



DOMAIN COMMUNITY REFERENCE GROUP

Meeting #21

Wednesday 8 April, Online Meeting

WORKS UPDATE



COVID-19 UPDATE

- Construction is continuing at all Metro Tunnel Project sites.
- The health and safety of the community and our workers is our key priority
- We have strict protocols in place to protect the safety of our construction workforce, including:
 - enhanced industrial cleaning arrangements
 - provision of personal protective equipment
 - measures to reduce staff contact





ANZAC STATION PROGRAM



Image from CYP-WN00331



MIDDLE BOX STAGING



MIDDLE BOX

- Completed D-wall and piling works in March
- Works continuing in the middle box to construct the roof slab
- This includes:
 - Excavating to roof slab level (*commenced*)
 - Putting down a blinding layer of concrete (*commenced*)
 - Installing steel reinforcements
 - Pouring concrete slab
- This will be done in stages, similar to how the south box roof slab was constructed.



MIDDLE BOX EXCAVATION



STATION ENTRANCE – SHRINE OF REMEMBRANCE



BENTONITE PLANT REMOVAL



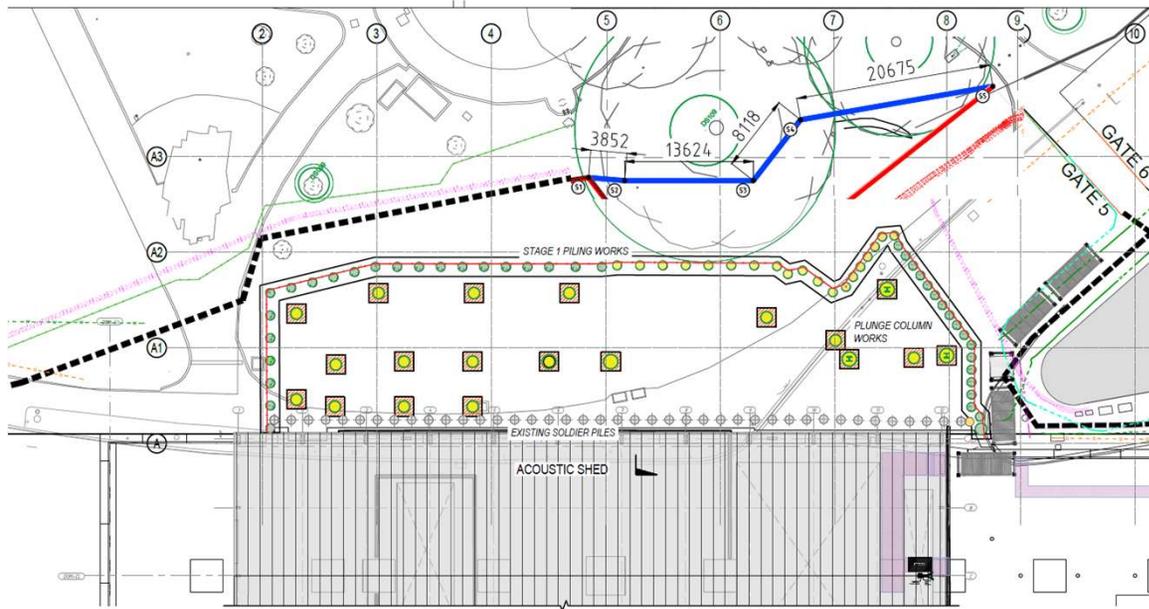
- Completion of the D walls in the middle box means that the bentonite plant is no longer required and is now being decommissioned
- The yellow bentonite silos have been drained and are being removed from the site
- The concrete slab beneath will also be removed in order to start construction of the station entrance
- This will involve road saws for concrete cutting, excavators for breaking up the concrete and loading of materials off site

STATION ENTRANCE CONSTRUCTION

- Preparation for construction of the station entrance at the edge of the Shrine of Remembrance grounds has begun
- Involves a 'bottom-up' construction method, with excavation down to the base of the entrance before the structure is built back up
- Involves piling, excavation, ground anchor installation and concreting
- This will take place over a period of approximately two years



PILING AND EXCAVATION



- These works will occur north of the acoustic shed
- Piling will commence mid year
- The site boundary has been pushed back to accommodate these works
- The area will then be excavated and piles will be cut back

