

Melbourne Metro Tunnel Phase 2: Main Works

June 2022

Independent assurance report to Parliament
2021–22: 21



This report is printed on Monza Recycled paper. Monza Recycled is certified Carbon Neutral by The Carbon Reduction Institute (CRI) in accordance with the global Greenhouse Gas Protocol and ISO 14040 framework. The Lifecycle Analysis for Monza Recycled is cradle to grave including Scopes 1, 2 and 3. It has FSC Mix Certification combined with 99% recycled content.

ISBN 978-1-921060-42-7

Melbourne Metro Tunnel Phase 2: Main Works

Independent reasonable assurance report to Parliament

Ordered to be published

VICTORIAN GOVERNMENT PRINTER
June 2022

PP no 318, Session 2018–22



The Hon Nazih Elasmr MLC
President
Legislative Council
Parliament House
Melbourne

The Hon Colin Brooks MP
Speaker
Legislative Assembly
Parliament House
Melbourne

Dear Presiding Officers

Under the provisions of the *Audit Act 1994*, I transmit my report *Melbourne Metro Tunnel Phase 2: Main Works*.

Yours faithfully

A handwritten signature in black ink, appearing to read "Andrew Greaves", with a long, sweeping horizontal stroke extending to the right.

Andrew Greaves
Auditor-General
22 June 2022

The Victorian Auditor-General's Office acknowledges the Wurundjeri Woi Wurrung People as the traditional custodians of the land on which our office is located. We pay our respects to their Elders past and present.

Contents

Audit snapshot	1
1. Audit context.....	7
1.1 The Metro Tunnel Project.....	8
1.2 Four key project works packages	8
1.3 Project roles and responsibilities	9
1.4 Contractual arrangements	10
1.5 Six key milestones in the integrated program	11
1.6 Our 2019 audit of early works.....	12
2. Is the Metro Tunnel Project progressing as planned?.....	13
2.1 Delivering against expected project scope.....	14
2.2 Performance against project budget.....	16
2.3 Meeting construction timelines.....	22
2.4 Quality, safety and environmental requirements.....	24
APPENDIX A Submissions and comments	28
APPENDIX B Acronyms, abbreviations and glossary.....	35
APPENDIX C Scope of this audit.....	37

Audit snapshot

Are the main tunnel and stations works for the Melbourne Metro Tunnel being delivered as planned?

Who and what we examined

We looked at the progress of the tunnels and stations main works against the scope, time, cost and quality targets in the amended December 2020 contract.

The 5 entities we audited are:

- Cross Yarra Partnership (CYP)
- Department of Transport (DoT)
- Department of Treasury and Finance (DTF)
- Metro Trains Melbourne (MTM)
- Rail Projects Victoria (RPV).

Why this audit is important

The project will have a major impact on Melbourne's public transport system, freeing up City Loop capacity and adding a cross-city line from Sunbury to Dandenong and beyond.

The tunnels and stations main works are the largest construction package in the project and are key to the project opening by the announced date of 2025.

What we concluded

While the tunnels and stations main works package is being delivered satisfactorily, the overall project is facing cost and time pressures and has been affected by the coronavirus (COVID-19) pandemic.

Some work has been descoped from the project, almost all risk contingency funds have been used or allocated, and many potential project risks remain.

These risks include electromagnetic interference (EMI) from trains, which could affect medical and scientific equipment near 2 stations.

While RPV and CYP have plans to mitigate these EMI risks, they will need to implement them before train testing starts in June 2023.

To stay within the project's approved budget of \$12.58 billion and meet the September 2024 internal target opening date, RPV needs to diligently manage the project's emerging risks.

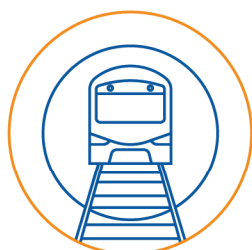
Our recommendations

We made 3 recommendations to DoT, DTF and RPV about:

- reassessing the sufficiency of project contingency funds
- mitigating current known delays in the project schedule
- formalising currently proposed EMI mitigations with relevant stakeholders.

Key facts

Beginning of works to May 2022



\$364m

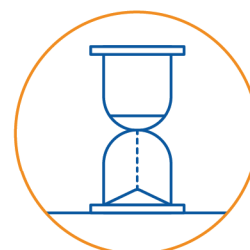
forecast overspend on the tunnels and stations package



RPV has almost fully allocated

\$740m

it had held in contingency



21m hours

worked on the tunnels and stations*

Note: * Hours worked up to February 2022.

Source: VAGO and RPV.

What we found and recommend

We consulted with the audited entities and considered their views when reaching our conclusions. Their full responses are in Appendix A.

Progress against the December 2020 amended contract's targets

This audit assessed delivery of the Melbourne Metro Tunnel Project (MTP) tunnels and stations main works against the scope, budget, schedule and quality requirements set out in the December 2020 amended public-private partnership (PPP) contract.

Due to commercial and delivery issues that Cross Yarra Partnership (CYP) faced in the first 2 years of the project, it and the state—through Rail Projects Victoria (RPV)—negotiated and agreed to reset the contract for the tunnel and stations main works. This reset contract altered some cost and time expectations that were in the original December 2017 contract.

An independent expert's analysis found that construction costs would be about \$2.74 billion more than the 2017 contract. The 2020 contract amendments required the state to pay up to an extra \$1.37 billion towards the construction phase costs on condition that CYP meets contractual milestones. CYP will also need to absorb its share of the new estimated cost, including any potential cost increases above that.

The 2020 contract amendments also enhanced the project's oversight, planning and scheduling processes. These changes should allow for more focus on timely delivery and better define the project's governance and coordination processes.

Delivery of the project's contracted scope

CYP is currently delivering the tunnels and stations main works package, as described in the amended December 2020 contract, in a satisfactory manner.

However, the MTP has experienced some cost overruns and time delays since the contract reset. As the project moves into the next risky phases further cost and time pressures could appear.

These ongoing cost and time pressures leave RPV limited flexibility to address future risks because they have either used or allocated almost all their risk contingency funds.

A **public-private partnership** (PPP) typically involves a long-term contract between the state and a private-sector party to design, finance, build and maintain social or economic infrastructure that delivers public services.

Risk contingency funds refers to funding that the State adds to the cost estimate in a project budget to account for uncertainty and unknown risks. If unexpected events lead to added costs, the project may draw upon these risk contingency funds.

The risky and complex activities in future project phases include:

- installing rail systems
- testing trains in the tunnels
- integrating the signalling and communications systems
- fitting-out and commissioning the 5 new underground stations.

RPV and its contractors will need to quickly identify and mitigate risks if and when they emerge.

There have been 33 variations to the scope of the main works during the main construction phase. RPV has assessed and approved the costs from these scope additions or changes and reflected this in its final cost forecast. RPV uses a rigorous process to assess whether these scope changes are needed and whether they will enhance the project's overall design quality and functional outcomes.

At a program-wide level, RPV has descope part of the rollout of the new high-capacity signalling (HCS) system. This will reduce the new signalling technology by about 27 kilometres, or about one third, of the previously announced coverage. This reduction in scope has freed up \$91 million for RPV to redirect to other areas of the project.

The government has also agreed to descope several 'wider network enhancements' from the original MTP budget (worth \$236 million) and reallocated this to offset overspends in various areas of the project.

Cost pressures on the project budget

Since at least June 2021, RPV was forecasting an overall project overspend of \$311 million. During this audit, in May 2022, the government decided to de-scope some project components and internally reallocate the funds. This decision effectively eliminated the previously forecast overspend.

As of May 2022, RPV forecasts that the overall project will cost \$12.58 billion. This is a \$1.55 billion (14 per cent) increase over the 2017 approved project budget. This comparison does not allow for the wider network enhancements and HCS work which have been descope. Adjusting for this, the overall project increase over the 2017 approved is \$1.88 billion (17 per cent).

Within this overall estimate, RPV forecasts a \$364 million overspend on the tunnels and stations component of the project (the focus of this audit). This does not translate to a program-wide overspend due to savings and descope works in other areas of the budget.

The cost of the main works to be delivered by CYP under the December 2020 fixed-price contract is \$6.45 billion. Payments to CYP are tracking as expected.

RPV has had to bear the cost of approved scope variations and other unexpected budget pressures, such as COVID-19-related costs and mitigating the risk of electromagnetic interference (EMI) from trains operating in the tunnels.

Due to this and other realised risk events, RPV has used or allocated almost all (98 per cent) of the project's \$740 million listed as risk contingency funds.

A June 2021 project assurance review (PAR) team found that the project's risk contingency funds were not sufficient for the project's inherent risks. The review team recommended that RPV re-baseline the project's risk contingency requirements and request more funds from government so that RPV could deliver the full project scope and benefits.

RPV has implemented part of the PAR recommendation and recalculated its likely risk scenarios. It has advised government of the range of additional risk contingency funds it will likely need to complete the project.

RPV anticipates the project will require further funds in the 2 financial years from 2023 but has not yet requested them.

Construction schedule time pressures

RPV formalised an integrated program, which is an integrated construction schedule for all the works packages, when it signed the December 2020 contract amendments. This gives all project parties a clearer view of interfacing works and the overall status of construction across multiple packages.

