# Esso Pipeline Replacement Project-Giant Gippsland Earthworm Survey Report

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# **Final Report**



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Terrestrial Invertebrate Consulting



# Esso Pipeline Replacement Project-Giant Gippsland Earthworm Survey Report

Prepared for Biosis Pty, Ltd,

on behalf of

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by



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#### **ABREVIATIONS**

DEPI: Department of Environment and Primary Industries DoE: Department of the Environment EPBC Act: Environment Protection and Biodiversity Conservation Act 1999 EVC: Ecological Vegetation Class FFG Act: Flora and Fauna Guarantee Act 1988 GGE: Giant Gippsland Earthworm, Megascolides australis HDD: Horizontal Directional Drilling

#### **EXECUTIVE SUMMARY**

#### **Project Background**

Esso Australia Pty Ltd currently transports stabilised liquids (both crude and condensate) in a pipeline between the Longford Crude Stabilisation Plant in Longford and the Long Island Point Tank Farm in Hastings. The existing pipeline is approaching its practical end of life, due to integrity issues and projected future flows. It is proposed to replace the pipeline with a new generation, smaller capacity pipeline within the existing easement (Esso Pipeline Replacement Project).

Approximately 27 km of pipeline traverses the northern extent of the range of *Megascolides australis*, the Giant Gippsland Earthworm (GGE) listed as Vulnerable (*Environment Protection and Biodiversity Conservation Act 1999*).

INVERT-ECO was commissioned by Biosis Pty Ltd on behalf of WorleyParsons to undertake a technical investigation and targeted field surveys for the GGE within the designated survey envelope of the Esso Pipeline Replacement Project. This report provides the results of this assessment in order to inform referrals and documents to assist in the construction planning process in order to avoid or reduce environmental impacts on this species.

#### **METHODS**

A targeted field assessment for GGEs was undertaken over approximately 27 km of the pipeline alignment east of Darnum Park Rd, Warragul to west of Westernport Rd, Drouin South between 28 October 2013 and 12 January 2014.

#### RESULTS

Evidence of Giant Gippsland Earthworms was identified from seven sites within (11550, 11600, 11740, 11840, 11860) or near (11610, 11730) the project survey envelope.

#### DISCUSSION

Activities associated with the construction and installation of the Esso Pipeline Replacement Project that have the potential to impact on GGE colonies include:

- Excavation and disturbance of soil by machinery associated with geotechnical investigations and open trenching for pipeline construction.
- Local hydrological disturbance associated with excavation of trench, diversion of water along pipes, changes to existing table drains, use of gravel and dewatering.
- Post site maintenance such as weed control.
- Potential isolation of adjacent populations.

#### RECOMMENDATIONS

Measures available to avoid or reduce any potential impacts of pipeline construction on GGE colonies in order of preference include:

- 1) Localised re-alignment of pipeline (avoidance).
- 2) Trenchless construction (boring) underneath GGE habitat (avoid/minimise).
- 3) Open trench and include salvage and release (may require offset).

Further details and requirements for these measures are provided in the report (section 6), with site specific recommendations provided in Table 2.

It is also recommended that these be further detailed in a Species Management Plan which can be submitted to Council and the projects Construction Environmental Management Plan.

A Contingency Plan is also provided to be implemented in the event that previously undetected populations of GGEs are accidentally exposed (Appendix 3).

The project has the potential to impact upon five of the seven colonies identified during the GGE desktop and field assessment. Only one site (Property # 11840) is potentially directly impacted by the proposed trenching works as the existing pipeline easement intersects current (occupied) GGE habitat. All other sites may be impacted indirectly by works undertaken within GGE buffer zones. However, impacts to the colonies can be avoided or substantially minimised by utilizing trenchless construction within GGE buffer zones and current habitat in addition to implementing the recommendations outlined in this report.

