

**Technical Note 140**

**Source Material Assessment for Subtype 2.5,  
Subtype 3.5 and Type 4 Unbound Pavement Materials**

**March 2015**

## Copyright



<http://creativecommons.org/licenses/by/3.0/au/>

© State of Queensland (Department of Transport and Main Roads) 2015

**Feedback:** Please send your feedback regarding this document to: [tmr.techdocs@tmr.qld.gov.au](mailto:tmr.techdocs@tmr.qld.gov.au)

## 1 Introduction

The objectives of this Technical Note are to assure the quality and supply capacity for the source material from which MRTS05 *Unbound Pavements* Subtype 2.5, or Subtype 3.5 and/or Type 4 pavement material is produced.

Where a Subtype 2.5 or Subtype 3.5 pavement material is sourced from a quarry registered under the TMR Quarry Registration System (QRS), this Technical Note does not apply.

This Technical Note:

- details the requirements for assessing and reporting a source material for supplying Subtype 2.5 and/ or Subtype 3.5 pavement material
- details a best practice guideline for assessing and reporting a source material for supplying MRTS05: *Unbound Pavements* Type 4 pavement material.

Where a product is to be blended from different sources, except when imported fine aggregates only are blended with a material from one source, each source shall be assessed and:

- the source/s of the coarse component/s shall be assessed in accordance with this technical note except for the relevant laboratory tests for the nominated product, and
- the blended (that is, combined) product shall be tested according to the relevant laboratory tests for the nominated product.

## 2 Source Material Assessment Report

The assessment shall be reported in a Source Material Assessment Report (SMAR), which shall be prepared by a suitably qualified and experienced engineering geologist or geotechnical engineer, or pavement material technician. The name and qualifications of the SMAR's author shall be noted. For each source material, the SMAR shall include, as applicable:

1. Site details including:
  - a. site name, location, locality plan, address and proximity to the project
  - b. real property description (lot numbers and plan numbers) and Global Positioning System (GPS) coordinates (preferably in latitude and longitude)
  - c. survey and lay-out plans
  - d. land ownership and tenure
  - e. site owner/operator/manager and contact details
2. The MRTS05 "nominated product" proposed to be supplied by the source
3. Confirmation compliance with relevant legislation and regulation applicable to assessing, sourcing, winning and using the material
4. A copy of the consent from the landowners and interest holders to access and win materials
5. Geological and geotechnical information including:
  - a. Regional Geology and geological formation (its origin such as igneous, metamorphic, sedimentary and duricrust)
  - b. Site Geology and geological material types (for example, alluvial, colluvial, residual, duricrust and weathered rock) preferably on a geological map
  - c. Site working conditions (for example, pre-existing quarry or borrow pit, undeveloped land)
  - d. Any other geological features that relate to the material source (for example, deep weathering profiles, dykes and fault zones and heavily fractured and frittered rock outcrops of non-durable soft rocks if any)

- e. Detailed description of the material including soil and rock types or naturally occurring aggregates (for example, ridge gravels, pea-gravels and ironstone cobbles) and duricrust materials (for example, silcrete, calcrete, ferricrete or other forms of lateritic materials or cemented saprolite), and soft non-durable rocks (for example, white rocks and mudrocks) in accordance with Section 9 in the AS1726
- f. Where the coarse component is sourced from a non-weathered source rock that is to be crushed, an interpretative petrographic analysis of the source is to be completed and reported in accordance with ASTM C295 by an experienced petrographer. The analysis and report shall confirm:
  - i. the source material classification
  - ii. the nature of weak, moisture sensitive unsound, deleterious minerals (for example, reactive secondary minerals, such as clay, carbonate and/or some micas). The results must be interpreted in terms of the rock suitability as a source of road pavement material
- g. Any hazardous materials such as asbestos or radioactivity within the source material
6. For each nominated product, the relevant laboratory tests for the specification shall be reported and:
  - a. laboratory test results shall be no older than two years
  - b. all properties applicable to the relevant pavement material specifications shall be tested
  - c. test samples shall be representative of the product supplied to the Work and shall be sufficient to accommodate the variability within the source material
  - d. test results shall not be supplied unless the final combined product satisfies the specification requirements
  - e. for a Type 4 product, additional CBR testing using four point testing under Test Method Q113A shall be completed
  - f. 4 point CBR test results under Test Method Q113A shall be reviewed for each product, and comment included on the product's strength and moisture sensitivity
7. Description of the processes for winning, producing and constructing the product including:
  - a. Volumetric estimate of available material
  - b. Constraints which may impact on extraction from the source, such as access, topographic constraints and overburden thickness
  - c. Methods for extracting the material to assure consistency, including as applicable:
    - i. overburden stripping methods (if applicable) and extraction methods
    - ii. depth control methods
    - iii. crushing and screening operations
    - iv. mixing methods including
    - v. timing and practice of mixing or diving insitu layers including plant operation
    - vi. where imported fine material is added, the fine material source, percentage added and blending methods shall be identified
    - vii. other blending methods
  - d. Methods for stockpiling including:
    - i. lot management and relationship to stockpile management and traceability
    - ii. stockpile size range
    - iii. the expected stockpiling production rate
    - iv. management of underlying undisturbed material
    - v. pushing up processes

- vi. protection from moisture entry
- vii. method to assure adequate supervision during winning and stockpiling
- e. Methods for preparing the material for use including loading and transportation
- f. Plant
- g. The Quality Management System for the extraction and processing of the pavement material, including the inspection and test plan with testing frequencies nominated appropriate to the variability of the source material and its impact on the consistency of the product.
- h. A copy of the rehabilitation plan.

