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Creating a safer state with electricity and gas

# Greenfield Underground Residential Distribution (URD) – Cable Jointing Research Project

Findings report

VICTORIA State Government

# Preface

This findings report has been prepared by Energy Safe Victoria (ESV) pursuant to the objectives, powers and functions conferred on it by the *Electricity Safety Act 1998* (Act).

Specifically, these include, amongst other things, working co-operatively and in consultation with the industry and community to facilitate safety outcomes, developing and communicating safety and efficiency requirements and programs, monitoring, auditing, and enforcing compliance with the requirements, and administering licensing, registration and approval systems that maintain safety standards and skills.

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# Summary

This research project originated as an outcome of the remaking of the Electricity Safety (Registration and Licensing) Regulations 2020 (the Regulations), which came into effect on 1 January 2021. An important addition to the Regulations required electrical lineworkers to be licensed and the scheme also included the creation of a new cable jointer licence category.

Since 1999 an Order in Council existed as part of the electricity safety legislative framework to exclude the application of Part 3 of the *Electricity Safety Act 1998* (the Act) to work carried out on any parts of the electricity distribution supply network (which included the construction of new underground supply networks in residential estates). This part of the Act was intended to apply to the work performed by licensed electricians in industrial and residential premises, and includes requirements such as certificates of electrical safety, inspections of electrical installations by licensed electrical inspectors and compliance with the Wiring Rules.

The exemption was required in the Order to ensure that qualified lineworkers, electrical fitters and cable jointers (that are not licensed electricians) could continue to work on distribution supply networks operated by Major Electricity Companies (MEC). If the exemption had not been in place, only licensed electricians would have been permitted to work on the distribution network. The impact of the Order in Council, among other things, had the effect of exempting cable jointing work carried out in 'greenfield' Underground Residential Distribution (URD) networks from being defined as *electrical installation* work under the Act.

Late in the stakeholder consultation process on the new Regulations in 2020, concerns were raised about the impact of this exemption and the safety, regulatory requirements and oversight of cable jointing undertaken on URD networks in new 'greenfield' estates prior to them being energised and becoming part of the Major Electricity Company network.

When the Order was remade in 2020, the exemption referred to above was no longer required as changes had since been made to the definition of *electrical installation* in the Act to exclude Major Electricity Company networks from being an electrical installation. The effect of the changes to the Order meant that it was now arguable that the requirements of Part 3 of the Act applied to the construction of new URD networks including a requirement that only licensed electricians could do that work.

As Energy Safe Victoria (ESV) had no data about incidents or current work practices in greenfield URD estates and other stakeholders had no additional information at the time the Regulations had to be remade, it was determined that the issues needed further examination. Energy Safe Victoria (ESV) had also not widely consulted with the civil construction sector on the issue.

As a way forward, Government and key stakeholders agreed that ESV would conduct a consultative process to gather information and views on the safety of electrical cable jointing activities associated with URD networks, and then provide the findings from this consultation to Government to inform future policy.

The research objectives were to:

- identify and consult with affected stakeholders
- understand the nature and extent of any safety issues
- collect views and information on whether there were potential problems with the operation of the new legislative requirements for these activities.

In preparing this report, ESV engaged a research partner to follow the project methodology (as outlined in the scope in Section 1.3) and assist with the research and consultation undertaken with contractors, auditors and developers, MECs, and unions.

The evidence gathered during consultation suggests that there are no systemic or widespread safety or competency issues associated with cable jointing in greenfield URD estates. The findings of this research suggest this is likely to be because this work is currently undertaken by Certificate III qualified workers, which is largely a requirement of the industry itself and as a contractual requirement of some MECs.

Because the URD cable jointing exemption was not inlcuded in the Order from 1 January 2021, the legislation requires that all such work should be carried out by a licensed electrician and subject to Certificates of Electrical Safety (COES), inspection and wiring requirements. However, as agreed with the Government and key stakeholders during the scoping of this project, ESV has chosen not to enforce these requirements until this review is completed given that there had been no reports or evidence of systemic or widespread safety issues and key industry participants have been engaged in the research.

The key findings of the greenfield URD cable jointing research project are that:

1. No systemic or widespread evidence of safety or competency issues or use of unqualified workers was found.
2. Certificate III qualified cable jointers typically undertake work in greenfield URD estates.
3. Contractual arrangements are established between developers and MECs prior to construction commencing, and some MECs specify the use of Certificate III qualified cable jointers only.
4. The specific exemption was not remade in the Order in Council with the introduction of the remade Electricity Safety (Registration and Licensing) Regulations 2020 from 1 January 2021. Therefore, as URD cable jointing work is defined as '*electrical installation'* work, it is arguable that it is required to be carried out by licensed electricians.