TUNNELLING UPDATE



TBM ASSEMBLY



- TBM *Millie* is being assembled and will commence tunnelling to South Yarra in early May
- TBM *Alice* has been moved all the way up to the launch ring as assembly continues in the north box
- *Alice* is expected to commence tunnelling approximately four weeks after *Millie*



TIME LAPSE

March time lapse of North box



TUNNELLING COMMENCEMENT

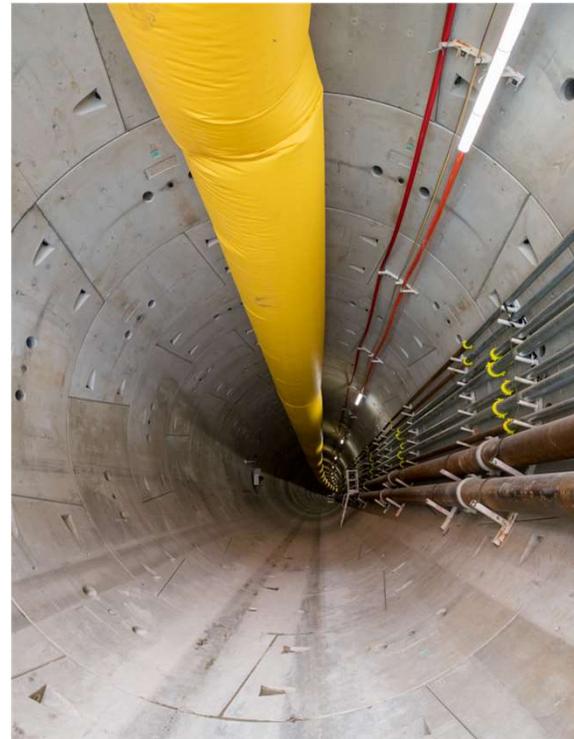
- Millie is due to launch in early May.
- The TBMs will move approximately 10 metres every 24 hours
- The first TBM is expected to arrive in South Yarra at the back end of 2020
- The TBMs will be retrieved from the TBM retrieval shaft in South Yarra and transported back to Domain for relaunch towards the CBD.





CONSTRUCTING THE TUNNELS

- The Metro Tunnel project is using mixshield TBMs – commonly known as slurry TBMs - they are purpose-built to suit the local ground conditions along the tunnel alignment.
- To construct the tunnels, the TBMs will progressively line each tunnel with curved concrete segments.
- The twin tunnels will comprise 56,000 individual concrete segments.



Meg's completed tunnel (Arden)



