

An Assessment of the Resource Potential for the Industrial Limestone at Matayan Tehsil Dras District Kargil Ladakh J&K State

Mohsin Noor¹, Muhammad Aslam Reli²

^{1,2}Department of Geology and Mining, Sanat Ghar Bemina Srinagar Kashmir 190018, India

Abstract: *The investigation on the Matayan limestone was carried out in the mid June of 2014, by way of detailed surface geological mapping, covering an area of 20 hectares on 1:1000 scale. The purpose of the investigation was to calculate the limestone reserves and to ascertain its grade for use in cement, fertilizer and/or glass industry. About 144 numbers of channel sample and 100 numbers of random chip sample were collected along the dip direction to ascertain the grade of Matayan limestone. The Matayan limestone deposits lies 0.5 kilometers east of Matayan village in tehsil Dras district Kargil. Matayan, a small village of 32 huts situated at an altitude of 3260 meters above mean sea level in the north central part of Great Himalayas. The Matayan Limestone falls under the geographical coordinate 34°22'07" N 75°35'38" E at an elevation of 3310 m above mean sea level. The limestone deposits are well exposed along the east of the Matayan Stream. The limestone is fine grained, compact and massive, ranging in colour from dark grey to greenish grey. The age of the Matayan Limestone is Late Triassic. The analytical result of surface samples of Matayan limestone deposits indicates CaO 47.5 % with MgO 5 % and Silica 1.8 %. The broad chemical specifications of Cement Grade limestone for cement manufacture suggested by the Bureau of Indian Standards, New Delhi, is CaO 42% (min), Al₂O₃ 1 to 2 %, SiO₂ 12 to 16% and Mgo < 3 %, maximum tolerance being 5%. As per the Bureau of Indian Standards, the Matayan Limestone is suitable for the manufacturing of cement. Based on estimates using geological Cross Section method, the Matayan limestone reserves acquired a tonnage of 10.43 million within 30 meters of depth from the surface. However, drilling is necessary for estimation of actual reserves and confirmation of the quality of the limestone at depth.*

Keywords: Limestone, Geological Mapping, Cross-Section, Grade and Tonnage

1. Location and Accessibility

Matayan, a small village of 32 huts situated at an altitude of 3260 meters above mean sea level in the north central part of Great Himalayas. The limestone deposits lies 0.5 kilometers east of Matayan village in Dras tehsil, district Kargil (Map 01). The area of investigation falls in the Survey of India Topo Sheet No.43 N/11 with geographical coordinate 34° 22' 11" North 75° 35' 27.75" East. The limestone deposits are well exposed along the east of the Matayan Stream and are easily accessible by a road worthy vehicle. The Matayan village, situated at a distance of about 115 km from Srinagar on the Srinagar-Leh National Highway. The road remains open to vehicular traffic only during summer period.

Physiography

The area is highly mountainous and ranges in elevation from 3260 to 6000 m above mean sea level. The higher ranges remain snow covered throughout the year. Matayan valley, in particular, presents the inhospitable terrain and the climate, as it being the second coldest inhabited place in the world with temperature - 30 °C in winter and 20 °C in summer. The area is presumably the coldest place in Ladakh and receives heavy snowfall ranging from 1 to 3 meters during the winter. The Matayan village is drained by the Matayan Stream, which forms the main drainage of the area. The northern and eastern slopes of the mountain ranges are devoid of vegetation. The area is mostly barren except for some sparse growth of high altitude varieties of willows and poplars along the watercourses. At higher ups, a variety of cypress, and occasional grassy shrubs, are noticed.

Flora and fauna

The area is mostly barren, apart from the few cultivated fields along the watercourses in the low lying area. There is no vegetation other than some patches of Willow and Poplar trees, besides grass and scrub. The main fauna of the area includes Yak, Zommo (a cross breed between yak and cow), Ibex, Wild Horse, Wolves, Snow Leopard, Marmot and a variety of birds, including Pigeon. Yak, Zommo, Pones and Donkey are main source of animal transport available in the area.

Previous Work

The Geology and Mining Department, Srinagar previously mapped the area for identification/establishment of mineral resource. Later on detailed geological mapping was carried out to establishment the grade and reserves of Matayan limestone and Channigund Granite, of whom special reference of Nisar Ahmad, Ghulam Qadir Bhat, Muhammad Aslam Reli and Mohsin Noor can be made.

Present Work

Ladakh region is considered to be one of the loftiest region of the world, having rich potential of mineral resources. However, due to lack of infrastructure the mineral exploration was restricted to the accessible areas. The Geology and Mining Department, is presently working for project oriented mineral investigations for exploration and exploitation of the mineral resource in the Jammu and Kashmir State with a view to find such minerals that could be converted into value added products. This department is in a constant effort to explore potential mineral wealth of the region so that socio-economic conditions of the people are improved. The aim of the present study is to explore the quantity and quality of Matayan limestone.

Geological Setup

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Based on the Regional Tectonic Framework (RTF), the entire Himalayan Arc (HA) can be subdivided into four major tectonic zones, separated by a series of major thrusts. From South to North, these structural units are: (1) Outer Himalaya (2) Lesser Himalaya (3) Greater or Higher Himalaya and (4) Trans-Himalaya. Extensive deposits of limestone are known to occur in and around the Kashmir Valley but there is a vast track of mountainous terrain extending from northeast of Sonamarg through Baltal, Zojila and beyond over 50 kilometers in which occurs a huge thickness of limestone deposits yet un-explored. The study area forms the north central part of Tethyan Geosyncline Zone. The general rock formations encountered in the area are Late Triassic Limestone and Dras Volcanics. The geological succession of rock types met within the area is as follows:

Formation	Age
Talus, Scree and Sand river terraces glacial deposit granitic boulders and gravel beds	Recent-Pleistocene
-----Unconformity-----	
Hornblende-Biotite-granite	Post-Cretaceous
-----Intrusive Contact-----	
Dras Volcanic, intertrappen sediment And differentiated Ultramafites	Cretaceous
-----Thrust Contact-----	
Limestone and Shale's (<i>Matayan Limestone</i>)	Late Triassic

2. Description of Stratigraphic lithounits

Limestone

A thick horizon of limestone, mostly unfossiliferous, is explored in the form of very prominent escarpments all along the area south of Dras River. Based on regional mapping carried out by the earlier workers, the limestone has been assigned Late Triassic age. The limestone is bluish in colour, thinly bedded and very much folded, and in consequence, variations in the amount and direction of dip are frequent.

