



ADDING NEW DIMENSIONS

# METRO CUBE

A MUMBAI METRO RAIL CORPORATION NEWSLETTER

## MD Speaks

Ms. Ashwini Bhide, IAS

*"We have several times used the phrase breakthrough routinely on various occasions. Now we have actually seen a breakthrough and I am happy to witness this and congratulate the team Metro-3"*, this euphoric statement by Hon. Chief Minister has delighted the entire team Metro-3 comprising of MMRC, General Consultants and Contractors. The tireless efforts of the team for the last three years has started showing fruits in the form of first tunneling section completed from Marol (Pali Ground) CSIA T2. This landmark event after relentless work of 259 days by TBM Wainganga-1 was nothing less than celebration in the journey of Metro-3. The occasion was marked by presence of Hon. Chief Minister of Maharashtra Shri. Devendra Fadanvisji.

TBM Wainganga-1 was commissioned on 8<sup>th</sup> January 2018 and has completed 1.26 km tunnel drilling its way through rocky strata from Pali Ground, Marol to CSMIA T2 Station. Accomplishment of this important mile stone was full of challenges, however, the team of 250 comprising our engineers, project managers, contractors, facilitators were unstoppable at all occasions to fulfill the vision called Metro-3!! Undoubtedly, this achievement is encouraging not only for the Metro-3, but also for establishment of the entire 250 km network in the MMR.

We are thankful and deeply honored to receive strong support from the government administration, different stakeholders and citizens. Out of 17 Tunnel Boring Machines, 14 are now in full action and the remaining three will activate within the month of October 2018 to tunnel through the deep-down rocks of Mumbai. So far, 9 km of tunneling is completed.

On the systems front, French manufacturer ALSTOM is appointed as rolling stock supplier for Metro-3, and will be responsible for designing, manufacturing, installing and testing 31 trains with 8 car configurations for Metro-3. This will surely forward our commitment towards realizing our goals to provide a safe and comfortable metro ride for Mumbaikars.

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First TBM Breakthrough of Package-07 at CSIA International Station

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# Mighty Rivers, Make Your Way

*“Make your way, Mighty-Rivers, Make you way: The story behind names of Metro-3’s Tunnel Boring Machines (TBMs)”*

United Maharashtra was formed in 1960 with 26 districts at that time. Similarly, the Metro-3 project, first fully underground metro project of the country, would be having 26 underground stations which would be connected perennially by underground metro lines like mighty rivers of the State of Maharashtra. These 26 districts were located in the regions known as Konkan, Vidharbha, Western Maharashtra, Khandesh and Marathwada across Maharashtra on the basis of geographical, cultural and lingual basis. All these regions were connected by mighty rivers of Maharashtra like Surya, Vaitarna, Tansa, Godvari, Tapi, Krishna, Wainganga, etc. flowing across the State. The underground tunnel work of Metro-3 is being undertaken through the highly sophisticated and mighty Tunnel Boring Machines which are working 24/7 like these mighty rivers which run kilometres before merging into sea like our metro-lines which would merge in the car depot at Aarey.

According to tunneling tradition, a TBM starts working only once it is named. This tradition is carried out throughout the world as a sign of good luck for the project ahead. It is believed that such naming of TBMs attracts good luck and blessings of earth. Giving TBMs female names is also a long-standing tradition in the tunneling world. In Hinduism, the earth is given status of mother and rivers are considered as daughters of Goddess Earth, God Shiva and God Sun. The very special faith and respect for the Rivers in India are as old as Indian culture itself. The history of rivers in nurturing culture and civilizations is appreciated through promoting integration of cultures to develop Indian civilization. Almost every river in India is revered as a Goddess.

To seek blessings of the mother earth for the project, MMRC has creatively named TBMs of Metro-3 after important mighty rivers of Maharashtra, the mighty daughters of this soil. Naming TBMs after Rivers of Maharashtra represents the parts of the State through which these rivers are flowing and connecting to form a united Maharashtra. They have been named after rivers for a “personal touch” and “to create a sense of belonging” and representing the State of Maharashtra.