   In practice the work is being carried out by qualified cable jointers. Requiring the work to be carried out by licenced electricians may not necessarily improve the quality and safety outcomes of work as licenced electricians generally do not perform cable jointing of this nature.

Other findings:

1. All contractors consulted, and some MECs, already require the use of Certificate III cable jointers in this area.
2. At the time of consultation over 70 per cent of all qualified cable jointers working in greenfield URD estates had already applied for, or had obtained, a cable jointers licence.

# 1 Introduction

## 1.1 Purpose

The aim of this report is to provide the findings from the ESV research project on cable jointing in greenfield Underground Residential Distribution (URD) networks in residential estates.

The objective of the research project was to investigate whether safety or competency issues exist around cable jointing in greenfield URD estates, consult with key stakeholders and industry, gather any views on the safety of electrical cable jointing activities associated with URD networks, and to then provide the findings from this consultation to Government to inform future policy.

## 1.2 Background

### Legislative and policy objectives

The primary legislation that regulates electrical safety in Victoria is the *Electricity Safety Act 1998* (the Act).[1] The Act takes a comprehensive approach to promote end-to-end safety when dealing with electricity.

Energy Safe Victoria (ESV) is the independent statutory authority responsible for electricity, gas and pipeline safety in Victoria. As a safety regulator, it licenses Victoria's electrical workers, manages the Certificate of Electrical Safety (COES) program, conducts community safety campaigns, ensures electrical and gas products are approved and safe for use, and investigates gas and electrical incidents.

ESV's role is broad and ranges from accepting industry's safety cases and safety management schemes to enforcing standards and administering regulations covering gas and electrical appliances and installations, pipelines and energy efficiency. In relation to electrical safety, ESV's regulatory role also includes ensuring the safety of:

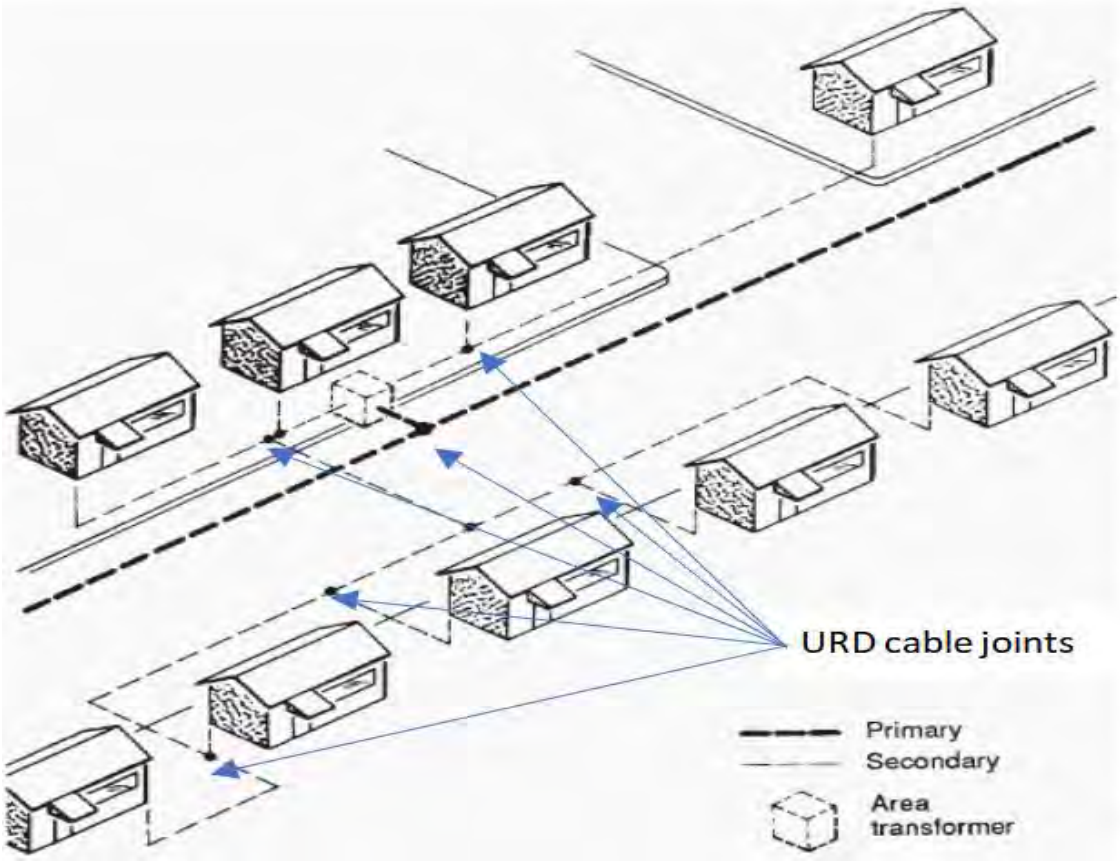
- electrical generation, transmission and distribution systems, electrical installations and electrical equipment, and
- the standards of electrical work.