Dras Volcanic Series

This series, occupying a major part of the Dras valley, is bordered by the Triassic limestone on the south and hornblende granite on the north. The volcanic belt is about 15 km wide in the central part and comprises well stratified volcanic tuffs, agglomerates, massive and vesicular basalts and dykes of basic and ultra basic rocks. The basal member

of this volcanic series is an agglomeratic conglomerate horizon, 200m to 300m thick, and occurs as imperfectly stratified beds in contact with the Triassic limestone escarpments.

Igneous Intrusives

Acid, basic and ultra-basic intrusives are noticed traversing the volcanics at Dras, Khiber and Thasgam. Stocks, bosses, sills and dykes of coarse-grained dolerite, epidiorite and pyroxenite are seen around Dras and Thasgam. Acid intrusives are noticed in the northern part of area, gradually margins merging with the main hornblende granite of Dras. These intrusives traversing the Dras volcanic sequence are considered as post Cretaceous in age.

Hornblende Granite

The north and northeastern margin of the Volcanics is in contact with an intrusive granite which constitutes the major range to the north of the area mapped. The granite is massive, fine to medium grained, and white to grey in colour. Megascopically, the rock appears to be composed of quartz, white to grey feldspars, hornblende and occasional biotite. Xenoliths of dolerite are also noticed in it.

Sub-Recent Alluvium

Thick accumulations of talus and scree are seen in the lower reaches of the Matayan Stream. Alluvial terraces are seen on both sides of Matayan and Gumri Stream almost throughout the are

Structure

The Triassic limestone and Dras volcanics are complexly folded and a recumbent fold (Image 01) in the limestone is conspicuously displayed near south east of Matayan village along roadside. The thrust contact can be seen clearly in the gap north-west of Pandras, where complexly folded thick Limestone is thrust north wards over the Dras Volcanic. The granite, towards the northern part of the area appears to be unaffected by structural disturbances and remain massive and unfoliated for the most part, indicating that the intrusion of granite has been subsequent to the folding of the Cretaceous volcanics. The general strike of the limestone beds is NW-SE with a dip amount of 35° due east. One set of joint was observed during the field survey. The joint plane (J₁) is running parallel to the bedding plane (S₀) and other joint plane (J₂) is running across the bedding plane.



Image 1: A recumbent fold developed in the Late Triassic Limestone at Matayan

Description of Matayan limestone deposits

The detailed surface geological mapping (Map 02) carried out during current investigation revealed potential deposits of cement grade Limestone worth exploitation. The Matayan limestone deposit (Image 02) is light bluish grey to dark grey in colour, medium to fine grained hard, compact and massive. Some of the limestone bands are traversed by thin calc-silica vein-lets along and across the strike of the limestone beds. They are 1 to 5 mm thick, disappear and reappear at a distance of 1 to 1.5 meters. The general strike of the limestone beds is NW-SE with a dip amount of 35° due east. One set of joint was observed during the field survey. One joint plane (J_1) is running parallel to the bedding plane (S_0) and other joint plane (J_2) is running across the bedding plane. Main megascopic features of the limestone are listed below;

- 1) The limestone deposit of Matayan is simple sedimentary deposits of Triassic age, extending laterally in northwest-southeast direction (regional trend).
- 2) The deposits are bluish grey to dark grey in colour, changing to off white (milky limestone) towards east, showing a slight lithological change.
- 3) Differential weathering of calcareous soft material and arenaceous hard material is conspicuous by the presence of sugar cube structure, which is a peculiar weathering feature in cold desert regions.

The analytical result of surface samples received from the departmental Chemical and Mineralogical Testing Laboratory indicate that the deposit contain **calcium oxide (average Wt %) 46**. Based on estimates using the method of Cross Section Matayan limestone reserves acquired tonnage of 10.43 million.



Image 2: Matayan Limestone at Dras

3. Sampling and Analyses

In order to access the quality of Matayan Limestone deposits four sampling channels designated as CH_1 CH_2 CH_3 and

CH_4 (Annexure 01) were cut across the strike of the limestone beds to cover the deposit for surface sampling process, besides collection of 100 numbers of random chip samples (Annexure 02). The Channel samples were

collected for an interval of two meters and/or less depending upon the lithological unit and variation in individual lithological unit. After crushing these samples to 25 mesh size, were dispatched to the Departmental Chemical and Mineralogical Testing Laboratory at Ompura Budgam for determination of CaO, MgO, SiO₂, Al₂O₃, Fe₂O₃ and L.O.I. Based on the analytical results, average grade for 244 samples were calculated which indicated maximum value of average grade of CaO 47.5 % with MgO 5 % and Silica 1.8 %.

Reserve and Grade

The reserves of the Matayan limestone deposits have been computed by drawing two geological cross section lines (Map 03) designated as A-B and B-C across the limestone beds, whereby the sectional area was multiplied by the dipdown extension to get the volume of the deposit. The volume thus arrived was multiplied by the specific gravity of the rock (Table 01).