Metro-3 plans to deploy 17 TBMs amongst seven underground civil packages. The brief details of TBMs and respective rivers representing them are as follows:

### 1. Package-01, Surya 1 & 2

Two TBMs of UGC-01 have been named after the River Surya as Surya-1 and Surya-2. This Package will be experiencing the energy of the Goddess Surya River in the form of Tunnel Boring Machines (Surya 1 & 2) exploring earth and creating a tunnel length of 2.932 km and 2.962 km respectively. Most of the power supply to the city of Mumbai is from the power plants running on water of Surya River. This river is running from east to west meeting merging with Vaitarna River in Palghar district. The River Surya (Sun) is full of energy and supplying water to most of the parts of Mumbai Metropolitan Region.

### 2. Package-02, Vaitarna 1 & 2

Two TBMs of UGC-02 have been named after the river Vaitarna as Vaitarna-1 and Vaitarna-2. This Package will be experiencing the energy of Goddess Vaitarna River in the form of Tunnel Boring Machines (Vaitarna 1 & 2) exploring earth and creating a tunnel length of 3.813 km and 3.830 km respectively. The water of Vaitarna River fuels the Mumbaikars to run Mumbai 24/7 to maintain its status of the city of dreams. It is the largest river in the northern Konkan Region and drains Maharashtra’s whole Palghar District. It originates in Sahyadri mountain ranges near Trimbakeshwar. It has a confluence with the Tansa just before it enters the Arabian Sea. It has three major dams which supply water to the city of Mumbai.



### 3. Package-03, Tansa 1 & 2

Two TBMs of UGC-03 have been named after the river Tansa as Tansa-1 and Tansa-2. This Package will be experiencing the energy of Goddess Tansa River in the form of Tunnel Boring Machines (Tansa 1 & 2) exploring earth and creating a tunnel length of 3.86 km each. The river Tansa is one of the important rivers in the Mumbai Metropolitan Region and life line of Mumbai and Thane. The Tansa Lake supplying water to Mumbai is embanked by one of the largest masonry dams in the world, built in 1892.

### 4. Package-04, Krishna 1, 2 & 3

Three TBMs of UGC-04 have been named after the river Krishna as Krishna-1, Krishna-2 and Krishna-3. This Package will be experiencing the energy of Goddess Krishna River in the form of Tunnel Boring Machines (Krishna 1, 2 & 3) exploring earth and creating a tunnel length of 2.500 km, 2.485 km & 1.311 km respectively. The Krishna River originates in the Western Ghats near Mahabaleshwar at an elevation of about 1,300 metres, in the state of Maharashtra in central India. It is one of the longest rivers of India. The Krishna River is around 1,300 km in length. It flows through the state of Karnataka before entering the State Telangana and empties into the Bay of Bengal at Hamaladeevi (near Koduru) in Andhra Pradesh, on the east coast.

*Continued on page 6*

# What Lies Beneath The Earth

In last month, we have seen the alignment of Construction Package 5. This month we will see Construction Package 6. The alignment of Metro-3 in Package 6 starts from mid-ventilation shaft near Santacruz Agripada area and ends at CSIA International Terminal Station. This package includes three Metro Stations (CSIA Domestic, Sahar Road and CSIA International).

The alignment passes below the Chhatrapati Shivaji International Airport (CSIA) in this package. The predominant rock type found in this stretch are Basalt & Breccia and subsidiary Tuff. Shale also has shown presence in some stretch of tunnel. Basalt is harder and stronger variety of rock and the Breccia is weaker than Basalt. Cut-and-Cover method of construction is being used for construction of this package except for the crossover portion after Sahar Road Station towards CSIA International Station. Which will be constructed by NATM method of construction.

### The challenges while working in this area: -

- 1. Rocky Strata:** It is variable and different type of rock e.g. Basalt and Breccia encountered. Any weak rock layer shall be identified during construction and necessary precautionary measures to be taken as necessary.
- 2. Strength of Rock:** Strength of rock varies in similar grade of rock at different locations.
- 3. Ground Water:** Earth-retaining system should be water tight in upper soil and highly fractured rock mass layers.
- 4. Upper Soil and Completely Weathered Rock Mass:** During the station construction, the top soil and weathered rock will be supported by secant piles (earth retaining system), which will be constructed before start of the excavation.
- 5. Tunnel Boring Machine (TBM):** The tunnel crown may be in weathered rock resulting seepage and loss of volume. To cater this Tunneling in this stretch will be executed by Dual Mode Tunnel Boring Machine (TBM). The TBM will operate in closed mode by Earth Pressure Balancing Technology in weak rock stretches.
- 6. Alignment:** TBM has to negotiate locations near existing flyover in International Airport area. The NATM portion in Sahar Road crossover is in good quality of Basalt Rock.

