BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
NEW DELHI

O.A.No.304 OF 2019

M. Haridasan ... Applicant in the O.A.

Versus

State of Kerala & Ors. ... Respondents in the O.A.

AND

IN THE MATTER OF:-

I.A.No.81 OF 2021

Poabs Granites Ltd. & Anr. ..... Applicants/Respondents

ADDITIONAL DOCUMENTS FILED BY POABS GRANTIES PVT. LTD.

INDEX

ADVOCATE FOR THE RESPONDENTS: MR.E.M.S.ANAM AND MR.M.S.VISHNU SHANKAR
Chamber No.56,
Supreme Court of India,
New Delhi – 110 001,
Mob: 9810115141,
Email ID: 56chamber@gmail.com

Place: New Delhi
Dated: 06.11.2025

IN THE HIGH COURT OF KERALA AT ERNAKULAM

PRESENT

THE HONOURABLE MR. JUSTICE P.V.KUNHIKRISHNAN

MONDAY, THE 30TH DAY OF MAY 2022 / 9TH JYAISHTA, 1944

WP(C) NO. 19044 OF 2020

PETITIONER/S:

MUBARAQ GRANITES
WEST CHATHALLUR P.O. OTHAYI, MALAPPURAM DISTRICT 676 541, REPRESENTED BY ITS MANAGING PARTNER A.M. MUHAMMED ALI, AGED 55 YEARS, S/O. A.M. KUNHIMUHAMMED.

BY ADVS.
K.M.SATHYANATHA MENON
SMT.KAVERY S THAMPI

RESPONDENT/S:

1 STATE OF KERALA
REPRESENTED BY ITS PRINCIPAL SECRETARY, DEPARTMENT OF REVENUE AND DISASTER MANAGEMENT, SECRETARIAT, THIRUVANANTHAPURAM 695 001.

2 THE KERALA STATE DISASTER MANAGEMENT AUTHORITY, REPRESENTED BY ITS CONVENER, OBSERVATORY HILLS, VIKAS BHAVAN P.O. THIRUVANANTHAPURAM 695 033.

3 THE DISTRICT DISASTER MANAGEMENT AUTHORITY, REPRESENTED B ITS CHAIRPERSON, COLLECTORATE, CIVIL STATION, UPHILL, MALAPPURAM 676 122.

4 THE DIRECTOR, GEOLOGICAL SURVEY OF INDIA, MANIKANDESWARAM, NETTAYAM, THIRUVANANTHAPURAM, KERALA 695 01

BY ADVS.
SHRI.P.VIJAYAKUMAR, ASG OF INDIA
MANU S., ASG OF INDIA

OTHER PRESENT:

SMT.DEEPA NARAYANAN, SR.GP,
SRI.MANU.S, ASGI

THIS WRIT PETITION (CIVIL) HAVING COME UP FOR ADMISSION ON 30.05.2022, THE COURT ON THE SAME DAY DELIVERED THE FOLLOWING:

P.V.KUNHIKRISHNAN, J.

W.P.(C) No.19044 of 2020

Dated this the 30th day of May, 2022

JUDGMENT

The above writ petition is filed with following prayers:

"i) *to declare that the petitioner's quarry is not situated in high hazard zone.*

ii) to issue a writ of certiorari or any other appropriate writ order or direction calling for the original of Ext P12 and Ext P13 and quash the same to the extent it imposes ban on petitioner's quarry and permit the petitioner to operate the quarry;

iii) Issue a writ of mandamus or any other appropriate writ order or direction directing the respondents to lift the ban imposed in Ext-P13 on the petitioner quarry and permit the petitioner quarry to function;

iv) issue such other reliefs which may deem fit and proper on the facts and circumstances of the case; and

v) allow this Writ Petition (Civil) with costs."

2. When this writ petition came up for consideration on 17.12.2020, 22.07.2021 and on 16.03.2022, this Court passed

three separate interim orders. It will be better to extract those orders here:

Order dated 17.12.2020:

> *"The petitioner in W.P. (C)No.19044/2020 approached this court challenging a ban imposed on petitioner's quarry. Admittedly, the petitioner's quarrying area has been classified as high hazard zone. There is a challenge against the petitioner's quarrying operation in W.P.(C) No.32821/2019, at the instance of one Mujeeb Rahman. On 2.12.2020, this Court passed the following order:*
>
> > *"The learned Central Government Counsel is directed to get instructions from the 4th respondent in WP (C)No.19044/2020 as to the classification of the quarrying operation belongs to the petitioner in that writ petition is based on the verification already done."*
>
> *2. The learned Central Government Counsel submits that classification as high hazard zone was based on 2018 flood and not with reference to any operation of quarrying.*
>
> *3. Having considered the submission as above, it is appropriate to direct the 4th respondent - The Director, Geological Survey of India in W.P.(C)No.19044/2020 to conduct a study as to the impact of quarrying operation*

in the area and to report whether the classification as high hazard zone has to be retained or not. This has to be done specifically based on the aspect relating to the quarrying operation of the petitioner in W.P.(C)No. 19044/2020. A report shall be filed before this Court by next posting. If any fees are leviable for such study, it is open for the Director to levy such fees from the petitioner in W.P.(C)No. 19044/2020.

Post on 28.01.2021."

Order dated 22.07.2021

"In this writ petition filed seeking inter alia to declare that the petitioner's quarry is not situated in High Hazard Zone, this Court on 17.12.2020 passed an interim order directing the 4th respondent-Director, Geological Survey of India to conduct a study as to the impact of quarrying operation in the area and to report whether the classification as High Hazard Zone has to be retained or not. The petitioner submits that the study conducted by the GSI pursuant to the interim order is regarding alleged fissure/crack seen at Chekkunnu Mala and not a study on the impact of operation of petitioner's quarry. The alleged fissure crack is at a distance of 4 Km. (800 metres aerial distance). The impact of NONEL detonators used in the quarry for blasting will have any impact only within a maximum distance of 45 metres only. The petitioner can establish the same if a Vibration Study is conducted by a competent expert body.

2. This Court finds that in view of the interim order dated 17.12.2020 and in continuation thereof, it will be only just and proper, especially when the note of the Preliminary Geo-technical Assessment submitted by the Geological Survey of India also advises further study in the matter, to permit Vibration Study.

3. The Member Secretary, Kerala State Disaster Management Authority has provided a list of technically competent six agencies for conducting Geo-technical Studies, including the National Institute of Technology Karnataka, Suratkal, Mangalore-575 025.

4. Accordingly, the petitioner is permitted to engage the National Institute of Technology Karnataka, Suratkal, Mangalore-575 025 for Vibration Study on the quarrying operations in the area involved, at the petitioner's expense. The Advisory Committee on Landslides of Kerala State Disaster Management Authority constituted vide G.O.(Rt) No.356/2020/DMD dated 17.03.2020 should decide on the terms of reference of such Vibration Studies which are to be conducted. The inspection by the team of experts of NITK and studies, should be conducted with notice to the 3rd respondent-District Disaster Management Malappuram and in presence of its representatives.

Post the writ petition after eight weeks."

Order dated 16.03.2022

"Read orders dated 17.12.2020 and 22.07.2021.

Based on the directions of this Court a report is submitted by the National Institute of Technology, (NIT) Karnataka, Surathkal, which is produced as Ext.P15 in WP(C) No.19044 of 2020. The petitioner in WP(C) No.32821 of 2019 conceded that the 2nd respondent is the authority to consider Ext.P15 report. Hence, the 2nd respondent in WP(C) No.19044 of 2020, can pass an order based on the report submitted by the NIT, Karnataka. Therefore, there will be a direction to the 2nd respondent to consider Ext.P15 and pass appropriate orders, in accordance to law, and produce a copy of the same before this Court, within three weeks from the date of receipt of a copy of this order. If there is any extension of time is necessary, the 2nd respondent can approach this Court with necessary application.

I make it clear that I have not considered the matter on merit and the 2nd respondent is free to pass orders, in accordance to law."

3. Based on the directions of this Court, the Government Pleader produced the Government Order as GO(Rt) No.388/2022/DMD dated 28.04.2022 along with a memo dated 05.05.2022. It will be better to extract the relevant portion of the Government Order here:

"Government have examined the matter in detail are pleased to issue following directions to operate the Quarry namely M/s. Mubaraq Granites situated at 4.8157 hectares of land comprised in Sy.No.93/1pt, 94/pt, 95/pt and 96/pt in Block No.70 of Perakkamanna, Eranad Taluk in Malappuram District.

1. The report of the NIT, Karnataka specifically recommends measures to reduce the disaster impacts of any quarrying in the area. The quarry owner should implement all the prescriptions of NIT, Karnataka.

2. The District Collector, Malappuram shall be responsible for ensuring that the quarry owner follows all these measures prescribed and report to the DDMA (District Disaster Management Authority), Malappuram.

3. The DDMA Malappuram shall, after considering the report of the District Collector, issue the necessary operational clearance to the quarry.

4. The District Collector or authorized representative shall conduct a specific inspection of the quarry once every 6 months and ascertain that the prescriptions of NIT Karnataka are continued to be enforced, particularly regarding blasting. The periodic visit reports shall be furnished to DDMA Malappuram and DDMA shall, if finding any specific deviation from the prescriptions of NIT Karnataka, immediately stop the

functioning of the quarry based on the report of the crisis management committee.

5. The report suggests the use of nonel blasting to reduce any vibration and consequent conditioning of the surrounding land to trigger landslides. Therefore, blasting in this quarry should be conducted only by a blaster with specific training and certification in nonel blasting from competent agencies.

6. This case shall not be considered as a general precedence and that it should only be considered as a specific case based on site specific study conducted by a competent technical agency. The above shall not also be seen as a clearance to override any other laws, rules and regulations applicable in the case of quarrying in the site imposed by other relevant agencies.

