

Environmental Impact Assessment

October 2020

India: Bengaluru Metro Rail Project

Phase 2B (Airport Metro Line)

KR Puram to Kempegowda International Airport

Volume 5

Annex 5

NOTES

- (i) The fiscal year (FY) of the Government of India and its agencies ends on 31 March. "FY" before a calendar year denotes the year in which the fiscal year ends, e.g., FY2019 ends on 31 March 2019.
- (ii) In this report, "\$" refers to United States dollars.

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Base Line Vibration Monitoring for the Proposed Metro Project in Bangalore Phase -2A & 2B

Prepared for Client :

Bangalore Metro Rail Corporation Limited, Bangalore

Report Prepared By

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EXECUTIVE SUMMARY

Geosmart have been requested by AECOM to collect vibration level data from the existing environment at BMRCL phase 2 location . The scope of the survey is to complete day and night time measurements at noted sensitive locations within the immediate vicinity to BMRCL stage 2 area for selected properties as mentioned in the report.

The following report details the findings in regard to collected vibration levels. The aim of the survey is to provide Base Line data which can then be used as a part submission for a further information request from authorities



1.0 Introduction:

Ground borne vibrations from sources such as blasting, piling, machinery or road/rail traffic can be a source of concern for occupants of building and the structure of the building itself with in the vicinity of the source of vibration. This concern leads to a need to assess the effect of the imposed vibration on the building structure to ascertain whether damage could occur to the building due to vibration.

The measuring of vibration includes the following instrumentation:

- Transducers
- Data recording system

In general, the transducer would consist of a tri-axial sensor which would record the vibration in three directions namely vertical, longitudinal, and transversal. The data recording system will consist of processors, which will record the above measurement and record them in the system.

2.0 PROJECT LOCATION & SCOPE OF WORKS

The works under this Contract includes the supply and installation of vibration sensor , monitoring, recording and presentation of the data from these instruments for 10 locations at BMRCL Phase 2A and Phase 2B and vibration data will be recorded for a continues 24 hours in a single schedule. Below table depicts the proposed VM locations



LIST OF VIBRATION MONITORING STATIONS

PHASE – 2A (Central Silk Board to KR Puram)

Sl. No.	Station Code	List of Vibration monitoring locations	Chainages (km)	LHS/ RHS	Distance from Center Line (m)	Remarks
1	VM1	Near HSR Apartment Bus Stop	1+020	LHS	25	Thick Residential Area
2	VM2	Krupanidhi College (RHS) & Thick Residential Area (LHS)	6+800	RHS	50.00	
3	VM3	Saphire Honda Show room Near Salarpuria Hallmark	8+900	LHS	15.00	Alignment is very close
4	VM4	Car Care show room near ISRO	12+370	LHS	15	Row of Buildings are as near as 15 m
5	VM5	Lowry Memorial Educational Institution	16+800	LHS	58	

PHASE – 2B (KR Puram to Kempegowda International Airport via Hebbal Junction)

Sl. No.	Station Code	List of Vibration monitoring locations	Chainages (km)	LHS/ RHS	Distance from Center Line (m)	Remarks
1	VM6	Motherhood Hospital	3+700	LHS	30.00	
2	VM7	Manyata Tech Park	9+200	RHS	25.00	
3	VM8	Columbia Asia Hospital Hebbal	12+100	RHS	44.70	
4	VM9	Cytecare Cancer Hospital,	19+900	LHS	90.00	Cancer Research Lab
5	VM10	Chikkajala Fort	26+900	RHS	33.00	Archaeological Importance

3.0 Installation of Manual Vibration Monitoring System:

- Secure the Transducer to the ground using anchor
- Make sure that the arrow on the sensor is pointing towards the direction of activity.
- Secure a steel Protection Box over the sensor
- Connect the sensor with the readout unit with manufacturer's provided



connection cable and extended battery.

- Turn the Unit by “ON” by pressing *.
Press SET UP to or edit the setups. Test to check geo channels or to access events..
- Press Start Monitor to enter monitor mode.





Features

- ⊕ Instant LCD readout for all blast results
- ⊕ Sturdy case makes for completely self contained unit
- ⊕ Case mounted microphone with ground spike alternative
- ⊕ Standard 175+ event memory, optional 300+ memory
- ⊕ Completely waterproof for continuous all weather operation
- ⊕ Standard RS-232 port for downloading with downloading software in Windows included

4.0 Operation:

The following details are to be recorded at the time of testing at the site:

- Source of vibration
- Type of building
- a sketch of the site location and the sensor location
- directions of measurements



5.0 Base Line Monitoring :

It is important that baseline monitoring be conducted prior to the onset of actual construction in order to measure any subsequent changes due to actual construction that may be attributed to the ground vibrations.

Setting a baseline of vibration data involves collecting multiple data sets on all monitored sensors under normal operating conditions.

Once a baseline has been established, vibration analysts use the signature as a point of reference to track deviations due to other construction activity. Monitoring periods ranged from continues 24 hours for every location.

Threshold limit (upper Limit) has been set to 0.5 mm/s which refers the event has been captured above 0.5mm/s.

Guideline values of vibration velocity, for evaluating the effects of short term vibration, DIN4150-3:1999

Line	Type of Structure	Vibration peak particle Velocity (mm/s)			
		Foundation Frequency			Plane of Floor of Uppermost Storey
		Less than 10 Hz	10 to 50 Hz	50 to 100* Hz	Frequency Mixture
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that, because of their sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (eg buildings that are under a preservation order)	3	3 to 8	8 to 10	8



6.0 Summary of Reading :

A summary of the maximum baseline vibration recorded at each location is shown in Below Table

VIBRATION MONITORING SUMMARY				
S.NO	INSTRUMENT ID	DATE OF MONITORING	LOCATION	MAXIMUM TRIGGER
PHASE-2A (CENTRAL SLIK BOARD TO KR PURAM)				
1	VM01	11/12/2019	Near HSR Apartment Bus Stop	No events record
2	VM02	12/12/2019	Krupanidhi College (RHS) & Thick Residential Area (LHS)	No events record
3	VM03	11/12/2019	Saphire Honda Show room Near Salarpuria Hallmark	No events record
4	VM04	12/12/2012	Car Care show room near ISRO	1.22m/s
5	VM05	13/12/2019	Lowry Memorial Educational Institution	No events record
PHASE-2B (KR PURAM TO KEMPEGOWDA INTERNATIONAL ARIPOINT VIA HEBBAL JUNCTION)				
6	VM06	15/12/2019	Motherhood Hospital	3.32mm/s
7	VM07	15/12/2019	Manyata tech park	No events record
8	VM08	13/12/2019	Columbia Asia Hospital Hebbal	1.82m/s
9	VM09	14/12/2019	Cyte Care Cancer hospital	No events record
10	VM10	14/12/2019	Chikkajala Fort	1.71mm/s

Based on the results of the vibration monitoring, the ground vibrations during this monitoring period were below typical threshold limits and no waveforms were recorded except VM04, VM06, VM08 and VM10.