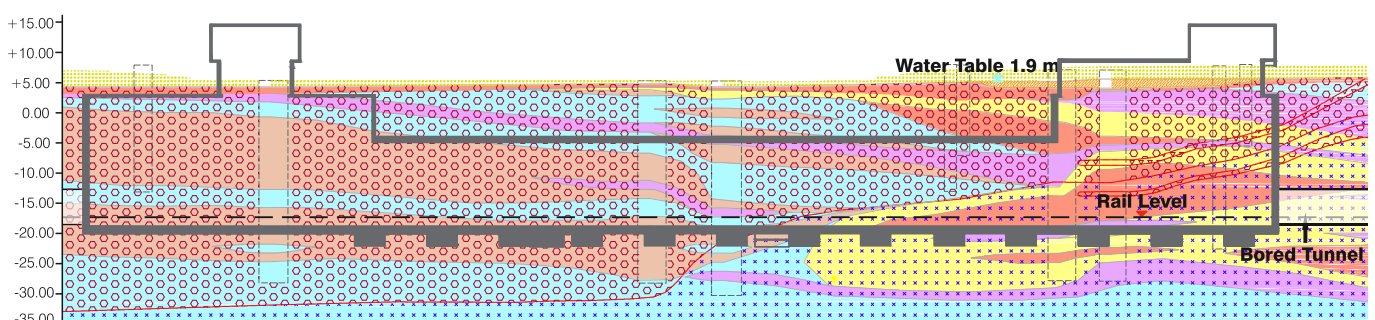
# MD Speaks

*Continued from page 1*

14<sup>th</sup> TBM, Godavari-3 was commissioned at BKC in presence of Mr. R.A. Rajiv, Metropolitan Commissioner, MMRDA, Mr. R.L. Mopalwar, Vice Chairman & Managing Director, MSRDC, Mr. Anil Kumar, Prin. Commissioner, Income Tax. TBM Godavari-3 manufactured by Terratec will be boring a 890 meter tunnel from BKC Station to Vidyanagari Station. Tapi-1, the first TBM of Pkg 6 was launched at south launching shaft of CSIA T2 International airport metro station in presence of Mr. Sanjay Reddy, MD MIAL, Mr. Keshava Sharma, Reg. ED AAI, Mr. Kashinath Tripathi, DIG CISF.

Another milestone achievement was completion of 100% rehabilitation of project affected slum PAPs. The final lot of 30 families from Andheri-MIDC were allotted houses at Chakal & shops at Kanjurmarg Hariyali village by online lottery system.

Last but not the least, the Metro-3 car depot at Aarey Colony has now surpassed all the legal hurdles, when the NGT directed NGO Vanashakti to withdraw their petition asking NGT to declare Aarey colony land as a forest. With this directive, we can assure the Metro-3 car depot work to proceed in full swing and meet our target completion dates.