The direction of the Hon'ble High Court of Kerala in its order dated 16.03.2022 is complied accordingly.

(By order of the Governor)

DR A JAYATHILAK IAS

Convener KSDMA & ADDITIONAL CHIEF SECRETARY"

4. In the light of the above order nothing survives in this case. The impugned orders as against the petitioner can be quashed and the District Collector can be directed to pass

consequential order based on GO(Rt) No.388/2022/DMD dated 28.04.2022.

Therefore, this writ petition is disposed of in the following manner:

1. Exts.P12 and P13 as far as the petitioner is concerned is quashed.

2. The 3rd respondent is directed to pass consequential order in the light of GO(Rt) No.388/2022/DMD dated 28.04.2022, as expeditiously as possible, at any rate, within two weeks from the date of receipt of a copy of this judgment.

3. I make it clear that if the petitioner is aggrieved by any of the conditions in GO(Rt) No.388/2022/DMD date//d 28.04.2022, they are at liberty to challenge the same, in accordance to law.

sd/-

P.V.KUNHIKRISHNAN
JUDGE

das

APPENDIX OF WP(C) 19044/2020

PETITIONER EXHIBITS

EXHIBIT P1	TRUE COPY OF THE PROCEEDINGS NO. 46/2017-18/7932/M3/2015/DMG DATED 27.04.2017 ISSUED BY THE DIRECTOR OF MINING AND GEOLOGY, THIRUVANANTHAPURAM.
EXHIBIT P2	TRUE COPY OF THE QUARRYING LEASE EXECUTED BY THE PETITIONER WITH THE GOVERNOR OF KERALA (STATE GOVERNMENT) IN FORM H DATED 12.05.2017.
EXHIBIT P3	TRUE COPY OF THE ENVIRONMENTAL CLEARANCE CERTIFICATE NO. 19/2017 DATED 22.02.2017 ISSUED TO THE PETITIONER BY THE STATE ENVIRONMENTAL IMPACT ASSESSMENT AUTHORITY.
EXHIBIT P4	TRUE COPY OF THE EXPLOSIVE LICENSE ISSUED TO THE PETITIONER BY THE JOINT CHIEF CONTROLLER OF EXPLOSIVES, SOUTH CIRCLE CHENNAI DATED 11.01.2018.
EXHIBIT P5	TRUE COPY OF THE MINE FOREMAN'S CERTIFICATE OF COMPETENCY ISSUED BY BOARD OF MINING EXAMINATIONS, GOVERNMENT OF INDIA TO SRI.A. ARJUNAN DATED 2.01.2014.
EXHIBIT P6	TRUE COPY OF THE CONSENT VARIATION ORDER ISSUED TO PETITIONERS QUARRY BY THE KERALA STATE POLLUTION CONTROL BOARD DATED 28.4.2018.
EXHIBIT P7	TRUE COPY OF THE D AND O LICENSE ISSUED BY THE SECRETARY, EDAVANNA GRAMA PANCHAYAT FOR THE QUARRY OF THE PETITIONER DATED 6.6.2018.
EXHIBIT P8	TRUE COPY OF THE REGISTRATION CERTIFICATE ISSUED BY THE DIRECTOR OF MINING AND GEOLOGY, THIRUVANANTHAPURAM DATED 13.03.2019.
EXHIBIT P9	TRUE COPY OF THE PROCEEDINGS NO. D.M. 1-5563/2019 DATED 22.7.2019 OF THE THIRD RESPONDENT.

EXHIBIT P10	TRUE COPY OF THE PROCEEDINGS NO. D.M.I-5563/2019 OF THE 3RD RESPONDENT DATED 16.09.2019.
EXHIBIT P11	TRUE COPY OF THE COMMUNICATION NO. 10684/M3/2019 DATED 21.01.2020 ISSUED BY THE DIRECTOR, MINING AND GEOLOGY DIRECTORATE, THIRUVANANTHAPURAM TO THE 1ST RESPONDENT.
EXHIBIT P12	TRUE COPY OF THE COMMUNICATION NO. DMA2/1047/2018-DMD ISSUED BY THE 1ST RESPONDENT TO THE 3RD RESPONDENT DATED 6.02.2020.
EXHIBIT P13	TRUE COPY OF THE PROCEEDINGS NO. D.M.1-5563/2019 DATED 7.02.2020 ISSUED BY THE 3RD RESPONDENT.
EXHIBIT P14	TRUE COPY OF THE INDIAN STANDARD PREPARATION OF LAND SLIDE HAZARD ZONATION MAPS IN MOUNTAINOUS TERRAINS GUIDELINES.
Exhibit P15	TRUE COPY OF THE REPORT SUBMITTED TO THE DISTRICT COLLECTOR/CHAIRPERSON OF DISTRICT DIASTER MANAGEMENT AUTHORITY MALAPPURAM ON 27-01-2022.
Exhibit P16	TRUE COPY OF THE PETITION SUBMITTED BY THE PETITIONER BEFORE THE 3RD RESPONDENT.
Exhibit P16(a)	TRUE COPY OF ACKNOWLEDGMENT ISSUED BY THE OFFICE OF THE 3RD RESPONDENT DATED 30.04.2022.

RESPONDENT EXHIBITS

EXHIBIT R3(a)	TRUE COPY OF THE PROCEEDINGS OF THE CHAIR PERSON OF MALAPPURAM DISTRICT DISASTER MANAGEMENT AUTHORITY AND DISTRICT COLLECTOR DATED 16.09.2019.
EXHIBIT R3(b)	TRUE COPY OF COMMUNICATION ISSUED BY THE GOVERNMENT DATED 06.02.2020.
EXHIBIT R3(c)	TRUE COPY OF THE PROCEEDINGS OF THE DISTRICT DISASTER MANAGEMENT AUTHORITY DATED 07.02.2020.

EXHIBIT R3(d)	TRUE COPY OF THE GOVERNMENT ORDER DATED 17.03.2020.
EXHIBIT R3(e)	TRUE COPY OF THE COMMUNICATION ISSUED BY THE DISTRICT COLLECTOR, MALAPPURAM TO MEMBER SECRETARY, KERALA STATE DISASTER MANAGEMENT AUTHORITY, TVP DTD 29.06.20. .

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NOTE ON THE PRELIMINARY GEOTECHNICAL ASSESSMENT OF MUBARAQ GRANITE QUARRY AND ITS ADJACENT AREAS, PERAKAMANNA VILLAGE, ERNAD TALUK, MALAPPURAM DISTRICT, KERALA.

Ramesh Kumar A., Geologist
Sulal N.L., Senior Geologist
Archana K.G., Senior Geologist

In pursuance to the Interim order passed by the Honourable High Court of Kerala in response to the writ petition no. 19044/2020 (E), dated 17.12.2020, a team of officers from Geological Survey of India conducted a preliminary geotechnical assessment of Mubaraq Granite quarry and its adjacent areas on 28.12.2020, 30.12.2020, 02.01.2021, 06.01.2021 and 08.01.2021. The study area (location: 11°15'28.28" N and 76° 6'47.89" E in Survey of India Toposheet No. 58A/03), is located at West Chathallur, Othayi, Edavanna, Perakamanna Village in Ernad Taluk of Malappuram District (Fig. 1 & 2). The Othayi – West Chathallur road is passing about 100 m upslope of the Mubaraq granite. A preliminary slope stability assessment of the site was carried out after considering the geological and geomorphological characteristics of the terrain vis-à-vis past landslide incidences. The details of the assessment, findings and recommendations are dealt hereunder.

