GUIDELINES FOR THE PREPARATION OF INFORMATION FOR TENDERERS

Materials Engineering Branch
Report No. 2006-40M

MAIN ROADS Western Australia
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ABSTRACT

This report provides an outline of the type of information to be supplied and the format to be used when presenting test results and other information for inclusion in tender documents for Main Roads WA road and bridge construction contracts.

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1. INTRODUCTION

Main Roads provides information to Tenderers on site conditions, foundation materials, borrow, subgrade, sub-base, base course and aggregate on which, or out of which, roads are to be constructed. Main Roads also provides information on water bores, rainfall and river flows.

The purpose of this guide is to provide an outline of the type of information to be supplied and the format to be used when presenting test results and other information for inclusion in tender documents.

It is emphasised that this guide is intended to provide direction on the format in which available information is to be presented. It is not intended that all the tests listed in this guide must be carried out. The information to be supplied is that obtained by consultants and Main Roads in the normal course of investigations for a project.

There are four categories into which information can be grouped.

a. Facts

Some examples of facts are: the percentages of materials passing individual sieves in a PSD test, photographs of diamond drill core samples, and water levels in groundwater observation bores.

b. Interpretation

Some examples of interpretation are: geological sections drawn by interpolating between bore logs.

Bore logs tend to fall on the boundary between matters of fact and interpretation. Laboratory test results on samples from the bore and details such as water level are facts. Visual classification of core specimens and the graphic log showing zones of materials are interpretations. Interpretation is normally carried out by a geotechnical or materials specialist.

c. Opinions

Some samples of opinions are: whether or not a certain material will be rippable based on seismic velocity results, an opinion as to whether a gravel is suitable for use as a base course.

Opinions must only be given by persons who are able to demonstrate that they are an expert by reason of specialised training, study or experience.

d. Speculation

Where there are insufficient “facts” to carry out an interpretation or form an opinion, a geotechnical specialist may speculate on the basis of his experience or hearsay.

All available relevant factual information should be made available to tenderers. Whether matters of interpretation or opinion are made available is a matter to be determined on the merits of each individual case. Interpretations or opinions on geotechnical or materials matters may be referred to the Materials Engineering Branch before inclusion as information for tenderers. Speculation should never be included as 'Information for Tenderers'.

2. OBJECTIVES

The principal objectives in supplying information to Tenderers are:

- To minimise the cost to the Tenderer of preparing his tender.
- To enable the tenderer to estimate the cost of doing work as accurately and competitively as possible.
- To reduce the risk of the Contractor encountering unforeseen conditions and thereby minimise the occurrence of contractual claims and disputes.

These objectives can be achieved by ensuring:

- Factual information is accurate.
- Interpretations are soundly based.
- Opinions are only expressed where they are relevant, necessary and offered by those with the appropriate training, qualifications and experience.

In practice, much of the information available has been collected with design objectives in mind, rather than as information for tenderers. Where this is the case, the information should be qualified.

3. QUALIFICATION AND RE-APPRAISAL

Where appropriate, the information supplied should be qualified setting out any limitations or deficiencies. Note that a qualification is different from a 'disclaimer' as set out in Section 13 of this guide.

Examples of qualifications are:

- 'Sampling of material from borrow pits was carried out to assess strength for pavement thickness design purposes, not for an assessment of workability. Boulders and large cobbles were therefore excluded from the samples'.

- Source rock for aggregate described on Los Angeles Abrasion test reports as 'dolerite'. Subsequent mineralogical examination established the source rock is 'diorite'.

- 'The low soaked CBR result on the sample is inconsistent with the classification test results on that sample'.

- 'The boundary between soil and rock shown in Fig…… of the geotechnical report was for the purpose of establishing the design gradeline. It may not correspond with the definition of rock contained in the contract documents'.

A re-appraisal of information collected during the preliminary stages of a project is frequently required. For example, the proposed road alignment may have shifted and test reports showing the location relate to the old centre line. The inclusion of a table of locations showing 'location as shown on test report (or bore log)' and 'location with reference to current centre line' may be required.

Where material has been processed prior to testing then the process should be described. A description of how and by what machinery the material was produced and a detailed description of treatment of the material should be stated. For example:

- 'Classification and CBR test results were carried out on the material after ripping and stockpiling by a D7 dozer and pre treatment by compaction in the laboratory. The samples were pre-treated using a hand held rammer reducing the particle size to 10 – 15% retained on 19mm for MDD and CBR only.'