#### **1** INTRODUCTION

#### 1.1 Project Background

Esso Australia Pty Ltd currently transports stabilised liquids (both crude and condensate) in a pipeline between the Longford Crude Stabilisation Plant in Longford and the Long Island Point Tank Farm in Hastings (Figure 1). This pipeline (LFD700), approximately 186 km in length, was constructed in 1969 and the 86 km section between Longford and Westbury was replaced in 1980. The existing pipeline is approaching its practical end of life, due to integrity issues and projected future flows. It is proposed to replace the pipeline with a new generation, smaller capacity pipeline within the existing easement (Esso Pipeline Replacement Project).

The project aims to avoid triggering the need for an Environmental Effects Statement under the *Environmental Effects Act 1978* or *Environmental Protection Biodiversity Conservation Act 1999*. However, at the same time, Esso Australia Pty Ltd is committed to minimizing any adverse environmental impacts.

A desktop review of environmental sensitivities undertaken for the proposed works by WorleyParsons (2013), identified approximately 27 km of the existing pipeline traverses the northern extent of the range of *Megascolides australis*, the Giant Gippsland Earthworm (GGE), a species of State and Federal conservation significant (see section 1.2).

INVERT-ECO was commissioned by Biosis Pty Ltd on behalf of WorleyParsons to undertake a technical investigation and targeted field surveys for the GGE. This report provides the results of a targeted field assessment for the GGE within the survey envelope in order to inform referrals and documents to assist in the construction planning process in order to avoid or reduce environmental impacts on this species.



Figure 1 Location of the study area, Longford 700 Pipeline, Longford to Hastings

#### 1.2 Giant Gippsland Earthworm Megascolides australis

EPBC Act 1999 Conservation Status: Vulnerable FFG Act Conservation Status: Threatened IUCN Red List of Threatened Animals: Vulnerable DSE Advisory List of Threatened Invertebrates: Listed

The Giant Gippsland Earthworm is one of the largest species of earthworm in the world, with adults reaching lengths of over 1.5 m and weights of up to 400 g (Van Praagh 1992). The species is restricted to south and west Gippsland, Victoria, with Warragul and Drouin marking the northern extent of its range and Almurta and Korumburra the southern extent (Figure 2). Mt Worth represents the most easterly point of distribution. Three records of GGE occur within or close to the survey envelope (Victorian Biodiversity Atlas and INVERT-ECO, 2010).

The majority of the species range occurs on private land used for agriculture. The most common place where colonies are found is along clay creek banks and drainage lines, usually above the areas prone to flooding. Away from waterways, they occur near underground springs and soaks, either in gullies or on south-facing slopes with terracettes. The species is generally found in the deep blue-grey or red clay soils.

While the species occurs over an area of approximately 40,000 ha, areas of suitable habitat within its range are patchy leading to small, fragmented populations. A combination of many interrelated factors such as slope, micro-topography, nature

and depth of the soil and hydrological processes determine suitable habitat (Van Praagh *et.al.* 2007). GGEs live in complex, permanent burrows that extend to around 1.5 m in depth. Worms remain underground, feeding on the root material and organic matter ingested in the soil. They breed in spring and summer when they lay large, amber coloured egg cocoons (Van Praagh 1996).



Plate 1 Adult Giant Gippsland Earthworm

Aspects of the biology and ecology of the GGE such as long lifespan, low reproductive and recruitment rates, and poor dispersal ability render the fragmented populations particularly vulnerable to threatening processes (Van Praagh 1992). There are a range of processes that threaten GGE colonies. The most widespread and serious are the physical disturbance and compaction of soils, alterations to water tables and drainage patterns at the local and regional level.

#### **1.3 Scope of Assessment**

The objective of the study is to extend the findings of the desktop sensitivities assessment by WorleyParsons to:

- Identify the location of GGE populations which could potentially be affected by the project.
- Provide coordinates of areas where field studies are needed to confirm the presence or absence of GGE sites prior to construction.
- Field verify these locations to confirm the presence or absence of GGE populations.
- Provide specific, practical, achievable mitigation measures to protect GGE populations during pipeline construction.



# Figure 2 Known distributional range of the Giant Gippsland Earthworm (produced by Baw Baw Shire Council)

## 2. METHODS

The Giant Gippsland Earthworm assessment was a two stage process involving a desktop review of existing data and information and targeted field survey.