CSIA Domestic Station Cross Section



# Know Your Station - Sahar Road Station



Hyatt Regency



Sahar Business Center



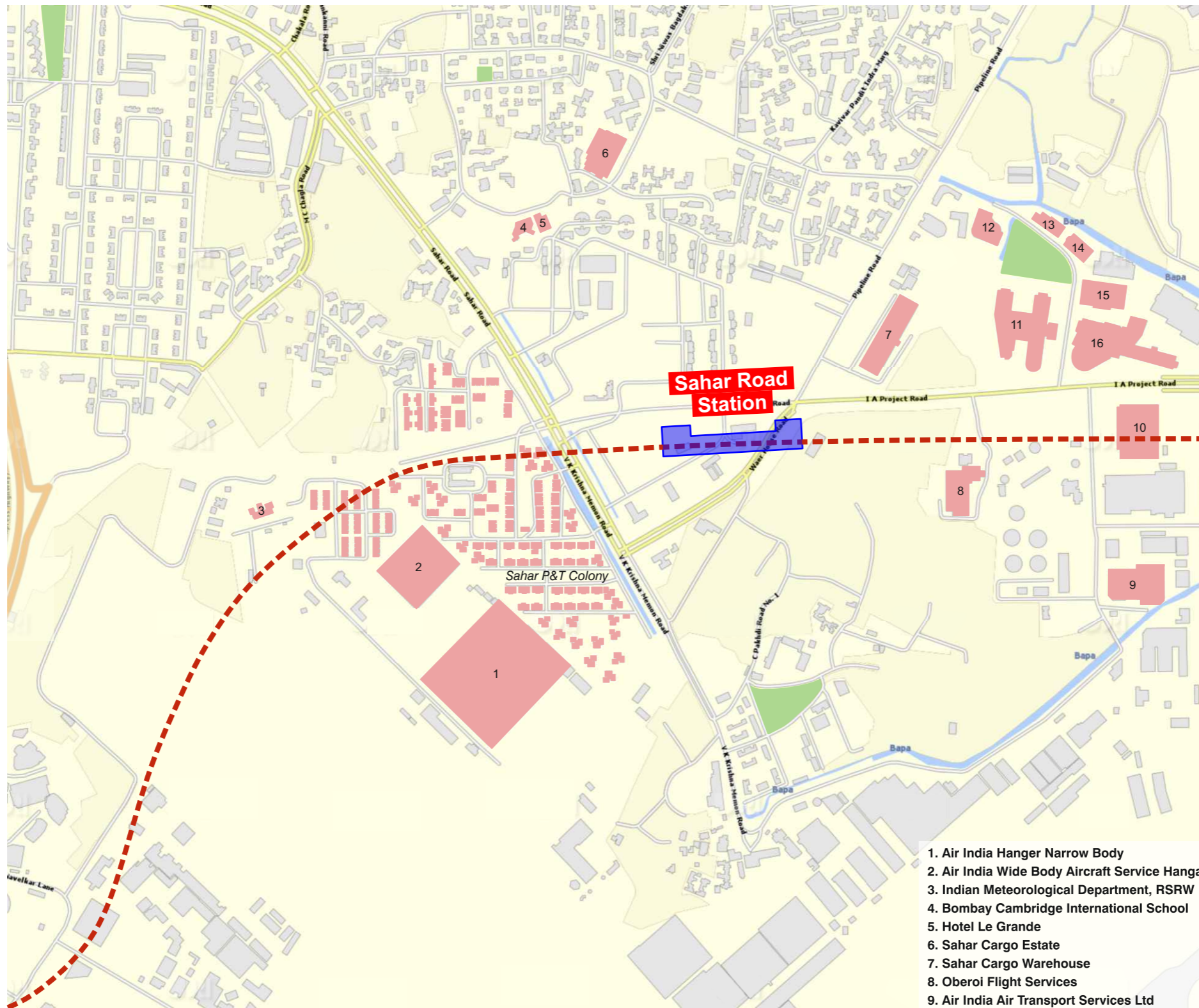
Bombay Cambridge International School



ITC Maratha



Blue Dart Center



1. Air India Hanger Narrow Body
2. Air India Wide Body Aircraft Service Hangar
3. Indian Meteorological Department, RSRW
4. Bombay Cambridge International School
5. Hotel Le Grande
6. Sahar Cargo Estate
7. Sahar Cargo Warehouse
8. Oberoi Flight Services
9. Air India Air Transport Services Ltd
10. Chefair Catering Service
11. ITC Maratha
12. Prime Corporate Park
13. Blue Dart
14. Jet Airways
15. Hilton Mumbai International Airport
16. Hyatt Regency Mumbai

The airport is now operated by Mumbai International Airport Limited (MIAL), a Joint Venture between the Airports Authority of India and the GVK Industries Ltd. In early 2012, the MMRDA held talks with MIAL to either construct or finance the construction of three of the line's stations. MIAL agreed to bear the cost of constructing for the three stations, expected to total 777 Crore, because of the potential increase in passenger convenience.

Map source : <http://www.loginmumbai.org/map.html>

Sahar village is one of the oldest settlements on the Salsette Island. The opening of the Sahar International Terminal of the Chhatrapati Shivaji International Airport in the 1980s led to subsequent urban development in the area including the opening of the first hotel of The Leela Group in 1988. It's nearby areas surrounding the airport are Andheri, Vile Parle, Marol, Chakala and Saki Naka.

The second busiest airport in the country in terms of passenger and cargo traffic, 29<sup>th</sup> busiest airport in the World has a history dating back to the World War II, little known to the people.

The Salsette-Trombay Railway line, about 13 km long was opened in 1928 by the Great Indian Peninsular Railway under the Bombay Improvement Trust. The line was operational from Trombay Island to Andheri with halt at Sahar Village to Sahar Station. Later, in 1934 the line was shut down to make the way for the Santacruz Airport, hence Sahar Station was dismantled.