4. TERMINOLOGY

Terminology used should, where possible, be in accordance with

AS 1726 'Geotechnical site investigation'

or other relevant Australian Standards.

For geological terms not found in AS 1726 refer to 'The Penguin Dictionary of Geology'.

5. INFORMATION RELATING TO THE LOCATION OF MATERIALS OR SAMPLES

5.1. Pavement Materials

The location of samples taken from the pavement should be described by SLK or by chainage and offset from reference pegs.

Details of whether the sample was taken from a windrow or at a particular depth within a pavement horizon should be stated.

5.2. Borrow Pit Areas

The location of borrow pit areas should be made as clear as possible by using a combination of maps and sketches.

Each pit area should be marked on a copy of relevant 1:100,000 topographical map. If 1:100,000 scale maps are not available then the latest version of 1:250,000 topographical maps should be used. The extent of borrow pit area should also be defined by GPS coordinates.

Any new alignment should be plotted on these maps and the position of any existing haul roads accurately shown.

The boundary of proposed pit areas should be clearly marked with prominent steel pegs. The pegs should be identified with aluminium tags and references on the detailed map of the area.

Where safety requirements can be satisfied (e.g. fencing), sufficient test holes should be left open to allow a prospective tenderer to visually assess the type of material in each pit area. The holes should be identified with pegs and tags. The information for tenderers should make the method of sampling (test pit, face sample off stockpile, costean through stockpile) clear. Any limitation on excavation depth in the borrow pit should be explained on a separate sheet to the test report.

The number of samples required from a deposit will depend on the variability of the material and the purpose for which the samples are taken. Gravel Search Manual (Materials Engineering Report No. 2001-6M, Section 6.3) provides guidelines for the minimum testing frequency for assessing basecourse and sub-base materials.

An example of a pit area location report sheet and pit management plan is given in Appendix A.

5.3. Stockpiled Material

Stockpiled locations should be described with similar sketches and detailed as those provided for the pit areas.

In addition, the location report sheet should show the approximate height of the stockpiled material.

Sample sites should be marked with pegs and tags, and the method of sampling should be stated. Plaques should be placed on stockpiles indicating stockpile number and its intended use. Sample sites should be marked on the pit plan.

5.4. Quarry Sites

Information on quarry sites should be provided as described in Materials Report 1985/8M. The location of the sites should be given in the same way as location report for the pit areas and stockpiles.

5.5. Trial Excavations and Bore Logs

The location of trial excavations and logged bores should be described by the chainage and offset from reference pegs. Where possible the ground level to AHD should be reported. Where safety requirements can be satisfied, trial excavations should be left open to allow visual assessment by prospective tenderers.

6. INFORMATION ON LABORATORY TESTING

All testing must be performed in accordance with Main Roads WA "Materials Testing Manual". Where no MRWA Test Method exists, Australian Standards should be utilised. All test results must be presented as NATA endorsed reports. All test data should include the reference number of the test method used. If a non-standard test is used, this should be stated and details given. If a material has been stabilised, details should be given. If the information requires qualification, this may appear on the report form provided NATA requirements are not contravened or as a commentary in the information for tenderers.

6.1 Sampling

The method of sampling should be stated.

Examples: 'Samples taken from test pits prior to stockpiling'
'Samples taken as face samples from the stockpile'

These remarks may be placed as a commentary prior to a set of test results or be reported on each test report.

6.2 Particle Size Distribution

The percentage passing should be reported as 100% passing the largest sieve up to 37.5mm.

An estimate of the percentage by volume of material larger than 37.5mm in the stockpiled material must be given. This value should be stated as being approximate only since it is difficult to accurately estimate oversize material. Where cobbles, boulders or other material has been excluded from the sample this should be stated. Suggested wording is 'The stockpiled material contains boulders, cobbles and tree roots. Roots and particles larger than about 100mm were excluded from the sample'.

Parameters such as dust ratio, product rule (LS x $P_{0.425}$) or grading modulus may be included in a statistical summary of the data.

6.3 Consistency Limits

Consistency limits and linear shrinkage should be reported on the same report sheets as the particle size distribution.

Curing details should be provided in the 'remarks' space provided on the report sheet.