### 2.1 Data and Information Review

- a review of the Department of Environment and Primary Industries' Victorian Biodiversity Atlas and private records (INVERT-ECO). See Figure 2; and
- a visual assessment of aerial photographs of the proposed alignment to identify areas of potential GGE habitat for targeted field sampling.

Based on this analyses, the area to be reviewed included approximately 27 km of the pipeline alignment east of Darnum Park Rd, Warragul, to west of Westernport Rd, Drouin South, as identified in Maps 1-5 provided in the GGE study brief by WorleyParsons (September 2013).

This area was then assessed for suitable GGE habitat and the selection of sites for targeted for field investigations. Suitable earthworm habitat includes moist, blue-grey and red clays along stream banks, soaks, gullies and south facing hillslopes.

### 2.2 Field Survey

Field surveys were undertaken between 28 October 2013 and 12 January 2014.

- Visual inspection of the proposed alignment, where possible to identify additional areas of suitable habitat.
- Sampling was primarily restricted to the survey envelope, targeting areas of suitable habitat. Surveys extended outside the envelope if suitable habitat was directly adjacent to the survey envelope.

As GGEs are completely subterranean, there are no above ground signs to indicate whether this species is present. Identification of colonies requires excavation of soil quadrats to look for GGE evidence.

• Surveys involved banging the ground with a spade and listening for "gurgles", the sound that is made when the worms retreat down their burrows (note that absence of gurgling does not exclude presence) and;

• Digging small soil quadrats to a maximum depth of approximately 30 cm<sup>3</sup> to look for GGE burrows and cast (waste) material (Plate 2). GGE burrows are much larger than those of other earthworm species (up to 2.5 cm in diameter) and generally have the earthworm's annuli or rings, imprinted on the inside of the burrows (Plate 3). Wet burrows indicate an earthworm is currently occupying the burrow.



Plate 2 GGE sampling quadrat with earthworm burrow



Plate 3 GGE burrow showing annuli

For the purposes of this report, a site where direct evidence of GGEs was recorded is referred to as "current GGE habitat". Sites where sampling failed to located evidence of the species but supported a number of suitable habitat characteristics are described as "potential GGE habitat" to compensate for the limitations in sampling (see Section 2.4).

#### 2.3 Data Collection

A handheld Garmin GPS with an accuracy of 3-15 m was used to collect GGE location data (GDA 94). This data was supplied to Biosis Pty Ltd for mapping.

#### 2.4 Assessment Qualifications and Limitations

This targeted assessment was restricted to the survey envelope identified in the concept alignment maps supplied (Biosis Pty Ltd - 30 September & November 12 2013). Some sites within the targeted sampling areas were inaccessible due to water-logging and access track conditions.

The depth of quadrat excavation was restricted to a maximum of 30 cm due to the presence of existing pipeline infrastructure. This may have reduced the likelihood of detecting very small or low density colonies. To compensate, additional quadrats were excavated where possible.

GGEs can be difficult to detect due to their patchy distribution, the often small extent of individual colonies and subterranean habits. It is therefore possible that some areas of suitable habitat were not identified during the desktop or field assessment and that some colonies remain undetected. Areas most at risk include those away from waterways and soaks where sites of increased or seasonal soil moisture are more obscure. These risks are addressed by the development of a contingency plan, endorsed by DEPI for the accidental exposure of GGEs not identified during this assessment (see Section 7, Appendix 3).

# **3. RESULTS**

The distribution of GGEs and potential habitat identified within the proposed Esso Pipeline Replacement Project survey envelope is provided in Figures 3-8 and Appendix 1 & 2. Evidence of GGEs was identified from seven sites during this assessment. Of these seven sites, five sites occur within the survey envelope (11550, 11600, 11740, 11840, 1160) while the remaining two sites (1730 & 11610) occurred adjacent to or near to the survey envelope.