Based on the stream cut section, which have exposed 50 meters of limestone bands along the Matayan stream, a dipdown extension of 30 meters have been taken into the consideration for estimation of Matayan limestone reserves. Geological Cross section along A-B and C-D

Table 1

Geological Cross Section along	Sectional Area (Square Meters)	Dip Down Extension (Meters)	Density	Reserves (M.T)
A-B	72500	30	2.75	5.98
C-D	54000	30	2.75	4.45
Total Reserves (M.T)				10.43

Based on estimates using the method of geological cross section Matayan limestone reserves acquired a tonnage of 10.43 million within 30 meters of depth from the surface.

4. Conclusion and Recommendation

The detailed surface geological mapping coupled with surface sampling and inference drawn from geological cross sections reveals that the Matayan limestone encompasses deposits to the tune of 10.43 million tons. The quality of Matayan limestone suggests that it can be used for manufacturing of cement. However, drilling is necessary for estimation of actual reserves and confirmation of the quality of the Matayan limestone deposits at depth.

5. Acknowledgement

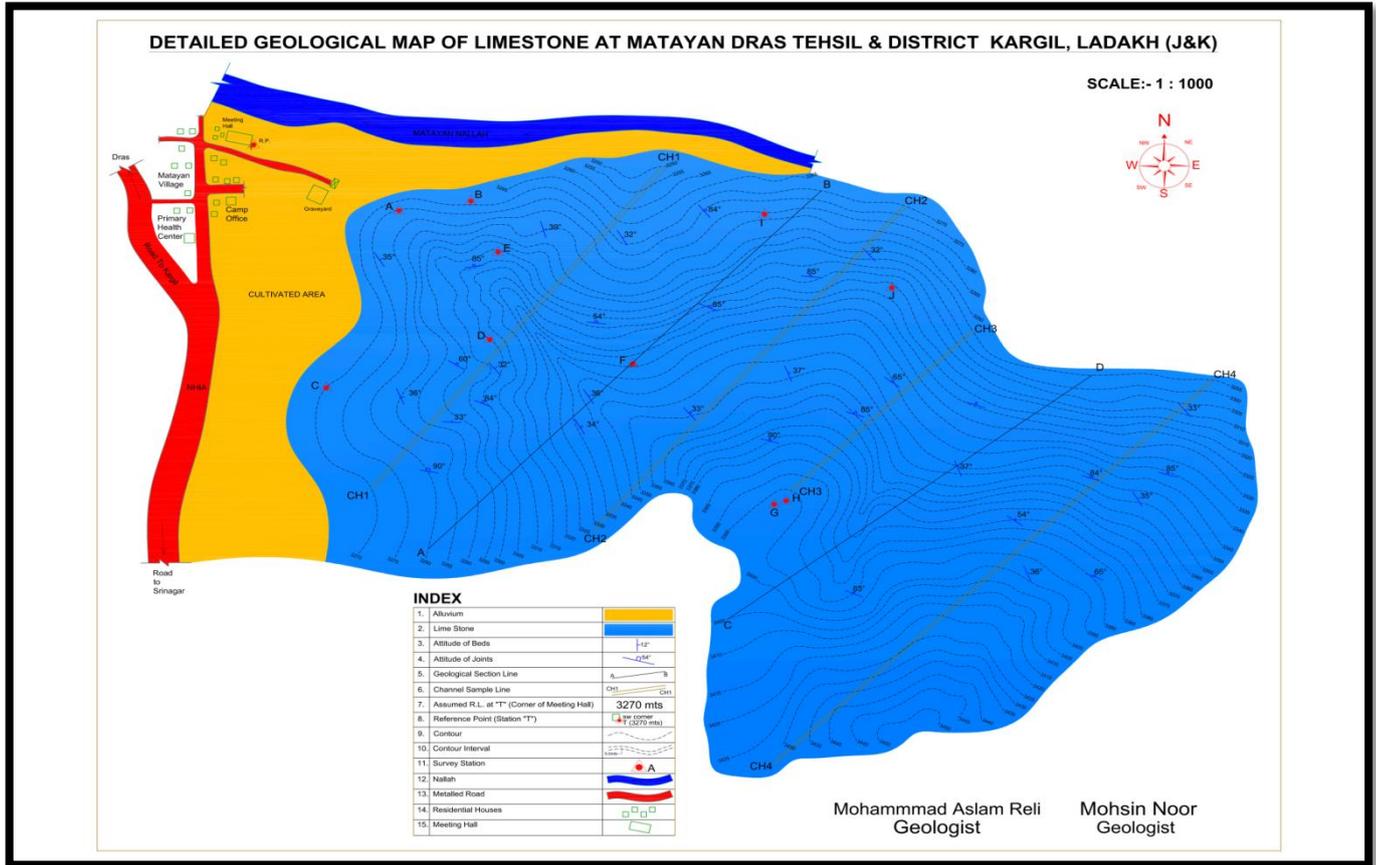
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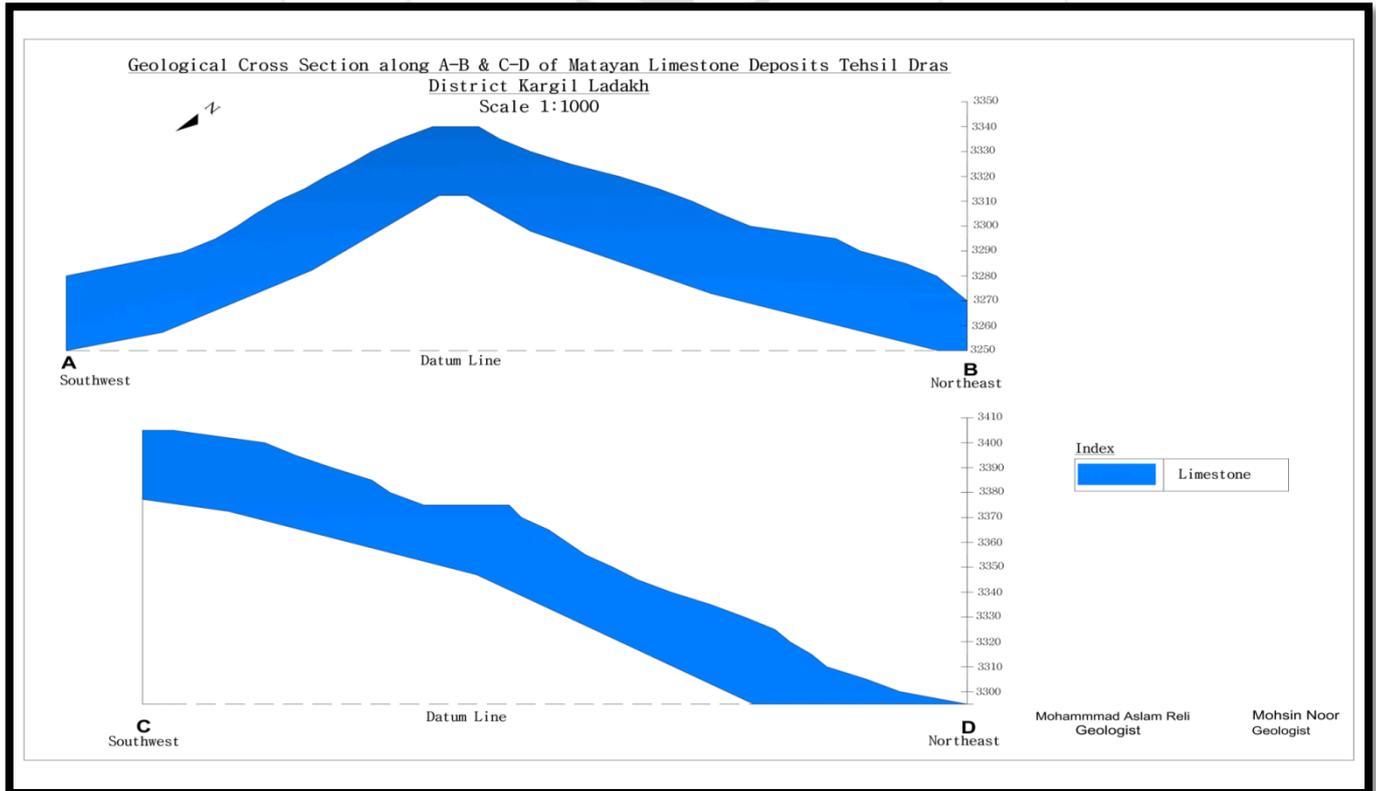
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Map 01.