The milestones in the integrated program are additional to CYP's contracted targets. It is critical that the wider project and main works align because any delays in the tunnels and stations package can cause knock-on delays in the integrated program.

The government's COVID-19 public health directions and restrictions have increased CYP's costs and lowered site productivity. In January 2022, CYP estimated that COVID-19 had delayed its construction schedule by 52 days.

In February 2022, CYP presented RPV with a new construction schedule, including a suite of measures to mitigate the existing delays, which RPV is analysing. The independent reviewer (IR) and financiers' certifier (FC) have reviewed the new program and recognise that, if it is implemented as planned, CYP can recover its delays.

The proposed accelerated program will likely cost the state an extra, unplanned amount, that is yet to be determined. RPV will weigh this potential cost against any 'extension of time' claim that CYP might make because of government-directed site shutdowns due to COVID-19.

At the time of this audit, RPV was still considering CYP's proposal. Any future commercial agreement will need government approval.

Electromagnetic interference from trains in the tunnels

If left unmitigated, EMI from High Capacity Metro Trains (HCMT) in the Parkville and State Library station precincts will be a significant risk to sensitive equipment that medical and research institutions use in these locations.

While RPV and CYP anticipated this risk, they did not fully understand the potential impact during the project's planning and design phase.

To address this, RPV and CYP have tested a wide range of potential mitigations and have developed a suite of actions in consultation with precinct stakeholders. RPV and CYP are confident that these EMI mitigations will work. Implementing them will pose

Project assurance reviews (PAR) are part of DTF's capital project assurance framework. A team of public and private sector reviewers gives independent advice on a project or program's progress, objectives, governance and readiness. These reports are not usually made public.

RPV and CYP have jointly appointed an **independent reviewer** to review design packages, conduct construction surveillance, track the progress of the works against the construction schedule and certify completion.

CYP's lending institutions have appointed a **financiers' certifier** to assess and certify CYP's progress against contractual requirements.

an unexpected extra cost for RPV, which is still being finalised. RPV has made a provision in its final completion forecast to cover these likely extra costs.

The proposed mitigations include:

- limiting the strength of the traction power current drawn by HCMTs between Arden and State Library stations
- relocating some medical magnetic resonance imaging (MRI) services away from the tunnels to new and refurbished facilities
- installing or adjusting active magnetic cancellation systems for sensitive diagnostic and research equipment.

Buying and installing new MRIs and shielding equipment will take 6 to 12 months.

To deliver these mitigations before live train testing starts in June 2023, CYP and RPV will need to promptly formalise agreements with the education, health and research institutions in the Parkville and State Library precincts.

Monitoring and oversight of project scope, budget, schedule, and quality requirements

Across the project, RPV and CYP have effective systems in place to monitor performance against the project's scope, budget, schedule, and quality requirements.

These systems help RPV and CYP to understand and respond to project risks.

To monitor CYP's ...	RPV ...
delivery of the agreed scope	uses a range of data sources and assesses and approves variations
progress against contractual milestones	tracks construction using source data and reviews FC and IR reports
compliance with construction quality requirements	conducts construction surveillance and reviews the IR reports
compliance with safety requirements	conducts safety surveillance and reviews independent safety auditor (ISA) reports
compliance with environmental requirements	reviews independent environmental auditor (IEA) reports.

Recommendations on project delivery

We recommend that:

Response

Department of Transport, Department of Treasury and Finance and Rail Projects Victoria	1. implement the June 2021 PAR recommendation on the project's budget and conduct a comprehensive, bottom-up review of the overall project's budget and contingency situation to determine what additional funds might be required, noting the upcoming complex and risky works (see Section 2.2)	Accepted by: Department of Transport, Department of Treasury and Finance and Rail Projects Victoria
Rail Projects Victoria	2. finalise its analysis of the COVID-19 impact and time delay mitigations and acceleration proposal delivered by CYP in February 2022 and brief the government on any cost or other implications and, if approved, implement it (see Section 2.3)	Accepted by: Rail Projects Victoria
Department of Transport and Rail Projects Victoria	3. formalise the implementation of proposed electromagnetic interference mitigations with relevant external parties to allow for installation and commencement of technical solutions before train testing commences in the tunnels in June 2023 (see Section 2.4).	Accepted by: Department of Transport and Rail Projects Victoria

1.

Audit context

The Metro Tunnel Project (MTP) is a \$12.58 billion investment in Melbourne's passenger rail system. RPV is delivering the project. This report focuses on the main works package, which includes the twin tunnels, 5 new underground stations and other relevant construction.

CYP is delivering the design and construction of the tunnels and stations works package under a public–private partnership (PPP) contract signed with the state in December 2017 for \$5.08 billion. The amended contract signed in December 2020 resulted in the state committing to pay up to an extra \$1.37 billion.

This chapter provides essential background information about:

- The Metro Tunnel Project
 - Four key project works packages
 - Project roles and responsibilities
 - Contractual arrangements
 - Six key milestones in the integrated program
 - Our 2019 audit of early works
-

1.1 The Metro Tunnel Project

The MTP is a significant public infrastructure investment for Victoria. The approved budget for the project is \$12.58 billion.

The government announced in 2018 that the project will open in 2025. RPV's internal milestones, which reflect the contractual arrangements it has put in place, aim to achieve Day 1 operations for passenger trains by mid-September 2024.

The project will impact many aspects of Melbourne's metropolitan public transport system, by:

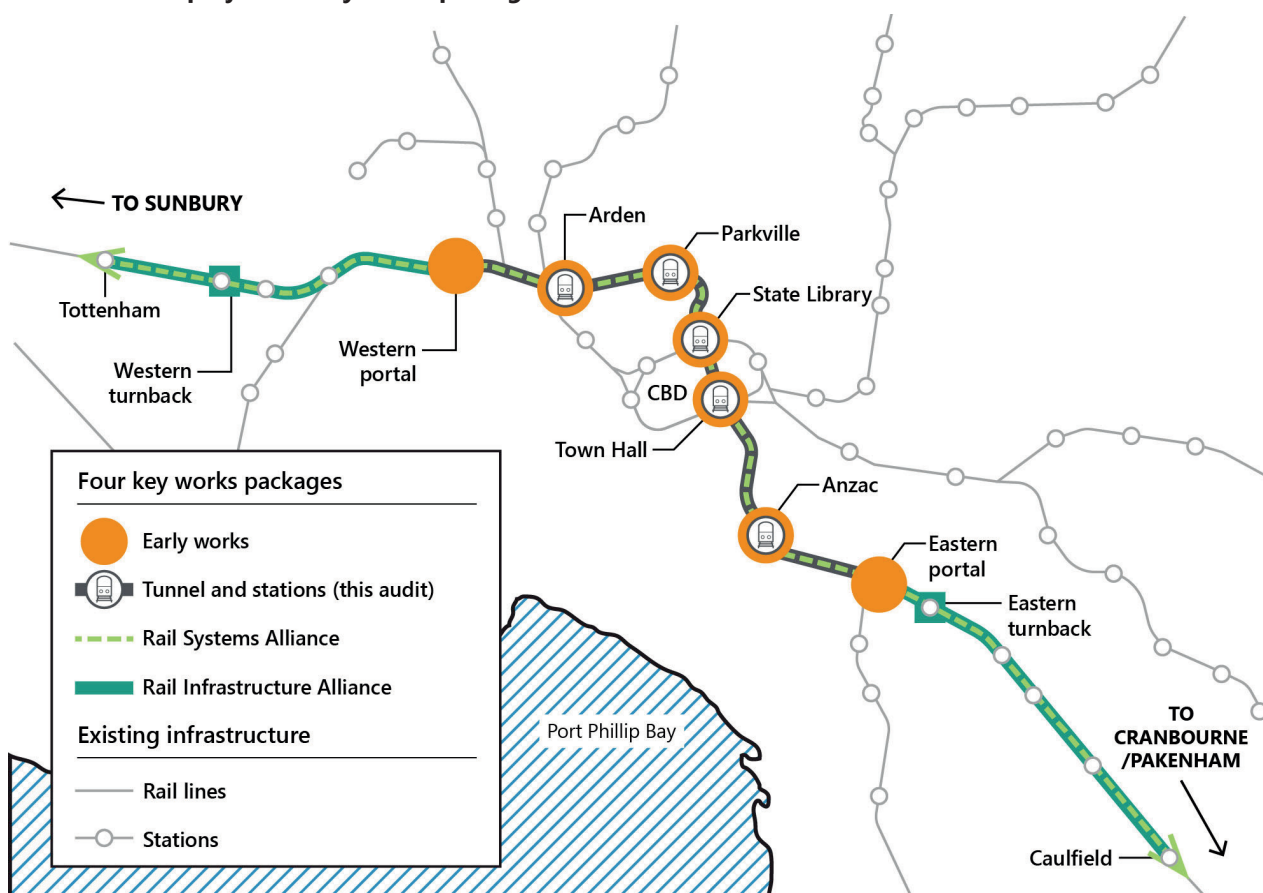
- increasing capacity in the City Loop central rail system by adding two 9-kilometre tunnels and 5 new underground stations
- allowing HCMTs to run from Sunbury to Dandenong via the Metro Tunnel and then on to Cranbourne or Pakenham
- connecting the recently announced Melbourne Airport Rail to the central business district (from Sunshine railway station).