#### 3.1 Property #11550

GGEs were identified along the north eastern boundary of this property, adjacent to Cameron's Rd (Figure 3). Evidence of GGEs extended approximately 10-15 metres into the pasture but did not extend to the drainage line which traverses east-west through the property (Plate 4). While burrows were located, it was difficult to determine the status of the colony as no gurgles were heard. The land owner had not heard the worms for around 10 years when he collected a live individual while doing drainage works along the fenceline. While GGEs occur within the study area, they are unlikely to occur within the existing pipeline easement which is situated much higher above a north-west facing slope of the property.



Plate 4 GGE habitat adjacent to fence line at property #11550

#### 3.2 Property #11600

GGE were recorded in 2010 (Van Praagh 2010) from this property when they were disturbed during road construction for a proposed residential development. The colony occurred along the base of the south facing slope, a major portion of which is now under the paved access road (Serine Close- Figure 4, Plate 5). Large numbers of GGE

were destroyed during the construction of this road and a number of earthworms were rescued and released in the northwest corner of the property (see Figure 4). Despite extensive sampling over the survey envelope during the current survey, only one GGE burrow was detected within the original colony site and another burrow at the relocation site. It appears likely that the previous site works have substantially reduced GGE numbers. GGE are unlikely to occur within the existing pipeline easement within this property where it occurs higher up on the drier section of the south facing slope or in the areas prone to long periods of water-logging (Plate 6). However, due to the size of the survey envelope, it is possible that the species occurs in very low densities elsewhere on the site and may be impacted by any site works outside of the existing pipeline easement.



Plate 5 GGE habitat between existing pipeline easement and Serine Close at property #11600



Plate 6 Areas of waterlogged soil which are generally unsuitable for GGEs at property #11600

#### 3.3 Property #11610

While no evidence of GGE was found within the survey envelope, a large colony was located adjacent to the southern boundary of the survey envelope (Figure 4, Plate 7) where they occurred extensively within the vegetated area and associated creek bank. It is likely that the colony extends into the survey envelope along its southern boundary, under the tree canopy where suitable conditions were found (Plate 8).



GGE colony adjacent to survey envelope

Plate 7 GGE habitat among vegetation adjacent to the southern boundary of survey envelope at property #11610



Plate 8 Potential GGE habitat within survey envelope property #11610

#### 3.4 Property #11730

No evidence of GGEs was found within the study envelope. However, records of the species occur approximately 150 m north of the survey envelope along the tributary of Hazel Creek (Figure 5).

#### 3.5 Property #11740

Evidence of GGEs was located among stand of Swampy Woodland Ecological Vegetation Class (EVC) (pers. com Matt, Dell, Biosis) in the northern section of the survey envelope (Figure 6, Plate 9). The colony extended over an area of approximately 75 m east-west and 30 m south from the track to the edge of the water-logged wetland. However, the highest density of burrows was restricted to a smaller area of moist soil in the eastern section of the identified habitat.



GGE colony

Plate 9 GGE habitat among Swampy Woodland at property #11740

#### 3.6 Property #11840

GGEs (including empty egg cocoon) were located in and around a large stand of Damp Forest EVC (pers.com. Matt Dell, Biosis). GGE habitat was located within and adjacent to the southern edge of the survey envelope, around King Parrot Creek (Figure 7, Plate 10 & 11). Burrows did not appear to occur directly within the existing pipeline corridor.



Plate 10 GGE habitat extending to the southern edge of the survey envelope at property #11840



Plate 11 Empty egg cocoon located directly adjacent to survey envelope at property #11840

#### 3.7 Property # 11860

One GGE colony was identified from within the study envelope. The colony was found in the open areas of the stand of remnant vegetation and extended approximately 8 m into the pasture around the edges of the vegetation (Figure 8, Plate 12). Two additional sites outside the survey envelope were identified as containing potential GGE habitat, but no evidence was found (Plate 13 & 14).