Map 02.



Map 03.

(Annexure 01)

Analytical report of Lime Stone Channel Samples (CH-I) (Matayan, Drass, Kargil)

S.No.	Sample Name	SiO ₂ %	Fe ₂ O ₃ %	Al ₂ O ₃ %	CaO%	MgO%	L.O.I%
1.	MDK/LST/CH-I/01	1.45	0.98	0.96	51.40	1.84	42.88
2.	MDK/LST/CH-I/02	1.38	0.89	0.75	51.78	1.74	42.98
3.	MDK/LST/CH-I/03	1.28	0.78	0.56	52.64	1.18	43.06
4.	MDK/LST/CH-I/04	1.10	0.88	0.92	52.28	1.32	43.04
5.	MDK/LST/CH-I/05	1.15	0.71	0.76	52.02	1.82	43.06
6.	MDK/LST/CH-I/06	1.10	0.69	0.80	52.98	0.98	42.95
7.	MDK/LST/CH-I/07	1.03	0.72	0.69	52.64	1.38	43.06
8.	MDK/LST/CH-I/08	1.15	0.69	0.54	53.20	0.88	43.07
9.	MDK/LST/CH-I/09	0.85	0.50	0.59	52.68	1.60	43.30
10.	MDK/LST/CH-I/10	0.92	0.38	0.57	52.84	1.60	43.20
11.	MDK/LST/CH-I/11	1.16	0.35	0.53	52.62	1.70	43.15
12.	MDK/LST/CH-I/12	1.20	0.25	0.61	52.58	1.70	43.16
13.	MDK/LST/CH-I/13	1.38	0.74	0.85	52.53	1.30	42.70
14.	MDK/LST/CH-I/14	1.20	0.62	0.71	52.66	1.38	42.93
15.	MDK/LST/CH-I/15	1.40	0.58	0.69	52.64	1.31	42.88
16.	MDK/LST/CH-I/16	0.90	0.11	0.14	52.97	1.75	43.63
17.	MDK/LST/CH-I/17	1.30	0.34	0.51	52.62	1.63	43.10
18.	MDK/LST/CH-I/18	1.02	0.15	0.20	52.85	1.76	43.52
19.	MDK/LST/CH-I/19	1.18	0.45	0.53	52.64	1.60	43.10
20.	MDK/LST/CH-I/20	1.16	0.46	0.57	52.28	1.97	43.06
21.	MDK/LST/CH-I/21	1.04	0.31	0.52	52.78	1.57	43.30
22.	MDK/LST/CH-I/22	1.30	0.53	0.79	52.55	1.40	42.93
23.	MDK/LST/CH-I/23	1.03	0.32	0.42	53.76	0.80	43.17
24.	MDK/LST/CH-I/24	1.27	0.39	0.49	52.64	1.61	43.10
25.	MDK/LST/CH-I/25	0.95	0.28	0.34	52.68	1.98	43.32
26.	MDK/LST/CH-I/26	1.36	0.22	0.28	53.26	1.28	43.12
27.	MDK/LST/CH-I/27	0.84	0.18	0.20	53.92	1.02	43.34
28.	MDK/LST/CH-I/28	1.29	0.20	0.26	53.46	1.20	43.13
29.	MDK/LST/CH-I/29	0.56	0.16	0.18	54.08	0.98	43.56
30.	MDK/LST/CH-I/30	1.11	0.26	0.30	54.12	0.68	43.03
31.	MDK/LST/CH-I/31	0.86	0.27	0.37	54.00	0.80	43.20
32.	MDK/LST/CH-I/32	1.02	0.35	0.47	53.76	0.80	43.10
33.	MDK/LST/CH-I/33	0.81	0.33	0.50	53.86	0.80	43.20
34.	MDK/LST/CH-I/34	1.09	0.38	0.51	53.20	1.22	43.10
35.	MDK/LST/CH-I/35	1.07	0.18	0.25	53.76	1.08	43.20