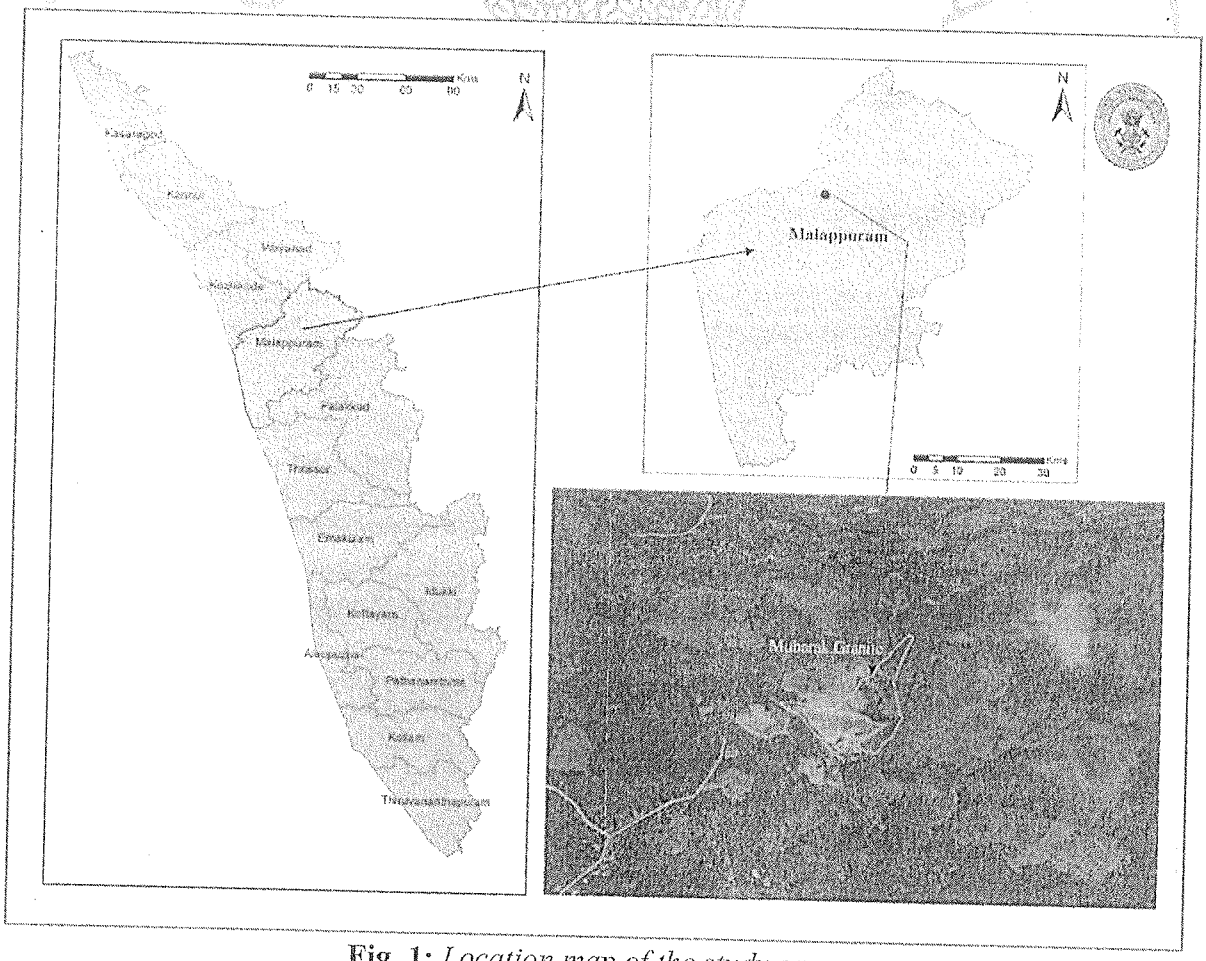

Fig. 1: *Location map of the study area.*

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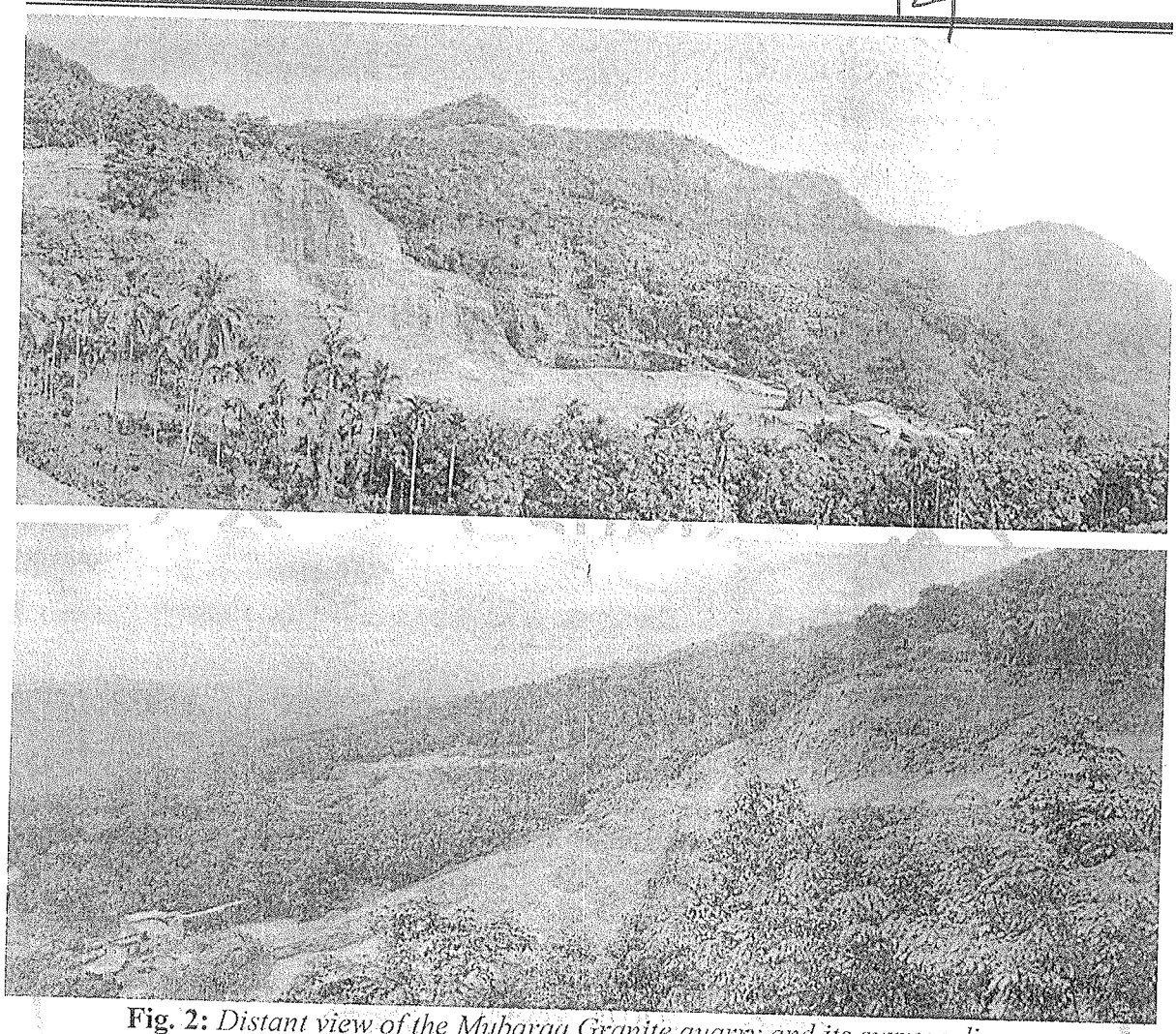

Fig. 2: *Distant view of the Mubaraq Granite quarry and its surroundings.*

GEOTECHNICAL ASSESSMENT

The study area forms a part of Western Ghats and is located at the waning slope part of the 10 km long E-W trending ridge extending from Mampad in the east - Kinaradappan in the west. As per the GPS points provided, the study area covers about 4.90 hectares (Fig. 3). The maximum elevation recorded in the quarry boundary is 243 m above MSL. Majority of the area studied are flattened due to the quarrying activities in the past and is exposed with the hard and massive bed rock. The charnockite and charnockite gneiss form the major lithological units along with pegmatite intrusive and quartz veins are exposed in the quarry. The predominant discontinuities present in this area include foliation, foliation parallel joints and other five sets of joints. Foliation is having a general strike N 50° - N 230° dipping 70° towards N320°.The attitude of joint sets other than foliation parallel joints include

(i) Strike N 340° - N 160°, dipping 63° towards N 250°.

(ii) Strike N 340° - N 160°, dipping 30° towards N 250°.

(iii) Strike N 260° - N 70°, dipping 22° towards N 170°.

(iv) Strike N 320° - N 140°, dipping 80° towards N 50°.

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(v) Strike N 345° - N 165°, dipping 54° towards N 75°.

The slope angle just above the western part of the quarry boundary varying between 5°-10° were benching of slope is noticed and is sparsely to moderately vegetated. While in the northern portion the slope angle is noticed to be slightly higher varying between 25°-35° and is occupied with rubber plantation (Fig. 3). The overburden thickness all along the slope is relatively thin (varying from 0.5 m to 5 m) comprising of top soil and hard compact slope debris containing isolated rolled over boulders (Fig. 4) and at the cut section in the downslope near the crusher unit laterization is evident (Fig. 5).

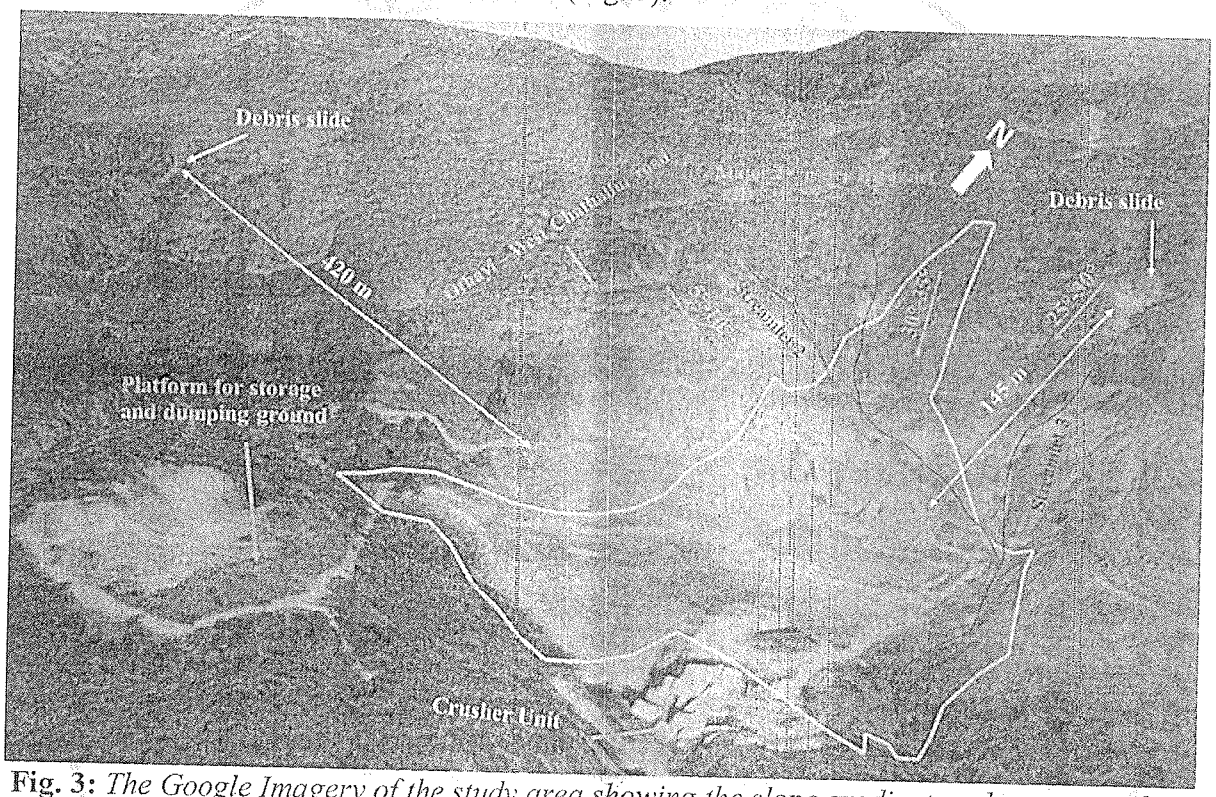

Fig. 3: *The Google Imagery of the study area showing the slope gradient upslope, streamlets and the adjacent debris slides.*