The **total estimated investment** published in *Budget Paper 4 2022–23* is \$12.36 billion. This amount does not include operational expenditure of \$182 million and a COVID-19 claim of \$41 million. In this report we use the May 2022 approved budget of \$12.58 billion.

1.2 Four key project works packages

The MTP has 4 key works packages, as Figure 1A shows. This audit focuses on the tunnels and stations (or 'main works') package.

FIGURE 1A: The project's 4 key works packages



Source: RPV.

The Rail Infrastructure Alliance (RIA) and Rail Systems Alliance (RSA) works are also currently underway, but they are not part of the scope of this audit. The Metro Tunnel will only use HCMTs. A different project is delivering these new trains and they are currently entering into service along the Dandenong rail corridor.

1.3 Project roles and responsibilities

CYP is building the main works package under a PPP contract.

Five public sector entities and 3 private sector entities are directly involved in the wider project. Figure 1B describes their roles in the MTP.

FIGURE 1B: **Roles and responsibilities of entities involved in the project**

Entity	Role	Project-specific responsibilities
Public sector		
Department of Transport (DoT)	The 'client' for the MTP. State's lead transport agency (aims to integrate transport planning and coordination to better connect people, places and opportunities).	Sets the project scope and intended network benefits. Works with the Major Transport Infrastructure Authority (MTIA) to coordinate construction activities.
Department of Treasury and Finance (DTF)	Provides economic, financial and resource management advice to help the government deliver its policies. Runs the state budget process, which is key to approving funding for major infrastructure projects such as the MTP.	Advises government on project delivery issues and oversees project funding requirements. Runs the Gateway and High Value High Risk project assurance processes.
Department of Premier and Cabinet (DPC)	Leads the Victorian public service. Supports the government to achieve its strategic objectives by assisting the Premier and members of the Cabinet. Leads the whole-of-government policy agenda for major transport projects.	The secretariat of a key interdepartmental committee relevant to the project.
Major Transport Infrastructure Authority (MTIA)	Established on 1 January 2019 to plan and oversee major transport projects in Victoria. Made up of 5 project groups: • Level Crossing Removal Authority • Major Road Projects Victoria • North East Link Program • West Gate Tunnel Project • Rail Projects Victoria (RPV) (responsible for the MTP).	Responsible for all delivery aspects of the MTP, including procurement, construction and project commissioning.
VicTrack	Residual owner of all the state's railway assets. Operator of some critical rail and communications technology in the Metro Tunnel.	Responsible for design approval of some technology assets in the Metro Tunnel such as: • rail signal cabling and fixtures • station telecommunications, mobile phone coverage and information displays • security and safety systems (CCTV systems).

Entity	Role	Project-specific responsibilities
Private sector		
Cross Yarra Partnership (CYP)	Prime contractor for the tunnels and stations main works package, delivered under a PPP contract signed in 2017 and further amended in 2020.	Finances, designs and builds the tunnels and stations. Maintains tunnels and stations for 25 years after completion.
Metro Trains Melbourne (MTM)	Train franchisee (operator)	Tests and operates trains in the Metro Tunnel. Accredited rail operator and confirms compliance of any train network changes with its accreditation.
Yarra Trams	Tram franchisee (operator)	Operates tram network that interfaces with the project. Accredited rail operator and certifies any tram network changes from the project.

Source: VAGO.

1.4 Contractual arrangements

In December 2017, after a public procurement process, the state signed a PPP contract with CYP to build the new tunnels and stations.

CYP is partnering with 4 equity investors for the tunnels and stations PPP:

- Lendlease Infrastructure Investments Pty Ltd
- John Holland Group Pty Ltd
- Bouygues Construction Australia Pty Ltd
- John Laing Investments Limited.

CYP engaged Lendlease, John Holland and Bouygues Construction under an unincorporated joint venture arrangement (known as the design and construction [D&C] subcontractor) to design and construct the tunnels and stations component of the PPP.

'Availability' PPP contract

The main works contract is an 'availability' PPP, which requires CYP to:

- finance, design and build the new tunnels and stations
- maintain the infrastructure to applicable standards for 25 years after the project's practical completion.

Main works contract pricing

In 2017 the contracted price for CYP to design and construct the tunnels and stations PPP package was \$5.08 billion.

However, during the first couple of years of building and tunnelling, CYP faced several difficulties, including:

- design and construction methodology challenges
- lower than expected labour and excavation productivity

An **availability PPP** is a partnership between the private sector and government to deliver assets and services, by financing, designing, building and maintaining them over a specified time frame. The main revenue stream for the private sector is a performance-based service payment from the government linked to the availability of the asset.

- slow site and equipment mobilisation
- other project management issues.

As a result, RPV and CYP agreed to an 'open book' review of the project costs and construction schedule. After reviewing advice from jointly appointed cost and schedule experts, CYP and the state agreed to share the extra construction costs and negotiated a contract reset.

The state agreed to pay up to a further \$1.37 billion towards the increase in construction costs on the condition that CYP meets its contractual milestones. CYP will need to absorb their share plus any costs higher than this from their own financial resources.

On 23 December 2020, the Minister for Transport Infrastructure signed settlement and amending deeds with CYP to address the commercial and delivery issues.

In an **open book** process, the contract parties agree to share information with each other that they would not normally disclose, such as budgets, forecasts and financial statements.

1.5 Six key milestones in the integrated program

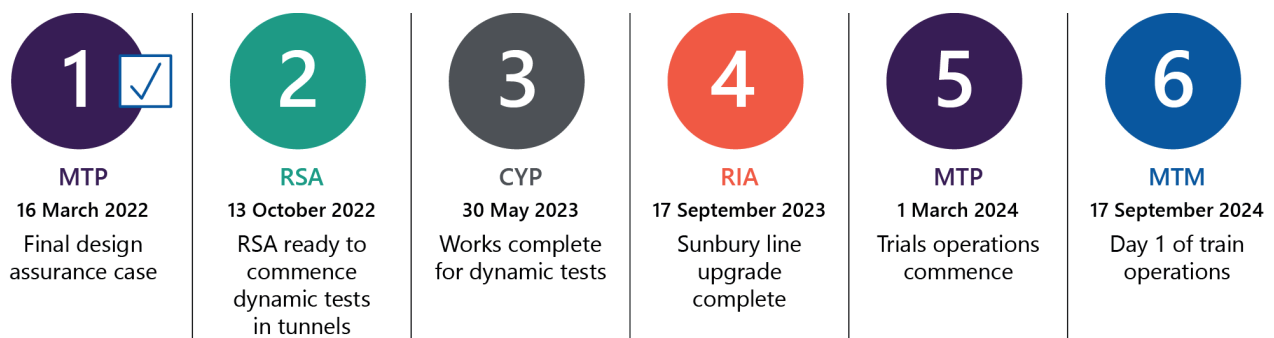
Before the settlement of the renegotiated PPP contract in December 2020, each package contractor developed its own construction program with milestones that were relevant to their specific works package.

Contract negotiations between RPV and CYP formalised an integrated program as part of the amended contract agreement process and included the other relevant packages in this decision.

The new integrated program designates 6 key project milestones to achieve RPV's internal milestone of Day 1 operations on 17 September 2024.

Figure 1C shows the milestones and the entities responsible for them.

FIGURE 1C: Six key milestones in RPV's integrated program



Note: MTP refers to responsibilities shared by all entities.

Source: RPV.

1.6 Our 2019 audit of early works

This performance audit is our second assurance engagement examining the progress of the MTP. Our 2019 report, *Melbourne Metro Tunnel Project—Phase 1: Early Works*, covered aspects of the project's planning and early works. We completed that audit before CYP and the state commenced negotiations to amend the PPP agreement, which they finalised in December 2020.

Our 2019 audit found that unexpected cost increases in the early works phase had put pressure on the state's project budget and the risk contingency funds. The audit recommended that DPC, DTF, and DoT review the remaining Melbourne MTP risk contingency funds.

In our June 2021 report, *Responses to Performance Audit Recommendations: Annual Status Update*, DoT, DTF, and DPC said that work is still underway to address this recommendation.

Our 2019 audit also identified a range of impacts on external stakeholders from the tunnel and station works, such as construction disruptions, vibration from heavy equipment and electromagnetic interference (EMI). We said that these impacts need to be actively managed.

2.

Is the Metro Tunnel Project progressing as planned?

Conclusion

The tunnels and stations main works are currently progressing as planned and RPV and CYP's systems for monitoring and achieving project requirements are effective.

However, the overall project is facing time and cost pressures and RPV has allocated almost all its MTP contingency funds. RPV has also descoped some MTP signalling works and wider network enhancements. RPV also needs to formalise agreements with precinct stakeholders to implement EMI mitigations before train testing starts in June 2023.

RPV and CYP need to carefully manage all these risks to achieve RPV's internal milestone date of Day 1 train operations by September 2024 and deliver the project's intended benefits.