6.4 Dry Density / Moisture Content Relationship

In addition to the reported values of maximum dry density and optimum moisture content, the dry density / moisture content curve should be included. The curve should clearly show the individual compaction points achieved. Curing details should be reported.

6.5 California Bearing Ratio (CBR)

California Bearing Ratio results should show whether specimens were soaked or unsoaked and if soaked, the period of time in the water bath and the swell. Surcharge mass should be stated.

The test specimen relative density and percentage of optimum moisture content shall be reported.

No assessment as to suitability, workability or other subjective interpretation should be included on the test report sheet.

6.6 Chemical Tests

If details of chemical analysis of soil samples are available ($CaCO_3$ for calcrete, Fe_2O_3 and Al_2O_3 for laterite) then the test reports should be included. The method of test and the fraction on which the test was conducted should be stated.

6.7 Aggregate Testing

Aggregates are tested for use as sealing aggregate, priming sand and concrete aggregate.

The Aggregate Test Report sheet has provision for Particle Size Distribution, Los Angeles Abrasion Value, Flakiness Index and Average Least Dimension Tests. Additional tests such as Aggregate Crushing Value, Wet/Dry Strength Variation, Pendulum Friction (PAFV), Organic Impurities, Clay and Fine Silt etc., can be added as required in the spaces provided on the sheet.

Test reports such as petrological description and reactivity testing should be included as information for tenderers in the form that the information is received.

6.8 Water Testing

All tests carried out on water samples should be reported on the appropriate Test Report Sheet and made available to tenderers.

6.9 Geotechnical Investigation

Geotechnical testing carried out on foundation material may be performed by geotechnical consultants. The report should be made available to the tenderers in full.

6.10 Seismic Refraction and other Geophysical Tests

The consulting geophysics report is normally made available in full.

6.11 Photographs

Photographs of drill core, test pits, basecourse pits or rock outcrops can be a valuable inclusion in information for tenderers documents. The following guidelines should be adhered to:

- Diamond drill core should be photographed in colour prior to removal of portions for testing.
- An identifying number of marks should be included in each photograph.
- The date and location on which the photograph was taken should be included with the information for tenderers.
- Original/negatives should be stored in a place they can be located at a later date. Photographs of test pits or costeans are particularly valuable if the pit has to be backfilled prior to the letting of tenders to avoid danger to the public or stock.

7. INFORMATION ON LABORATORY TESTING PERFORMED BY EXTERNAL TESTING ORGANISATIONS

Test result reports which have been supplied by external testing bodies should be included in tender documents in the format in which they are received. Where qualifying information is needed this should be presented on a separate sheet.

8. INFORMATION ON QUARRY SITES

Tenderers should be provided with copies of all factual information of interest contained in any geological report on the quarry site.

a. Photographs of drill core samples.

b. Results of petrographic studies.

c. Los Angeles test results and a description of whether the testing was carried out on spalls or on a crushed section of a drill core.

d. Location maps.

e. Percussion drilling rates (where investigated).

f. Blast details (where trial blasts were carried out).

g. Details of where core samples are stored for inspection.

h. Bore log information and geological maps are example of interpretations which should be supplied if available.

i. Details of joint spacing and orientation, if available.

9. EXPLORATORY EXCAVATION (TEST PITS, COSTEANS)

Costeans in proposed borrow pits or cuttings may be excavated for a number of reasons:

- Recovery of samples for testing to establish pavement thickness requirements in the cut.
- Recovery of samples to establish the suitability of the products of excavation for use as embankment fill.
- Exposure of deeper layers to assist in cut slope stability analysis.
- Identification of the soil/rock interface to assist in geometric design.
- Assistance in selection of excavation equipment.

Soils and rocks should be described as per AS 1726 Geotechnical site investigation.

For soils the recommended order of terms is:

- Consistency
- Colour
- Size of particles:
  - Subordinate fraction
  - DOMINANT FRACTION
  - Minor fraction
- Accessory material
- Other pertinent information (eg, geological type, local name)
- Group symbols

Examples:

- Medium density gravely SAND with silt and clay (pisolitic laterite), SM/SC.
- Medium density silty GRAVEL with some cobbles, boulders and shells (Roe Calcarenite) GM.
- Very stiff sandy clay with minor gravel CL.
- Dense silty SAND with some gravel (lateritic) SM.