Plate 12 GGE habitat within and adjacent to stand of vegetation at #11860



Plate 13 Potential GGE habitat around creek bank and dam though no evidence found #11860

### 4 KEY THREATS

#### 4.1 Giant Gippsland Earthworm

GGEs live in often small, isolated areas that support a complex of interrelated variables that create suitable habitat. They live entirely underground in permanent, burrow systems (Kretzschmar and Aries 1992) and have very low dispersal abilities (Woods 2006). This means that they are unable to move away from threatening processes, making colonies highly vulnerable to changes in their environment. There are a range of processes that pose threats to GGEs colonies including disturbances to their soil habitat (physical and chemical) and alteration to local drainage patterns and water table levels. These include:

- Soil excavation and disturbance –Damages or kills individuals and egg cocoons. GGE are fragile and do not appear to recover from bruising or injury.
- Altering the local soil habitat e.g., compaction and fill deposition.
- Altering local soil hydrological conditions directly within earthworm habitat e.g., realignment or filling-in existing drainage channels, altering topography and inappropriate re-vegetation of earthworm habitat.
- Changing hydrological conditions indirectly e.g., upslope or adjacent to earthworm habitat.
- Chemical disturbances -Run-off of pollutants, use of weedicides and herbicides.

#### 4.2 Potential Project Impacts

Activities associated with the construction and installation of the proposed Esso Pipeline Replacement Project that have the potential to impact on GGE include;

Physical Disturbance:

- Excavation and disturbance corridor associated with open trenching for pipeline construction.
- Excavation for geotechnical investigations.
- Compaction and churning of soil by machinery.
- Potential isolation of adjacent populations.

Local hydrological disturbance:

- Changes in local topography associated with excavation of trench.
- Diversion of water along pipes.
- Disturbance of existing table drains, use of gravel.
- Dewatering.

Post site maintenance:

• Weed control.

# 5 ENVIRONMENTAL POLICY AND LEGISLATION

#### 5.1 Environment Protection and Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act (EPBC Act) establishes a Commonwealth process for assessment of proposed actions that are likely to have a significant impact (Table 1) on matters of national environmental significance, or on Commonwealth land. The EPBC Act applies to actions (e.g. developments or projects) that may have a significant impact on matters of national environmental significance. The nine matters of national environmental significance to which the EPBC Act applies are:

- Listed threatened species and ecological communities
- Listed migratory species
- World heritage properties
- National heritage places
- Wetlands of international importance
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions
- A water resource (for coal seam gas or coal mining development)

#### Table 1 Summary of significant impact criteria for Vulnerable EPBC Act listed threatened

Significant Impact Criteria
Criteria 1: Lead to a long-term decrease in size of population
Criteria 2: Reduce the area of occupancy of the species
Criteria 3: Fragment an existing population into two or more populations
Criteria 4: Adversely affect habitat critical o the survival of the species
Criteria 5: Disrupt a breeding population
Criteria 6: Modify, destroy, remove, isolate or decrease the availability or quality of habitat
to the extent that the species is likely to decline
Criteria 7: Result in invasive species that are harmful to an endangered species becoming
established in the species' habitat
Criteria 8: Introduce disease that may cause the species to decline
Criteria 9: Interfere substantially with the recovery of the species.

Important populations are a key consideration when assessing impacts on threatened species as they are essential for future conservation, dispersal, supporting gene flow and maintaining population viability.

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- Key source populations either for breeding or dispersal
- Populations that are necessary for maintaining genetic diversity, and/or
- Populations that are near the limit of the species range.

As the GGE is an EPBC Act-listed species, a referral to the Commonwealth Minister for DEWHA may be necessary if the works are deemed to have an impact on an important population. Determining the importance of an individual GGE colony is challenging given our lack of understanding of this species such that the loss of any GGE colony should be viewed in the overall context of incremental habitat loss for this species. The majority of known populations of Giant Gippsland Earthworms are small and isolated and therefore highly vulnerable to disturbance.

#### 5.2 FFG Act

The Flora and Fauna Guarantee Act (FFG Act) is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes. The FFG Act lists:

- Threatened species of flora and fauna (genera, species, subspecies, varieties);
- Threatened communities of flora and fauna (the Threatened List);
- Protected flora; and
- Potentially threatening processes (the processes list).

A permit is required from DSE if an action on public land proposes to collect, kill, injure or disturb protected flora and fauna and ecological communities.

A permit from DSE under the FFG Act in relation to the Giant Gippsland Earthworm is required where the project impacts on colonies on public land.