7.0 Discussion and Conclusion

The general environs during the monitoring period was that of passing commuter traffic including buses, trucks and commercial delivery vehicles

When a bus or a truck strikes an regularity / irregularity in the road surface, it generates an impact load and an oscillating load due to the subsequent “axle hop” of the vehicle.

The impact load generates ground vibrations that are predominant at the natural vibration frequencies of the soil / structures for the following locations mentioned in the below table. The traffic including buses and trucks were the predominant source of vibration



level as the following instruments were located close proximity of highway, road and sub road.

S.NO	INSTRUMENT ID	DATE OF MONITORING	LOCATION	MAXIMUM Value
4	VM04	12/12/2012	Car care Showroon near ISRO	1.22mm/s
6	VM06	15/12/2019	Motherhood Hospital	3.32mm/s
8	VM08	13/12/2019	Columbia Asia Hospital	1.82mm/s
10	VM10	14/12/2019	Chikkajala Fort	1.71mm/s

- In general the majority of base line vibration events recorded are in the range of 0.5 to 1.9mm per sec at locations motherhood hospital and fort .
In addition there are few Maximum events PVS recorded 2.5mm and 3.3mm, that shall be taken as isolated events and shall be ignored .
- At hospital location, the vents are recorded especially at night time that could be due to fast moving traffic at the adjacent roads at night time
- DIN standards on the permissible vibration limits for various buildings are mentioned in above pages (5.0 Base Line Monitoring) as a reference and guidelines

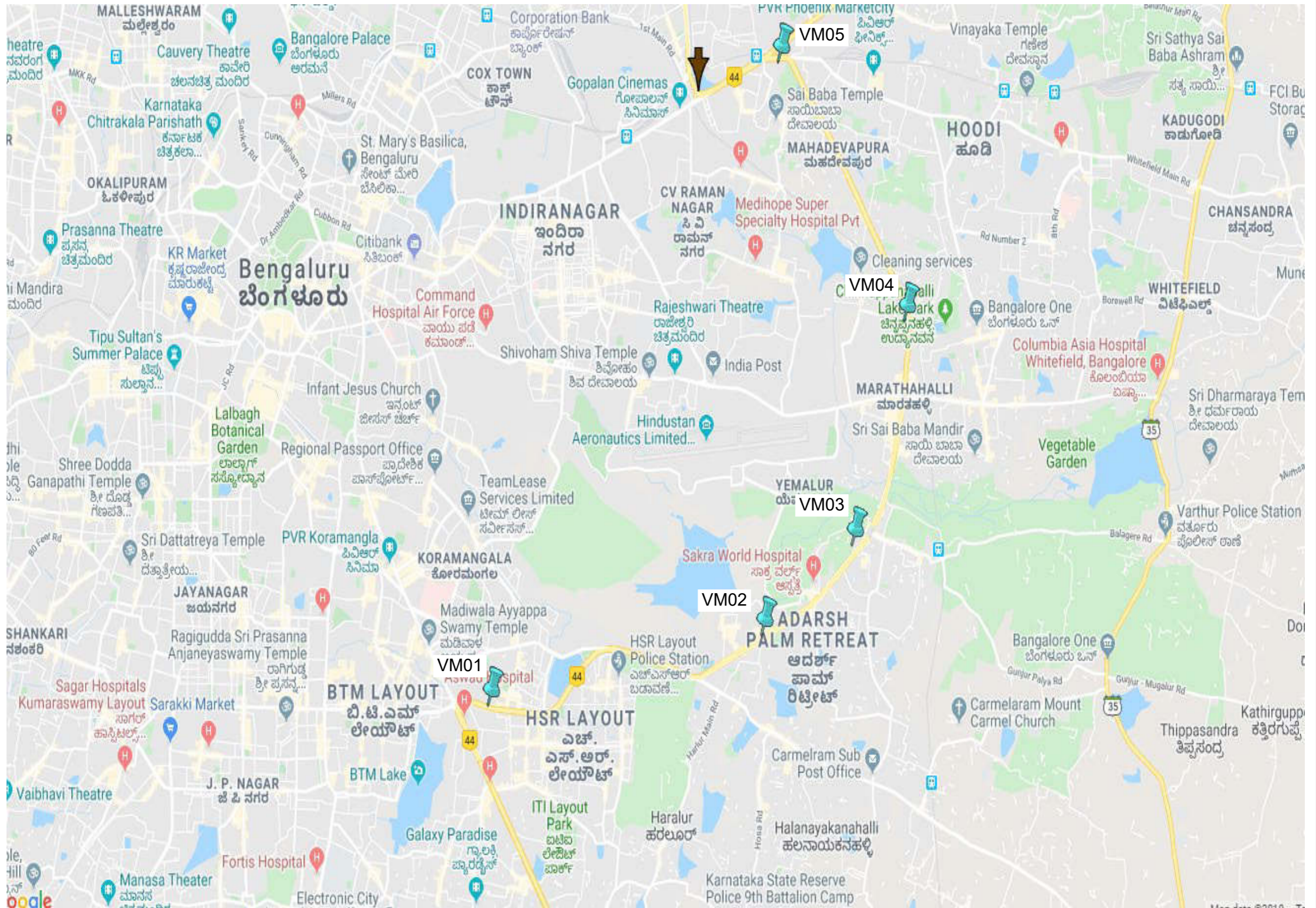
The predominant frequencies and amplitude of the vibration depend on many factors including suspension system; soil type and stratification; traffic time Peak / Non Peak hours; distance from the road / highway; and type of building and the effects of these factors are interdependent. Vibrations readings are depicted in Appendix



Appendix

Location and Readings

PHASE-2A
(Central Silk Board to KR Puram)