CONSTRUCTING THE TUNNELS

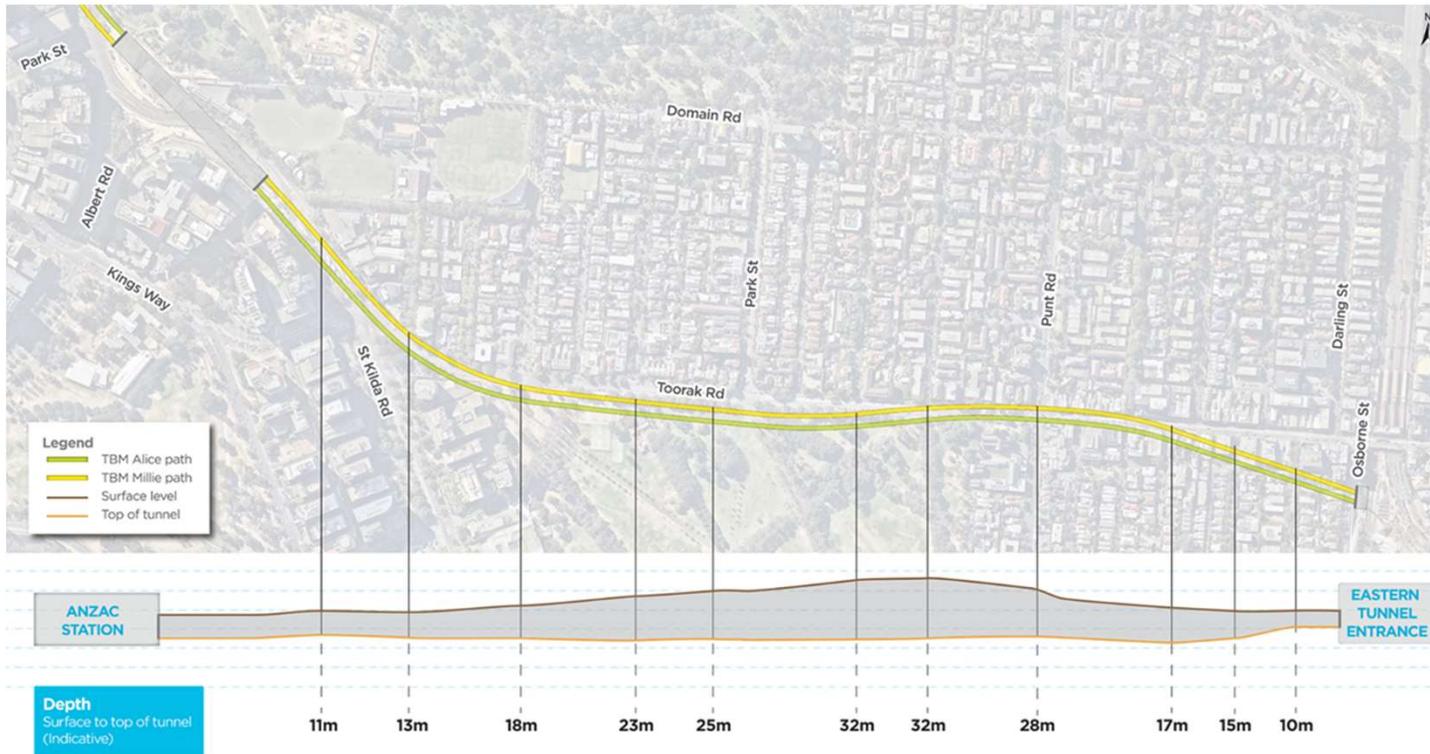
- Each TBM will be equipped with a state-of-the-art navigation system that will ensure accurate tunnel alignments are achieved.
- A crew of up to 10 people, including a TBM operator, will work on the TBM at any one time
- The TBM and the team will work 24/7 until completion.



TBM retrieval shaft, South Yarra



TBM ROUTE





TBM SUPPORT SITE

- Edmund Herring Oval is set up as the TBM support site
- The excavated material from the TBMs is mixed with bentonite, making slurry, and then transported back via a series of pipes to the treatment plant
- There the excavated material goes through a series of filters, before the excavated material is taken from site via trucks.



TUNNELLING NOISE AND VIBRATION



MODELLING PROCESS

TBM Ground borne Noise and Vibration Model Process

- 1. Model for potential noise and vibration exceedances;**
- 2. Validate in stages (Domain to South Yarra; Domain to City) - attended monitoring**
- 3. Update model with attended monitoring data**

Consultation will be progressively undertaken with potentially affected residents prior to TBM arrival.



TBM NOISE AND VIBRATION EPR'S

NV8 – Vibration Guideline Targets for Structures (PPV)

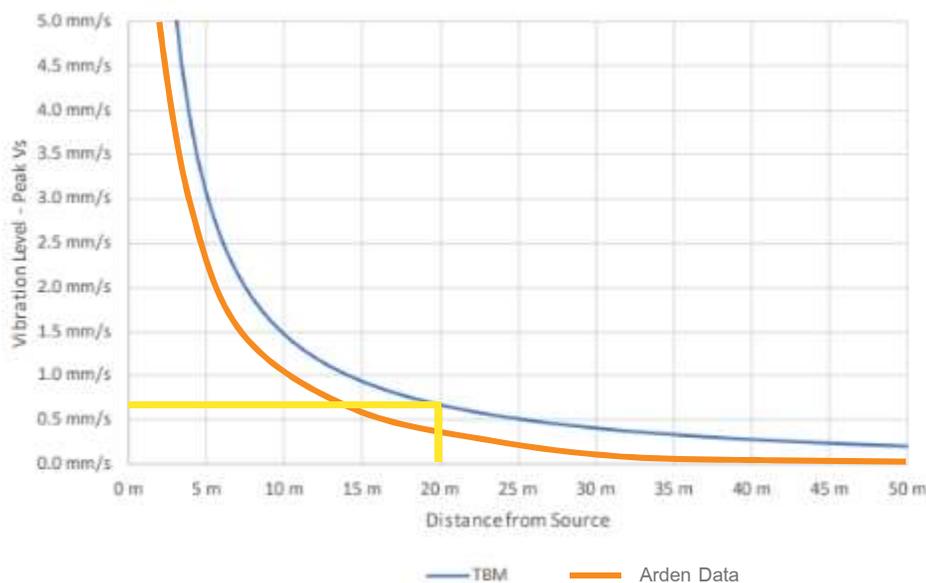
External vibration targets for infrastructure to ensure the integrity is not affected by construction generated vibration.