### Underground Residential Distribution networks in residential estates

Since the 1990s, it has been the standard for new residential estates to place electrical cables underground, rather than distributing electricity by overhead power lines. Where cables branch off to properties, they require jointing. Figure 1 below illustrates cable joints in a typical residential development. A subdivision of 40 properties, for example, would typically require around 20 low voltage cable joints.

[1] There are also other Acts that promote electrical safety, such as the *Occupational Health and Safety Act 2004.*

**Figure 1: URD cable joints in a typical residential development**




There are a number of handbooks and guidelines that set out 'best practice' for installing and inspecting URD networks.[2] Notably, the Victorian Electricity Supply Industry (VESI) has recently released an industry standard, the URD Design and Construction Standard (May 2021), to provide a common set of engineering design and construction principles that meet the relevant legislative and Australian Standards requirements for URD installation across all Victorian electricity supply industries.[3] The VESI standards set out the typical steps in constructing an URD network. These consist of:

- trenching
- laying of high voltage, low voltage, service and public lighting cables
- laying of conduits
- laying of bedding sand and protective cover slabs
- preparation of substation foundations
- substation installation and earthing works
- installation of public lighting columns
- installation of pillars and service pits
- **jointing and terminating cables** [*the focus of this report*][4]
- backfilling and site clean-up

[2] These include: VESI Urban Residential Development Design and Construction Standard. Version 12; VESI Fieldworker Handbook, Section 9: Underground Distribution URD; and inspection systems published by network owners.

[3] The Victorian Electrical Distribution Networks (VEDN) is a committee of VESI, which is responsible for accrediting contractors who are involved in the civil aspects of underground electrical infrastructure.

[4] The focus of this findings report is to consider safety and competency issues associated with jointing and terminating cables in URD networks.

- testing
- detailed recording of cable location and other associated works as detailed on the construction plan.

The VESI *Fieldworker Handbook, Underground Distribution URD*, notes as a general principle that 'when working on underground distribution assets, employees shall be appropriately trained and authorised for the purpose of the work'[5,6] The Electrical Trades Union (ETU) echoed this point, commenting that 'using properly qualified personnel provides the assurance that each part of the installation is installed to the highest standard …'.[7]

## 1.3 Scope

The scope of the ESV research is part of the overall project and covers steps 1 to 3 in the project plan (Appendix A). Steps 1 to 3 included:

- conduct initial consultation with key stakeholders:
  - flesh out key concerns, views and data sources
- understand the work:
  - scale, governance, current competency
- assess safety outcomes:
  - undertake preliminary research, gather and analyse data, and
  - determine safety benefits to be realised, as outlined in this report.

## 1.4 Regulatory context

### Government regulation - Victoria

Before the privatisation of the electricity industry in the 1990s, cable jointing in greenfield URD estates was undertaken by electrical workers employed by the State Electricity Commission of Victoria (SECV). Following privatisation, MECs became responsible for the distribution infrastructure, including URD networks.

The Act was amended (commencing December 2009) to introduce mandatory Electricity Safety Management Schemes (ESMSs) for MECs, the definition of '*electrical installation'* was also amended to exclude supply networks owned or operated by a MEC. This removed MEC supply networks from the electrical installation requirements of the Act. Similar arrangements exist in other jurisdictions in Australia (see section 2.3).

The 1999 Order in Council also provided an exemption from the Act, for workers undertaking URD cable jointing on greenfield estates, from being a licensed electrician.[8] This exemption had the effect of exempting cable jointing work in URD on greenfield estates from licensing requirements, together with COES, inspection and Wiring Rules (AS/NZS 3000) requirements.