VM05

VM04

VM03

VM02

VM01

Bengaluru
ಬೆಂಗಳೂರು

INDIRANAGAR
ಇಂದಿರಾ ನಗರ

HOODI
ಹೂಡಿ

ADARSH
PALM RETREAT
ಆದರ್ಶ ಪಾಮ್ ರಿಟ್ರೀಟ್

BTM LAYOUT
ಬಿ.ಟಿ.ಎಮ್ ಲೇಔಟ್

HSR LAYOUT
ಎಚ್.ಎಸ್.ಆರ್. ಲೇಔಟ್

Bangalore One
ಬೆಂಗಳೂರು ಒನ್

WHITEFIELD
ವಿಟಿಫಿಲ್ಡ್

KORAMANGALA
ಕೋರಮಂಗಲ

MARATHAHALLI
ಮಾರಾಠಹಳ್ಳಿ

YEMALUR
ಯೆಮಲೂರು

Tipu Sultan's
Summer Palace
ತಿಪ್ಪು ಸುಲ್ತಾನನ ಸುಮರ ಪಾಲ್ಯೆಸ್

Lalbagh
Botanical Garden
ಲಾಲ್ಬಾಗ್ ಸಸ್ಯೋದ್ಯಾನ

Infant Jesus Church
ಇನ್ಫೆಂಟ್ ಜೀಸಸ್ ಚರ್ಚ್

Hindustan
Aeronautics Limited

Vegetable
Garden

Sri Dharmaraya Temple
ಶ್ರೀ ಧರ್ಮರಾಯ ದೇವಾಲಯ

Shree Dodda
Ganapathi Temple
ಶ್ರೀ ದೊಡ್ಡ ಗಣಪತಿ

JAYANAGAR
ಜಯನಗರ

Madiwala Ayyappa
Swamy Temple
ಮಡಿವಾಳ ಮಡಿವಾಳ ಸ್ವಾಮಿ

HSR Layout
Police Station
ಎಚ್.ಎಸ್.ಆರ್ ಲೇಔಟ್ ಪೊಲೀಸ್ ಠಾಣೆ

Carmelram Sub
Post Office

Carmelaram Mount
Carmel Church

Kathirguppe
Thippasandra
ಕತ್ತಿರಗುಪ್ಪೆ ತಿಪ್ಪಸಂದ್ರ

Sagar Hospitals
Kumaraswamy Layout
ಸಾಗರ್ ಹಾಸ್ಪಿಟಲ್ಸ್ ಕುಮಾರಸ್ವಾಮಿ ಲೇಔಟ್

Sarakki Market
ಸಾರಕ್ಕಿ ಮಾರ್ಕೆಟ್

J. P. NAGAR
ಜಿ.ಪಿ.ನಗರ

BTM Lake
ಬಿ.ಟಿ.ಎಮ್ ಲೇಔಟ್ ಲೇಕ್

Galaxy Paradise
ಗ್ಯಾಲಕ್ಸಿ ಪ್ಯಾರಡೈಸ್

ITI Layout
Park
ಐಟಿ ಲೇಔಟ್ ಪಾರ್ಕ್

Haralur
ಹರಲೂರು

Halnayakanahalli
ಹಲನಾಯಕನಹಳ್ಳಿ

Karnataka State Reserve
Police 9th Battalion Camp

Electronic City
ಎಲೆಕ್ಟ್ರಾನಿಕ್ ಸಿಟಿ

Google



GEOSMART

VIBRATION REPORT

INSTRUMENT ID : VM01

DATE : 11-Dec-19

LOCATION :Near HSR Apartment Bus Stop



INSTALLATION PHOTO



INSTRUMENT ID : VM 01

LOCATION NAME : Near HSR Apartment Bus Stop

PROJECT STRECTCH : PHASE – 2A (Central Silk Board to KR Puram)

Type	Serial No.	Date/Time	No. Chan	Trigger	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	Mic Peak (pa./dB)	PVS1 (mm/s)	Description
LOG	UM11175	Dec 11 /19 16:11:08	***	***	***	***	***		***	Start Monitoring
LOG	UM11175	Dec 12 /19 15:26:15	***	***	***	***	***		***	Stop Monitoring



GEOSMART

VIBRATION REPORT

INSTRUMENT ID : VM02

DATE : 12-Dec-19

LOCATION : Krupanidhi College (RHS) & Thick Residential Area (LHS)



INSTALLATION PHOTO



INSTRUMENT ID : VM 02

LOCATION NAME : Krupanidhi College (RHS) & Thick Residential Area (LHS)

PROJECT STRECTCH : PHASE – 2A (Central Silk Board to KR Puram)

Type	Serial No.	Date/Time	No. Chan	Trigger	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	Mic Peak (pa./dB)	PVS1 (mm/s)	Description
LOG	UM11175	Dec 12 /19 16:14:08	***	***	***	***	***		***	Start Monitoring
LOG	UM11175	Dec 13 /19 12:51:13	***	***	***	***	***		***	Stop Monitoring