NV11 – Vibration Dose Values (VDV's) Human Comfort

Vibration dose values that are appropriate for the protection of personal amenity.

NV13 - Ground-borne (Internal) Noise Guidelines for Amenity

Regenerated noise, or ground-borne noise, is an associated effect of the small vibration related displacement that occur on hard surfaces within buildings.



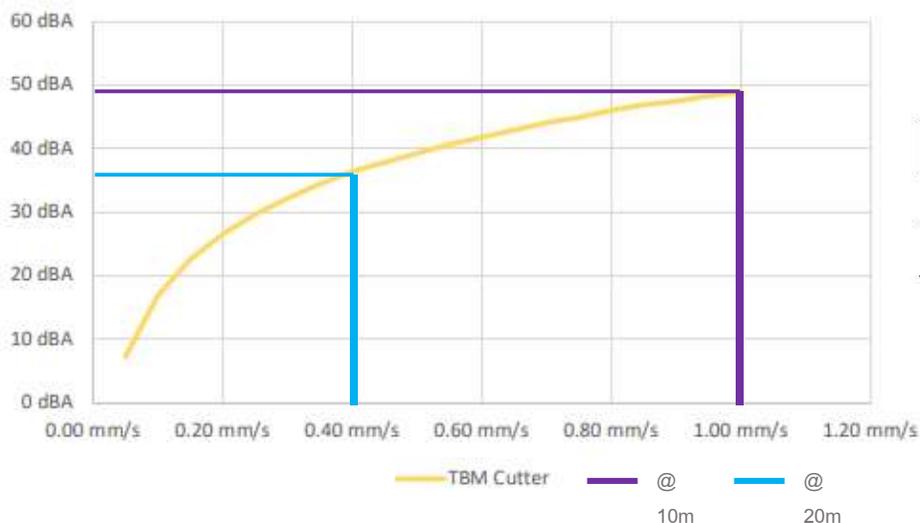
Graph: Estimated level of vibration as a function of distance from the TBM cutter head

EPR NV8 Criteria

Table NV8-1: Short-term vibration on structures

Type of structure	Vibration at the foundation, mm/s (Peak Component Particle Velocity)			Vibration at horizontal plane of highest floor at all frequencies
	1 - 10 Hz	10 - 50 Hz	50 - 100 Hz ¹	mm/s (Peak Component Particle Velocity)
Type 1: Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 - 40	40 - 50	40
Type 2: Dwellings and buildings of similar design and/or occupancy	5	5 - 15	15 - 20	15
Type 3: Structures that have a particular sensitivity to vibration e.g. heritage buildings	3	3 - 8	8 - 10	8

TBM MODELLING – NV13 GROUNDBORNE NOISE

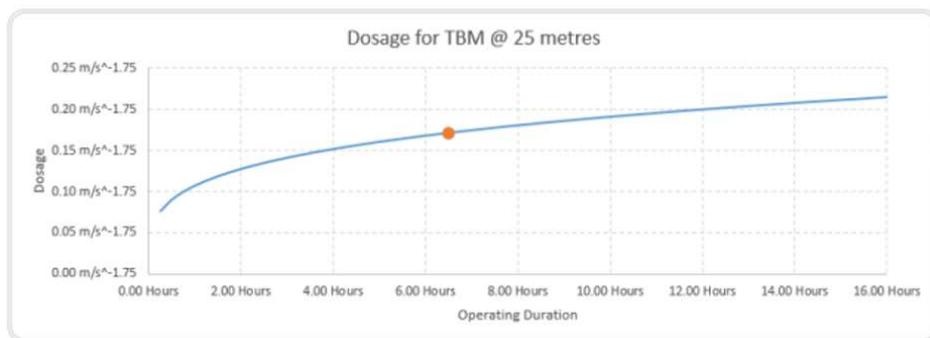


Graph: Estimated range of groundborne noise levels depending upon source vibration characteristics