The Royal Airforce Airfield in Bombay – RAF Santacruz, constructed in 1930, on an area of 610 ha, initially operated with three runways, was extensively used during the World War II from 1942 to 1947. In 1946, the RAF was handed over to Director General of Civil Aviation for Civil operations and two old abandoned hangars of the Royal Air Force were converted into terminals for passenger traffic. One hangar was used as a domestic terminal and the other for international traffic. In 1958, The new passenger terminal was commissioned and later went through multiple upgradation stages, including a complete modernisation of the airport complex by 2015.

The nearest stations on the Western Railway are Vile Parle and Andheri while Airport Road and Marol Naka Metro Stations on Mumbai Metro Line-1.

The Proposed Sahar Road station will serve important landmarks like Indian Meteorological Department, RSRW, Bombay Cambridge International School, Hotel Le Grande, Sahar Cargo Estate, ITC Maratha, Prime Corporate Park, Hilton Mumbai International Airport, Hyatt Regency Mumbai etc.

# Automatic Train Washing Plant in Depot

In-line with Metro-3 mission to make travel comfortable, dignified & people-friendly; we strive to provide safe and reliable services to our esteemed passengers, offering the necessary convenient, neat and clean coaches. Automatic Train Washing Plant is a multistage external cleaning system for trains, used for removing dust, greasy dirt and other stains on the exterior of train. It automatically performs the operation by chemical and physical effects of water and detergents with the help of washing brushes. The Plant can achieve complete exterior cleaning of a rake consisting of 8 coaches in about 5 minutes time.

## Basic Component:

1. **Brush-** to clean the surface of the train.
2. **Jet Spray-** to spray the pressurized water for cleaning the exterior surface.
3. **Dryer-** to quickly dry the washed surface using pressurized air.
4. **Sensor-** to capture the present/upcoming train.
5. **Controller-** to control the entire process
6. **Pressure Pump-** to provide continuous pressurized water.
7. **Nozzle -** to guide and control the pressure of air and water.

## Salient Feature:

1. The plant does away with the very labour intensive activity of external cleaning.
2. Has minimal electrical energy consumption, maintenance and manpower requirement for operation.
3. Reduced requirement of water and consumables as compared to conventional cleaning practices.
4. Washing plant water is treated through ETP (Effluent Treatment Plant) and reused hence making it ecofriendly.

**Working:** Processes carried out on the moving train at a speed of 3 to 5 kmph:

1. Pre-wetting / rinsing
2. Detergent spraying
3. Multiple Brushing stations
4. Final rinsing
5. Mopping

## Control Room:

1. A control room is provided with underground tank of water and overhead tank for soap solution.
2. Electronic operating panel with electrical fittings, wiring etc. are provided in the control room with PLC (Programmable Logic Controller) control system for automatic working of the entire plant with a provision to control manually as well.
3. Working pressure pumps with spare pumps are provided in series with an arrangement to switch over in case of break down.

## Mighty Rivers, Make Your Way

*Continued from page 2*

### 5. Package-05, Godavari 1, 2, 3 & 4

Four TBMs of UGC-05 have been named after the River Godavari as Godavari-1, Godavari-2, Godavari-3 and Godavari-4. This Package will be experiencing the energy of Goddess Godavari River in the form of Tunnel Boring Machines (Godavari 1, 2, 3 & 4) exploring earth and creating a tunnel length of 1.163 km, 1.160 km, 1.679 km & 1.710 km respectively. The Godavari River is India's second longest river after the Ganga. Its source is in Triambakeshwar, Maharashtra.

### 6. Package-06, Tapi 1, 2 & 3

Three TBMs of UGC-06 have been named after the river Tapi as Tapi-1, Tapi-2 and Tapi-3. Godavari-1 and Godavari-2 of UGC-05 will be re-named as Tapi-2 and Tapi-3 respectively while operating in UGC-06. The Package-06 will be experiencing the energy of Goddess Tapi River in the form of Tunnel Boring Machines (Tapi 1, 2, & 3) exploring and creating a tunnel length of 1.383 km, 2.791 km & 2.763 km respectively. The Tapi River (or Tapi) is a river in central India between the Godavari and Narmada rivers. River Tapi is also known as *Suraya putri* (daughter of Sun). It flows from east to west over a length of 724 km. It originates in Madhya Pradesh, flows through Vidharbha-Khandesh in Maharashtra and finally meets Arabian Sea in Gujarat near Surat.