GEOSMART

VIBRATION REPORT

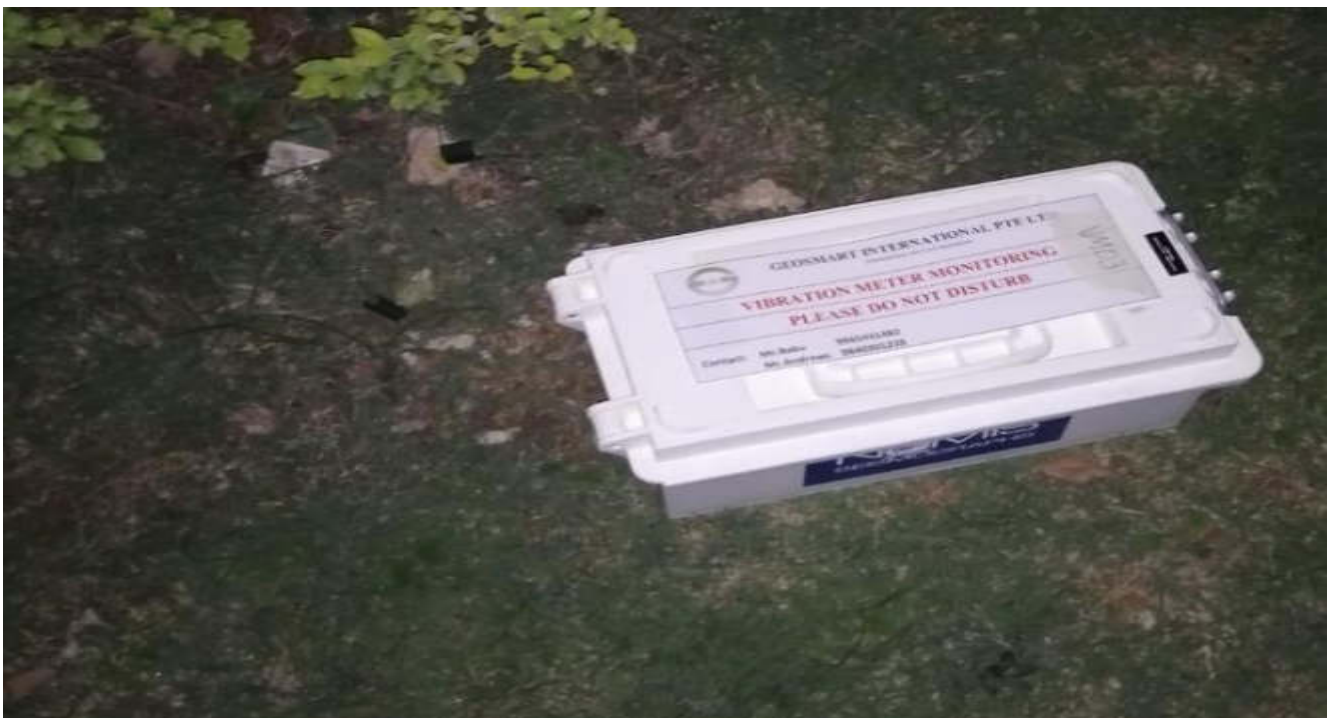
INSTRUMENT ID : VM03

DATE : 11-Dec-19

LOCATION : Sapphire Honda Show room Near Salarpuria Hallmark



INSTALLATION PHOTO



INSTRUMENT ID : VM 03

LOCATION NAME : Saphire Honda Show room Near Salarpuria Hallmark

PROJECT STRECTCH : PHASE – 2A (Central Silk Board to KR Puram)

Type	Serial No.	Date/Time	No. Chan	Trigger	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	Mic Peak (pa./dB)	PVS1 (mm/s)	Description
LOG	UM10787	Dec 11 /19 18:26:04	***	***	***	***	***		***	Start Monitoring
LOG	UM10787	Dec 12 /19 16:32:52	***	***	***	***	***		***	Stop Monitoring



GEOSMART

VIBRATION REPORT

INSTRUMENT ID : VM04

DATE : 12-Dec-19

LOCATION : Car Care show room near ISRO



INSTALLATION PHOTO



INSTRUMENT ID : VM 04

LOCATION NAME : Car Care show room near ISRO

PROJECT STRECTCH : PHASE – 2A (Central Silk Board to KR Puram)

Type	Serial No.	Date/Time	No. Chan	Trigger	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	Mic Peak (pa./dB)	PVS1 (mm/s)	Description
W	UM10787	Dec 12 /19 17:51:30	3	Long	0.418	0.378	1.088	***	1.129	
W	UM10787	Dec 12 /19 17:52:53	3	Long	0.189	0.812	0.930	***	1.220	
W	UM10787	Dec 12 /19 17:53:03	3	Long	0.473	0.835	0.946	***	1.166	



GEOSMART

VIBRATION REPORT

INSTRUMENT ID : VM05

DATE : 13-Dec-19

LOCATION : Lowry Memorial Educational Institution



INSTALLATION PHOTO



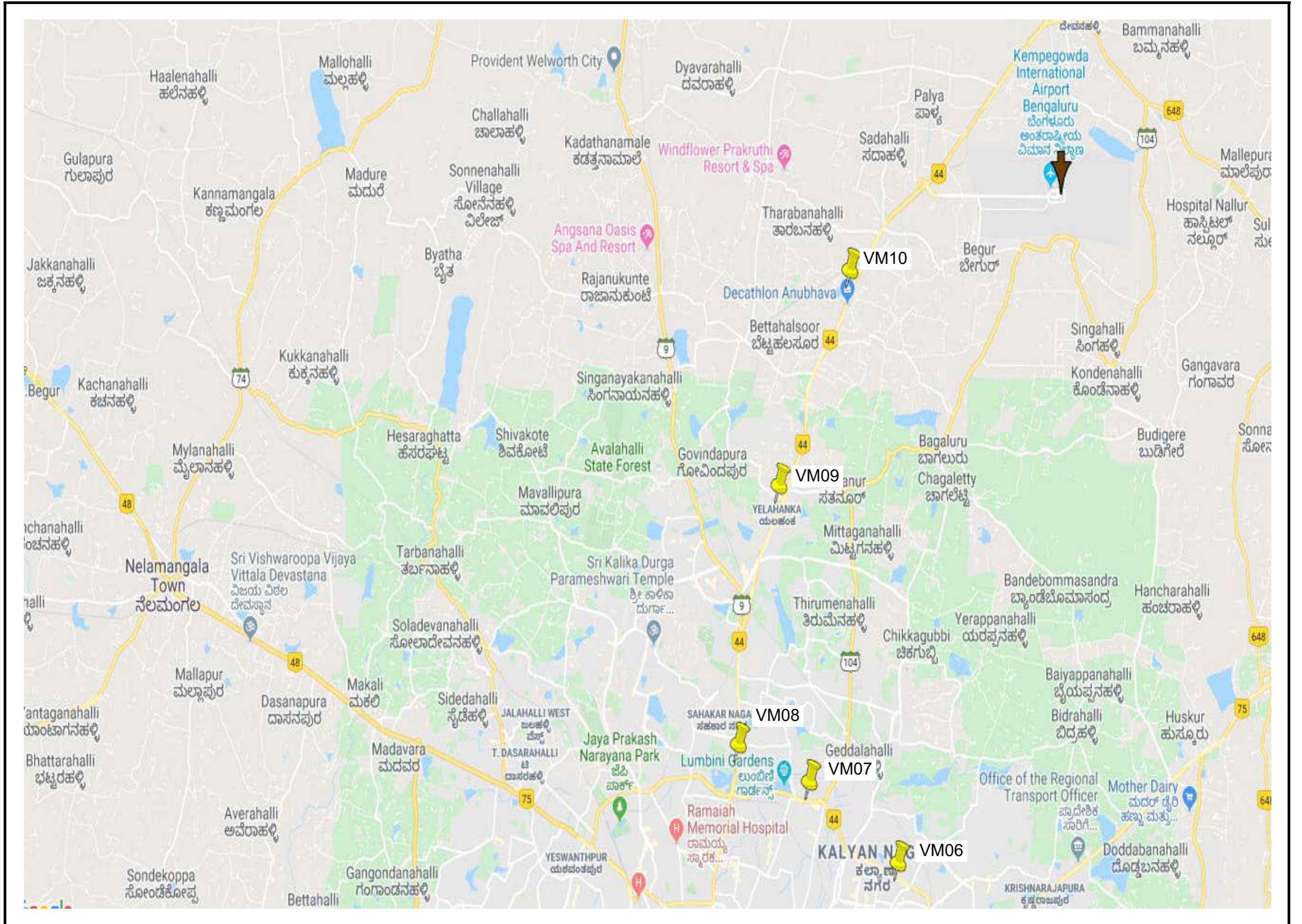
INSTRUMENT ID : VM 05

LOCATION NAME : Lowry Memorial Educational Institution

PROJECT STRECTCH : PHASE – 2A (Central Silk Board to KR Puram)