This chapter discusses:

- Delivering against expected project scope
 - Performance against project budget
 - Meeting construction timelines
 - Quality, safety and environmental requirements
-

2.1 Delivering against expected project scope

Delivering the main works package's scope

CYP is delivering the main works as required by the PPP contract. The project specification and technical requirements (PS&TR) section of the contract clearly describes the works required at each site and precinct. These include:

- 9 kilometres of twin bored tunnels (now complete)
- surface portals and interconnecting passages in the tunnels
- 5 new underground stations and connections to 2 existing stations
- surface works in these precincts.

RPV and CYP first negotiated the PS&TR as part of the original December 2017 PPP contract and did not substantively alter it in the 2020 amended contract.

We have not identified any risk of significant or material departures from the required scope of the main works.

RPV's monitoring of CYP's progress

RPV has an effective monitoring process in place to make sure CYP and other contractors are delivering the agreed scope of works.

The MTP reports on a similar basis to the other projects delivered by RPV and other MTIA teams.

This reporting is found in:

- monthly management and progress dashboards for users at RPV and MTIA
- project progress data embedded in monthly reports for the MTIA Director-General and the Major Transport Infrastructure Board (an MTIA advisory board)
- reporting to the DoT executive, central agencies and ministers' offices
- the quarterly Major Projects Performance Report, which the Office of Projects Victoria compiles and submits to a subcommittee of Cabinet.

RPV also uses data from CYP's monthly progress report and monthly reports from the IR and FC. The IR and FC reports assess progress against the approved scope and calculate CYP's construction effort.

We examined recent examples of each of these levels of reporting, as well as source data. The description of the project's progress in the higher-level briefings we reviewed is accurate and aligns with the source material.

Scope changes during the construction phase

Since the start of the main works construction phase in early 2018, RPV and CYP have formalised many proposed scope and design changes during the main construction phase.

To date, these 33 scope changes have cost the state \$55.83 million. RPV has included these costs in its project budget forecasts as committed funds.

RPV approved these changes because they were required to rectify project scope gaps, implement new or changed mandatory requirements, or to enhance the project's overall design and construction quality, as well as its functional benefits.

RPV is considering further potential scope and design changes, such as:

- applying new external standards and requirements to the project's public domain design and finishes
- building kerb-separated bike lanes, which the local authority now requires
- amending tram track designs
- installing irrigation systems for replanted trees and greenery
- waterproofing works for a property affected by the project.

RPV's current budget forecast includes the potential costs of these currently unapproved changes.

Impacts of COVID-19 on construction

The COVID-19 pandemic has caused some unexpected costs and operational impacts for CYP.

Official public health directions in response to the pandemic have also had various impacts on CYP. These include mandated site shutdowns, changes to shift patterns to make them staggered and extended, and lower site productivity due to mandated worker density limits.

In October 2021, the government approved an extra \$106 million for COVID-related impacts up to the end of May 2021. It also approved a further \$41 million in May 2022 for COVID-related impacts up to November 2021.

Works descope from the wider program

Train services in the Metro Tunnel will only use HCMTs operating the new HCS technology. Legacy signalling technology (such as trackside posts and lights) will not be installed in the tunnels, so only trains fitted with HCS equipment can use the tunnels.

In 2020, RPV directed its RSA contractors to reduce the rollout of HCS by about a third (or 27 kilometres of double rail track)—from the original announced scope of Watergardens to Dandenong to a new scope of West Footscray to Westall.

On the surface rail network outside the tunnels, the existing legacy train signalling system will remain in place for non-HCS metropolitan services, as well as for regional passenger and freight trains. HCMTs will have to revert to traditional signalling procedures once they leave the HCS area outside the tunnels. HCMTs are currently doing this on the Dandenong corridor so this should not restrict service coverage (as train drivers will have experience with both systems).

RPV received government approval in May 2022 to formally descope the previously deferred HCS works and reallocate \$91 million to other parts of the MTP budget. While the MTP budget had set aside \$91 million for these descope works, RPV recently estimated that the actual cost is more likely to be between \$300 million and \$500 million.

Descoping of parts of the originally announced HCS rollout is mainly due to the impact of the Melbourne Airport Rail and Cranbourne line duplication projects. The government approved these projects after it had announced the original scope of the MTP.

Avoiding design conflicts and potential waste from construction rework on these 2 interfacing projects, which will also use the HCS technology, is a prudent approach.

However, due to the descoping decision, the Melbourne Airport Rail project will now need to fund and complete the HCS rollout between West Footscray and Ginifer (previously, HCS was going to extend to Watergardens). It also means that the descoped Dandenong line section will have to be funded by a future project on that rail corridor.

In May 2022, the government also approved the descoping of \$236 million of wider network enhancements from the MTP budget, including a train turnback location and some signalling upgrades. RPV's rationale for this request was that pre-cursor works assumed in the original MTP business case have not been done, and therefore the original network enhancements scope cannot achieve network benefits. The funds released by the government's descope decision have been reallocated within the wider MTP budget.

2.2 Performance against project budget

Overall project cost forecast

Since at least June 2021, RPV was forecasting an overall project overspend of \$311 million, exclusive of unknown risks. During this audit, in May 2022, the government decided to de-scope some project components and reallocate the funds to offset the overspend.

RPV's May 2022 forecast shows an overall project cost of \$12.58 billion, which matches the revised budget approved in May 2022.

If this new forecast is accurate, this will be a \$1.55 billion (or 14 per cent) increase over the first project budget approved in 2017. This is \$152 million more than the approved budget when the state revised the PPP contract in December 2020. Adjusting for the HCS and wider network enhancements work which has now been descoped, the overall project is forecast to cost \$1.88 billion (17 per cent) more than 2017.

The overall forecast is an aggregate figure for all project components, as Figure 2A shows.

FIGURE 2A: **Budget versus forecast by project component (as of May 2022)**

MTP budget component	Approved budget	Final forecast cost	Forecast variance
Tunnels, stations and fitout (including the PPP works)	\$6,970.6 million	\$7,336.8 million	+\$363.5 million ^(b)
Rail systems (including integration and testing)	\$1,542.7 million	\$1,689.9 million	+\$147.2 million
Land acquisition	\$715.5 million	\$713.0 million	–\$2.5 million
Rail infrastructure alliance	\$1,355.6 million	\$1,087.3 million	–\$268.3 million
Wider network enhancements	\$345.9 million	\$101.2 million	–\$244.8 million
Project management	\$1,001.2 million	\$1,021.5 million	+\$20.3 million
Early works	\$652.9 million	\$634.7 million	–\$18.3 million
Total ^(a)	\$12,584.4 million	\$12,584.4 million	–\$2.7 million ^(c)

Note: (a) Totals may not correctly sum due to rounding.

(b) The stated variance does not reflect the actual variance between approved budget and final forecast cost due to a \$2.7 million prepayment (as reflected in the total forecast variance).

(c) RPV advised that this is not a budget saving but extra works pre-paid by another agency. This is why we show a variance despite no difference between the budget and the forecast.

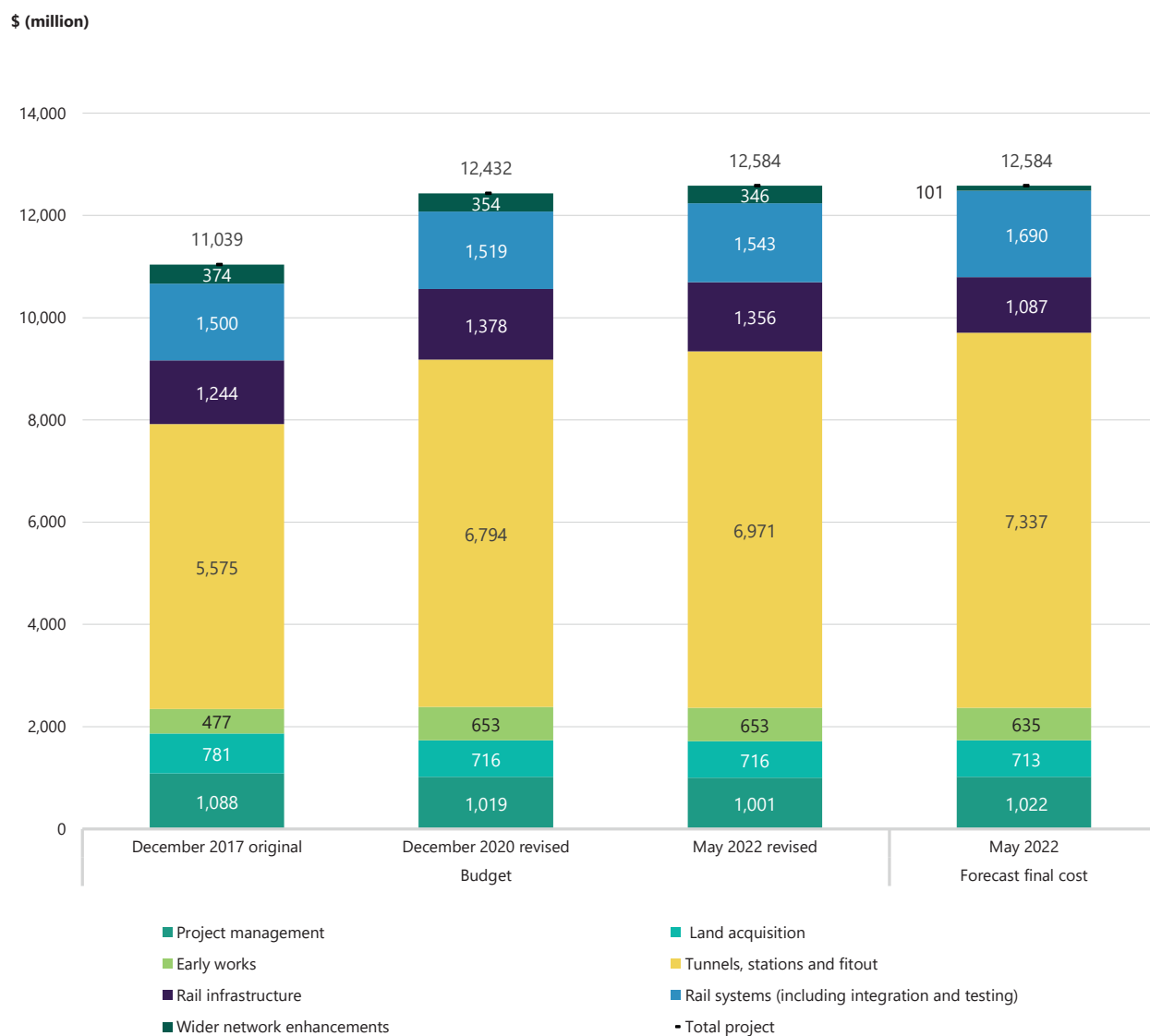
Source: VAGO, based on RPV data.