When the Order in Council was remade in 2020, the exemption that applied to work on URD networks was not remade as it was no longer required for its initially intended purpose, which was to exempt MEC distribution and transmission networks from the requirements of the Act that apply to electrical installations.

[5] VESI Fieldworker Handbook, Underground Distribution URD, p. 2, Section 9

[6] It is important to note that the VESI *Fieldworker Handbook* makes this statement in relation to work on commissioned URD networks, which poses a higher risk compared with URD networks before they are commissioned.

[7] ETU Submission, Response to Energy Safe Victoria URD Cable Jointing Research Project, June 2020

[8] Victorian Government Gazette, Electricity Safety Act 1998, Declaration under Section 4, G 17 29 April 1999, p.1002. Part 2 (1)(a). Divisions 1, 2, and 3 (with the exception of section 43) of Part 3 of the Act do not have effect in relations to [an] electrical installation upstream of the point of supply …

A more specific exemption applying to work carried out on URD estates was considered for the 2020 Order in Council, however, it was agreed with Government and key stakeholders to wait until this research project was completed before considering whether an exemption tailored to electrical work carried out on URD estates was required.

Given the removal of the exemption applying to electrical installations upstream of the point of supply, from 1 January 2021 any electrical work carried out in URD estates on equipment that is not owned or operated by an MEC it is arguable that it is required to be carried out by a licensed electrician.

As agreed with Government and key stakeholders ESV will not be enforcing these requirements until this review is completed given that the work had been previously exempted for a significant period of time, and there had been no evidence of safety issues or reports, and key industry participants have been engaged in the research.

## Licensing of lineworkers

The Victorian Government established the licensing regime for lineworkers through the introduction of the Energy Safety Legislation Amendment (Victorian Energy Safety Commission and Other Matters) Act 2020. Before then, most lineworkers in Victoria were registered with ESV – but not licensed. During the remaking of the regulations in 2020, ESV consulted with key stakeholders to form a view on the scope of work that should be covered by, and minimum qualification standards for, the lineworker licence.

Following this consultation and discussions with the Victorian Government, the Government decided that the scope of linework should include prescribed work on overhead transmission, distribution, and traction networks, along with certain types of cable jointing work. It was further decided that the minimum qualification for a cable jointer's lineworker licence would be a Certificate III in ESI[9] Power Systems-Distribution Cable Jointing, or equivalent. With respect to cable jointing, a new licence category was created – Lineworker Licence Class-C (Cable Jointing).

During the consultation (and while ESV was considering the specific requirements around cable jointing to inform its future work to implement the lineworker licensing regime) some stakeholders raised safety and competency concerns regarding cable jointing in greenfield URD networks. However, no evidence was provided or made available to ESV to support the concerns raised.

[9] Electricity Supply Industry (ESI)

# 2 Assess safety outcomes

## 2.1 Key Analysis

### Safety or competency issues

As ESV has not previously monitored or investigated the safety and quality of URD networks constructed by developers, it did not have data on faults or non-conformances. ESV conducted a number of stakeholder workshops, interviews and questionnaires to better understand the nature and extent of the alleged problems associated with URD cable jointing on greenfield residential estates.

ESV also requested underground cable fault data from contractors, auditors and MECs. The provided MEC data included detailed asset investigation reports concerning cable joint failures. A small number of failures occurred in 2021 that resulted in power outages. Common causes of joint failures were overloading and extreme weather conditions; poor preparation and installation of insulation/joints leading to moisture ingress and joint failure after some time. These instances have led to power outages, ranging from one to four hours generally, involving considerable costs to rectify, and potentially introduced additional health and safety risk for electrical or other utility workers. However, consultation demonstrated that safety issues and non-conformances were relatively rare, no injuries or near-misses were reported, and the data sourced during this research demonstrated to ESV that the risk of injury is low.

### Use of Certificate III qualified cable-jointers in greenfield URD estates

The information gathered during consultation showed that Certificate III qualified cable jointers are undertaking cable jointing tasks in greenfield URD developments. This is the same qualification as now required by the Electricity Safety (Registration and Licensing) Regulations 2020 for an Electrical Lineworker Class-C (Cable Jointer) Licence to undertake work on MEC networks.

Consultation revealed that eleven of the key URD contractors that undertake over 90 per cent of all cable jointing activity in greenfield URDs are currently all using Certificate III qualified cable jointers. Some contractors who did not directly employ cable jointers engage other contractors who employ Certificate III qualified cable jointers. Contractors have internal auditing systems to check that the cable joints conform to standards, and some contractors keep records of which individual cable jointer has completed each individual cable jointing task for auditing and performance monitoring.