Type	Serial No.	Date/Time	No. Chan	Trigger	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	Mic Peak (pa./dB)	PVS1 (mm/s)	Description
LOG	UM11175	Dec 13 /19 14:54:17	***	***	***	***	***		***	Start Monitoring
LOG	UM11175	Dec 14 /19 12:10:34	***	***	***	***	***		***	Stop Monitoring

PHASE – 2B
**(KR Puram to Kempegowda International
Airport via Hebbal Junction)**



KALYAN NAGAR VM06

GEDDALAHALLI VM07

SAHAKAR NAGA VM08

ANUR VM09

BETTHALSOOR VM10

Kempegowda International Airport Bengaluru

Windflower Prakruthi Resort & Spa

Angsana Oasis Spa And Resort

Singanayakanahalli

Nelamangala Town

Jaya Prakash Narayana Park

Ramaiah Memorial Hospital

Office of the Regional Transport Officer

Mother Dairy

Doddabanhalli

KRISHNARAJAPURA

ಕಲ್ಯಾಣ ನಗರ

ಗದ್ದಲಹಳ್ಳಿ

ಸಹಕಾರ ನಗರ

ಅನುರ

ಬೆಟ್ಟಹಲಸೂರ

ಬೆಂಗಳೂರು ಅಂತರಾಷ್ಟ್ರೀಯ ವಿಮಾನ ನಿಲ್ದಾಣ

ವಿಂಡ್‌ಫ್ಲೋರ್ ಪ್ರಾಕೃತಿ ರಿಸಾರ್ಟ್ & ಸ್ಪಾ

ಆಂಗ್ಸಾನಾ ಓಸಿಸ್ ಸ್ಪಾ ಆಂಡ್ ರಿಸಾರ್ಟ್

ಸಿಂಗನಾಯಕನಹಳ್ಳಿ

ನೆಲಮಂಗಲ

ಜಯಪ್ರಕಾಶ ನಾರಾಯಣ ಪಾರ್ಕ್

ರಾಮಯ್ಯ ಸ್ಮಾರಕ ಹಾಸಪಾಲಯ

ಪ್ರಾದೇಶಿಕ ಸಾರಿಗೆ ಅಧಿಕಾರಿಗಳ ಕಛೇರಿ

ಮದರ್ ಡೈರಿ

ದೊಡ್ಡಬನಹಳ್ಳಿ

ಕೃಷ್ಣರಾಜಪುರ



GEOSMART

VIBRATION REPORT

INSTRUMENT ID : VM06

DATE : 15-Dec-19

LOCATION : Motherhood Hospital



INSTALLATION PHOTO



INSTRUMENT ID : VM 06

LOCATION NAME : Motherhood Hospital

PROJECT STRECTCH : PHASE – 2B (KR Puram to Kempegowda International Airport via Hebbal Junction)

Type	Serial No.	Date/Time	No. Chan	Trigger	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	Mic Peak (pa./dB)	PVS1 (mm/s)	Description
W	UM10787	Dec 15 /19 16:24:49	3	Vert	0.520	0.504	1.301	***	1.323	VM06
W	UM10787	Dec 15 /19 16:24:58	3	Long	0.670	0.292	0.804	***	0.830	VM06
W	UM10787	Dec 15 /19 16:25:07	3	Long	0.378	0.158	1.584	***	1.587	VM06
W	UM10787	Dec 15 /19 16:25:16	3	Long	0.213	0.118	0.583	***	0.584	VM06
W	UM10787	Dec 15 /19 16:25:50	3	Vert	0.528	1.836	0.489	***	1.852	VM06
W	UM10787	Dec 15 /19 16:26:56	3	Long	1.584	0.623	1.702	***	1.942	VM06
W	UM10787	Dec 15 /19 16:27:28	3	Long	0.536	0.434	3.161	***	3.183	VM06
W	UM10787	Dec 15 /19 16:27:43	3	Long	0.213	0.134	0.741	***	0.746	VM06
W	UM10787	Dec 15 /19 16:35:36	3	Tran	0.591	0.315	0.418	***	0.638	VM06
W	UM10787	Dec 15 /19 20:02:21	3	Long	0.441	0.244	0.567	***	0.591	VM06
W	UM10787	Dec 16 /19 04:42:13	3	Vert	0.426	0.544	0.402	***	0.696	VM06
W	UM10787	Dec 16 /19 06:46:06	3	Long	0.150	0.638	2.554	***	2.579	VM06
W	UM10787	Dec 16 /19 06:46:16	3	Long	0.087	0.765	3.287	***	3.321	VM06
W	UM10787	Dec 16 /19 08:15:12	3	Long	0.110	0.331	1.316	***	1.320	VM06
W	UM10787	Dec 16 /19 10:17:01	3	Long	0.063	0.725	0.504	***	0.802	VM06
W	UM10787	Dec 16 /19 10:44:18	3	Vert	0.189	0.914	0.544	***	1.033	VM06
W	UM10787	Dec 16 /19 11:52:44	3	Vert	0.150	0.528	0.410	***	0.633	VM06
W	UM10787	Dec 16 /19 13:32:16	3	Long	0.071	0.126	0.835	***	0.839	VM06



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VIBRATION REPORT

INSTRUMENT ID : VM07

DATE : 15-Dec-19

LOCATION : Manyata Tech Park



INSTALLATION PHOTO



INSTRUMENT ID : VM 07

LOCATION NAME : Manyata Tech Park

PROJECT STRECTCH : PHASE – 2B (KR Puram to Kempegowda International Airport via Hebbal Junction)

Type	Serial No.	Date/Time	No. Chan	Trigger	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	Mic Peak (pa./dB)	PVS1 (mm/s)	Description
LOG	UM11175	Dec 15 /19 15:52:03	***	***	***	***	***		***	Start Monitoring
LOG	UM11175	Dec 16 /19 13:12:47	***	***	***	***	***		***	Stop Monitoring



GEOSMART

VIBRATION REPORT

INSTRUMENT ID : VM08

DATE : 13-Dec-19

LOCATION : Columbia Asia Hospital Hebbal



INSTALLATION PHOTO



INSTRUMENT ID : VM 08

LOCATION NAME : Columbia Asia Hospital Hebbal

PROJECT STRECTCH : PHASE – 2B (KR Puram to Kempegowda International Airport via Hebbal Junction)