Analytical report of Lime Stone Channel Samples (CH-II) (Matayan, Drass, Kargil)

S.No.	Sample Name	SiO ₂ %	Fe ₂ O ₃ %	Al ₂ O ₃ %	CaO%	MgO%	L.O.I%
1.	MDK/LST/CH-II/01	0.34	0.17	0.21	35.75	16.64	46.39
2.	MDK/LST/CH-II/02	2.49	1.25	2.46	40.72	9.70	42.88
3.	MDK/LST/CH-II/03	3.32	0.84	2.68	39.20	10.62	42.87
4.	MDK/LST/CH-II/04	3.24	0.92	1.34	40.81	10.10	43.10
5.	MDK/LST/CH-II/05	4.26	1.76	2.35	44.49	5.60	41.04
6.	MDK/LST/CH-II/06	2.15	0.52	0.70	40.35	11.40	44.40
7.	MDK/LST/CH-II/07	0.40	0.40	0.60	36.00	16.00	46.00
8.	MDK/LST/CH-II/08	3.79	1.20	1.30	40.10	10.50	42.88
9.	MDK/LST/CH-II/09	0.30	0.50	0.60	36.65	15.50	46.16
10.	MDK/LST/CH-II/10	3.16	0.60	0.80	41.00	10.40	43.56
11.	MDK/LST/CH-II/11	1.27	0.51	0.77	39.92	12.33	44.70
12.	MDK/LST/CH-II/12	0.70	0.40	0.85	46.10	7.40	44.12
13.	MDK/LST/CH-II/13	2.45	1.05	1.30	42.10	9.40	43.29
14.	MDK/LST/CH-II/14	2.10	0.59	0.71	42.56	9.60	43.95
15.	MDK/LST/CH-II/15	0.35	0.23	0.63	40.89	12.00	45.40
16.	MDK/LST/CH-II/16	4.88	1.79	2.78	46.05	3.70	40.30
17.	MDK/LST/CH-II/17	1.04	0.33	0.47	40.56	11.60	44.70
18.	MDK/LST/CH-II/18	8.40	0.86	1.10	44.66	4.40	40.08
19.	MDK/LST/CH-II/19	4.06	1.47	1.12	46.21	4.90	41.74
20.	MDK/LST/CH-II/20	2.69	1.05	0.72	38.60	12.40	44.07
21.	MDK/LST/CH-II/21	4.07	3.90	1.85	46.48	3.20	40.00
22.	MDK/LST/CH-II/22	1.46	1.50	0.75	47.60	5.20	43.12
23.	MDK/LST/CH-II/23	4.77	2.90	1.96	45.65	4.20	40.39
24.	MDK/LST/CH-II/24	2.78	1.45	0.90	40.52	10.40	43.49
25.	MDK/LST/CH-II/25	2.24	0.90	0.65	42.56	9.40	43.97
26.	MDK/LST/CH-II/26	2.14	0.86	0.88	44.16	8.02	43.45
27.	MDK/LST/CH-II/27	0.62	0.36	0.42	31.28	20.14	46.75
28.	MDK/LST/CH-II/28	5.52	1.98	2.28	35.62	12.52	41.58
29.	MDK/LST/CH-II/29	5.56	1.86	2.83	43.22	5.86	40.23
30.	MDK/LST/CH-II/30	3.77	1.14	1.97	45.68	5.28	41.70
31.	MDK/LST/CH-II/31	4.40	1.04	1.73	45.52	5.32	41.55
32.	MDK/LST/CH-II/32	2.32	0.62	0.73	43.68	8.40	43.75
33.	MDK/LST/CH-II/33	1.52	0.77	1.02	43.74	8.60	43.85
34.	MDK/LST/CH-II/34	2.86	0.97	1.42	44.80	6.80	42.65
35.	MDK/LST/CH-II/35	2.12	0.83	1.32	43.62	8.20	43.41

Analytical report of Lime Stone Channel Samples (CH-III) (Matayan, Drass, Kargil)

