site.

(5) In this clause, ***landfill site*** means a landfill site that can lawfully receive asbestos waste.

Appendix 6 - Example of a Mobile Litter Fence