Type	Serial No.	Date/Time	No. Chan	Trigger	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	Mic Peak (pa./dB)	PVS1 (mm/s)	Description
W	UM10787	Dec 13 /19 16:35:32	3	Long	0.181	0.118	0.607	***	0.609	VM08
W	UM10787	Dec 13 /19 16:37:32	3	Long	0.173	0.134	0.504	***	0.508	VM08
W	UM10787	Dec 13 /19 16:44:48	3	Vert	0.434	0.591	0.213	***	0.601	VM08
W	UM10787	Dec 13 /19 20:17:25	3	Vert	0.370	0.567	0.236	***	0.579	VM08
W	UM10787	Dec 13 /19 20:43:29	3	Tran	0.497	0.402	0.189	***	0.522	VM08
W	UM10787	Dec 13 /19 20:44:02	3	Vert	0.520	0.512	0.221	***	0.580	VM08
W	UM10787	Dec 13 /19 20:52:20	3	Vert	0.410	0.528	0.189	***	0.537	VM08
W	UM10787	Dec 13 /19 21:57:49	3	Tran	0.725	0.662	0.323	***	0.805	VM08
W	UM10787	Dec 13 /19 22:23:01	3	Tran	0.497	0.418	0.315	***	0.508	VM08
W	UM10787	Dec 13 /19 23:03:51	3	Tran	0.544	0.481	0.173	***	0.549	VM08
W	UM10787	Dec 13 /19 23:05:01	3	Vert	0.504	0.536	0.181	***	0.568	VM08
W	UM10787	Dec 13 /19 23:47:54	3	Vert	0.434	0.765	0.300	***	0.766	VM08
W	UM10787	Dec 13 /19 23:48:35	3	Vert	0.300	0.615	0.229	***	0.635	VM08
W	UM10787	Dec 13 /19 23:48:46	3	Vert	0.331	0.512	0.189	***	0.557	VM08
W	UM10787	Dec 13 /19 23:49:14	3	Tran	0.725	0.528	0.244	***	0.736	VM08
W	UM10787	Dec 13 /19 23:55:29	3	Vert	0.276	0.528	0.181	***	0.550	VM08
W	UM10787	Dec 13 /19 23:56:12	3	Vert	0.599	0.670	0.355	***	0.731	VM08
W	UM10787	Dec 14 /19 00:07:29	3	Vert	0.528	0.749	0.323	***	0.771	VM08
W	UM10787	Dec 14 /19 00:16:44	3	Vert	0.370	0.607	0.236	***	0.631	VM08
W	UM10787	Dec 14 /19 00:27:33	3	Vert	0.504	0.765	0.323	***	0.769	VM08
W	UM10787	Dec 14 /19 00:27:41	3	Vert	0.363	0.741	0.276	***	0.762	VM08
W	UM10787	Dec 14 /19 00:30:15	3	Vert	0.489	0.701	0.331	***	0.708	VM08
W	UM10787	Dec 14 /19 00:35:30	3	Vert	0.528	0.835	0.434	***	0.870	VM08
W	UM10787	Dec 14 /19 00:38:08	3	Vert	0.465	0.497	0.292	***	0.527	VM08
W	UM10787	Dec 14 /19 00:41:36	3	Vert	0.623	1.206	0.386	***	1.212	VM08
W	UM10787	Dec 14 /19 00:45:06	3	Vert	0.497	0.757	0.339	***	0.767	VM08
W	UM10787	Dec 14 /19 00:46:15	3	Vert	0.441	0.528	0.229	***	0.560	VM08
W	UM10787	Dec 14 /19 01:00:24	3	Vert	0.536	0.757	0.307	***	0.784	VM08

INSTRUMENT ID : VM 08

LOCATION NAME : Columbia Asia Hospital Hebbal

PROJECT STRECTCH : PHASE – 2B (KR Puram to Kempegowda International Airport via Hebbal Junction)