Figures 2A and 2B show some key movements between the May 2022 revised budget and forecast final costs. Notably, the tunnels and stations budget component is forecast to spend \$364 million more than its budget. The rail systems component (including integration and testing) is also expecting to spend \$147 million more than its budget.

These forecast overspends are offset by savings of \$268 million within the rail infrastructure budget, as well as the May 2022 decision to descope \$236 million of wider network enhancements and HCS works worth \$91 million.

Our 2019 audit examined the overall project's budget performance by project component. We have updated our previous analysis to show the forecast of final costs as of May 2022 in Figure 2B.

FIGURE 2B: Changes in the overall project budget and forecast since 2017



Note: Project management includes the 'program-wide common costs' and 'program management/Office of the Coordinator-General' budget components.

Source: VAGO, based on RPV data.

Tunnels and stations budget and cost forecast

RPV's initial budget for the tunnels and stations component of the project was \$5.58 billion in December 2017. This increased to \$6.79 billion after the December 2020 PPP contract amendment.

As of May 2022, the approved budget for the tunnels and stations component is \$6.97 billion. This is a 25 per cent increase over the original 2017 budget for tunnels and stations.

The May 2022 forecast final cost for the tunnels and stations component is \$7.34 billion, which would be a \$364 million budget overspend, or 32 per cent more than the 2017 budget.

The December 2020 contract reset accounts for about 78 per cent of the overall cumulative increase between the original 2017 budget and the May 2022 forecast final completion cost for the tunnels and stations.

Figure 2C shows key movements in the tunnels and stations component budget against the most recent forecast final cost.

FIGURE 2C: **Changes in tunnels and stations budgets vs forecast final cost**

Date of budget or forecast	Final cost for tunnels and stations	Increase on preceding budget/forecast
December 2017 original budget	\$5.575 billion	n/a
Post-December 2020 approved budget	\$6.794 billion	\$1.219 billion ^(a)
October 2021 approved budget	\$6.908 billion	\$114 million ^(b)
May 2022 approved budget	\$6.971 billion	\$62 million ^(c)
May 2022 forecast final cost	\$7.337 billion	\$364 million
Total cumulative increase		\$1.762 billion^(d)

Note: (a) This increase does not equal \$1.372 billion (per the December 2020 agreement) due to other movements in the tunnels and stations budget outside of the PPP contract.

(b) Includes an additional \$106 million for COVID-19 costs and funding for scope and design changes.

(c) Includes \$41 million for COVID-19 costs approved in May 2022.

(d) Increases don't sum to this total due to the \$2.7 million prepayment reflected in the forecast final cost, as noted in Figure 2A.

Source: VAGO, based on RPV data.

Tunnels and stations PPP contract payments

RPV's payments to CYP for work delivered under the PPP contract (worth \$6.45 billion) are tracking as expected. The PPP is a subset of the total budget for the tunnels and stations component of the MTP (worth \$6.97 billion).

The payment mechanism for the tunnels and stations PPP contract is broadly consistent with other 'availability-based' PPP projects where costs are amortised over time and paid if the private-sector contractor performs satisfactorily.

In addition to this typical PPP contract mechanism, the MTP's PPP contract includes capital contributions by the state during the main construction phase to help the

private-sector party reduce its construction-related debt as it delivers the asset. The state also agreed to some additional construction phase contributions in 2020.

Figure 2D shows the state contributions for the construction phase that were in the original 2017 contract and carried forward into the amended 2020 contract, as well as the agreed extra payments.

FIGURE 2D: **State contributions to project construction costs**

State contribution	Description	Nominal total
State construction contribution	Progressive capital contributions, provided to CYP in tranches during the D&C phase between January 2020 and provisional acceptance	\$2.5 billion
State capital contribution	Capital contribution at Final Integration Commencement	\$1.5 billion
Additional construction phase payments	Additional state capital contribution (\$1.06 billion) plus other incentive and performance payments (\$310 million)	Up to \$1.37 billion

Source: VAGO, based on RPV data.

CYP's main lending bank, which coordinates all the other lenders CYP has borrowed from to deliver the main works, has engaged a FC. The FC is a construction cost review expert appointed under the finance deed to help ensure that the payment process is accurate and timely for all parties.

The FC report shows earned value reporting for completed works. RPV uses this data about the certified works to populate an internal S curve and inform the final forecast cost estimate.

These processes have certified that CYP has performed works worth \$4.08 billion as of April 2022.

The disbursement of these amounts is subject to various requirements under the PPP contract. Up to April 2022, RPV had paid \$2.47 billion to CYP in the following contractual payment categories:

- state construction contribution (\$1.6 billion)
- state capital contribution (nil—these funds only become available after Final Integration Commencement)
- additional state construction contribution (\$865 million).

RPV has started to pay a range of new key performance indicator (KPI)-based incentives for CYP agreed in the December 2020 contract reset. To date, RPV has paid \$12.35 million to CYP in recognition of its performance against these KPIs.

Further detail on the PPP contract and how the various payments operate can be found on DTF's website.

Risk contingency funds

Our previous audit (*Melbourne Metro Tunnel Project—Phase 1: Early Works*), tabled in June 2019, found that unexpected cost increases for the early works phase had put pressure on internal budgets and wider project risk contingency funds.

Final Integration Commencement refers to the completion of all CYP works that are required to enable the commencement of full inter-package systems integration tests in the tunnels and stations.

Earned value measures the percentage of budgeted work that has been completed within a project at a point in time.

An **S curve** shows the use of resources over a project's timeline. It is a graphical display of cumulative staff-hours, cost, progress, or other quantities plotted against time.

According to RPV's latest final cost forecast it has spent or allocated almost all (98 per cent) of its risk contingency funds (\$727 million of \$740 million) due to a sequence of unplanned costs and unexpected risk events since the project started.

In light of the complex and risky works to come, the absence of any further risk contingency funds is a significant budget risk for RPV.

A PAR report on the MTP from June 2021 concluded that the project's risk contingency funding was too low at the business case stage and did not reflect the project's inherently high complexity and uncertainty. The report said the project would require more state funding to achieve the start of passenger service operations in September 2024 and deliver the intended scope and benefits, but did not quantify how much.

The PAR report recommended RPV re-baseline its risk contingency in a framework that would have a base contingency managed by RPV and an excess contingency held centrally by DTF.

It also recommended that this revised contingency calculation should support a funding request to the government for funds to complete the project.

RPV responded to the PAR recommendation in August 2021 by recalculating its contingency and showing this estimate in external status reports.

At the time of this audit, RPV had not sought extra funding from government to replenish its risk contingency funds to these new calculated amounts but it does show the recalculated contingency in its forecasts and reporting to Cabinet.

RPV advised government in May 2022 that it would likely require further funding in the 2 financial years from 2023 onwards to deliver the full scope of the project and deal with potential contingency costs.

Base contingency is the estimated cost of project risk and uncertainty at a 50 per cent confidence level (referred to as P50).

Excess contingency is the estimated project risk at a 90 per cent confidence level (P90). These estimates are based on a probabilistic model.

2.3 Meeting construction timelines

Integrated program for interfacing works packages

From June 2019 to December 2020, RPV worked with the contracted parties to develop an integrated program that would support a joint delivery approach across the whole MTP and other interfacing projects (including the HCMT PPP).

The integrated program is a 'P6' construction schedule (developed by using the Primavera Version 6 specialist construction scheduling software). It details the roles and responsibilities of all relevant entities for 6 key milestones, culminating in Day 1 operations of passenger trains.