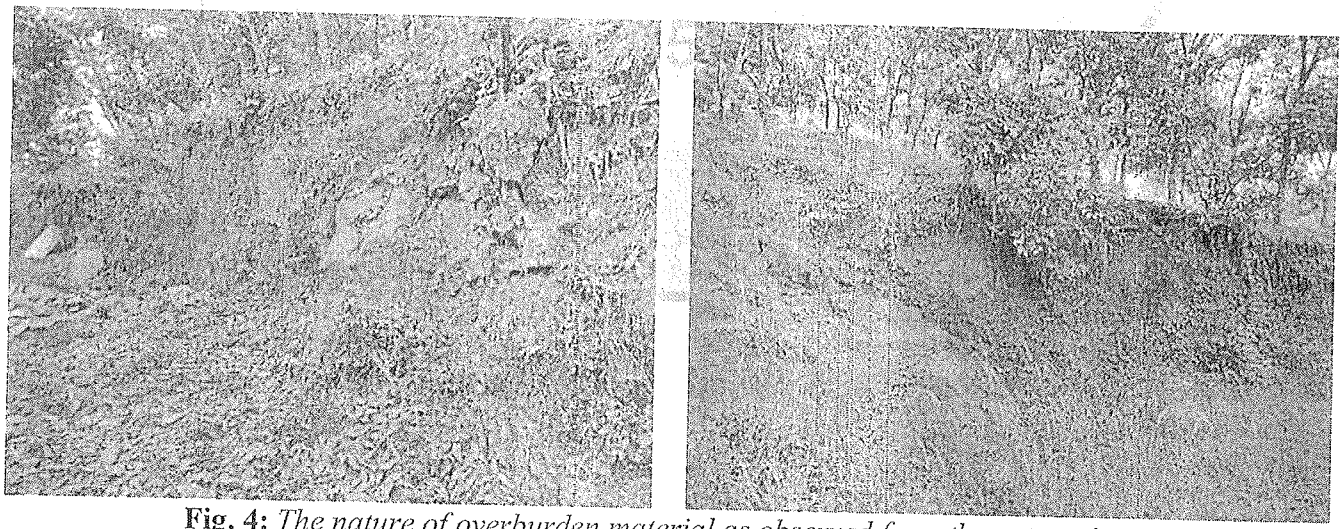

Fig. 4: *The nature of overburden material as observed from the cut sections.*

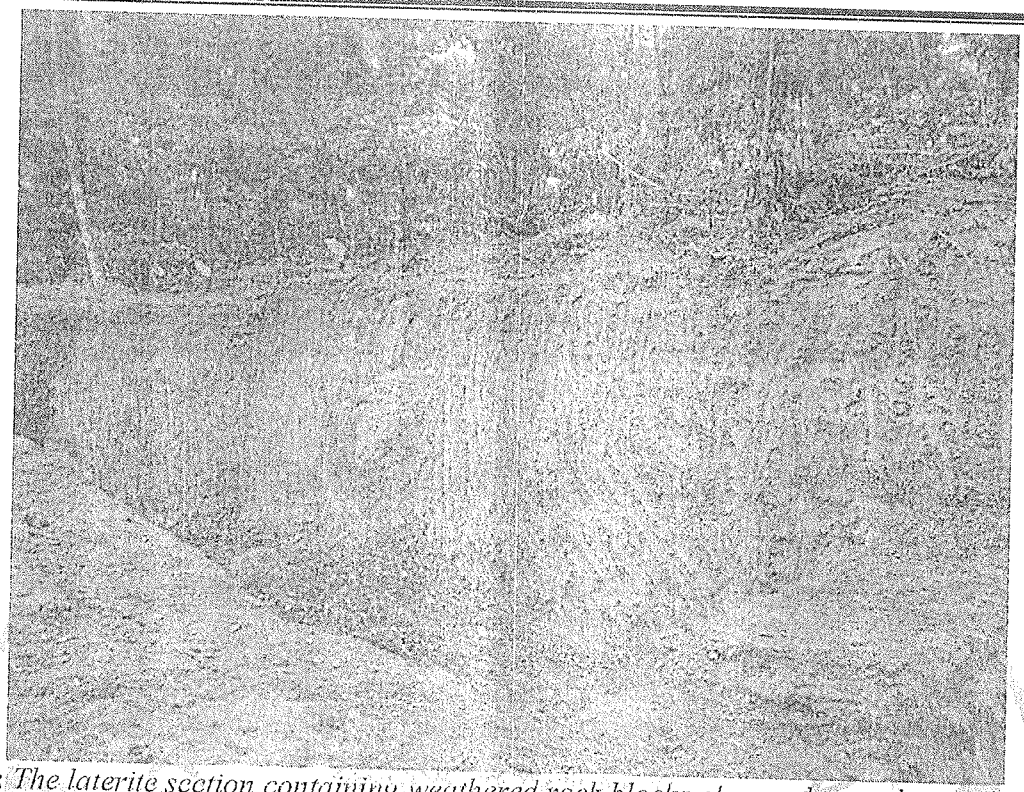

Fig. 5: *The laterite section containing weathered rock blocks observed near the crusher unit.*

Four streamlets are in direct contact with the quarry boundary, out of which one is a major 2nd order stream still flowing is the major source of water seen within the quarry, while the others are at present devoid of water. The 2nd order stream while reaching the quarry-plantation road follows a subsurface path (Fig. 6), a part of which reaches the water logging area of quarry through one of the major joint (Fig. 7).

Fig. 6: *The 2nd order stream contact at the quarry-plantation road.*

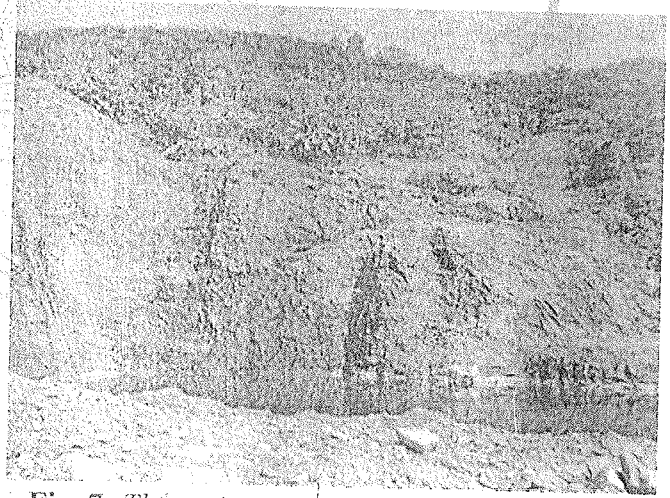

Fig. 7: *The major joint through which the water reaches the quarry.*

Two recent landslide incidences were identified nearby the study area. A debris slide (Fig. 3 & 8) occurred about 145 m north from the quarrying area (76° 6'50.67" E, 11°15'36.65" N) during heavy rains of 2018 southwest monsoon, within the rubber plantation. The slide initiated between the rock – overburden material contact. The slide is having a dimension of 20 m length,17 m width and 3 m depth.

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Fig. 8: *A view of the debris slide about 145m north from the Mubaraq Granite quarry.*

Fig. 9: *The debris slide which is about 420 m west from the Mubaraq Granite quarry.*

Another debris slide (Fig. 3 & 9) occurred about 420 m west of the Mubaraq Granite (76° 06' 31.3" E, 11° 15' 27.5" N) during the southwest monsoon of 2019. The slide is having a dimension of about 25 m in length and 12 m width, were the overburden material containing precarious boulders (debris) having a thickness ranging from 0.5 m to 1m slided down. This slide follows a first order stream path for about 150 m. The same streamlet reaches the western part of Mubaraq quarry after travelling 430 m. The failure initiated as a result of increase in pore water pressure and reduction in shear strength of slope forming material due to heavy rainfall.

As informed and mentioned in the petition, the slope at Chekkunnu mala along which two parallel tension cracks (40 m apart) were developed and enlarged during the southwest monsoons of 2018 and 2019 were investigated. In addition to these cracks, a subsidence zone having a dimension of 4 m x 5 m x 3 m is observed at the upslope part. The location is about 820 m aerial distance from the Mubaraq Granite quarry in the WNW direction (Fig. 10). On field investigation it was found that the distressed zone is situated within a paleo landslide scar of past origin. Within this paleo landslide scar, the presence of minor scars of reactivation and a recent debris slide were evident from the Google satellite imagery (Fig. 11). From the site investigation it is clear that the development of these tension cracks (Fig. 12) in this particular slope is the initiation of a major landslide during the southwest monsoons of 2018 and 2019, which got aborted as the development of slip circle terminated due to the break in slope and lesser regolith depth.