EPR NV13 Criteria

Time Period	Internal $L_{Aeq,15min}$, dB
Evening, 6pm to 10pm	40
Night, 10pm to 7am	35

TBM MODELLING – NV11 HUMAN COMFORT (VDV)



Graph: Example of the dosage calculations for estimating dosage based upon the peak vibration level in mm/s and the TBM operating schedule

Location	VDV (m/s ^{1.75})			
	Day 7:00am to 10:00pm		Night 10:00pm to 7:00am	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Residences	0.20	0.40	0.10	0.20
Offices, schools, educational institutions, places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

EPR NV11 criteria



DOMAIN PRECINCT – TBM MODELLING

Building	Max. Vibration (NV8)	Vibration Dose Value (NV11)	Groundborne Noise (NV13)
Hallmark Apartments	0.15mm/s	<0.1m/s ^{1.75}	23 dBA
Domain Hill	0.09mm/s	<0.1m/s ^{1.75}	20dBA
The Domain	0.49mm/s	0.13m/s ^{1.75}	38dBA
The Botanica	0.61mm/s	0.15m/s ^{1.75}	43dBA
416 St Kilda Road	0.53mm/s	0.14m/s ^{1.75}	41dBA
416A St Kilda Road	0.71mm/s	0.18m/s ^{1.75}	45dBA
418 St Kilda Road	0.54mm/s	0.14m/s ^{1.75}	41dBA

Key:
No exceedance predicted
Possible evening criteria exceedance
Possible night-time/evening exceedance



COMMUNITY ENGAGEMENT

1. Community Reference Group presentation
 2. Monthly Construction Notifications
 3. Letter 1: Notification of TBM launch (3-4 weeks out)
 4. Letter 2: Notification of TBM launch (1 week out)
 5. Resident information sessions (Now not possible)
 6. Resident Q&As
 7. TBM info on website including animations, maps and fact sheets.
- Engagement is progressively undertaken with potentially affected residents prior to TBM arrival along the alignment.
 - The Project team available 24/7 in advance of works and during to answer questions (1800 105 105)

GROUND MOVEMENT IMPACT ASSESSMENT AND INSTRUMENTATION MONITORING

BUILDING IMPACT ASSESSMENT

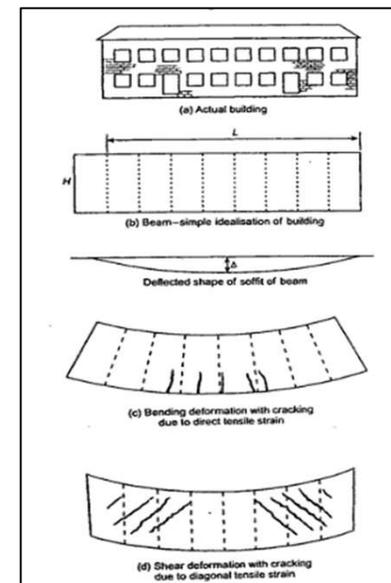
Building Impacts have been assessed using the approach by Burland 1995 which is common industry practice

Phase 1: Screening assessment to capture buildings within the Zone of Influence (5mm settlement contour)

Phase 2: Initial assessment supported by an engineering building inspection

Phase 3: Detailed ground movement assessment

Category of Damage	Limiting Tensile Strain (%)	Normal degree of severity
0	0 to 0.05	Negligible - hairline cracks less than 0.1mm.
1	0.05 to 0.075	Very Slight – fine cracks which are easily treated during normal decoration. Typical crack widths up to 1mm.
2	0.075 to 0.15	Slight – cracks are easily filled although redecoration is normally required. Some repointing may be required. Crack widths up to 5mm.
3	0.15 to 0.3	Moderate – cracks require some opening up and can be patched by a mason. Repointing of external brickwork and the possibility of a small amount of brickwork replaced. Typical crack widths are 5 to 15mm or several up to 3mm.
4	>0.3	Severe – extensive repair work. Typical crack widths are 15-25mm.