Figure 2E explains the 6 key integrated program milestones.

FIGURE 2E: **Six key integrated program milestones**

Milestone	Date	Description	Key responsible entity
1 Final design assurance case review completed	16/3/2022 (complete)	Achieve documented agreement that, 'if we build what we have designed, it will be safe for dynamic tests, trial operations and Day 1 operations'.	MTP (shared by all)
2 RSA ready to commence dynamic tests in tunnels	13/10/2022	Sufficient dynamic train testing has taken place on the surface to enable dynamic train tests to commence in the tunnels.	RSA
3 Works complete for dynamic tests in tunnel	30/5/2023	Trains can run through tunnels. Enables start of 16 months of testing of HCMTs and systems.	CYP
4 Sunbury Line Upgrade complete*	17/9/2023	Sunbury Line Upgrade complete and ready for HCMTs to commence passenger operations on the western corridor after Day 1 operations.	RIA, MTM
5 Trial operations commence	1/3/2024	Sufficient systems integration tests are complete to enable MTM to commence trial operations and trial running in the tunnel with train drivers and station staff.	MTP (shared by all)
6 Day 1 train operations of the MTP	17/9/2024	MTM's trial operations are complete and MTM can run passenger services in the new Metro Tunnel.	MTM

Note: *The Sunbury Line Upgrade includes improving the train traction power supply and other infrastructure to allow the HCMTs to run along the full length of the rail corridor from Sunbury to Pakenham/Cranbourne once the MTP opens.

Source: VAGO, based on information provided by RPV.

CYP's delays and subsequent mitigation proposal

Industry-wide and site-specific COVID-19 shutdowns in late 2021 have delayed CYP's construction schedule. In January 2022, CYP estimated that COVID-19 had caused 52 days of delay.

Delays against contracted milestones can impact the integrated program, especially if the activities are on the 'critical path' to achieve Day 1 operations. However, not all delays (calculated from the construction schedule) directly impact the achievement of the Day 1 operations target.

In February 2022, CYP lodged a new construction schedule with RPV that included proposed mitigations and accelerations to recover the delays registered in late 2021.

As of May 2022, RPV is still assessing CYP's proposed mitigations contained in the new construction schedule. The approximately 90 mitigation measures include measures such as changing building methodology, increasing workforce resources, adding extra shifts and improving logistics coordination.

The FC reviewed the new program in March 2022 and concluded that CYP can get back on track to achieve its contracted milestones.

The IR also reviewed the new program in its February 2022 report. While the IR acknowledges that the new program, if implemented as designed, can claw back the current delays, they also note some risks, such as:

- unproven technical feasibility of some designs
- design submission delays
- likelihood of the need for rework due to the magnitude of changes
- some work streams are still showing negative float, which will require close monitoring and proactive management
- insufficient time allowed for potential failed tests and retests during the upcoming testing and commissioning phase
- lack of available and skilled people to achieve workforce supplementation.

CYP has provided RPV with the estimated costs of the overall mitigation and acceleration approach. RPV is considering CYP's proposal and developing a response. Any future commercial arrangement will need government approval.

Tasks on the **critical path** are the tasks that RPV and CYP consider most important to achieving Day 1 operations. These tasks cannot be deferred, and/or other key tasks depend on them.

Float refers to the number of days that a task can be delayed without impacting subsequent tasks.

Negative float refers to the number of days needed to complete a task that goes beyond the scheduled completion date for a task.

2.4 Quality, safety and environmental requirements

Construction quality inspection and assessment

RPV and CYP have effective systems and practices in place to monitor compliance with technical construction quality requirements and make sure they take corrective actions in a timely manner.

Under the PPP contract, RPV and CYP jointly appointed an IR. The IR plays a key role in monitoring construction quality and has a large and well-resourced team of about 60 people. The IR has kept up frequent in-person construction surveillance activities throughout the COVID-19 restrictions period. The IR is satisfied with CYP's overall construction quality and has reported that CYP demonstrates a proactive and solution-oriented approach.

The IR has raised some non-conformance reports in its monthly reports. While some findings have been open for over a year, most are not urgent or cannot be fixed yet. RPV monitors construction quality non-conformance reports in CYP's document management system. It uses this information to encourage CYP to improve its quality performance.

The KPI incentive regime that the state added as part of the December 2020 contract reset also considers CYP's performance in the project quality domain. To date, CYP has met these quality performance expectations.

Health and safety requirements

RPV and CYP have effective systems and practices in place to monitor compliance with safety requirements.

As required by the PPP contract, CYP:

- uses a health and safety management plan certified to AS/NZS 4801:2001 *Occupational health and safety management systems*
- contracts an independent safety auditor (ISA) to review CYP's compliance with the plan twice a year.

The ISA considers that CYP maintains high safety standards overall and that its safety systems are sound.

CYP's reported safety performance is better than the industry standard for lost time injury frequency rate (LTIFR) and total recordable injury frequency rate (TRIFR), which Figure 2F shows.

FIGURE 2F: **Tunnels and stations safety performance compared to industry standards**

Rate	LTIFR	TRIFR
Industry standard	5.6 ^(a)	7.23 ^(b)
CYP tunnels and stations rate (as of November 2021)	1.16	6.8

Note: (a) Safe Work Australia building construction industry rate

(b) Federal Safety Commissioner Workplace Health and Safety Accreditation scheme rate.

Source: VAGO, based on RPV data.

CYP has contracted the Independent safety auditor (ISA) to conduct twice-yearly **safety audits** of CYP's compliance with safety requirements.

Safety audits review compliance with relevant safety standards and CYP's own health and safety plans. The audits can include desktop review of paperwork, and/or site inspections.

Frequency rates are calculated by multiplying the number of incidents by 1 million, then dividing by the hours worked in the reporting period.

LTIFR is a measure of the number of lost time injuries resulting in permanent disability or lost time from work of one day shift or more in the period.

TRIFR is a measure of the total number of medically treated injuries, lost time injuries, restricted work injuries and fatalities.

In its March 2021 report, the ISA noted a ‘gap’ in the way that CYP was actioning safety audit findings. It found that sometimes CYP did not action findings in a way that prevents recurrence or does not provide evidence that it has implemented, completed, monitored and reviewed actions. However, these repeat findings were not material, and the ISA did not raise any repeat findings in its November 2021 report.

CYP separately reports high-potential incidents and high-potential hazards to develop a lead indicator of avoided incidents. CYP has reported only 29 high-potential incidents and 14 high-potential hazards across 21 million hours of work on the tunnels and stations.

CYP has managed COVID-19 health and safety requirements well. Despite the size of the project and high infection risks from working in underground settings, as of November 2021 there were only 2 site closures due to COVID-19 exposures.

Environmental requirements

Our 2019 audit of early works found that the MTP underwent an extensive environmental effects statement process that developed an environmental management framework (EMF) and environmental performance requirements (EPRs).

RPV and CYP have effective systems and processes in place to monitor compliance with environmental requirements and make sure they take corrective actions in a timely manner. The independent environmental auditor (IEA) conducts quarterly risk-based audits that examine compliance with the EMF and environmental management plans.

The IEA told us that CYP has maintained high standards for environmental management. The IEA has not raised a non-conformance report—the most serious type of finding—since February 2020. IEA reports since February 2019 show that CYP has resolved most quarterly audit findings by the next audit. Longer-standing open findings are neither material nor significant.

Electromagnetic interference (EMI) impacts

The operation of HCMTs in the Metro Tunnel will emit electromagnetic frequency. If left unmitigated, this would interfere with sensitive equipment (known as receivers) installed in the Parkville and State Library station precincts.

Some of the receivers are critical medical diagnostic and research equipment such as magnetic resonance imaging (MRI) machines in the Melbourne Biomedical Precinct.

This precinct is a government-designated Priority Precinct and National Employment and Innovation Cluster and houses nationally significant medical and scientific research infrastructure.

The EMI risk will increase further if DoT introduces 10-car HCMTs (currently planned for 2038 in DoT’s strategic plans).

EPRs cover a wide range of areas including:

- flora and fauna
 - cultural heritage
 - ground water
 - noise and vibration.
-

External review parties—including the IR, IEA and ISA—may make three **types of findings**.

Starting from the most serious, they are:

1. non-conformance report
 2. opportunity for improvement
 3. observation.
-

Two requirements under the environmental management framework relate to EMI. To date, CYP has met these requirements by:

- preparing and implementing an electromagnetic compatibility management plan
- modelling and testing the EMI risk in the Parkville and State Library station precincts
- producing operational impact assessments for all sensitive receivers.

In consultation with precinct stakeholders, RPV and CYP have agreed in principle to a range of actions to mitigate EMI arising from the operation of 7-car HCMTs. The state will bear some unexpected costs to mitigate EMI and will need to relocate some medical diagnostic services as well as install shielding systems for some equipment.

RPV's preferred approach is a combination of at-source and at-receiver actions to mitigate EMI to within acceptable tolerances, which Figure 2G outlines.