The key URD contractors consulted also employ apprentice cable jointers. Apprentice numbers were found to be low compared to the number of qualified jointers, indicating that appropriate supervision is achievable.

At the time of the consultation, at least 70 per cent of the Certificate III qualified cable jointers in greenfield URD had already applied for an Electrical Lineworker Class-C (Cable Jointer) Licence since the commencement of the licencing regime from 1 January 2021.

Many stated that they have done so as they believed that, as qualified cable jointers, they were required to be licensed now. Some obtained a licence as it permits them to be employed by MECs to undertake ‘brownfield’ jointing, termination or connection work on MEC electricity supply networks as well as on greenfield URD estate work.

Following extensive consultation, ESV found no evidence to suggest that jointing in greenfield URD networks was being undertaken by unqualified workers.

### MEC and Developer contractual arrangements

Contractual arrangements between MECs and developers are put in place prior to construction commencing, and some of the MECs specify use of Certificate III qualified cable jointers in the contracts.

MECs audit projects and require certain electrical tests to be undertaken prior to accepting the URD project as being compliant and ready to connect to the electricity network.

### Exemption requirement - currently defined as electrical 'installation' work

As discussed earlier the Order in Council established in 1999 that, among other things, exempted cable jointing work carried out in greenfield URD estates from being *electrical installation* work under the *Electricity Safety Act 1998*. The Order was remade in 2020, however the specific URD cable jointing exemption was not remade as it was no longer required for its initially intended purpose, which was to exempt MEC distribution and transmission networks from the requirements of the Act that apply to electrical installations.

It could be argued that this means that from 1 January 2021 all such work should be carried out by a licensed electrician and subject to Certificates of Electrical Safety (COES), inspection and wiring requirements. However, as agreed with the Government and key stakeholders during the scoping of this project, ESV is not enforcing these requirements until this review is completed given that there had been no reports or evidence of systemic or widespread safety issues, and key industry participants have been engaged in the research.

Electricians do not generally perform such cable jointing work and are unlikely to have the necessary cable jointing skills. Therefore, requiring licenced electricians to undertake cable jointing work of this nature is unlikely to result in improved safety outcomes, and in fact may reduce the current level of quality and safety outcomes because of the inexperience of licensed electrician in this type of work.

Maintaining the status quo has the potential to displace the current workforce of cable jointers from the industry despite finding no evidence of systemic or widespread safety or competency issues.

## 2.2 Key Stakeholder Consultation

As an objective of the research, key stakeholders were contacted and views sought. A number of workshops were held, questionnaires circulated, and follow-up meetings and phone calls conducted. Consultation occurred during April through to June 2021 as follows:

- Workshops with URD contractors, auditors, and developers were held on 14 April 2021 and 19 April 2021. Questions asking for data on faults and safety issues were circulated to around 30 attendees; three responses were received.
- ESV held a meeting with the ETU and the Plumbing and Pipe Trades Employees Union (PPTEU) on 21 April 2021. Following this meeting the ETU wrote to ESV outlining a range of safety concerns with the current arrangements.
- A workshop with MECs was held on 10 May 2021. A short set of questions were circulated following this meeting. All MECs responded.
- ESV met with the Essential Services Commission (ESC) on 17 May 2021 to seek information for this project. In March 2021, the ESC released new standards aimed at reducing delays in electricity connections on new housing estates.
- The ESV consultant engaged by ESV to assist with the project conducted a telephone survey in June 2021 of eleven key URD contractors. It is estimated that these companies together undertake 90 per cent or more of URD cable jointing work in Victoria.

The key comments made by these stakeholders during the consultation are summarised below. A number of issues were raised that were not within the scope of the project; nevertheless, ESV has noted these issues also.

## Summary of key stakeholder views

The key points made by each of the stakeholders groups during consultation are summarised below and illuminate the findings.

### Key URD contractors, auditors, and developers

ESV engaged with key URD contractors, auditors, and developers via a combination of workshops, face-to-face individual meetings and telephone engagement. Detailed feedback was received from eleven of the primary URD contractors that account for over 90 per cent of greenfield URD cable jointing work undertaken in Victoria.

The view of all eleven of the key contractors consulted was that they already, either directly or by sub-contract arrangements, employ or engage only Certificate III qualified cable jointers to undertake this activity in greenfield sites. This is also a requirement of contractor accreditation and a contract condition with some MECs for greenfield work.