Source: Burland, 1995



IMPACT ASSESSMENT OUTCOME

The following buildings were assessed at Phase 3:

Building	Damage Category	Degree of Severity
The Domain, 1-29 Albert Road	0	Negligible
The Botanica, 400 St Kilda Road	0	Negligible
390 St Kilda Road	0	Negligible
Melbourne Grammar School	0	Negligible



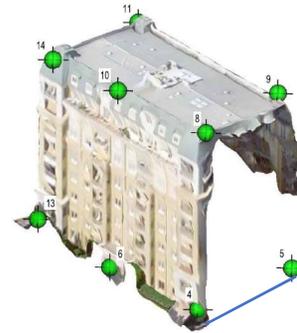
INSTRUMENTATION

Instrumentation has been installed on the four buildings below to enable monitoring of actual movements against predictions.

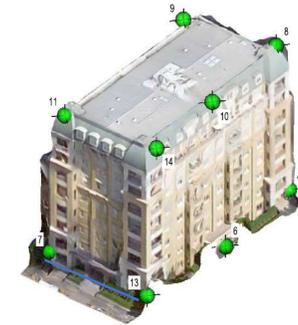
Monitoring of instruments commenced ahead of excavation where possible, to enable measurement of background environmental fluctuations



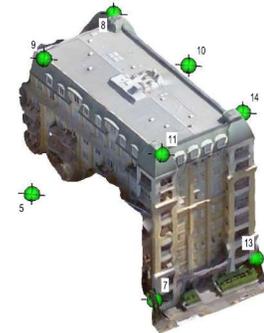
EXAMPLE MONITORING LOCATIONS



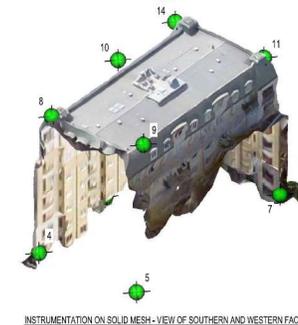
INSTRUMENTATION ON SOLID MESH - VIEW OF NORTHERN AND WESTERN FACES
N.W.S.



INSTRUMENTATION ON SOLID MESH - VIEW OF SOUTHERN AND EASTERN FACES
N.E.S.

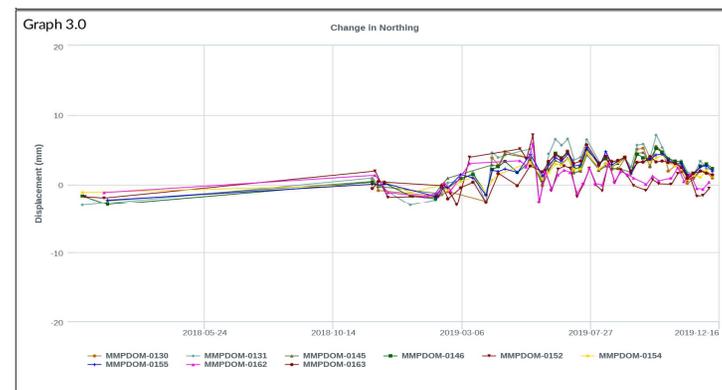
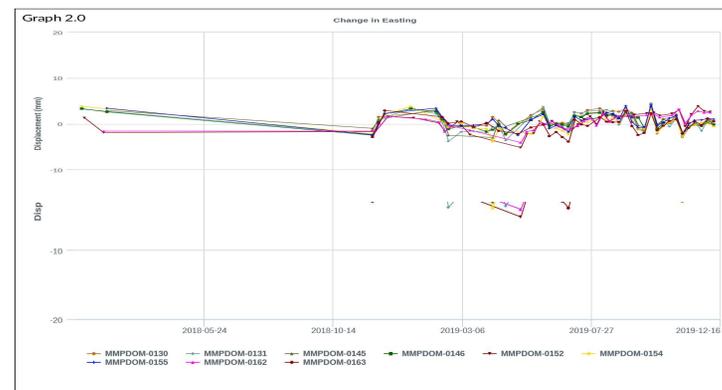
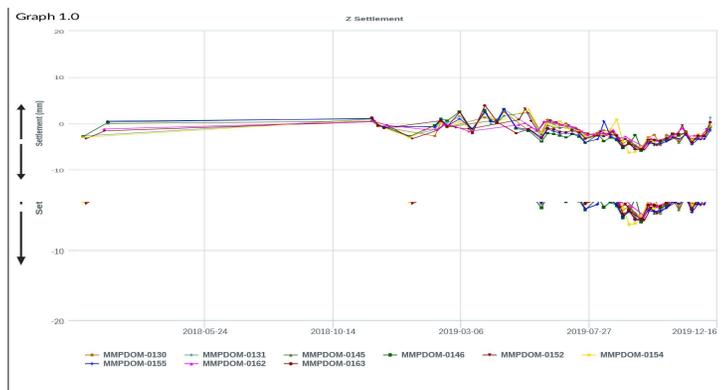