FIGURE 2G: **Proposed mitigations (for 7-car HCMTs) and their status**

Mitigation	Description	Status (as of January 2022)
Positive dipole	Repositioning and adding to the traction power current return conductor bar to reduce the size of magnetic fields.	Already implemented by CYP in the tunnel design.
Reducing the traction power current to 2300 amps (from 5300 amps) between State Library and Arden stations	Limiting how much electrical current the trains draw in certain sections of the tunnel to reduce electromagnetic frequency.	Approved by Network Development Reference Group (DoT decision-making body) on 21 January 2022.
Active and passive shielding on sensitive equipment	Installing magnetic field active cancellation systems (MACS) and materials such as 'mu-metal' shielding in equipment rooms to reduce EMI.	Under negotiation with the Peter Doherty Institute (University of Melbourne).
Active shielding	MACS, as above.	Agreed in principle with Peter MacCallum Cancer Centre (Peter Mac) and RMIT. Installation not yet commenced.
Relocation of some MRI services to new and/or alternative facilities	Procuring new equipment and construction and/or refurbishment of facilities outside the EMI zone.	Formally agreed with Peter Mac, Royal Melbourne Hospital and Royal Women's Hospital. If MACS are effective, Peter Mac MRI services could go back to their original location.

Source: VAGO.

Procuring and installing MRIs will take at least 6 months and the new machines will need to be installed, calibrated and operating by June 2023 (when train testing is scheduled to start in the tunnels).

RPV estimates that installing passive shielding at the Peter Doherty Institute will take up to 12 months, so both parties will need to agree whether to implement this action in June 2022.

Figure 2H shows the current status of the various proposed EMI mitigations for the affected institutions in the Parkville and State Library station precincts.

FIGURE 2H: **EMI mitigations at the affected institutions and their status**

Institution	Mitigation	In-principle agreement	Formal agreement	Funding agreement ^(a)
Peter Mac	Current limiting (for LINAC limits)	✓	✓	✓
	3 x MRI service relocation	✓	✓	X ^(b)
Royal Melbourne Hospital	3 x MRI service relocation	✓	✓	✓
Royal Women's Hospital	1 x MRI service relocation	✓	✓	X
Peter Doherty Institute	MACS on research equipment	✓	X	X
	Passive shielding in rooms			
RMIT	MACS on research equipment	✓	✓	X

Note: (a) Physical works are being tendered and RPV will finalise funding agreements with institutions once costings are known.

(b) RPV has funding agreements in place for 2 of 3 MRIs for Peter Mac but plans for the refurbished facilities had not been finalised at the time of this audit.

Source: VAGO, based on evidence provided by RPV.

APPENDIX A

Submissions and comments

We have consulted with CYP, DoT, DTF, MTM and RPV (MTIA), and we considered their views when reaching our audit conclusions. As required by the *Audit Act 1994*, we gave a draft copy of this report, or relevant extracts, to those entities and asked for their submissions and comments.

Responsibility for the accuracy, fairness and balance of those comments rests solely with the entity's accountable officer.

Responses were received as follows:

DoT joint response with RPV (MTIA)	29
DTF	32
MTM	34



Department of Transport

GPO Box 2392
Melbourne, VIC 3001 Australia
Telephone: +61 3 9651 9999
www.transport.vic.gov.au
DX 210074

Ref: BSEC-1-22-12049R

File:

Mr Andrew Greaves
Auditor-General of Victoria
Victorian Auditor-General's Office
Level 31, 35 Collins Street
MELBOURNE VIC 3000

Dear Mr Greaves

Victorian Auditor-General's Office – Proposed Report – Melbourne Metro Tunnel Phase 2: Main Works

Thank you for your letter dated 31 May 2022 enclosing the Proposed Report (Report) relating to the Melbourne Metro Tunnel Phase 2: Main Works audit.

The Metro Tunnel Project (Project) is the largest rail project since the City Loop was built in the 1970s. The Project commenced in 2015 and is on track to be completed in 2025. The project will create a new end-to-end rail line from Sunbury in the west to Cranbourne/Pakenham in the south-east, with bigger and better trains, next generation signalling technology and five new underground stations.

The Department and MTIA welcome your conclusion that the tunnels and stations main works package, being the largest construction package in the Project, is being delivered satisfactorily. Twin 9-kilometre tunnels have been constructed under Melbourne's CBD, with tunnel boring machines completing their work as planned in May 2021. Construction of the five new stations and complex systems integration work is progressing well.

The Department and MTIA accept the recommendations outlined in the Report and have provided comments on the recommendations for your office's consideration and for inclusion in the Final Report.

While the Report's recommendations are accepted, it is appropriate to emphasise some additional points of context that have not been included in the Report:

- The Metro Tunnel 2016 Business Case planned for a completion date for the Project of 2026. The Project continues to be ahead of that target and is on track to be completed a year earlier in 2025. While the Report notes the September 2024 contract date for Day 1 train operations, this date, whilst a target date for Day 1, does not include Owner's program contingency for managing the completion of the works which is why the date for completion remains in 2025.



- The Report observes that RPV's internal forecast earlier this year included a forecast overspend against the approved Project budget and records a forecast overspend in the tunnels and stations component of \$364m. As the Report also observes, the forecast overspend in the tunnels and stations component is offset by other budget movements - and following reallocation of savings and refinement of some elements of project scope there is no forecast overspend against the overall approved Project budget. RPV has effective systems in place to monitor performance against the Project's budget and will continue to conduct project cost reviews each month.
- Refinements in project scope which have enabled budget savings for the Project include:
 - changes to some High Capacity Signalling (HCS) work on outer parts of the Sunbury, Cranbourne and Pakenham lines, which will not be delivered as part of the Project. These changes avoid costly rework and duplication by removing works which are not required for the proposed Day 1 service plan and enable co-ordination with new projects that have been committed subsequent to the Project including Melbourne Airport Rail, Cranbourne line duplication and level crossing removals on the Pakenham line; and
 - removal of some Wider Network Enhancement scope which, as outlined in the 2016 Project Business Case, would not achieve network benefits without additional infrastructure investment and require pre-cursor and critically interdependent works to be completed which have not been progressed.

The Department and MTIA are committed to the success of this critical city-shaping Project and thank you for the opportunity to comment on the Report.

If you require further information, the nominated contacts for this audit are Henry Tiong, Director Project Integration RPV, DoT (Henry.Tiong@transport.vic.gov.au) and Tom McAvaney, Director, Commercial and Legal, RPV (Tom.Mcavaney@railprojects.vic.gov.au).

Yours sincerely



Paul Younis
Secretary
Department of Transport

14 June 2022

Melbourne Metro Tunnel Phase 2: Main Works

Department of Transport and Major Transport Infrastructure Authority – Action Plan

No.	VAGO Recommendation	Action	Due Date
1	DoT, DTF and RPV implement the June 2021 project assurance review (PAR) recommendation on the project's budget and conduct a comprehensive, bottom-up review of the overall project's budget and contingency situation to determine what additional funds might be required, noting the upcoming complex and risky works.	Accepted. RPV has implemented the June 2021 PAR recommendation on the project's budget and is updating the forecast risk requirements at a P50 and P90 probability on a monthly basis.	December 2025
2	RPV finalise its analysis of the COVID-19 impact and time delay mitigations and acceleration proposal delivered by CYP in February 2022 and brief the government on any cost or other implications and, if approved, implement it.	Accepted. RPV is considering CYP's proposal and developing a response. RPV will brief the government on any cost or other implications and, if approved, implement the arrangements once it has completed its analysis.	June 2023
3	DoT and RPV formalise the implementation of proposed electromagnetic interference mitigations with relevant external parties to allow for installation and commencement of technical solutions before train testing commences in the tunnels in June 2023.	Accepted. RPV will continue to work with DoT and relevant external parties on the proposed electromagnetic interference mitigations and formalise the agreed mitigations before train testing commences in the tunnels.	June 2023



Department of Treasury and Finance

1 Treasury Place
Melbourne Victoria 3002 Australia
Telephone: +61 3 9651 5111
dtf.vic.gov.au
DX210759

D22/83698

Mr Andrew Greaves
Auditor General
Level 31
35 Collins Street
MELBOURNE VIC 3000

Dear Mr Greaves

PROPOSED PERFORMANCE AUDIT REPORT: MELBOURNE METRO TUNNEL PROJECT PHASE 2 – MAIN WORKS

Thank you for your letter of 31 May 2022 inviting a response to the proposed performance audit report: *Melbourne Metro Tunnel Phase 2: Main Works*.

The Department of Treasury and Finance (DTF) notes the findings of the report and supports the following recommendation that relates to DTF:

Recommendation 1: The Department of Transport (DoT), DTF and Rail Projects Victoria (RPV) implement the June 2021 project assurance review recommendation on the project's budget and conduct a comprehensive, bottom-up review of the overall project's budget and contingency situation to determine what additional funds might be required, noting the upcoming complex and risky works.

I note this recommendation is also directed to DoT and RPV. My department has worked with DoT and RPV to provide an aligned response.

A proposed action plan for implementing the recommendation directed at DTF is attached to this letter.

Thank you for the opportunity to consider the proposed audit report. Should you require any further information please contact Ms An Nguyen, Executive Director, Infrastructure Delivery Group, DTF at An.Nguyen@dtf.vic.gov.au.