Generally, contractors believe that setting a minimum Certificate III qualification for greenfield URD jointing will ensure the current self-applied industry standard is assured into the future.

### Unions (ETU & PPTEU)

The unions view is that all cable jointing along with other tasks including jointing, connections, terminations, earthing systems and installation of associated high voltage equipment should be undertaken by tradespersons holding a licence, as it will be part of the supply network when commissioned. They believe using properly qualified personnel provides the assurance that each part of the installation is installed to the highest standard and can be signed off as compliant before becoming part of the MEC's network.

### Major Electricity Companies (MEC)

ESV engaged with MECs via a combination of workshops, face-to-face individual meetings and telephone engagement. Additionally the MECs submitted fault and incident data to ESV during this research project

MECs stated that:

- The Victorian Electrical Distribution Networks (VEDN) accreditation process is responsible for accrediting civil contractors who are involved in the civil aspects of URD electrical infrastructure installation. Cable jointing works are not considered part of these civil activities; however MECs maintain a separate Recognised Contractor List (RCL) for Customer Initiated Augmentation Works (CIAW) which includes the ability for contractors to undertake electrical work, including jointing.

  The RCL provides customers (including Developers) with a list of contractor options to undertake CIAW's. The RCL identifies, at a company level, the contractors who have met all the minimum electrical industry skill requirements to undertake the work. When making an application for inclusion as a recognised contractor the evidence provided by the applicant is checked against the industry skills matrix to ensure compliance. Contractors on the RCL are reviewed annually to ensure ongoing compliance.
- Historically there has been minimal public safety risk when an in-service underground cable joint fails, particularly as they are buried to an average depth of 800mm. The MECs had no records of any injury to third party persons caused by cable failures, nor to any workers

performing URD estate work (which is performed dead or de-energised). A cable fault will result in a power disruption almost 100 per cent of the time.

# 3 Key Findings

The key findings of the greenfield URD cable jointing research project are that:

1. No evidence of systemic or widespread safety or competency issues or use of unqualified workers was found.
2. Certificate III qualified cable-jointers typically undertake work in greenfield URD estates.
3. Contractual arrangements are established between developers and MECs prior to construction commencing, with some MECs specifying the use of Certificate III qualified cable jointers only.
4. The specific exemption was not remade in the Order in Council with the introduction of the remade Electricity Safety (Registration and Licensing) Regulations 2020 from 1 January 2021. Therefore, as URD cable jointing work is defined as '*electrical installation'* work it is arguable that it is required to be carried out by licensed electricians.

   In practice the work is being carried out by qualified cable jointers. Requiring the work to be carried out by licenced electricians may not necessarily improve the quality and safety outcomes of work as licenced electricians generally do not perform cable jointing of this nature.

## Other Findings

1. All contractors consulted, and some MECs, already require the use of Certificate III cable jointers in this area.
2. At the time of consultation over 70 per cent of all qualified cable jointers working in greenfield URD estates had already applied for, or obtained, a cable jointers licence.

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# Appendix A

| | Cable jointing in URD estates research project plan | | | |
|---|---|---|---|---|
| **Who** | **Step** | **Initiative** | **Milestones/deliverables** | **By** |
| ESV | **1.** | Initial consultation with key stakeholders | • Engage with all key stakeholders including but not limited to, VEDN civil contracting sector, Unions, MECs, Estate developers and DELWP to flesh out key concerns, views and any relevant data and facts. | March 21 |
| | **2.** | Understand the work | • Identify the scale/size of the workforce<br>• Understand the existing governance, oversight and controls/requirements<br>• Determine the current qualifications, training and skills of the workforce. | May 21 |
| | **3.** | Assess safety outcomes | • Identify sources of data for incidents and near misses in sector<br>• Analyse any identified incident data<br>• Complete a risk assessment of sector work<br>• Determine safety benefits to the realised. | May 21 |
| | **4.** | Research findings | • ESV to publish a research project findings report. | August 21 |
| DELWP | **5.** | Policy options | • DELWP to investigate potential implications of the findings report. | Aug - Sept 21 |
| | **6.** | If required, undertake regulatory impact analysis (RIS) | • Articulate the issues requiring regulatory response<br>• Identify the costs and benefits of options to rectify the identified issue<br>• Consult with all key stakeholders on the options. | Feb - Apr 22 |
| | **7.** | If required, finalise any regulatory changes | • Finalise any required action – either legislative amendment or regulatory policy. | May - Jun 22 |