

# Development of a Methodology for Selection of Industrial Grade-A Quarry Site for Coarser and Finer Aggregates

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**Abstract:** Recent history has revealed that the identification of prospective mineral resources is essential to sustain mineral based industry to full fill the demand required in future. Aggregate industry also has the same risk of sustaining due increased demand and the lack of available sites. Therefore this study assists to identify prospective sites which can be developed to IML-A grade quarry sites and this develops a methodology which can be applied to all over the country to recognize such locations. The applicability of designed methodology is ensured by applying it to Kalutara District - Dodangoda AGA Division and potential sites are identified. Local authorities like Geological Survey and Mines Bureau will be able to reserve the potential locations which will be identified by the study for future development without urbanizing those areas. This will facilitate establishing new quarries at a lower cost.

**Keywords:** Analysis, Dodangoda, Kaluthara, prospective, regulatory

## 1. Introduction

Sustainable development of any Mineral industry will depend on identification of prospective mineral resources. With the increasing population, demand for mineral resources and land inevitably will increase. Therefore people tend to inhabit in regions where mineral resources are found.

The same phenomena can be seen in Sri Lanka where land having higher potential for mineral occurrence have been urbanized preventing their exploitation. This has caused numerous problems for existing industries for their future operations.

Aggregate industry also has the same risk of sustenance due to the absence of minable sites. Road development and rapid civil construction have increased the demand for high quality aggregates. Therefore it is necessary to identify potential sites to establish quarry sites. Therefore this study is aimed at identifying prospective sites which can be developed to IML-A grade quarry sites for mass scale aggregate

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production. In this regard a methodology will be developed which can be applied all over the country to recognize such locations. This study has considered geological, mining, environmental, social and regulatory requirements in identifying prospective sites. This will enable investor to identify and develop a site at a lower cost for future development of this project will be useful for regulatory bodies such as Geological Survey and Mines Bureau (GSMB) to reserve potential locations for future development.

## 2. Methodology

### 2.1 Study Area

The selected study is in Kalutara District- Dodangoda division having an area of 117 square kilometers and population of 13,669. (Annual Report of Central Bank Sri Lanka- 2006)

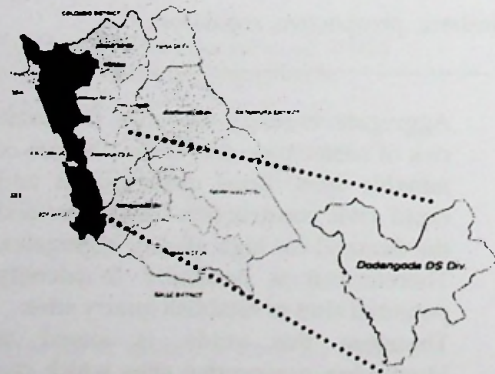


Figure 1 - Study Area Kalutara District - Dodangoda division

The study consist of two approaches; identifying existing lower grade quarries having a potential to be improved to Industrial or Mechanized quarry site with mass scale production, and identifying potential sites which have favourable conditions for IML-A grade quarry site, but not yet identified as prospective site.

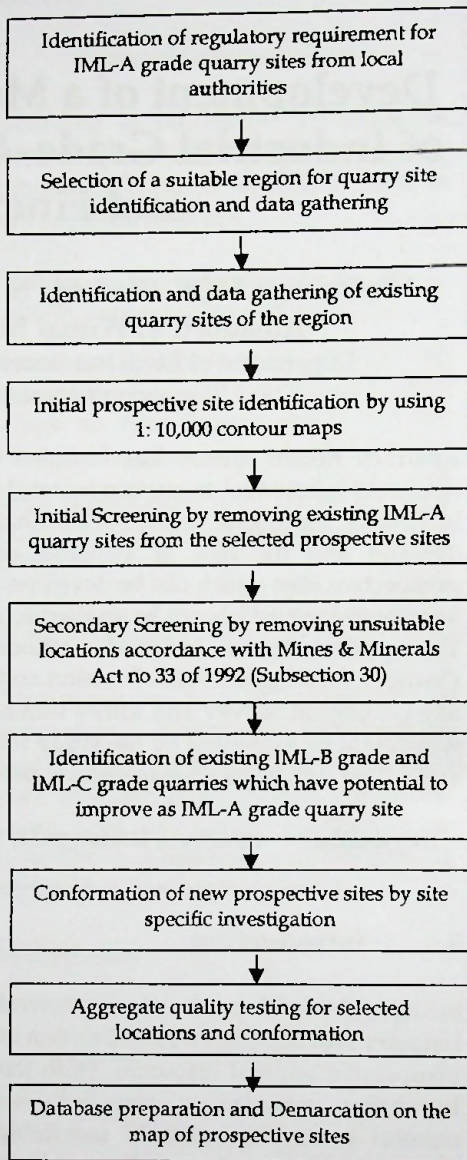


Figure 2 - Designed methodology

Regulatory requirements for IML-A grade quarry sites, which were introduced by relevant Local Authorities, were studied (Mines and Minerals Act No. 33 of 1992, and National Environment Act No. 47 of 1980). Then the selection of a suitable region for quarry site identification and information gathering was done. Dodangoda AGA Division in Kalutara District was

selected to see the applicability of the methodology developed.