Consistency terms may be omitted for stockpiled materials.

For rocks the recommended order of terms is:

- Strength
- Fabric (if appropriate)
- ROCK TYPE
- Defects (type and spacing)
- Weathering
- Other pertinent information

Example:

> High strength, massive GRANITE, vertical and horizontal joints at 0.5 to 2m, slightly weathered, joints filled with sandy CLAY.

Rock strength can be measured using the point load index. However, it is adequate for most purposes to estimate the strength using simple field tests described in Appendix B.

Where this procedure is used, Appendix B together with the statement 'Rock strength on the logs was estimated, not measured' should be included in the information for tenderers.

Weathering terms are presented in Appendix C. Note that for materials of pedogenic origin (laterite, calcrete, hardpan, duricrust) weathering terms are not appropriate.

Preparation of logs should be carried out under the supervision of an engineering geologist or geotechnical engineer. Where logging is carried out by the Testing Supervisor or Testing Officer, a site visit by a geologist or a geotechnical engineer from Materials Engineering Branch should be arranged to identify the rock types.

The value of the information on excavation logs is greatly enhanced if the type of machine used to excavate the pit, dimensions of the pit, and the time taken for excavation rate in m^3/hour are included. If ripping was required this should be reported. Refer to Appendix D for formulae for volume calculations.

Information from test pits will almost always need to be qualified. Suggested wording is "Test pit logs describe the material encountered at that site. However, actual conditions in the cutting/borrow pit are likely to vary".

10. BORE LOGS AND PUMP TESTS

Bore logs and pump test details should be presented in the format set out in Materials Report 1985/49M.

11. PAST EXPERIENCE

Details of relevant past Main Roads experience from work in the area or on similar materials may be included. Comments should be succinct and relevant. The past tense should be used.

Examples:

- Previous road construction experience with similar sand-clay base course demonstrated that curing of the basecourse material in a moist condition for at least 4 days prior to compaction was necessary, if specified densities were to be achieved.

- Previous earthworks experience in the swamp demonstrated that the peat had insufficient bearing capacity to support the weight of a Cat D7 Dozer.

12. OPINION

The Information for Tenderers Document must contain all factual and interpretive data relevant to the construction of the works. Expert opinion shall generally be excluded. Where expert opinion is considered essential to minimising the Principal's risk, it shall be clearly and appropriately qualified as opinion only.

Where opinion is included, the wording should be specific and limiting. References should be quoted if appropriate.

One case where opinion should be included is where site conditions are likely to change between the time of investigation and time of construction.

Example:

'At the time of site investigation (March 2006), the groundwater levels were low following a dry summer. Groundwater levels in October are likely to be at least 1.0 metre higher'.

13. DISCLAIMER CLAUSE

The disclaimer clause should be included in the information for tenderers document. It is available from the Main Roads WA website, under Tender document preparation, information for Tenderers, document number 67/05/3071.

NO ATTEMPT TO MODIFY OR IMPROVE THE WORDING SHOULD BE MADE WITHOUT SPECIFIC APPROVAL FROM THE MANAGER, MATERIALS ENGINEERING

14. RESPONSIBILITY

14.1 Design and Specification by Consultant

For works designed by consultant, the consultant may be responsible for preparation of information for tenderers. Information collected as part of preliminary investigation by Main Roads WA personnel should be supplied to the consultant.

14.2 Design and Specification by Main Roads WA personnel

For straight forward rural projects, the Regional Materials Manager is responsible for the preparation of information for tenderers.

The Project Manager is responsible for a review of information for tenderers prepared by the Materials Manager and for preparation of the information for more complex rural road projects and for urban road projects.

The Project Manager is responsible for preparation of information for tenderers for bridge projects. Advice should be sought from the Senior Engineer Structures.

Materials Managers and Project Managers are encouraged to seek advice from the Materials Engineering Branch when preparing information for tenderers.

15. PREPARATION OF ORIGINALS FOR PRINTING

The responsibility for the preparation of a set of test reports or bore logs suitable for use as 'originals' for printing rests with the Region or Branch carrying out laboratory or field testing. The following points should be noted:

- The originals should be on white paper.
- As most documents are produced by black/white photocopying, the use of colour should be avoided except where essential (eg photographs).
- If the 'originals' are produced by photocopying Regional/Branch records, care should be taken that the copy produced is square.
- A margin for binding should be allowed on the left edge of each report sheet.
- Any handwritten test results must be legible.