S.No.	Sample Name	SiO ₂ %	Fe ₂ O ₃ %	Al ₂ O ₃ %	CaO%	MgO%	L.O.I%
1.	MDK/LST/CH-III/01	1.04	0.22	0.36	43.68	9.40	44.80
2.	MDK/LST/CH-III/02	1.77	0.20	0.32	44.20	8.80	44.21
3.	MDK/LST/CH-III/03	0.15	0.13	0.16	44.29	9.46	45.33
4.	MDK/LST/CH-III/04	0.50	0.28	0.35	51.12	3.30	43.95
5.	MDK/LST/CH-III/05	0.47	0.18	0.27	42.00	11.15	45.45
6.	MDK/LST/CH-III/06	0.80	0.17	0.28	45.88	7.70	44.67
7.	MDK/LST/CH-III/07	3.49	0.23	0.37	45.76	6.50	43.15
8.	MDK/LST/CH-III/08	3.34	0.18	0.25	47.20	5.46	43.07
9.	MDK/LST/CH-III/09	0.42	0.12	0.24	42.12	11.13	45.47
10.	MDK/LST/CH-III/10	0.47	0.19	0.28	42.02	11.12	45.42
11.	MDK/LST/CH-III/11	0.42	0.12	0.19	44.22	9.35	45.20
12.	MDK/LST/CH-III/12	2.68	0.28	0.78	45.84	6.50	43.42
13.	MDK/LST/CH-III/13	1.44	0.80	0.11	45.85	7.80	44.60
14.	MDK/LST/CH-III/14	3.36	0.24	0.38	45.82	6.40	43.30
15.	MDK/LST/CH-III/15	3.28	0.28	0.37	45.62	6.82	43.15
16.	MDK/LST/CH-III/16	0.73	0.38	0.46	48.28	5.62	44.07
17.	MDK/LST/CH-III/17	3.55	0.29	0.48	45.62	6.60	42.96
18.	MDK/LST/CH-III/18	0.42	0.18	0.22	35.22	17.02	46.46
19.	MDK/LST/CH-III/19	3.42	0.43	0.47	44.22	7.83	43.15
20.	MDK/LST/CH-III/20	0.33	0.28	0.32	32.60	19.20	46.80
21.	MDK/LST/CH-III/21	2.12	0.16	0.98	45.78	6.90	43.56
22.	MDK/LST/CH-III/22	0.22	0.15	0.14	46.92	7.22	44.89
23.	MDK/LST/CH-III/23	2.72	0.24	0.88	45.78	6.60	43.28
24.	MDK/LST/CH-III/24	2.01	0.35	0.96	45.81	6.80	43.57
25.	MDK/LST/CH-III/25	0.20	0.10	0.14	46.87	2.38	44.92
26.	MDK/LST/CH-III/26	1.98	0.36	0.40	45.98	7.00	43.78
27.	MDK/LST/CH-III/27	1.09	0.11	0.15	45.85	7.70	44.60
28.	MDK/LST/CH-III/28	2.35	0.33	0.59	45.38	6.78	44.07
29.	MDK/LST/CH-III/29	4.25	0.62	1.02	44.98	6.38	42.25
30.	MDK/LST/CH-III/30	3.16	0.20	0.52	45.74	6.58	43.30
31.	MDK/LST/CH-III/31	4.21	0.94	1.46	44.88	6.11	41.90
32.	MDK/LST/CH-III/32	6.02	1.55	1.92	44.09	5.52	40.40
33.	MDK/LST/CH-III/33	2.86	1.48	1.52	43.68	7.50	42.47
34.	MDK/LST/CH-III/34	3.80	1.61	1.98	43.72	6.80	41.64
35.	MDK/LST/CH-III/35	3.88	1.29	1.43	44.82	6.20	41.89

Analytical report of Lime Stone Channel Samples (CH-IV) (Matayan, Drass, Kargil)

S.No.	Sample Name	SiO ₂ %	Fe ₂ O ₃ %	Al ₂ O ₃ %	CaO%	MgO%	L.O.I%
1.	MDK/LST/CH-IV/01	2.08	0.69	0.87	45.51	6.90	43.45
2.	MDK/LST/CH-IV/02	1.70	0.93	1.02	44.30	8.00	43.55
3.	MDK/LST/CH-IV/03	1.42	0.45	0.58	44.00	8.80	44.25
4.	MDK/LST/CH-IV/04	2.97	0.91	1.09	43.53	8.00	43.00
5.	MDK/LST/CH-IV/05	1.55	0.99	1.19	44.07	8.10	43.60
6.	MDK/LST/CH-IV/06	1.25	0.60	0.77	44.63	8.21	44.04
7.	MDK/LST/CH-IV/07	1.55	0.50	0.59	49.52	4.08	43.28
8.	MDK/LST/CH-IV/08	4.92	1.52	1.71	45.38	4.80	41.17
9.	MDK/LST/CH-IV/09	1.40	0.48	0.65	45.92	6.80	44.27
10.	MDK/LST/CH-IV/10	1.39	0.52	0.63	47.58	5.60	43.78
11.	MDK/LST/CH-IV/11	2.18	0.98	1.04	47.66	4.80	42.88
12.	MDK/LST/CH-IV/12	1.37	0.62	0.74	45.18	7.60	43.99
13.	MDK/LST/CH-IV/13	2.90	0.48	0.96	44.85	7.20	43.11
14.	MDK/LST/CH-IV/14	2.05	0.32	0.62	48.16	4.99	43.35
15.	MDK/LST/CH-IV/15	2.20	0.69	0.96	43.68	8.30	43.45
16.	MDK/LST/CH-IV/16	3.61	0.31	0.86	45.92	6.00	42.80
17.	MDK/LST/CH-IV/17	3.50	0.44	0.98	45.36	6.52	42.76
18.	MDK/LST/CH-IV/18	2.21	0.41	0.86	43.12	9.10	43.80
19.	MDK/LST/CH-IV/19	1.46	0.98	1.16	50.60	2.68	42.64
20.	MDK/LST/CH-IV/20	4.47	1.48	1.57	47.28	3.60	41.10
21.	MDK/LST/CH-IV/21	1.28	0.96	0.98	46.48	6.28	43.54
22.	MDK/LST/CH-IV/22	3.15	0.98	1.02	47.60	4.50	42.29
23.	MDK/LST/CH-IV/23	2.07	0.48	0.62	47.04	5.82	43.47
24.	MDK/LST/CH-IV/24	2.12	0.56	0.64	46.48	6.32	43.40
25.	MDK/LST/CH-IV/25	3.13	1.10	1.51	46.64	4.97	42.15
26.	MDK/LST/CH-IV/26	2.82	0.24	0.31	48.21	4.80	43.12
27.	MDK/LST/CH-IV/27	1.50	0.38	0.47	43.84	8.96	44.35
28.	MDK/LST/CH-IV/28	3.84	0.41	0.52	42.40	9.03	43.30
29.	MDK/LST/CH-IV/29	7.52	0.94	1.27	40.48	8.34	40.95
30.	MDK/LST/CH-IV/30	4.15	1.01	1.33	32.48	16.40	43.67
31.	MDK/LST/CH-IV/31	2.00	0.33	0.58	46.29	6.61	43.69
32.	MDK/LST/CH-IV/32	3.12	1.01	1.14	43.83	7.60	42.80
33.	MDK/LST/CH-IV/33	1.30	0.95	1.05	43.02	9.20	43.98
34.	MDK/LST/CH-IV/34	2.85	0.40	0.72	42.56	9.32	43.65
35.	MDK/LST/CH-IV/35	2.99	0.91	1.08	40.22	10.80	43.50