### 7. Package-07, Wainganga 1, 2, & 3

Three TBMs of UGC-07 have been named after the river Wainganga as Wainganga-1, Wainganga-2 and Wainganga-3. The Package-07 will be experiencing the energy of Goddess Wainganga River in the form of Tunnel Boring Machines (Wainganga 1, 2 & 3) exploring earth and creating a tunnel length of 2.951 km, 1.139 km & 2.987 km respectively. The Wainganga River is a major river flowing through tiger reserves forest of India, originating in the Mahadeo Hills of Satpuda range in the state of Madhya Pradesh and feeds Vidharbha. It is a major tributary of the Godavari River. The river flows south in a winding course through the states of Madhya Pradesh and Maharashtra, roughly 579 km. After joining the Wardha River, the united stream, which is known as the Pranahita River, empties into the Godavari River at Kaleshwaram, Telangana.

## First TBM Breakthrough

*"I am extremely pleased to witness the first TBM breakthrough achieved by Metro-3 team today. It is no doubt an important step towards a safer, more comfortable and faster mode of transport to be made available to Mumbai citizens."*

**Hon. CM Mr. Devendra Fadnavis**



The Honorable Chief Minister of Maharashtra State Mr. Devendra Fadnavis witnessed the first Metro-3's TBM breakthrough at CSIA International station on 24 September 2018. TBM Wainganga-1, which was commissioned on 8 January 2018 from Pali Ground, Marol completed its tunnel drive of 1.26 km in package-7 to see the light at its end at CSIA International Station. Wainganga-1, made its way through the rocky strata made of Basalt, Breccia and Tuff drilling relentlessly for exactly 259 days to attain the breakthrough. It marks the achievement of an important milestone towards the coherent completion of the 33.5 km long Metro-3 corridor.

M/s. Larsen & Toubro and Shanghai Tunnel Engineering Co. Ltd. are consortia partners for the construction of Package-7 which runs from Marol Naka to SEEPZ via MIDC. The total length of the tunnel is 7.07 km and the contractors expect about eleven lakh cubic meters of muck to be generated. The generated muck will be disposed of at Talawali-Pise, a government land spared for dumping the muck. As of 24 September 2018, the contractors have disposed of 2.5 lakh cubic meters of muck.

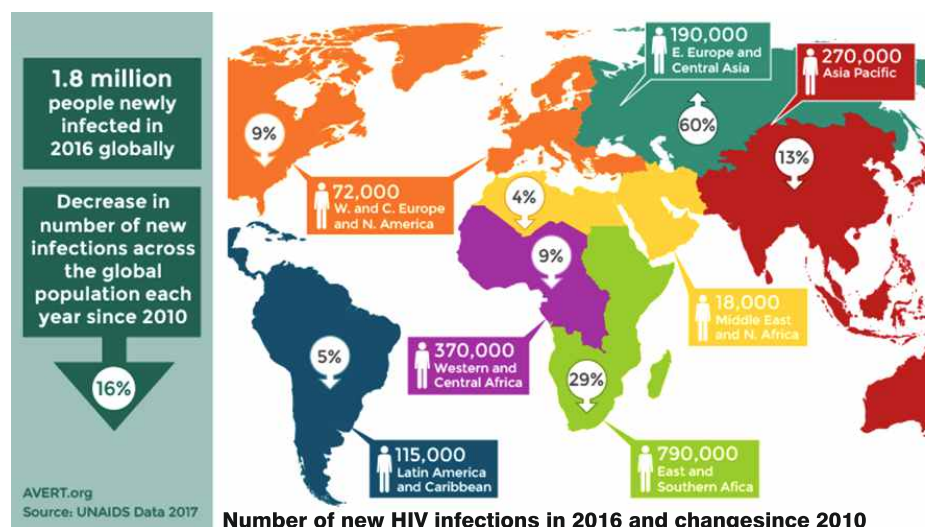
## HIV Awareness Programme

### Commercially Sexually Exploited (CSE) women and HIV:

Notice we don't call them Commercial Sex Workers (CSW's) but CSE's because it's not dignified work but pure exploitation. An estimated 2.2% of female CSE in India are living with HIV, although this figure varies between states. For example, one 2013 study cited HIV prevalence among CSE in Maharashtra at 17.9%, Manipur at 13.1%, Andhra Pradesh at 9.7% and Karnataka at 5.3%.