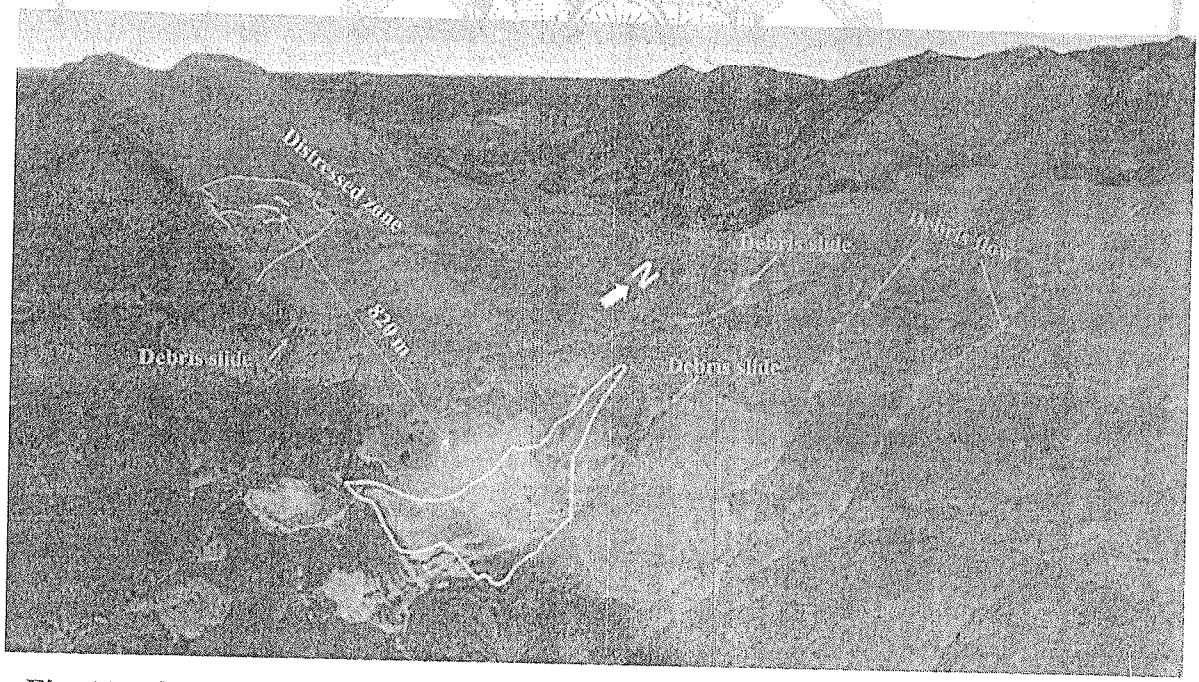

Fig. 10: *The Google satellite imagery showing the distressed zone at Chekkunnu mala and slope failures in the adjacent slopes of Mubaraq Granite quarry.*

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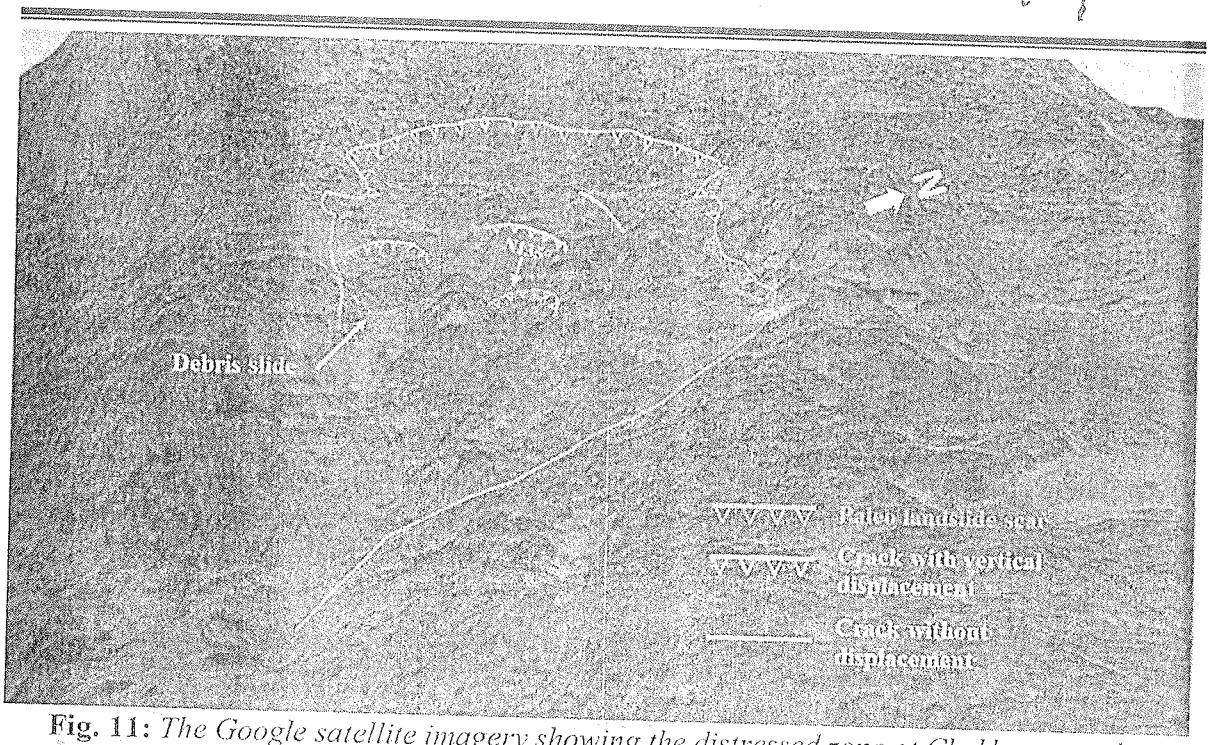

Fig. 11: *The Google satellite imagery showing the distressed zone at Chekkunnu mala.*

Fig. 12: *The photographs showing the distressed zone at Chekkunnu mala.*

Many debris slides and debris flows were identified either in field or using Google satellite imagery (Fig. 10) in the adjacent slopes of Mubaraq Granite quarry. On investigation it was found that the causative factors for all these failures are natural one mainly due to the type of slope forming material, the depth to the bed rock, slope gradient and the heavy downpour prevailing during the period of initiation of failures. The debris flows in the eastern part initiated as stripping failures which eventually joins the first order stream path and converted to debris flows.

CONCLUSION AND RECOMMENDATIONS

It is stated that the study area and its surroundings were assessed based on the condition prevailed as on the period of study, which may subject to change in case of abnormal climatic events and modification by human activities. Based on the preliminary investigations carried out, the following conclusions are made and recommendations are suggested.

The causative factors of slope failures identified in the adjacent areas of Mubaraq Granite quarry are purely natural triggered due to the intense heavy rainfall prevailed during the period and any interference of anthropogenic activities causing the events were not identified during the study. The distressed zone (tension cracks) formed at Chekkunnu mala during the southwest monsoon falls within a paleo landslide scar within which minor other scars and one recent debris slide were identified implies the slope is vulnerable to failures. From the field studies it is evident that the tension cracks are the initiation point of a major landslide which got aborted due to low slope gradient and lesser regolith depth which will reactivate during the next monsoon. So, it is recommended to relocate the houses in the vicinity of the paleo landslide scar to a safer location. The field investigation reveals no such evidence to establish any connection with the quarrying activities to these slope failures. However, to evaluate the effect of blasting on stability of any slopes and in view of the unscientific cracks developed in the buildings situated in the close proximity of quarry, it is recommended to carry out ground acceleration monitoring studies by suitable agencies.

The area occupied by the Mubaraq Granite and its upper and lower reaches were thoroughly investigated and found that the active quarrying area is totally flattened and devoid of any overburden material. The upper reaches of the Mubaraq Granite are occupied with hard compact debris containing isolated large rock blocks with thickness ranging from 0.5 m to 5 m. At the northern reaches where the slope angle varies between 25°-35° the chances of slope failures are higher which is evident from the recent debris slide. The 2nd order stream flowing along the northern slope is prone to debris flow, so it is recommended to construct a suitable culvert at the stream to quarry – plantation road contact (marked 1 in Fig. 3) and maintain the stream path properly for the free flow of water. The overburden material dumping ground (Fig.

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13) in the southern part of the quarry should be stabilized by benching and laying permeable geotextile fabric so as to avoid any slope failures there.

Fig. 13: *The overburden material dumping site of Mubaraq Granite.*

The landslide susceptibility map from the National Landslide Susceptibility Mapping (NLSM) programmme was prepared during the Field Season 2015-16 and changes in land use / landcover pattern and slope morphometry of the study area due to quarrying during the last five years were evident from the Google satellite imagery (Fig. 14). Even the Othayi – West Chathallur road was in the development stage. From this study, it is deduced that the landslide probability is minimum for the area which is flattened and exposed with hard bedrock after quarrying, while the landslide probability is higher in the northern portion where the slope gradient is 25°-35° with debris as overburden material having a thickness ranging from 0.5 m to 5 m. Hence it is to be concluded that quarrying in the low landslide probability area can be continued using controlled blasting techniques as per the Mining and Geology guidelines after considering the results of ground acceleration monitoring studies. While in the higher landslide probability area it is important to ensure optimum slope design by making benches as per the prevailing mining rules for minimizing slope instability issues and avoid waterlogging conditions on the vulnerable slopes. To minimize any destabilizing effect of quarrying on these slopes, it is advised to use controlled blasting and to avoid mining operations during the monsoon period.