Checked by
Khalid Mehmood Bhat,
Technical Assistant.
Chemical and Mineralogical Testing Laboratory,
Department of Geology and Mining, Srinagar.

(Annexure 02)

Analytical report of Lime Stone Random Chip Samples (Matayan, Drass, Kargil)

S.No.	Sample Name	SiO ₂ %	Fe ₂ O ₃ %	Al ₂ O ₃ %	CaO%	MgO%	L.O.I%
1.	MDK/LST/RC/01	0.85	0.77	0.98	52.04	2.02	42.86
2.	MDK/LST/RC/02	1.59	0.30	0.52	53.58	0.78	42.77
3.	MDK/LST/RC/03	1.02	0.69	0.52	53.60	0.82	42.89
4.	MDK/LST/RC/04	1.26	0.30	0.42	53.42	1.02	43.10
5.	MDK/LST/RC/05	3.78	0.98	1.04	40.32	10.40	43.02
6.	MDK/LST/RC/06	0.98	0.31	0.42	52.52	1.82	43.47
7.	MDK/LST/RC/07	0.38	0.22	0.26	52.08	2.82	43.82
8.	MDK/LST/RC/08	2.22	0.52	0.61	48.16	4.98	43.05
9.	MDK/LST/RC/09	2.48	0.70	0.88	48.72	4.12	42.62
10.	MDK/LST/RC/10	6.50	1.45	3.25	40.50	7.60	40.20
11.	MDK/LST/RC/11	1.28	0.54	0.88	50.20	3.40	43.20
12.	MDK/LST/RC/12	0.70	0.33	0.43	51.18	3.16	43.70
13.	MDK/LST/RC/13	0.40	0.23	0.47	53.20	1.60	43.60
14.	MDK/LST/RC/14	3.35	0.37	0.63	44.00	7.85	43.30
15.	MDK/LST/RC/15	1.05	0.22	0.31	49.47	4.55	43.90
16.	MDK/LST/RC/16	2.90	0.72	0.88	40.08	11.12	43.80
17.	MDK/LST/RC/17	2.16	0.21	0.51	48.84	4.50	43.30
18.	MDK/LST/RC/18	1.10	0.30	0.53	51.57	2.61	43.40
19.	MDK/LST/RC/19	2.95	0.48	0.62	44.92	7.23	43.30
20.	MDK/LST/RC/20	1.20	0.63	1.31	37.18	14.20	44.98
21.	MDK/LST/RC/21	1.10	0.39	0.60	49.71	4.10	43.60
22.	MDK/LST/RC/22	5.54	1.80	2.45	44.80	4.60	40.30
23.	MDK/LST/RC/23	1.01	0.13	0.26	53.43	1.41	43.25
24.	MDK/LST/RC/24	0.78	0.14	0.27	52.13	2.40	43.78
25.	MDK/LST/RC/25	0.82	0.24	0.38	38.78	13.69	45.59
26.	MDK/LST/RC/26	1.42	0.43	0.63	51.24	2.10	43.68
27.	MDK/LST/RC/27	8.74	0.72	0.88	45.62	3.62	39.92
28.	MDK/LST/RC/28	3.60	0.95	1.51	38.64	11.60	43.20
29.	MDK/LST/RC/29	1.50	0.42	0.88	50.40	3.20	43.10
30.	MDK/LST/RC/30	4.76	0.26	0.58	45.95	5.85	42.10
31.	MDK/LST/RC/31	2.97	0.31	0.85	51.59	2.50	43.28
32.	MDK/LST/RC/32	0.71	0.20	0.41	52.56	2.10	43.52
33.	MDK/LST/RC/33	2.25	0.50	0.77	47.85	5.03	43.10
34.	MDK/LST/RC/34	3.30	0.68	1.01	42.56	8.80	43.15
35.	MDK/LST/RC/35	4.25	1.03	1.67	44.60	6.10	41.85
36.	MDK/LST/RC/36	0.95	0.25	0.38	45.92	7.60	44.40
37.	MDK/LST/RC/37	0.90	0.44	0.82	52.64	1.60	43.10
38.	MDK/LST/RC/38	1.10	0.53	0.67	52.95	1.25	43.00
39.	MDK/LST/RC/39	0.91	0.54	0.69	51.96	2.02	43.40
40.	MDK/LST/RC/40	2.28	0.78	0.92	31.24	18.88	45.42
41.	MDK/LST/RC/41	3.18	0.98	1.02	41.94	9.20	43.18
42.	MDK/LST/RC/42	1.28	0.78	0.91	50.92	2.56	43.08
43.	MDK/LST/RC/43	2.50	0.91	0.98	41.44	10.00	43.67
44.	MDK/LST/RC/44	4.82	1.02	1.23	45.88	4.80	41.75
45.	MDK/LST/RC/45	1.12	0.45	0.48	50.28	3.58	43.63
46.	MDK/LST/RC/46	3.28	0.93	0.98	42.48	8.75	43.09