In this study existing quarry sites of the region were studied to see the compliance of regulatory requirements and to identify geological, environmental, mining and sociological aspects which are favourable to the operation of the quarry sites. Also aggregate samples of the quarries were taken and tested to get an idea about the rock quality of the region.

Initial prospective sites were identified by considering 1:10,000 topographic maps by assessing contours where there are steep slopes with suitable elevation conditions. Then initial screening of prospective locations were done by eliminating the existing quarry sites from the list of prospective locations and secondary screening by eliminating sites which have unfavourable conditions in accordance with mines and minerals act no. 33 of 1992 where there are burial ground or cemetery, land nearby to a railway track, aerodrome, main road, power lines or other public building, any land within wild life reservation, any land within catchment area of the reservoir and any land vested in any naval, military or air force.

In initial site conformation the study was focused on existing IML-B, IML-C and artisanal quarry sites which can be improved to IML-A grade quarry site by considering geological, environmental and regulatory conditions and rock quality of the existing quarry sites. Also site observations and preliminary investigations were carried out to conform the potential sites which haven't been identified yet by any person or organization.

The study generates the results of the project as a database which gives site specific information to the local

authorities and investors and selected locations were demarcated in the 1:10,000 maps which indicate the accessibility to the selected locations.

### 3. Results

#### 3.1 Aggregate Test Results

The study emphasises to identify the rock quality of the region to identify the suitability of the aggregates produced for construction industries. Therefore Aggregate Crushing Value(ACV), Aggregate Impact Value(AIV), Los Angeles Abrasion Value(LAAV), Flakiness Index, Uni-axial Compressive Strength and Sieve Analysis were perform on samples taken from six IML-A grade quarries such as CA & CO, CML, ICC, Lanka Quarry, Maga, Rodrigo Aggregates.

#### 3.2 Prospective Site Identification

Topographical map analysis indicated

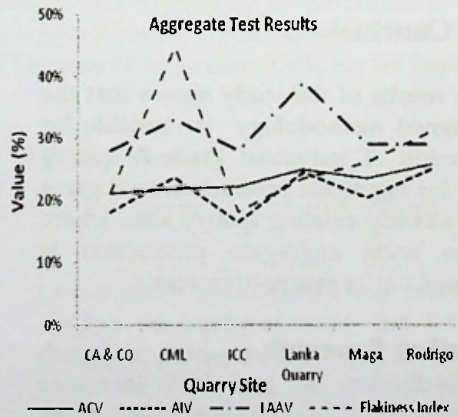


Figure 3: Variation of test results of existing quarries in the region

39 prospective sites situated in the Dodangoda division and from those 6 potential sites were identified in the Tudugala West, Bombuwela North Central, Gamagoda East, Tebuwana West and Tudugala East Gramaniladari Divisions.

## 4. Discussion

The test results given shows similar values with rock qualities which would be favourable for road construction and structural concrete. But comparing the flakiness index values the flakiness of IML-B Grade quarries like Rodrigo Aggregates and CML Mtd shows higher Values (figure 2) which indicates the improvement of existing crusher plants should improved when they are converting to IML-A Grade.

The Database prepared with the information related to the selected sites gives all the required information about the prospective sites which includes GPS Coordinates, Land Ownership, Nearby Special Structures and water reservoirs, rock type, etc... And also the prepared map demarcates the location, accessibility and transportation routes most preferable for quarrying operations.

## 5. Conclusions

The results of the study shows that the designed methodology is suitable for selection of industrial grade-A quarry site for aggregate production as it gives the already existing quarry sites where mass scale aggregate production is carried out as prospective sites.

## Further Research

Following recommendations are proposed for future usage of the study

- The methodology can be applied to entire country and reservation can be done for future development of the country.
- The methodology can be modified and applied to identify other prospective mineral deposits in the country.

- Sampling and testing can be done for the prospective sites to identify the suitability of aggregates in the improvement of the project

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