Yours sincerely

Jason Loos
Acting Secretary

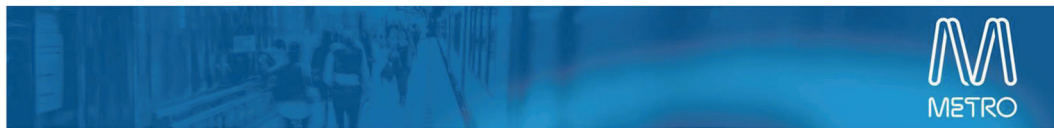
10/6/2022



Department of Treasury and Finance action plan to address recommendations from the performance audit of Melbourne Metro Tunnel Project: Phase 2 – Main Works

No	VAGO recommendation	Action	Completion date
1	We recommend that the Department of Transport (DoT), Department of Treasury (DTF) and Rail Projects Victoria (RPV): Implement the June 2021 project assurance review (PAR) recommendation on the project's budget and conduct a comprehensive, bottom-up review of the overall project's budget and contingency situation to determine what additional funds might be required, noting the upcoming complex and risky works.	Agreed DTF is supporting DoT and RPV to implement the June 2021 project assurance review (PAR) recommendation on the project's budget and contingency situation to determine what additional funds might be required, noting the upcoming complex and risky works. This will include reviewing RPV's forecast updates which are expected to be provided on a monthly basis.	December 2025

OFFICIAL



Ref: MTM-206

Andrew Greaves
Auditor-General
Victorian Auditor-General's Office (VAGO)
Level 31 / 35 Collins Street
Melbourne Vic 3001

14/06/2022

Dear Andrew,

Provisional Draft Report: Melbourne Metro Tunnel Phase 2 – Main works

We refer to your letter "Proposed Performance Audit Report: Melbourne Metro Tunnel Phase 2- Main Works" dated 31 May 2022 (**Letter**).

MTM acknowledges receipt of the proposed performance audit report attached to the Letter and confirm that MTM have no further comments in relation to this provisional draft report.

Should you wish to discuss this further please do not hesitate to contact Mike Moyes.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Raymond O'Flaherty', is written over a light blue rectangular background.

Raymond O'Flaherty
Chief Executive Officer, Metro Trains Melbourne

Incoming Ref: 34680 22

METRO TRAINS MELBOURNE
GPO BOX 1880
Melbourne VIC Australia 3001

Office of the CEO
Phone: +61 3 9610 3644
ABN 43 136 429 948

APPENDIX B

Acronyms, abbreviations and glossary

Acronyms

COVID-19	coronavirus
CYP	Cross Yarra Partnership
D&C	design and construct
DoT	Department of Transport
DPC	Department of Premier and Cabinet
DTF	Department of Treasury and Finance
EMF	environmental management framework
EMI	electromagnetic interference
EPR	environmental performance requirement
FC	financiers' certifier
HCMT	High Capacity Metro Train
HCS	high-capacity signalling
IEA	independent environmental auditor
IR	independent reviewer
ISA	independent safety auditor
KPI	key performance indicator
LTIFR	lost time injury frequency rate
MACS	magnetic field active cancellation system
MRI	magnetic resonance imaging
MTIA	Major Transport Infrastructure Authority
MTM	Metro Trains Melbourne
MTP	Metro Tunnel Project

Acronyms

PAR	project assurance review
Peter Mac	Peter MacCallum Cancer Centre
PPP	public-private partnership
PS&TR	Project Scope and Technical Requirements
RIA	Rail Infrastructure Alliance
RMIT	Royal Melbourne Institute of Technology
RPV	Rail Projects Victoria
RSA	Rail Systems Alliance
TRIFR	total recordable injury frequency rate
VAGO	Victorian Auditor-General's Office

Glossary

Reasonable assurance	We achieve reasonable assurance by obtaining and verifying direct evidence from a variety of internal and external sources about an agency's performance. This enables us to express an opinion or draw a conclusion against an audit objective with a high level of assurance. We call these audits reasonable assurance engagements. Our assurance services fact sheet
----------------------	---

APPENDIX C

Scope of this audit

Who we examined

Their key responsibilities

DoT	The State's lead transport agency responsible for integrating transport planning and coordination. Acts as the 'client' for the MTP and sets the project scope and intended network benefits. Works with RPV (MTIA) to coordinate MTP construction activities.
DTF	Coordinates the state budget process, which is key to approving funding for major projects such as the MTP. Advises government on project delivery issues and runs project assurance processes.
RPV (MTIA)	One of 5 project groups within MTIA that plans and oversees major transport projects in Victoria. Responsible for all delivery aspects of the MTP, including procurement, construction, and project commissioning.
CYP	Prime contractor for the tunnels and stations main works package, delivered under a PPP contract signed in 2017 and further amended in 2020. Finances, designs and builds the tunnels and stations and will maintain them for 25 years after completion.
MTM	Metropolitan train franchisee (operator). Accredited rail operator and confirms compliance of any train network changes. Will test and operate trains in the Metro Tunnel.

What we examined

We focused on RPV's oversight, and CYP's delivery, of the MTP's tunnels and stations main works package, which has been under construction since 2019.

We used our follow the dollar powers to directly audit CYP due to their critical role in constructing the main works.

We also included Metro Trains Melbourne in the audit due to their role in planning the future running of trains in the tunnels and the operation of the 5 new underground stations.

Objective

The objective for this audit was to determine whether the main tunnel and stations works for the Melbourne Metro Tunnel are being delivered as planned.

How we assessed performance

To form our conclusion against our objective we use the following lines of inquiry and associated evaluation criteria:

Line of inquiry	Criteria
Is the main tunnels and stations package progressing to the amended (December 2020) plan and delivering within expected scope, time, cost, and quality parameters?	1. Relevant entities can show that the tunnels and stations package is delivering within expected tolerances for the project's approved scope. 2. Relevant entities can show that the tunnels and stations package is delivering within expected tolerances for the project's approved budget. 3. Relevant entities can show that the tunnels and stations package is delivering within expected tolerances for the project's approved schedule. 4. Relevant entities can show that the tunnels and stations package is delivering within expected tolerances for the project's approved quality (including safety and environmental) requirements.

Our methods

As part of the audit we:

- reviewed RPV's monitoring and reporting systems to assess how it oversees and manages the project
- used data from RPV, CYP and other external parties to assess if CYP was delivering the works within expected tolerances for each of our 4 criteria
- met with relevant key staff at each department and associated entity.

We conducted our audit in accordance with the *Audit Act 1994* and ASAE 3500 Performance Engagements to obtain reasonable assurance to provide a basis for our conclusion.

We complied with the independence and other relevant ethical requirements related to assurance engagements.

We also provided a copy of the report to the Department of Premier and Cabinet.

Cost and time

The full cost of the audit and preparation of this report was \$720,000.

The duration of the audit was 11.7 months from initiation to tabling.

Auditor-General's reports tabled during 2021–22

Report title

<i>Integrated Transport Planning (2021–22: 01)</i>	August 2021
<i>Major Infrastructure Program Delivery Capability (2021–22: 02)</i>	September 2021
<i>Clinical Governance: Department of Health (2021–22: 03)</i>	September 2021
<i>Managing Conflicts of Interest in Procurement (2021–22: 04)</i>	September 2021
<i>Major Projects Performance (2021–22: 05)</i>	September 2021
<i>Administration of Victorian Courts (2021–22: 06)</i>	October 2021
<i>Protecting Victoria's Biodiversity (2021–22: 07)</i>	October 2021
<i>Management of Spending in Response to COVID-19 (2021–22: 08)</i>	October 2021
<i>Supplying and Using Recycled Water (2021–22: 09)</i>	November 2021
<i>Auditor-General's Report on the Annual Financial Report of the State of Victoria: 2020–21 (2021–22: 10)</i>	November 2021
<i>Results of 2020–21 Audits: Local Government (2021–22: 11)</i>	December 2021
<i>Council Waste Management Services (2021–22: 12)</i>	December 2021
<i>Business Continuity During COVID-19 (2021–22: 13)</i>	February 2022
<i>Effectiveness of the Navigator Program (2021–22:14)</i>	March 2022
<i>Government Advertising (2021–22:15)</i>	April 2022
<i>ICT Provisioning in Schools (2021–22:16)</i>	April 2022
<i>Offsetting Native Vegetation Loss on Private Land (2021–22:17)</i>	May 2022
<i>Fraud Control over Local Government Grants (2021–22:18)</i>	May 2022
<i>Managing Body-Worn Cameras (2021–22:19)</i>	June 2022
<i>Melbourne Metro Tunnel Phase 2: Main Works (2021–22:21)</i>	June 2022

All reports are available for download in PDF and HTML format on our website www.audit.vic.gov.au

Auditor-General's responsibilities

Our fact sheets provide you with more information about our role and our audit services.

[About VAGO](#)

Information about the Auditor-General and VAGO's work.

[Our assurance services](#)

Information about the nature and levels of assurance that we provide to Parliament and public sector agencies through our work program.

Victorian Auditor-General's Office
Level 31, 35 Collins Street
Melbourne Vic 3000
AUSTRALIA

Phone +61 3 8601 7000
Email enquiries@audit.vic.gov.au