47.	MDK/LST/RC/47	1.05	0.62	0.69	52.68	1.60	42.88
48.	MDK/LST/RC/48	0.78	0.36	0.58	52.78	1.82	43.20
49.	MDK/LST/RC/49	0.52	0.17	0.48	50.52	3.90	43.94
50.	MDK/LST/RC/50	0.80	0.78	0.85	53.02	0.98	43.07
51.	MDK/LST/RC/51	2.80	0.34	0.62	49.84	2.80	43.10
52.	MDK/LST/RC/52	0.58	0.12	0.17	52.81	2.10	43.72
53.	MDK/LST/RC/53	0.97	0.21	0.27	52.12	2.41	43.52
54.	MDK/LST/RC/54	0.82	0.11	0.16	52.27	2.44	43.70
55.	MDK/LST/RC/55	1.28	0.33	0.44	51.52	2.65	43.30
56.	MDK/LST/RC/56	0.44	0.19	0.28	52.20	2.59	43.80
57.	MDK/LST/RC/57	1.05	0.28	0.42	47.20	6.40	44.15
58.	MDK/LST/RC/58	1.09	0.32	0.43	53.76	0.80	43.10
59.	MDK/LST/RC/59	1.63	0.12	0.18	50.87	3.20	43.50
60.	MDK/LST/RC/60	1.05	0.24	0.31	52.35	2.10	43.45
61.	MDK/LST/RC/61	1.50	0.26	0.37	52.80	1.47	43.10
62.	MDK/LST/RC/62	1.02	0.18	0.22	51.63	2.80	43.65
63.	MDK/LST/RC/63	0.38	0.32	0.34	52.64	2.02	43.80
64.	MDK/LST/RC/64	0.98	0.19	0.28	52.68	2.00	43.37
65.	MDK/LST/RC/65	0.32	0.28	0.32	49.92	4.60	44.06
66.	MDK/LST/RC/66	1.24	0.38	0.48	50.52	3.40	43.50
67.	MDK/LST/RC/67	1.92	0.15	0.16	50.42	3.40	43.49
68.	MDK/LST/RC/68	0.96	0.36	0.58	51.68	2.62	43.30
69.	MDK/LST/RC/69	1.06	0.62	0.86	48.16	5.20	43.60
70.	MDK/LST/RC/70	1.23	0.69	0.80	50.96	2.82	43.00
71.	MDK/LST/RC/71	0.68	0.41	0.48	50.40	3.72	43.83
72.	MDK/LST/RC/72	1.04	0.88	0.94	47.60	5.52	43.54
73.	MDK/LST/RC/73	1.20	0.48	0.58	48.72	4.82	43.70
74.	MDK/LST/RC/74	1.12	0.93	0.98	48.16	5.02	43.29
75.	MDK/LST/RC/75	1.32	0.37	0.49	47.36	5.60	44.36
76.	MDK/LST/RC/76	1.03	0.12	0.28	49.28	4.79	44.00
77.	MDK/LST/RC/77	0.35	0.15	0.19	48.29	6.12	44.40
78.	MDK/LST/RC/78	0.82	0.11	0.12	48.72	5.45	44.28
79.	MDK/LST/RC/79	1.29	0.24	0.87	47.60	5.80	43.70
80.	MDK/LST/RC/80	1.85	0.48	0.51	48.32	4.96	43.38
81.	MDK/LST/RC/81	1.70	0.42	0.61	47.60	5.27	43.90
82.	MDK/LST/RC/82	0.90	0.33	0.49	52.08	2.40	43.30
83.	MDK/LST/RC/83	1.05	0.22	0.30	50.96	3.37	43.60
84.	MDK/LST/RC/84	1.30	0.40	0.51	49.84	4.00	43.45
85.	MDK/LST/RC/85	2.30	0.35	0.41	49.28	4.06	43.10
86.	MDK/LST/RC/86	0.90	0.23	0.32	52.80	1.85	43.40
87.	MDK/LST/RC/87	1.42	0.45	0.52	47.04	6.20	43.87
88.	MDK/LST/RC/88	0.36	0.18	0.22	48.16	6.12	44.46
89.	MDK/LST/RC/89	0.68	0.38	0.54	45.92	7.56	44.44
90.	MDK/LST/RC/90	0.78	0.20	0.24	52.64	2.18	43.50
91.	MDK/LST/RC/91	0.38	0.12	0.22	52.08	2.80	43.90
92.	MDK/LST/RC/92	4.12	0.42	0.73	49.89	2.94	41.40
93.	MDK/LST/RC/93	1.32	0.17	0.33	49.13	4.80	43.75
94.	MDK/LST/RC/94	1.16	0.27	0.41	49.52	4.41	43.73
95.	MDK/LST/RC/95	1.12	0.22	0.28	52.67	1.83	43.38

96.	MDK/LST/RC/96	0.25	0.10	0.16	52.80	2.29	44.00
97.	MDK/LST/RC/97	0.53	0.15	0.25	53.67	1.30	43.60
98.	MDK/LST/RC/98	0.51	0.12	0.18	50.64	3.90	44.15
99.	MDK/LST/RC/99	1.04	0.29	0.41	48.60	5.60	44.00
100.	MDK/LST/RC/100	0.48	0.13	0.17	54.32	0.80	43.60

Checked by

Khalid Mehmood Bhat,

Technical Assistant.

Chemical and Mineralogical Testing Laboratory,

Department of Geology and Mining, Srinagar.