INSTRUMENTATION ON SOLID MESH - VIEW OF SOUTHERN AND EASTERN FACES
N.E.S.



INSTRUMENTATION ON SOLID MESH - VIEW OF SOUTHERN AND WESTERN FACES
N.W.S.

MONITORING EXAMPLE - PRISMS



- Monitoring since November 2018
- Movements in the range of <7mm
- Environmental effects and Natural Building movements



MONITORING EXAMPLE – PRISM TILT/STRAIN

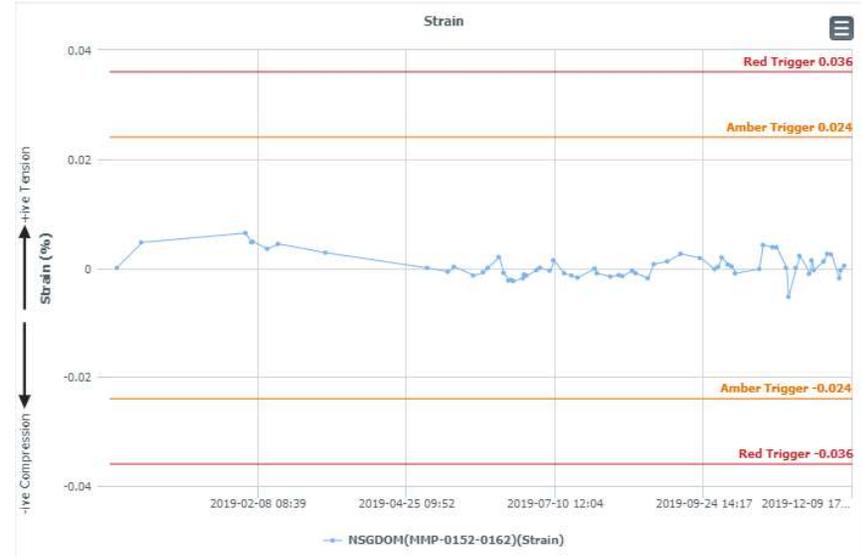
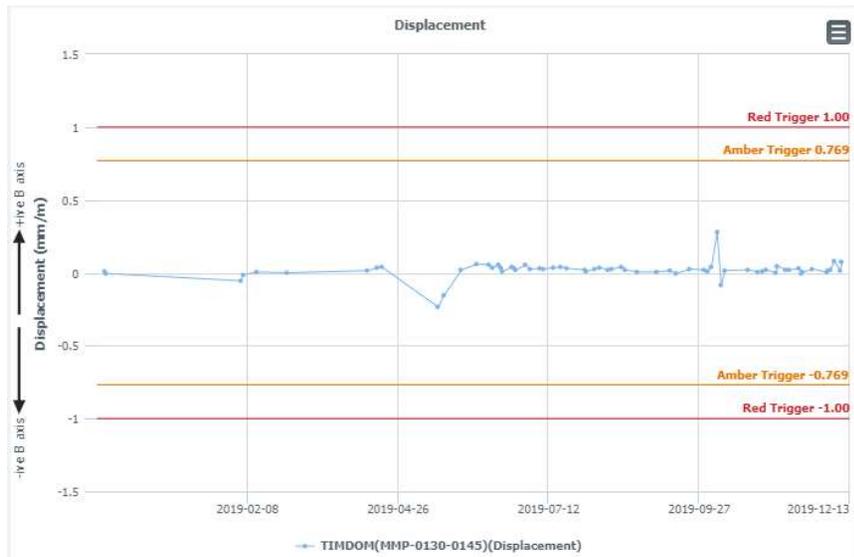