Type	Serial No.	Date/Time	No. Chan	Trigger	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	Mic Peak (pa./dB)	PVS1 (mm/s)	Description
W	UM10787	Dec 14 /19 01:04:30	3	Vert	0.552	0.678	0.363	***	0.684	VM08
W	UM10787	Dec 14 /19 01:06:31	3	Vert	0.560	0.670	0.504	***	0.758	VM08
W	UM10787	Dec 14 /19 01:06:42	3	Vert	0.386	0.701	0.244	***	0.702	VM08
W	UM10787	Dec 14 /19 01:13:56	3	Vert	0.481	0.575	0.205	***	0.606	VM08
W	UM10787	Dec 14 /19 01:16:05	3	Vert	0.418	0.560	0.315	***	0.611	VM08
W	UM10787	Dec 14 /19 01:20:23	3	Vert	0.331	0.623	0.221	***	0.643	VM08
W	UM10787	Dec 14 /19 01:20:58	3	Vert	0.307	0.512	0.260	***	0.536	VM08
W	UM10787	Dec 14 /19 01:22:33	3	Tran	0.717	0.694	0.347	***	0.798	VM08
W	UM10787	Dec 14 /19 01:23:03	3	Tran	0.567	0.457	0.252	***	0.590	VM08
W	UM10787	Dec 14 /19 01:32:25	3	Vert	0.520	0.804	0.370	***	0.835	VM08
W	UM10787	Dec 14 /19 01:34:48	3	Vert	0.331	0.567	0.236	***	0.577	VM08
W	UM10787	Dec 14 /19 01:40:44	3	Tran	0.780	0.678	0.378	***	0.808	VM08
W	UM10787	Dec 14 /19 01:43:28	3	Vert	0.481	0.552	0.284	***	0.592	VM08
W	UM10787	Dec 14 /19 01:48:13	3	Vert	0.378	0.591	0.244	***	0.615	VM08
W	UM10787	Dec 14 /19 01:53:49	3	Vert	0.418	0.560	0.276	***	0.563	VM08
W	UM10787	Dec 14 /19 02:38:14	3	Vert	0.615	0.567	0.244	***	0.660	VM08
W	UM10787	Dec 14 /19 02:45:57	3	Vert	0.694	0.701	0.213	***	0.721	VM08
W	UM10787	Dec 14 /19 03:00:11	3	Vert	0.631	0.575	0.378	***	0.726	VM08
W	UM10787	Dec 14 /19 03:02:58	3	Vert	0.489	0.749	0.300	***	0.750	VM08
W	UM10787	Dec 14 /19 03:03:24	3	Vert	0.694	0.694	0.355	***	0.749	VM08
W	UM10787	Dec 14 /19 03:06:09	3	Vert	0.315	0.504	0.284	***	0.547	VM08
W	UM10787	Dec 14 /19 03:21:22	3	Vert	0.418	0.591	0.284	***	0.593	VM08
W	UM10787	Dec 14 /19 03:21:32	3	Vert	0.378	0.512	0.363	***	0.567	VM08
W	UM10787	Dec 14 /19 03:23:06	3	Vert	0.536	0.843	0.323	***	0.884	VM08
W	UM10787	Dec 14 /19 03:35:45	3	Vert	1.040	1.135	0.599	***	1.205	VM08
W	UM10787	Dec 14 /19 03:37:53	3	Vert	0.394	0.646	0.363	***	0.684	VM08
W	UM10787	Dec 14 /19 03:51:17	3	Vert	0.363	0.575	0.236	***	0.606	VM08
W	UM10787	Dec 14 /19 03:54:17	3	Vert	0.575	0.883	0.378	***	0.909	VM08
W	UM10787	Dec 14 /19 03:54:31	3	Vert	0.536	0.623	0.252	***	0.633	VM08
W	UM10787	Dec 14 /19 03:55:30	3	Tran	0.615	0.701	0.221	***	0.732	VM08
W	UM10787	Dec 14 /19 04:08:22	3	Vert	0.599	1.080	0.363	***	1.083	VM08
W	UM10787	Dec 14 /19 04:08:49	3	Vert	0.670	1.056	0.434	***	1.059	VM08
W	UM10787	Dec 14 /19 04:09:51	3	Vert	0.386	0.615	0.244	***	0.617	VM08
W	UM10787	Dec 14 /19 04:12:25	3	Vert	0.418	0.678	0.339	***	0.714	VM08
W	UM10787	Dec 14 /19 04:17:56	3	Vert	0.260	0.504	0.355	***	0.508	VM08
W	UM10787	Dec 14 /19 04:18:55	3	Vert	0.599	0.662	0.276	***	0.673	VM08
W	UM10787	Dec 14 /19 04:23:13	3	Tran	0.615	0.607	0.236	***	0.657	VM08
W	UM10787	Dec 14 /19 04:25:14	3	Vert	0.552	0.867	0.370	***	0.895	VM08
W	UM10787	Dec 14 /19 04:27:29	3	Vert	0.370	0.623	0.347	***	0.644	VM08
W	UM10787	Dec 14 /19 04:29:20	3	Vert	0.449	0.780	0.418	***	0.818	VM08
W	UM10787	Dec 14 /19 04:29:59	3	Vert	0.662	1.001	0.307	***	1.005	VM08
W	UM10787	Dec 14 /19 04:30:25	3	Vert	0.323	0.536	0.378	***	0.582	VM08
W	UM10787	Dec 14 /19 04:33:31	3	Vert	0.686	0.717	0.347	***	0.855	VM08
W	UM10787	Dec 14 /19 04:34:02	3	Vert	0.520	0.528	0.252	***	0.554	VM08
W	UM10787	Dec 14 /19 04:38:00	3	Vert	0.394	0.528	0.276	***	0.557	VM08
W	UM10787	Dec 14 /19 04:38:35	3	Vert	0.560	0.638	0.307	***	0.655	VM08
W	UM10787	Dec 14 /19 04:43:28	3	Vert	0.339	0.638	0.276	***	0.655	VM08
W	UM10787	Dec 14 /19 04:49:15	3	Vert	0.441	0.544	0.252	***	0.568	VM08
W	UM10787	Dec 14 /19 04:51:08	3	Vert	0.512	0.843	0.489	***	0.847	VM08
W	UM10787	Dec 14 /19 04:52:11	3	Vert	0.504	0.725	0.339	***	0.739	VM08

INSTRUMENT ID : VM 08

LOCATION NAME : Columbia Asia Hospital Hebbal

PROJECT STRECTCH : PHASE – 2B (KR Puram to Kempegowda International Airport via Hebbal Junction)