16 REFERENCES

Standards Australia: Geotechnical Site Investigation, AS1726.

Standards Australia: Road and traffic engineering terms, AS1348-2002

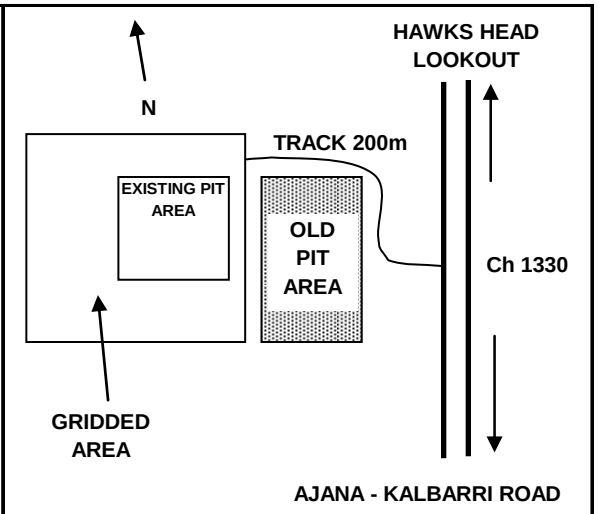
Whitten D G A & Brooks J R V (1972): 'The Penguin Dictionary of Geology' Penguin Books.

APPENDIX A
PIT AREA LOCATION REPORT SHEET
(3 pages, including this page)

PROJECT DESCRIPTION

YEAR	:	**2003**
REGION	:	**Midwest**
SHIRE	:	**Northampton**
MAJOR ROAD	:	**Hawks Head Access Rd**
CHAINAGE	:	**1300m**
Distance from alignment	:	**200m LHS**
PROPOSED USE	:	**Fill**
ESTIMATED QUANTITY	:	**10 500m3**
FIELD DESCRIPTION	:	**Various**
	:	
	:	
	:	
	:	
	:	**SHEET 1 of 2**
	:	
	:	