TABLE 2 - TRIGGER LEVELS FOR BOTANICA APARTMENTS 10DM_012				
TRIGGER	CRITICAL LINE	PREDICTED VALUE	AMBER	RED
TILT	MMPDOM-0130 TO MMPDOM-0145	1:1,100	1:1,300	1:1,000
	MMPDOM-0152 TO MMPDOM-0162			
ϵ (%)	MMPDOM-0130 TO MMPDOM-0145	0,03		
	MMPDOM-0152 TO MMPDOM-0162			



DOMAIN NOISE MODELLING



NOISE MODELLING

Construction Noise Vibration Impact Assessment (CNVIA) completed for upcoming works in the Domain Precinct.

- Modelling results shown per scope of works
- Noise levels are unmitigated, monitoring completed for similar works in the North and South Box have been below modelled predictions.

External noise target dB

L_{Aeq}(15min)

Noise Affected: 66dB>

Highly Noise Affected: 75dB>



SHRINE ENTRANCE WORKS

What's involved:

- Bentonite Plant slab break out and removal

Building	Unmitigated predicted noise level dB LAeq(15min)
The Domain	64
The Botanica	65
Hallmark Apartments	71
Domain Hill	65

** Modelled noise levels are unmitigated*



SHRINE ENTRANCE AND MIDDLE BOX

What's involved:

- CFA Piling for the shrine entrance, concrete pours for the middle box

Building	Unmitigated predicted noise level dB LAeq(15min)
The Domain	69
The Botanica	63
Hallmark Apartments	66
Domain Hill	63

** Noise levels are unmitigated, similar works complete in the North and South Box have been below modelled figures.*

MIDDLE BOX – ROOF SLAB WORKS

What’s involved:

- Excavating soil below the surface and removing from site via truck



Building	Unmitigated predicted noise level dB LAeq(15min)
The Domain	74
The Botanica	63
Hallmark Apartments	65
Domain Hill	65

** Noise levels are unmitigated, similar works complete in the North and South Box have been below modelled figures.*

MIDDLE BOX – HYDRODEMOLITION

What’s involved:

- Using a aqua cutter robot to strip away concrete and expose tie-in points for the future roof



Building	Unmitigated predicted noise level dB LAeq(15min)
The Domain	67
The Botanica	52
Hallmark Apartments	64
Domain Hill	64

** Noise levels are unmitigated*



TUNNELLING - NIGHT

What's involved:

- TBM support infrastructure (EHO) operating
- CNVIA predicts between 62dB – 65dB for key sensitive receivers surrounding Domain
- Modelled results are unmitigated, worst case
- Main contributor to noise is truck movements, not TBM infrastructure
- Strategy for noise mitigation is to manage the frequency and truck staging locations.

METRO TUNNEL CREATIVE PROGRAM



DOMAIN POP-UP PARK

- March 30 face to face info session cancelled due to COVID-19 concerns
- Online feedback form end date extended until April 17
- Creative Program will then analyse all data and make recommendations to Steering Committee
- Decision will then be worked through with City of Melbourne
- Advice provided back to community on next steps by middle of the year





ALBERT ROAD RESERVE POP-UP PARK

COVID-19 has delayed some aspects of initial works e.g. face to face site visits etc.

Still looking at a July / August timeframe for install.





LEGACY ARTS PROGRAM UPDATE

Shortlisted artists for Parkville, State Library, Anzac and Arden

In lieu of not being able to access physical archives and galleries shortlisted artists have been given online information and the offer to connect virtually with experts in organisations.

Town Hall EOI submission

We received a high number of quality submissions from artists both nationally and internationally for the Town Hall Station artwork commission.

Restrictions on travel have made it difficult to progress the commission, including the shortlisting process, with the uncertainty of artists being able to travel to Melbourne at this time. RPV and CYP are working through alternative ways to progress the commission.

Will provide update on revised timeframes in coming months.

QUESTIONS