Although sex work is not strictly illegal in India, associated activities such as running a brothel are where often the exploitation happens. This means authorities can justify police hostility and brothel raids. Stigma and discrimination against CSE's restrict their access to healthcare though a lot is being done by the Govt. and NGO's to provide access.

In April 2014, the Indian Supreme Court recognised transgender as a distinct gender. Since then, health and welfare programmes to meet this group's specific needs have been set up, people who inject drugs (PWID) (Injecting drug use is the major route of HIV transmission in India's north-eastern states. However, there is evidence that the number of people who inject drugs are growing.) and particularly migrant workers (Research worldwide has linked migration to increases in HIV transmission. There are an estimated 7.2 million migrant workers in India, of whom 0.99% are living with HIV, much higher than the national prevalence of 0.26%).



CSE's are one of the high-risk groups targeted by India's National AIDS Control Organization (NACO) with peer-to-peer HIV interventions (when individuals from key affected populations provide services to their peers or link them to services within healthcare settings). In 2015, NACO reported reaching 77.4% of sex workers with HIV prevention activities of this kind. Other high risk groups are transgender people.

In the light of increasing concern around widespread of HIV epidemic, MMRC has engaged Purnata, an NGO working in this domain. First HIV/AIDS and Human Trafficking program was conducted at Package-03, Mumbai Central.



# News @ MMRC



MMRC completes the rehabilitation of slum PAPs of Metro-3 as a final lot of 30 families from Andheri and MIDC were allotted houses at Chakala and shops at Kanjurmarg Hariyali village by online lottery system



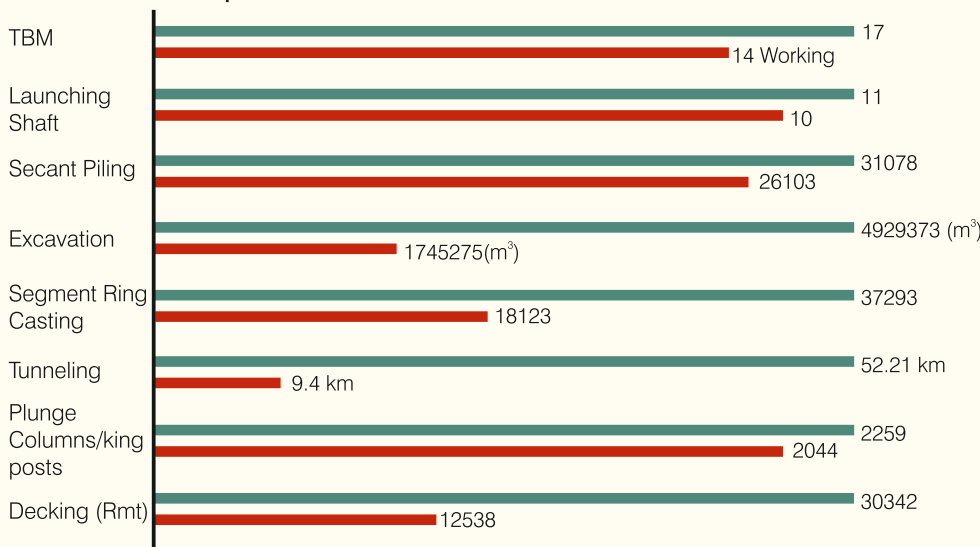
MMRC finalises ALSTOM as its rolling stock supplier for Metro-3 corridor. "This is a significant step towards realising our goals. The French manufacturer will be designing, manufacturing, installing and testing 31 trains with 8 car configuration.



MMRC commissions its 14<sup>th</sup> TBM, Godavari 3 at pkg-5 at BKC in presence of Mr. Shri. R.A. Rajiv IAS, Metropolitan Commissioner MMRDA & Mr. R.L. Mopalwar, Vice Chairman & Managing Director MSRDC and Mr. Anil Kumar Prin. Commissioner, Income Tax.

## Project Progress Update

As on 29<sup>th</sup> September, 2018



Package-2 completes 1000 tunnel rings

Legend  
█ Planned  
█ Completed

### MMRC Control Room

Contact us @ +91 9136805065 to report monsoon related grievances pertaining to Metro-3 construction work.



Website Link

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