PIT LOCATION



PRELIMINARY GRID

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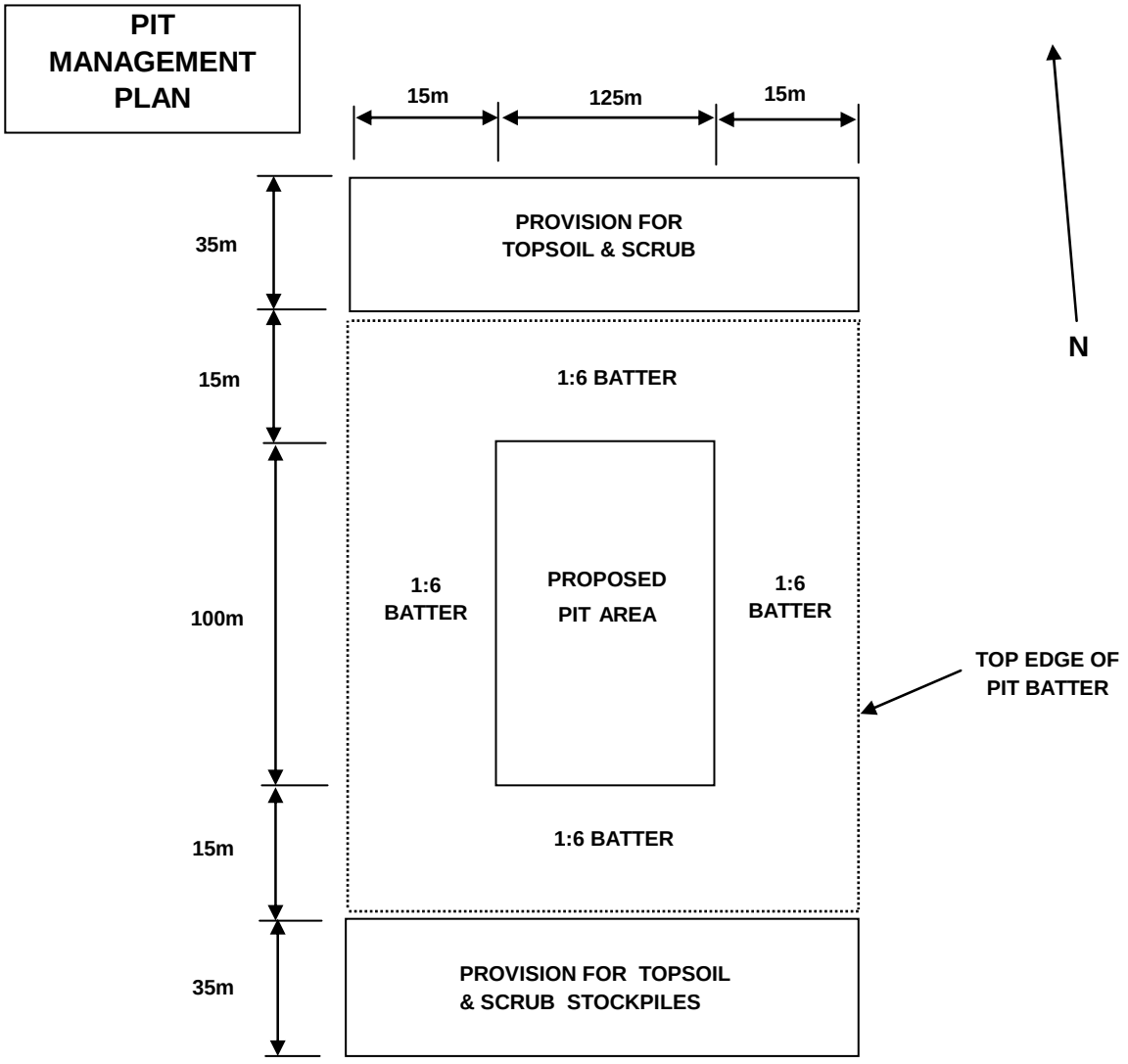
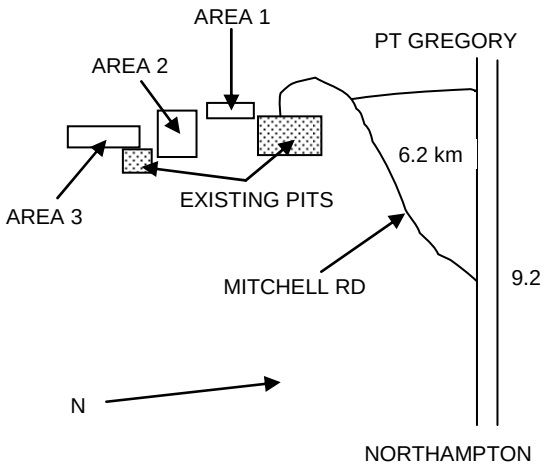


Date: **11.6.2003** Drawn by:

PROJECT DESCRIPTION

YEAR	:	2004
REGION	:	MIDWEST
SHIRE	:	NORTHAMPTON
MAJOR ROAD	:	HORROCKS - PT GREGORY
SLK	:	
ROAD	:	PT GREGORY
slk	:	9.2
LOCATION NUMBER	:	
OWNERS NAME	:	
DATE	:	21.5.2004
PROPOSED USE	:	BASECOURSE
MATERIAL TYPE	:	GRAVEL
GPS READING	:	S 28o 20.243
	:	E 114o 30.291
	:	**PIT 34**
	:	**AREA 3**