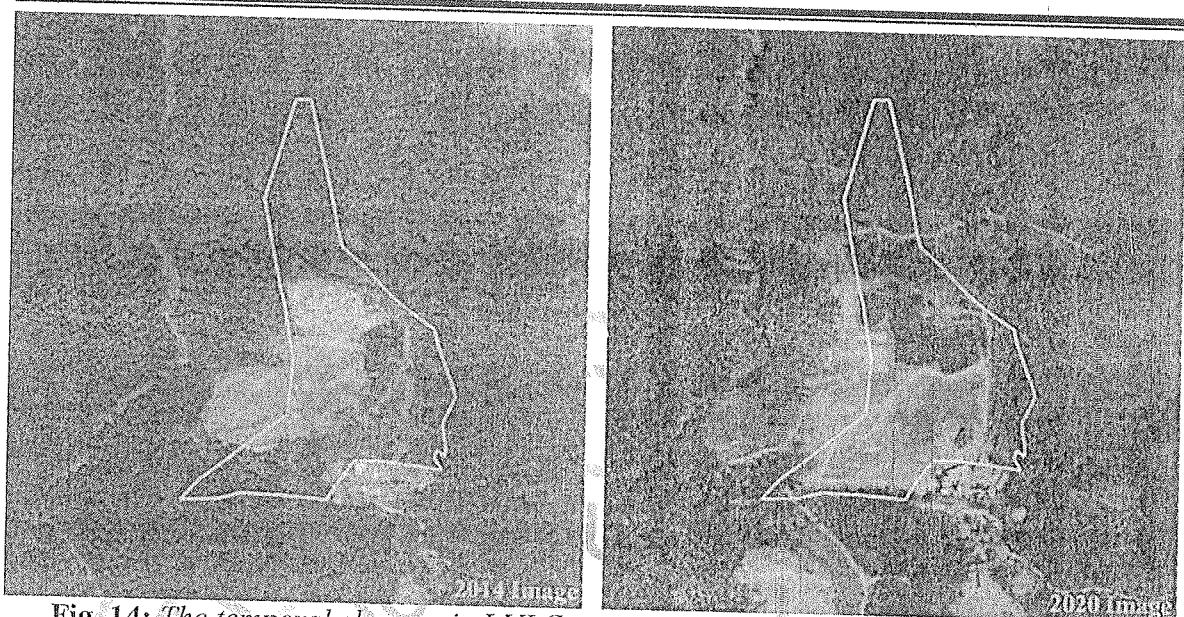

Fig. 14: *The temporal changes in LULC pattern observed in Google Satellite imagery.*

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IN THE HIGH COURT OF KERALA AT ERNAKULAM

Present:

THE HONOURABLE MR. JUSTICE A.MUHAMED MUSTAQUE

Thursday, the 17th day of December 2020/26th Agrahayana, 1942

WP(C) No.19044/2020(E)

PETITIONER

M/S.MUBARAQ GRANITES
WEST CHATHALLUR P.O. OTHAYI, MALAPPURAM DISTRICT 676 541,
REPRESENTED BY ITS MANAGING PARTNER A.M. MUHAMMED ALI,
AGED 55 YEARS, S/O. A.M. KUNHIMUHAMMED.

RESPONDENTS

1. STATE OF KERALA
REPRESENTED BY ITS PRINCIPAL SECRETARY,
DEPARTMENT OF REVENUE AND DISASTER MANAGEMENT,
SECRETARIAT, THIRUVANANTHAPURAM PIN-695 001.

2. THE KERALA STATE DISASTER MANAGEMENT AUTHORITY,
REPRESENTED BY ITS CONVENOR, OBSERVATORY HILLS,
VIKAS BHAVAN P.O. THIRUVANANTHAPURAM 695 033.

3. THE DISTRICT DISASTER MANAGEMENT AUTHORITY,
REPRESENTED BY ITS CHAIRPERSON, COLLECTORATE,
CIVIL STATION, UPHILL, MALAPPURAM 676 122.

4. THE DIRECTOR,
GEOLOGICAL SURVEY OF INDIA, MANIKANDESWARAM,
NETTAYAM, THIRUVANANTHAPURAM, KERALA 695 01

Writ Petition (civil) praying inter alia that in the circumstances stated in the affidavit filed along with the WP(C) the High Court be pleased to permit the petitioner to operate the quarry situated at 4.8157 hectares of land comprised in Sy Nos.93/1/pt,94/pt, 95/pt & 96/pt in Block No.70 of Perakamanna Village, Ernad Taluk in Malappuram District in pursuance to Ext-P1 and P2, pending disposal of the above Writ Petition (Civil).

This petition coming on for orders upon perusing the petition and the affidavit filed in support of WP(C) and upon hearing the arguments of M/S.K.M.SATHYANATHA MENON & KAVERY S THAMPI Advocates for the petitioner, GOVERNMENT PLEADER for the respondents 1 to 3 and of SRI.P.VIJAYAKUMAR, ASSISTANT SOLICITOR GENERAL OF INDIA for the respondent 4, the court passed the following:

pb/18.12.2020

p.t.o.

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A. MUHAMED MUSTAQUE, J.

W.P.(C) Nos. 32821/2019 & 19044/2020

Dated this the 17th day of December, 2020

ORDER

The petitioner in W.P.(C)No.19044/2020 approached this court challenging a ban imposed on petitioner's quarry. Admittedly, the petitioner's quarrying area has been classified as high hazard zone. There is a challenge against the petitioner's quarrying operation in W.P.(C)No.32821/2019, at the instance of one Mujeeb Rahman. On 2.12.2020, this Court passed the following order:

> "The learned Central Government Counsel is directed to get instructions from the 4th respondent in W.P.(C)No.19044/2020 as to the classification of the quarrying operation belongs to the petitioner in that writ petition is based on the verification already done."

2. The learned Central Government Counsel submits that classification as high hazard zone was based on 2018 flood and not with reference to any operation of quarrying.

3. Having considered the submission as above, it is appropriate to direct the 4th respondent – The Director,

Geological Survey of India in W.P.(C)No.19044/2020 to conduct a study as to the impact of quarrying operation in the area and to report whether the classification as high hazard zone has to be retained or not. This has to be done specifically based on the aspect relating to the quarrying operation of the petitioner in W.P.(C)No. 19044/2020. A report shall be filed before this Court by next posting. If any fees are leviable for such study, it is open for the Director to levy such fees from the petitioner in W.P.(C)No. 19044/2020.

Post on 28.01.2021.

Sd/-

A. Muhamed Mustaque,
Judge

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PR

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18/12/20

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GOVERNMENT OF KERALA

Abstract

Disaster Management Department- Judgement dated 16.03.2022 of Hon'ble High Court of Kerala in WP(C) 19044/2020 - Complied - Orders issued.

DISASTER MANAGEMENT (A) DEPARTMENT

G.O.(Rt)No.388/2022/DMD Dated 28-04-2022,Thiruvananthapuram

Read:- 1) Interim Order dated 22.07.2021 of the Hon'ble High Court of Kerala in IA.No.2/2020 in WP(c) No.19044 of 2020

2) G.O. (Rt) No. 817/2021/DMD dated 09-12-2021

3) Order dated 16.03.2022 of Hon'ble High Court of Kerala in IA.No.2/2020 in WP(c) No.19044 of 2020

4) Minutes of the the 7th meeting of the Advisory Committee on landslides held on 17.02.2022

5) Minutes of the State Executive committee meeting held on 05.04.2022

ORDER

The Hon'ble High Court of Kerala as per the order read as 1st paper above, permitted the petitioner to engage the National Institute of Technology, Karnataka for vibration study on the quarrying operations in the area where the petitioners quarry is located. The Advisory Committee on Landslides of Kerala State Disaster Management Authority (KSDMA) is directed to decide on the Terms of Reference of vibration studies and as per the G.O read as 2nd paper above, the Terms of Reference for carrying out vibration studies were approved

Accordingly the National Institute of Technology Karnataka, Suratkal had conducted scientific study in the Building stone quarry namely M/s. Mubaraq Granites in Perakamanna Village, Ernad Taluk, Malappuram District, Kerala to assess the intensity of ground vibrations generated from blasting operations carried out in the quarry. As per the study and test conducted, NIT, Karnataka reported that the intensity of ground vibrations, noise and fly rock caused due to blasting operations carried out in Stone Quarry are within permissible limits and such blasting operations will not damage the surroundings and cannot cause any instability problems. The Advisory Committee on landslides in its 7th meeting has found that the NIT conducted the vibration study at Mubarak Granite Quarry as per the Terms of References accepted by the Government and methods accepted by the Directorate General of Mines Safety.

The Hon'ble High Court in its order read as 3 rd paper above, directed the 2nd respondent (Convener, Kerala State Disaster Management Authority) to consider the study report of NIT and pass appropriate orders, in accordance with law. The matter was placed before the State Executive Committee of the Kerala Disaster Management Authority held on 05.04.2022 and was approved as per 5th paper above.

Government have examined the matter in detail are pleased to issue following directions to operate the Quarry namely M/s. Mubaraq Granites situated at 4.8157 hectares of land comprised in Sy.No.93/1pt,94/pt, 95/pt and 96/pt in Block No.70 of Perakkamanna, Eranad Taluk in Malappuram District .

1. The report of the NIT, Karnataka specifically recommends measures to reduce the disaster impacts of any quarrying in the area. The quarry owner should implement all the prescriptions of NIT, Karnataka.
2. The District Collector, Malappuram shall be responsible for ensuring that the quarry owner follows all these measures prescribed and report to the DDMA (District Disaster Management Authority), Malappuram.