### 3 Source identification and conditions

In preparing the SMAR the following should be considered and, if included, reported:

1. Desk-top analysis including terrain evaluation studies for identification and classification of source materials shall be reported including, if applicable:
  - a. Aerial photographs or other forms of images delineating features such as alluvial areas, water courses (including for example seasonal or former stream patterns), topography, landuse, rock outcrops, vegetation associated with different soil and weathered rock types, infrastructure, quarries and pits, and soil types as indicated by colour and tonal variations
  - b. Any other relevant available information of site such as maps of cadastral, soil and pedology, hydrology, land-use and vegetation and meteorology
  - c. Existing information of site geological condition including investigation bore logs,
  - d. The interpretative results from any other relevant geophysical methods
  - e. Any other relevant information including maps for: cadastral, soil/pedagogical , hydrology, landuse and vegetation, and
2. Local conditions that may negatively impact on the consistency or quality of material properties and their supply, such as:
  - a. Topography land use
  - b. Environmental impact noting that environmental damage to native vegetation is reduced when sourcing from existing disturbed land
  - c. Surface hydrology (stream, creek, rivers and surface water bodies) active erosion, and runoff
  - d. Groundwater regime including profiling for creeks or streams
  - e. Meteorology expected weather patterns
3. Provide a suitable scale (for example 1:5,000 or 1:10,000) locality plan identifying the material deposit and key landmarks. While the plan may not be precisely to scale, distances of significant dimensions (such as borrow pit size and distance to declared roads) must be identified. The plan shall include:
  - a. the location of the source and, if applicable, borrow pit/s with approximate boundaries marked
  - b. GPS locations of the proposed pits or source
  - c. proposed stockpiles locations, including for overburden
  - d. access tracks and declared roads
  - e. other infrastructure, if any, impacting the source and supply such as buildings, boreholes, fences, service cables and pipelines (including subsurface pipelines),
  - f. existing excavations and pits, if any, and their size and depth
  - g. significant landforms, if any, such as slopes and rock outcrops,
  - h. key interpretative data from the desktop analysis, for example taken from geological map data and aerial photography,

- i. site photographs of the exploration pit and visible change in material profile, if any
- j. identification of risks or problems, if any, such as: topographic constraints, boulders, location and thickness of excessive overburden, presence of water, and other environmental or heritage concerns and potentially hazardous materials.

#### **4 Naturally occurring gravel pits**

This section details guidance for characterisation and mapping of materials from naturally occurring gravel pits, often called "borrow pits". These materials require either no crushing or minimal crushing in preparation for their use as a pavement material.

Naturally occurring gravel pits should be investigated, measured and tested with the goal to develop a three dimensional model of the location, layering, thickness and properties of the deposits.

The deposit should be gridded, tested, mapped and reported in the SMAR as follows:

1. Determine a baseline for establishing the boundary of the deposit and demarcate the baseline and boundary with physical markers. The baseline preferably should be a permanent or semi-permanent fixture (such as a fence or road) and clear of the prospect so that the physical markers will not be disturbed during pit operations.
2. Determine a grid pattern, which alignment covers the shape of the deposit and where the grid typically has 25 m to 50 m spacings if the source changes over a short distance.
3. Develop a naming convention for the grid suitable to co-ordinate the location of materials (for example, A1, B2 etc).
4. At each grid point, determine overburden thickness and suitable material layer or layers thicknesses.
5. Select locations for trial pits where:
  - a. the characteristics of the site such as rock exposure and vegetation are considered,
  - b. the pits' test samples provide sufficient testing to establish the deposit's extent, conformance with pavement material requirements, and variability,
  - c. the number of the pits depends on the volume of material and associated risk
6. Remove test samples from trial pits so that:
  - a. Vegetation and topsoil are removed from the pit, trench or auger hole site and its surrounds.
  - b. With suitable equipment, excavate vertically to the full depth of the deposit and 150 mm or more into the underlying material (in the absence of a rock bottom). It is preferable to use equipment, such as:
    - i. hand auger for finer material if penetration can be achieved
    - ii. power augers (hand-held or vehicle mounted) or back-hoes for other materials
  - c. Excavated material is sampled from each representative horizon of the profile. Samples are to be of sufficient quantity to enable the required testing.
  - d. Characterise the material in each pit through:
    - i. identifying the thickness of layers of different materials.
    - ii. describing the soil profile of each layer in accordance with AS1736.
    - iii. identifying and logging the material (including its horizon) that shall be used in producing the nominated product.
    - iv. reporting all test results and investigation outputs.
  - e. Reinststate the pits with similar quality material, ensuring that no deleterious material in used

7. Develop a grid map preferably to a scale of 1:1000 to 1:2500 and include the following details:
  - a. the grid including the grid coordinates on GPS locators and Magnetic North
  - b. any existing features including borrow pits and the location of all other completed exploratory activities and sampling
  - c. the location of each trial pit including pit number and sample numbers
  - d. the thickness of overburden and thickness of the deposit at each grid point (expressed as depths)
  - e. the route and haulage distance to the declared road to be used to transport to the project