PIT LOCATION



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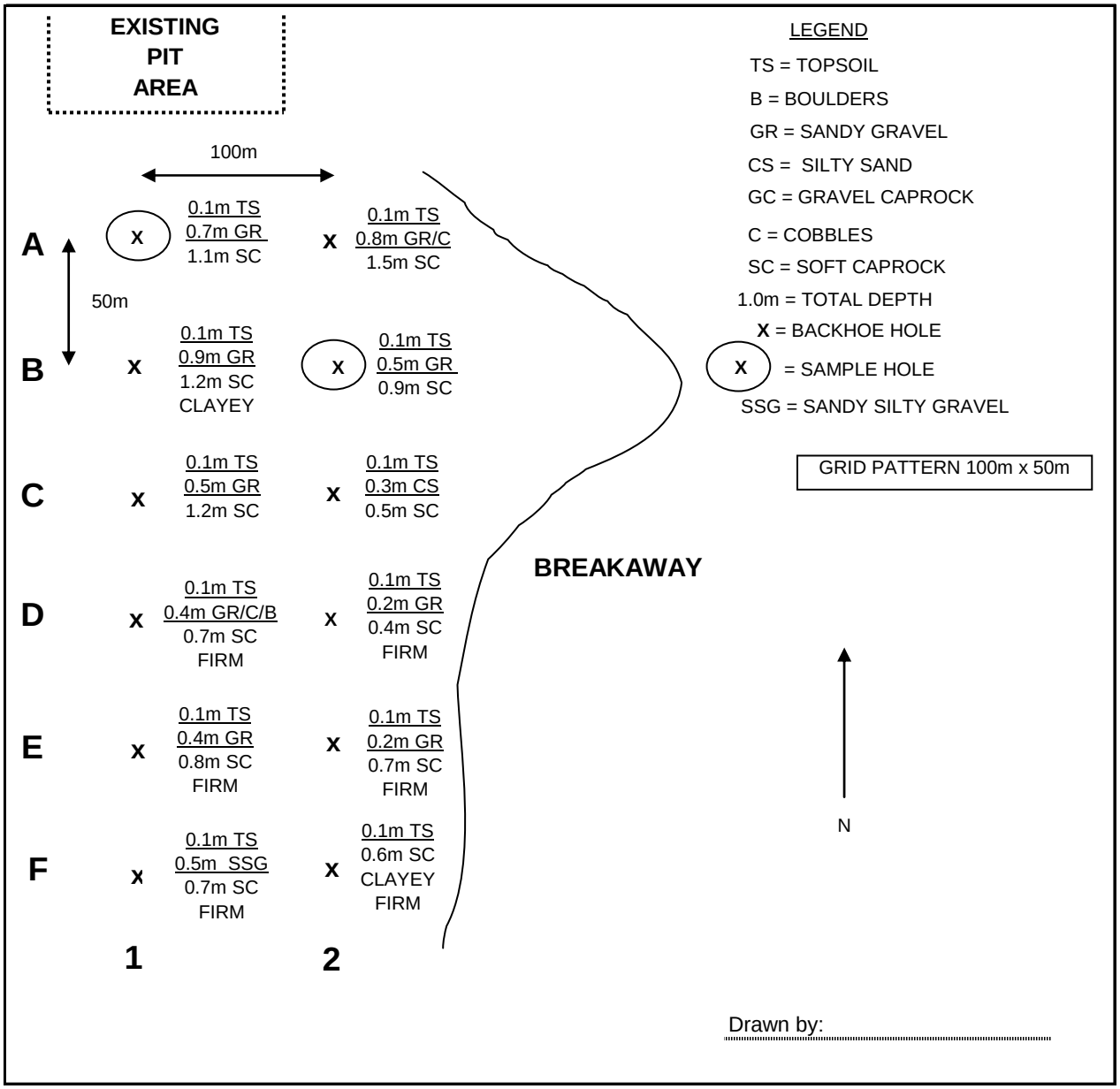


APPENDIX B
STRENGTH OF ROCK MATERIAL
(Reference: AS1726 Geotechnical Site Investigation)

Rock Strength Class (Term)	Abbreviation	Point Load Index (MPa) Is (50)	Field Guide to Strength
Extremely low	EL	≤ 0.03	Easily remoulded by hand to a material with soil properties.
Very low	VL	> 0.03 ≤ 0.1	Material crumbles under firm blows with the sharp end of a pick; can be peeled with a knife; too hard to cut a triaxial sample by hand. Pieces up to 3 cm can be broken by finger pressure.
Low	L	> 0.1 ≤ 0.3	Easily scored with a knife; indentations 1-3 mm show in the specimen with firm blows of the pick point; has a dull sound under a hammer. A piece of core 150 mm long and ~50 mm in diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium	M	> 0.3 ≤ 1.0	Readily scored with a knife; piece of core 150 mm long by ~ 50 mm in diameter can be broken by hand with difficulty.
High	H	> 1.0 ≤ 3.0	A piece of core 150 mm long by ~ 50 mm in diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very high	VH	> 3.0 ≤ 10.0	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely high	EH	>10.0	Specimen requires many blows with a pick to break through intact material; rock rings under hammer.

Notes:

1. These terms refer to the strength of the rock material and not to the strength of the rock mass which may be considerably weaker due to the effect of rock defects.