3. The DDMA Malappuram shall, after considering the report of the District Collector, issue the necessary operational clearance to the quarry.
4. The District Collector or authorized representative shall conduct a specific inspection of the quarry once every 6 months and ascertain that the prescriptions of NIT Karnataka are continued to be enforced, particularly regarding blasting. The periodic visit reports shall be furnished to DDMA Malappuram and DDMA shall, if finding any specific deviation from the prescriptions of NIT Karnataka, immediately stop the functioning of the quarry based on the report of the crisis management committee.
5. The report suggests the use of nonel blasting to reduce any vibration and consequent conditioning of the surrounding land to trigger landslides. Therefore, blasting in this quarry should be conducted only by a blaster with specific training and certification in nonel blasting from competent agencies.
6. This case shall not be considered as a general precedence and that it should only be considered as a specific case based on site specific study conducted by a competent technical agency. The above shall not also be seen as a clearance to override any other laws, rules and regulations applicable in the case of quarrying in the site imposed by other relevant agencies.

The direction of the Hon'ble High Court of Kerala in its order dated 16.03.2022 is complied accordingly.

(By order of the Governor)

DR A JAYATHILAK I A S

Convener KSDMA & ADDITIONAL CHIEF SECRETARY

Advocate General, Kerala (with covering letter)

Commissioner, Disaster Management

District Collector, Malappuram

BLASTING IN URBAN ENVIRONMENT FOR CONSTRUCTION OF U/G METRO RAIL PROJECT

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BLASTING IN URBAN ENVIRONMENT FOR CONSTRUCTION OF U/G METRO RAIL PROJECT

V.R. Sastry & K. Ram Chandar

ABSTARCT

To create large infrastructure projects like tunnels, canals, open excavation for hydro power stations, underground metro stations, etc., a large quantity of soil and rock mass needs to be excavated. To excavate the hard rock mass in such projects, drilling and blasting is the cheapest method. Development of metro rail projects involves excavation of hard rock mass, especially – underground stretches, near important buildings, old and sensitive structures. Carrying out blasting operations in such projects is a very challenging task, as the operation should be carried out without causing any damage to the structures. This paper describes the controlled blasting operations carried out in a major metro project where underground stations are being developed close to important structures, some of which are more than 100 years old.

INTRODUCTION

Drilling and blasting operations are not only limited to mining industry, but are also common in various civil engineering projects like tunnels, canals, pipeline projects, hydel power projects, ports, etc., wherever hard rock formation has to be excavated. Objectives of blasting operation are fragmenting and displacing the hard rock mass using chemical energy in the form of explosives. Usage of explosive energy, in addition to fragment and displace the intact rockmass, is always associated with some side detrimental effects like ground vibrations, fly rock and noise. Before the commencement of blasting operations, it is necessary to carry out a critical analysis taking into consideration and careful examination of all the factors that influence the blasting operations, public complaints, statutory regulations, environmental restrictions etc. Sastry and Ramchandar [5] summarized the influence of side effects of blasting operations and control measures in blasting operations (Table-1).

Major problems encountered in blasting operations are ground vibrations, fly rock and noise. Ground vibrations cause damage to structures and annoyance to residents in neighboring areas, in case the intensity is above threshold values. Threshold value of ground vibration varies for different types of structures. In most of the cases, it also happens that though intensity of ground vibrations is much lower than safe limits, complaints still keep pouring in due to psychological factors of the people. Noise generated during blasting operations is a major problem as human beings are very sensitive to noise even though its effect is for a very short duration. Fly rock is another major problem that may cause damage to structures in the vicinity of excavation works and may also result in serious to fatal accidents if proper care is not taken. In some extreme cases, environmental problems may endanger the operation of project itself. It is, therefore, important to evaluate the impact of these risks / problems in order to design safe control measures.

A number of factors influence the intensity of ground vibrations and the predominant one is Maximum Charge per Delay (MCD). It is established by various research studies that as MCD increases, the intensity of ground vibrations also increases and vice versa. To reduce vibration levels the MCD should be decreased by introducing delay between holes or group of holes and / or by deck charging etc. If large number of holes are involved in bigger projects, delay element in the blast round can be achieved using detonating cord coupled with cord relays. However, detonating cord produces higher noise levels due to high grammage of PETN in the cord and also fly rock. Non-electric based shock tube detonators with surface connectors provide a good alternative to the conventional systems. Major advantage of this system is that it ensures true bottom initiation and it gives lesser noise levels compared to detonating cord initiated blasts. Studies conducted by Sastry and Chandar [6] showed a considerable reduction of 5 to 10 per cent in noise levels with shock tube initiation compared to conventional D-cord system.

Another major problem in rock blasting in infrastructure projects is fly rock. There are various factors, and a major source is stemming ejection, which may be due to improper stemming material, ineffective stemming or insufficient stemming column. Normally, detonating cord initiation system results in premature loosening of stemming column resulting in fly rock. To eliminate this problem, non electric initiation systems based on shocktube detonators may be used. Another effective method to control fly rock is the muffling arrangement.

CASE STUDY

A case study was taken up in a civil engineering project site where hard rock mass is being excavated for the construction of a station for a metro rail project. Hard granitic formation is exposed almost to the surface with thin soil layer of about 1-1.5m. Total depth of excavation required is around 24m for the construction of underground railway station. It was planned to excavate the hard granitic rock formation by benching method using drilling and blasting technique. The area of excavation is surrounded by important buildings like Central College, Session Court etc., with one of the structures declared as Heritage Structure of more than 100 years old. Fig. 1 shows some of the important structures around the rock excavation site. A Pre-Blast survey was taken up before commencing the blasting operations. All the buildings / structures in the vicinity were surveyed carefully to assess the type and condition of structures. Some sample cracks were indentified and marked. Different structures were assigned threshold ground vibration levels of 2mm/s, 5mm/s and 10mm/s, depending upon the type and condition of structure, following International Standards (Table-1).

Air Blast / Noise may give rise to structural damage such as breakage of window panes or nuisance to the inhabitants in the surrounding areas. Extremely high air over-pressure levels could cause formation exterior masonry cracks or interior plaster cracks in the structures. Although it is possible that high air blast levels could cause structural damage, those from routine blasting operations under normal atmospheric conditions are not likely to do so. The principal effects from blasting operations are:

- Slight air over pressure level that rattles the window panes
- Noise that startles people

Typical sound / air blast levels and the effects are given in Table–2. The glass window panes may break at over pressure levels of about 1.0psi, than needed for structural damage such as cracking of plaster (>2.0psi). About 180dB is required to cause structural damage like plaster cracking. Nicholls et al. [4] suggested an air over pressure level of 164dB as a safe limit for glass breakage.

2.1 Methodology

Blastholes of 32mm diameter were drilled using wagon drills, with the depth varying from 0.75m to 3.5m (Fig. 2). After drilling, each blasthole was charged with cartridged slurry explosives. Shock tube system of initiation was used to initiate each blasthole. Each blasthole was charged with explosive quantity of 0.125kg to 1.3125kg. The maximum charge per delay varied from 0.125kg to 0.375kg, 0.625kg and a maximum of 1.0kg. The total explosive charge per blast round varied from 0.875kg to 6.18kg, 13.75kg, 58.25kg, 83.75kg and a maximum of 128.125kg in different blasts.

Fly rock along with ground vibrations is a major concern as a number of important buildings are there in the surroundings and also due to busy public traffic. Heavy muffling arrangement was done using rubber blast mats, each weighing 2.5t (Fig. 3). Each blast was monitored using two units of Minimate Plus blast vibrations monitors, Instantel, Canada, for ground vibrations and noise at specific locations on day to day basis (Fig. 4). Based on the nature of rock mass, condition of the buildings and distance from the buildings to excavation site, controlled blasting methodology was devised.
Controlled blasting methodology was established based on data generated from 31 stage wise trial blasts conducted, considering previous experiences in similar ground conditions. Details of trial blasts conducted for establishing the controlled blasting methodology are given in Table-3. Subsequently, blasting operations were carried out in a very safe and efficient manner for completing the excavation at the given site.

Post-Blast analysis was conducted periodically after every 10 to 15 blasts, by verifying the sample cracks recorded during Pre-Blast analysis. Data generated from more than 1100 blasts conducted at the specific Metro Station is presented in Fig. 5. It was observed that out of more than 1100 blasts conducted, only on 17 occasions the peak particle velocity at different structures exceeded the permissible levels (Fig. 5). The data clearly indicates the implementation of safe blasting methodology by the Metro Rail Corporation.

CONCLUSIONS

Blasting is an essential activity in rock excavation projects. Usage of explosive energy is always associated with side environmental effects like ground vibrations, fly rock ad noise. These aspects assume special significance while conducting blasting operations in urban environment. Blast rounds should be designed keeping in view the rock mass characteristics and safety of surrounding structures and the people. Pre-blast and post-blast surveys along with risk assessment forms the basis of blast design in such conditions. Ground vibrations , fly rock and noise could be controlled by resorting to modern system of initiation and controlling the delay system in the blast rounds coupled with appropriate muffling arrangement. Such planning and execution of blasting operations can lead to successful completion of any infrastructural project involving huge rock excavation activity operating under restricted environment.

REFERENCES

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Fadeev, A.B., Glosman, L.M., Kurtuzov, M.I. and Safonov, L.V., 1987. Seismic control of mine and quarry blasting in the USSR. Proc. 6th ISRM Conf. Rock Mechanics, Canada, 1: 617 – 619.