Type	Serial No.	Date/Time	No. Chan	Trigger	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	Mic Peak (pa./dB)	PVS1 (mm/s)	Description
W	UM10787	Dec 14 /19 04:54:35	3	Vert	0.828	1.230	0.528	***	1.331	VM08
W	UM10787	Dec 14 /19 04:57:39	3	Vert	0.410	0.662	0.236	***	0.675	VM08
W	UM10787	Dec 14 /19 05:02:36	3	Vert	0.528	0.725	0.276	***	0.726	VM08
W	UM10787	Dec 14 /19 05:05:36	3	Vert	0.378	0.623	0.370	***	0.685	VM08
W	UM10787	Dec 14 /19 05:07:45	3	Vert	0.355	0.638	0.347	***	0.640	VM08
W	UM10787	Dec 14 /19 05:09:12	3	Vert	0.363	0.607	0.268	***	0.631	VM08
W	UM10787	Dec 14 /19 05:10:41	3	Vert	0.489	0.851	0.441	***	0.872	VM08
W	UM10787	Dec 14 /19 05:11:23	3	Vert	0.363	0.670	0.394	***	0.685	VM08
W	UM10787	Dec 14 /19 05:14:33	3	Vert	0.426	0.512	0.181	***	0.528	VM08
W	UM10787	Dec 14 /19 05:15:07	3	Vert	0.489	0.638	0.315	***	0.660	VM08
W	UM10787	Dec 14 /19 05:21:38	3	Vert	0.363	0.520	0.213	***	0.531	VM08
W	UM10787	Dec 14 /19 05:30:17	3	Tran	0.552	0.607	0.276	***	0.636	VM08
W	UM10787	Dec 14 /19 05:30:28	3	Tran	0.544	0.504	0.244	***	0.588	VM08
W	UM10787	Dec 14 /19 05:31:41	3	Vert	0.378	0.528	0.260	***	0.540	VM08
W	UM10787	Dec 14 /19 05:34:42	3	Vert	0.323	0.520	0.236	***	0.524	VM08
W	UM10787	Dec 14 /19 05:35:28	3	Tran	0.520	0.418	0.300	***	0.595	VM08
W	UM10787	Dec 14 /19 05:42:35	3	Vert	0.623	0.725	0.197	***	0.743	VM08
W	UM10787	Dec 14 /19 05:43:01	3	Vert	0.504	0.567	0.260	***	0.609	VM08
W	UM10787	Dec 14 /19 05:45:12	3	Vert	0.394	0.575	0.355	***	0.620	VM08
W	UM10787	Dec 14 /19 05:51:13	3	Tran	0.497	0.473	0.150	***	0.552	VM08
W	UM10787	Dec 14 /19 05:51:33	3	Vert	0.370	0.670	0.378	***	0.683	VM08
W	UM10787	Dec 14 /19 05:58:44	3	Vert	0.449	0.544	0.276	***	0.576	VM08
W	UM10787	Dec 14 /19 06:01:15	3	Vert	0.307	0.497	0.260	***	0.527	VM08
W	UM10787	Dec 14 /19 06:02:51	3	Vert	0.300	0.536	0.221	***	0.539	VM08
W	UM10787	Dec 14 /19 06:11:09	3	Vert	0.560	0.638	0.276	***	0.645	VM08
W	UM10787	Dec 14 /19 06:14:33	3	Vert	0.418	0.733	0.244	***	0.771	VM08
W	UM10787	Dec 14 /19 06:15:35	3	Vert	0.441	0.583	0.213	***	0.623	VM08
W	UM10787	Dec 14 /19 06:17:52	3	Vert	0.473	0.544	0.221	***	0.630	VM08
W	UM10787	Dec 14 /19 06:19:15	3	Vert	0.402	0.623	0.221	***	0.665	VM08
W	UM10787	Dec 14 /19 06:21:53	3	Vert	0.418	0.599	0.252	***	0.621	VM08
W	UM10787	Dec 14 /19 06:33:35	3	Vert	0.599	0.599	0.339	***	0.753	VM08
W	UM10787	Dec 14 /19 06:37:27	3	Tran	0.662	0.599	0.331	***	0.814	VM08
W	UM10787	Dec 14 /19 06:41:05	3	Vert	0.504	0.544	0.205	***	0.613	VM08
W	UM10787	Dec 14 /19 06:44:01	3	Vert	0.355	0.536	0.181	***	0.540	VM08
W	UM10787	Dec 14 /19 06:50:43	3	Vert	0.536	0.552	0.292	***	0.619	VM08
W	UM10787	Dec 14 /19 06:51:35	3	Tran	0.536	0.449	0.213	***	0.553	VM08
W	UM10787	Dec 14 /19 06:56:10	3	Vert	0.363	0.662	0.347	***	0.662	VM08
W	UM10787	Dec 14 /19 06:56:30	3	Vert	0.394	0.662	0.260	***	0.666	VM08
W	UM10787	Dec 14 /19 06:57:57	3	Vert	0.457	0.520	0.197	***	0.559	VM08
W	UM10787	Dec 14 /19 06:58:23	3	Vert	0.552	0.670	0.363	***	0.685	VM08
W	UM10787	Dec 14 /19 07:03:36	3	Vert	0.449	0.512	0.284	***	0.527	VM08
W	UM10787	Dec 14 /19 07:05:34	3	Vert	0.434	0.520	0.181	***	0.578	VM08
W	UM10787	Dec 14 /19 07:08:43	3	Tran	0.528	0.465	0.181	***	0.540	VM08
W	UM10787	Dec 14 /19 07:10:52	3	Vert	0.315	0.528	0.252	***	0.547	VM08
W	UM10787	Dec 14 /19 07:19:33	3	Vert	0.441	0.567	0.252	***	0.579	VM08
W	UM10787	Dec 14 /19 07:28:36	3	Vert	0.331	0.575	0.244	***	0.579	VM08
W	UM10787	Dec 14 /19 07:44:36	3	Vert	0.418	0.528	0.181	***	0.557	VM08
W	UM10787	Dec 14 /19 07:55:05	3	Tran	0.654	0.560	0.370	***	0.706	VM08
W	UM10787	Dec 14 /19 08:16:23	3	Tran	0.504	0.465	0.268	***	0.560	VM08
W	UM10787	Dec 14 /19 08:26:34	3	Vert	0.347	0.615	0.189	***	0.623	VM08

INSTRUMENT ID : VM 08

LOCATION NAME : Columbia Asia Hospital Hebbal

PROJECT STRECTCH : PHASE – 2B (KR Puram to Kempegowda International Airport via Hebbal Junction)

Type	Serial No.	Date/Time	No. Chan	Trigger	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	Mic Peak (pa./dB)	PVS1 (mm/s)	Description
W	UM10787	Dec 14 /19 08:30:35	3	Vert	0.504	0.788	0.378	***	0.790	VM08
W	UM10787	Dec 14 /19 08:35:52	3	Tran	0.512	0.426	0.205	***	0.544	VM08
W	UM10787	Dec 14 /19 08:38:02	3	Tran	0.504	0.520	0.315	***	0.564	VM08
W	UM10787	Dec 14 /19 09:06:08	3	Tran	0.709	0.631	0.221	***	0.810	VM08
W	UM10787	Dec 14 /19 13:52:25	3	Long	1.718	0.355	0.993	***	1.826	VM08



GEOSMART

VIBRATION REPORT

INSTRUMENT ID : VM09

DATE : 14-Dec-19

LOCATION : Cytecare Cancer Hospital



INSTALLATION PHOTO



INSTRUMENT ID : VM 09

LOCATION NAME : Cytecare Cancer Hospital

PROJECT STRECTCH : PHASE – 2B (KR Puram to Kempegowda International Airport via Hebbal Junction)

Type	Serial No.	Date/Time	No. Chan	Trigger	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	Mic Peak (pa./dB)	PVS1 (mm/s)	Description
LOG	UM11175	Dec 14 /19 17:02:03	***	***	***	***	***		***	Start Monitoring
LOG	UM11175	Dec 15 /19 14:51:47	***	***	***	***	***		***	Stop Monitoring



GEOSMART

VIBRATION REPORT

INSTRUMENT ID : VM10

DATE : 14-Dec-19

LOCATION : Chikkajala Fort





GEOSMART





GEOSMART





GEOSMART

INSTALLATION PHOTO



INSTRUMENT ID : VM 10

LOCATION NAME : Chikkajala Fort

PROJECT STRECTCH : PHASE – 2B (KR Puram to Kempegowda International Airport via Hebbal Junction)

Type	Serial No.	Date/Time	No. Chan	Trigger	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	Mic Peak (pa./dB)	PVS1 (mm/s)	Description
W	UM10787	Dec 14 /19 15:38:20	3	Long	0.977	0.095	0.528	***	1.038	VM10
W	UM10787	Dec 14 /19 15:38:42	3	Long	0.567	0.260	0.796	***	0.919	VM10
W	UM10787	Dec 14 /19 15:38:51	3	Long	0.213	0.087	0.512	***	0.517	VM10
W	UM10787	Dec 15 /19 14:18:56	3	Long	0.386	0.268	1.301	***	1.351	VM10
W	UM10787	Dec 15 /19 14:19:31	3	Long	0.205	0.158	0.741	***	0.771	VM10
W	UM10787	Dec 15 /19 14:19:40	3	Long	0.142	0.071	0.512	***	0.516	VM10
W	UM10787	Dec 15 /19 14:19:53	3	Vert	1.245	0.820	1.442	***	1.714	VM10