2. The field guide visual assessment of rock strength may be used for preliminary assessment or when point load testing is not available.

3. Anisotropy of rock material samples may affect the field assessment of strength.

APPENDIX C
ROCK MATERIAL WEATHERING CLASSIFICATION
(Reference: AS 1726 Geotechnical Site Investigation)

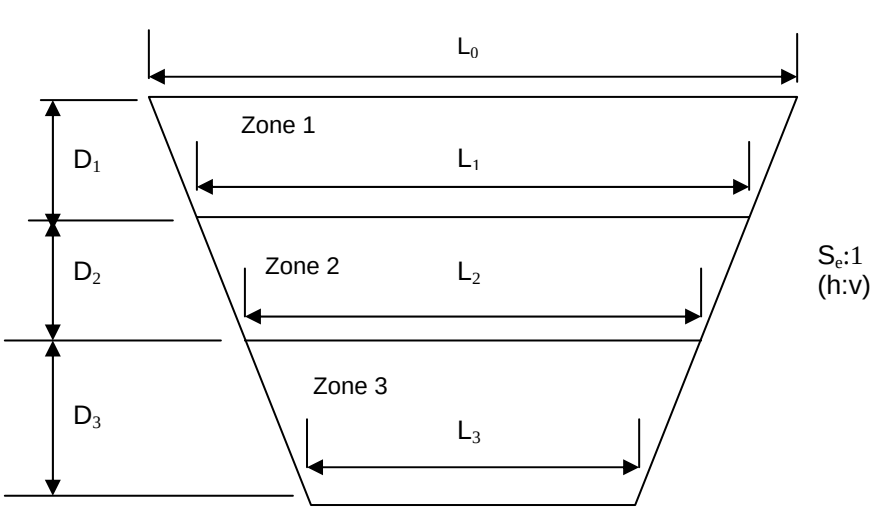
Term	Symbol	Definition
Residual Soil	RS	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely Weathered Rock	XW	Rock is weathered to such an extent that it has "soil" properties, viz, it either disintegrates or can be remoulded, in water.
Distinctly Weathered Rock	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron-staining. Porosity may be increased by leaching, or may be decreased due to the deposition of weathering products in pores.
Slightly Weathered Rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh Rock	FR	Rock shows no sign of decomposition or staining.

APPENDIX D
FORMULA FOR VOLUME CALCULATIONS
(3 pages, including this page)

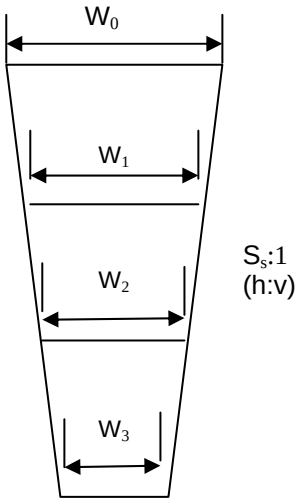
APPENDIX D

FORMULA FOR VOLUME CALCULATIONS

Excavation Rates from Test Pits



Long Section



Cross Section

$L_1 = L_0 - 2S_eD_1$ $\quad W_1 = W_0 - 2S_sD_1$

$L_2 = L_1 - 2S_eD_2$ $\quad W_2 = W_1 - 2S_sD_2$

$L_3 = L_2 - 2S_eD_3$ $\quad W_3 = W_2 - 2S_sD_3$

Zone Volume:

Volume of Zone 1 (V_1) = $(L_0 W_0 + L_1 W_1)(D_1/2)$

Volume of Zone 2 (V_2) = $(L_1 W_1 + L_2 W_2)(D_2/2)$

Volume of Zone 3 (V_3) = $(L_2 W_2 + L_3 W_3)(D_3/2)$

Excavation Rate:

For Zone 1, $R_1 = V_1 / t_1$

For Zone 2, $R_2 = V_2 / t_2$

For Zone 3, $R_3 = V_3 / t_3$

Where;

L_o = Length of top of pit

W_o = Width of top of pit

S_e = End slope

S_s = Side slope

D_1 = Depth of zone 1

D_2 = Depth of zone 2

D_3 = Depth of zone 3

t_1 = excavation time for zone 1

t_2 = excavation time for zone 2

t_3 = excavation time for zone 3