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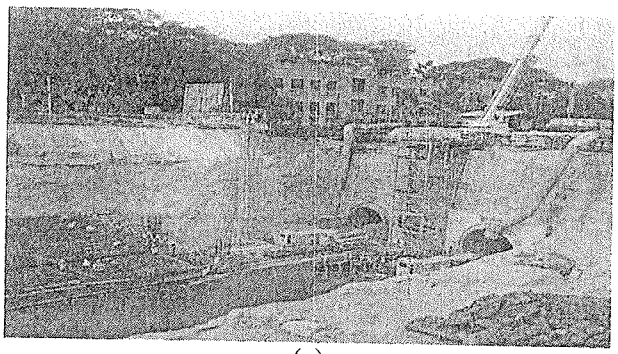

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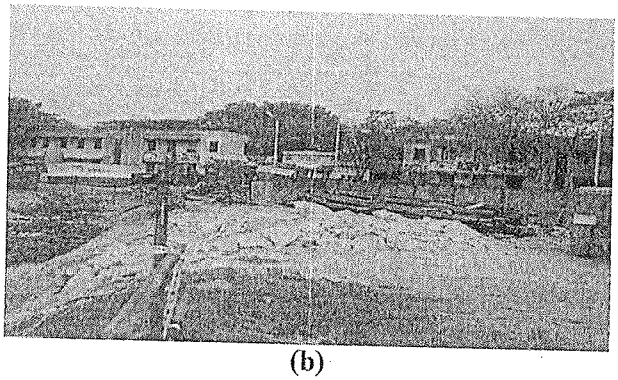

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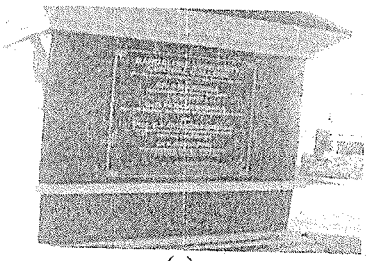

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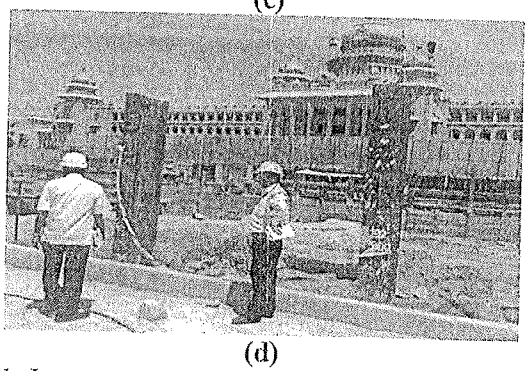

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Figure 1: Important structures near the rock excavation site

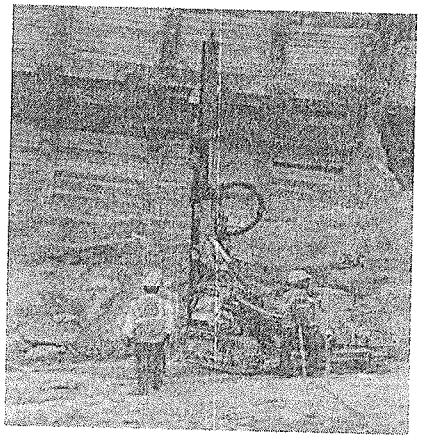
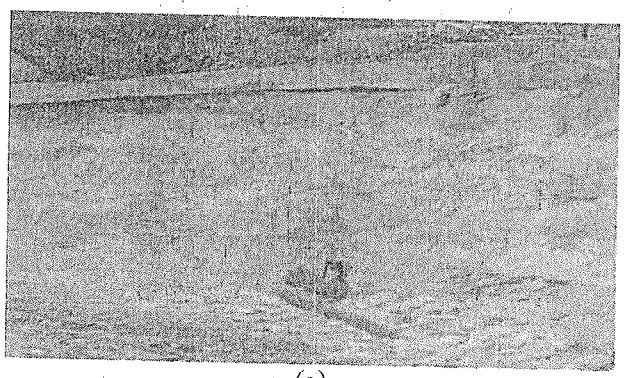


Figure 2: Drilling of blastholes in progress



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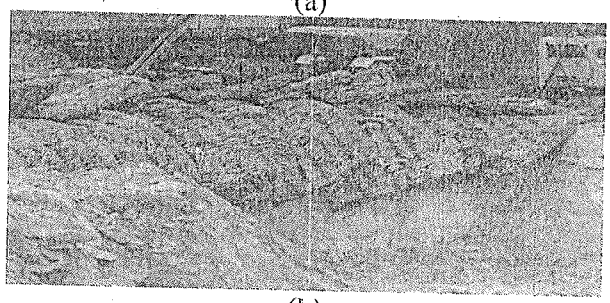

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Figure 3: Muffling arrangement for controlling fly rock

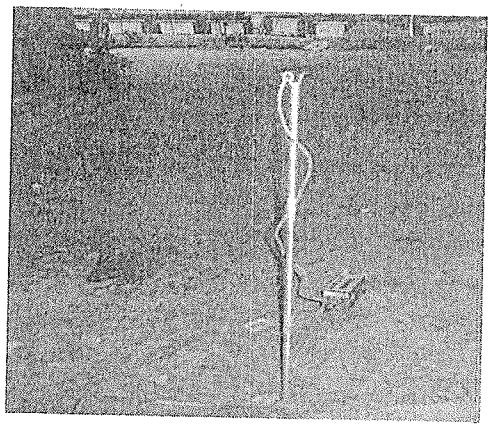

Figure 4: Ground vibrations monitoring near the structures

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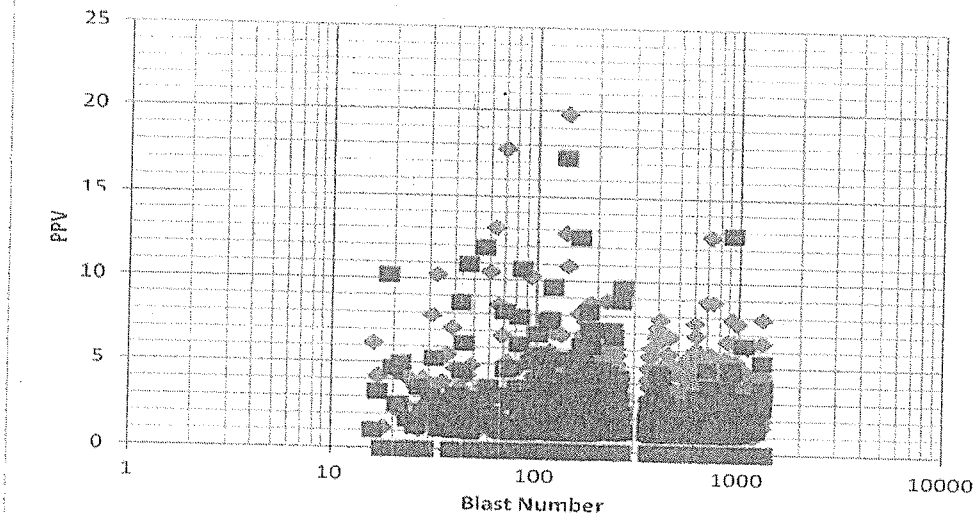

Figure 7: Ground vibrations recorded near the structures of importance

Table. 1: Ground vibrations standards in different countries

Country	Type of structure	Permissible PPV
UK (Ashley & Parkes, 1976) [2]	Ancient & historic monuments	7.5 mm/s
Erstwhile USSR (Fadeev et al., 1987) [3]	Hospitals (more sensitive) – no mention of historical or archeological monuments	8.0 mm/s
Norms in India by - DGMS (Anon, 1997) [1]	Objects of historical importance & sensitive structures	2 mm/s for < 8 Hz **5 mm/s for 8-25 Hz** 10 mm/s for > 25 Hz

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TABLE-1 INFLUENCE OF SIDE EFFECTS OF ROCK BLASTING AND CONTROL MEASURES

Parameter	Effect	Control
Ground Vibrations	-Damage to structures -Annoyance to people -Migration of wild life -Rehabilitation of settlements - Litigations	- Proper blast design - Increase delays - Proper initiation system and sequence - Decrease maximum charge per delay - Reduce confinement - Create a spilt/channel between blast site and structure
Flyrock	-Damage to structures/ machinery -Injury to people -Fatal accidents -Frequency	- Blast design - Change explosive - Change initiation system - Reduce confinement - Muffling arrangement
Noise	-Inconvenience to people -Structural damage -Frequency	- Cover the D-cord with soil - Use short delay detonators - Use sequential blasting machine - Change initiation from conventional to shocktube system

Table. 2: Effects of air blast / noise

Air over pressure levels		Air blast effect
dB	kpa	
177	14.0	All windows break
170	6.30	Most windows break
150	0.63	Some windows break
140	0.20	Some large glass windows may break Disks and loose windows rattle
136	0.13	USBM interim limit of allowable air blast
128	0.05	Complaints likely

Table 2: Details of the trial blasts conducted

Sl. No.	MCD (kg)	Distance (m)	PPV (mm/s)
1	0.38	27.73	4.70
2	0.25	28.18	2.60
3	0.31	31.99	2.35
4	0.13	31.30	1.52
5	0.25	28.65	1.65

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6	1.00	26.63	8.89
7	0.25	29.15	2.29
8	0.25	29.15	2.79
9	0.31	32.25	2.60
10	0.25	32.50	2.10
11	1.00	32.76	5.46
12	0.38	30.23	2.86
13	0.38	38.91	1.46
14	0.25	31.51	1.46
15	0.25	48.47	1.00
16	0.38	31.16	2.60
17	0.25	31.16	3.49
18	0.38	30.61	2.67
19	0.38	27.72	3.11
20	0.38	30.73	2.48
21	0.75	31.64	5.02
22	0.38	32.20	3.56
23	0.13	35.00	1.00
24	0.75	43.51	4.25
25	0.25	49.87	1.14
26	0.25	36.40	2.03
27	0.25	34.38	1.65
28	0.31	41.10	1.71
29	0.25	34.52	2.60
30	0.25	34.66	2.54
31	0.31	43.30	1.65

PPV : Peak particle velocity
MCD: Maximum charge per delay

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SD: Scaled distance