#### 5.3 Significance Overlays

Each municipality in Victoria is covered by a planning scheme, which sets out policies and provisions for the use, development and protection of land (zones and overlays). An overlay is a planning provision intended to ensure that important aspects of the land are recognised. Overlays indicate the type of development and/or protection, which may be appropriate in that area.

Baw Baw Shire Council has incorporated an Environmental Significance Overlay Schedule 4 (ESO) – Protection of Giant Gippsland Earthworm and Habitat Areas and a Reference Document into the Baw Baw Planning Scheme. This Reference Document provides detailed planning pathways to facilitate proponent requirements for planning applications where GGEs are located within sites of development proposals.

#### 5.4 Recovery Plan

A National Recovery Plan for the GGE has been prepared (Van Praagh & Yen 2010). The Australian Government Minister for the Environment may make or adopt and implement recovery plans for threatened fauna, threatened flora (other than conservation dependent species) and threatened ecological communities listed under the EPBC Act.

Recovery plans set out the research and management actions necessary to stop the decline of, and support the recovery of, listed threatened species or threatened ecological communities. The aim of a recovery plan is to maximise the long term survival in the wild of a threatened species or ecological community.

## **6** IMPACT MINIMISATION RECOMMENDATIONS

#### 6.1 Options

The preferred strategy for mitigating negative impacts to GGEs that might arise from proposed works should avoid, minimise and/or offset such impacts. Suggested measures to avoid and minimise impacts from the proposed replacement pipeline project are outlined below. These should be further detailed in a Species Management Plan which can be submitted to regulators if required.

Measures available to avoid or reduce any potential impacts of pipeline construction on GGE colonies in order of preference include;

- 1) Localised re-alignment of pipeline (avoidance)
- 2) Trenchless construction (boring) underneath GGE habitat (avoid/minimise)
- 3) Open trench and include salvage and release (may require offset)

#### 6.1.1 Deviation of pipeline alignment - Avoid

As the footprint of the proposed trenching works associated with the construction of the pipeline is relatively narrow, deviation of the alignment maybe possible and is the preferred strategy. This can generally be achieved by seeking an alternative alignment that avoids discrete areas of GGE habitat. Any deviation of the alignment outside the proposed survey envelope would require additional investigation to ensure it does not encroach on suitable habitat.

The flexibility to substantially alter the proposed alignment may be constrained by the need to remain within the existing pipeline easement. If an alternate alignment that avoids GGE habitat cannot be identified or is not feasible, other mitigation options are required.

#### 6.1.2 Trenchless Construction - Avoid/Minimise

Where deviation of pipeline alignment is not possible, trenchless construction such as Horizontal Direction Drilling (HDD) or similar underneath GGE habitat is required. Where crossing waterways, trenchless construction involves drilling a tunnel beneath the bed and banks of the waterway into which the pipeline can be installed. The main advantage of this technique is that it does not disrupt the stream banks, which is the primary habitat of GGEs. This method can also be applied where GGE occur in suitable habitat away from waterways to avoid excavation within the top 2 m of soil occupied by GGEs. Requirements for trenchless construction include -

- Minimum depth of 3 metres from the soil surface to avoid any impact on GGEs with a preference for a greater depth where possible.
- A buffer between the edge of the earthworm habitat and the excavation of launching and receival pits (minimum 30 m).

While trenchless construction is thought to have minimal impact on GGE populations, the exact depth at which to bore may vary depending on local conditions. For example, GGEs usually occur within the top 1.5 m of soil but may burrow to greater depths depending on season and site specific conditions such as the depth of bedrock. In addition, any hydrological changes resulting from subsidence or redirecting of drainage around the pipeline once installed needs to be considered.

If this method is employed within occupied GGE habitat, the process should be monitored. This could include utilising an investigative camera while boring, inspecting the excavated soil for evidence of earthworm burrows and monitoring hydrological impacts.

#### 6.1.3 Rescue and Release and Offsets

Offsets can only be considered as a primary mitigation approach when all reasonable attempts have been made to avoid or reduce impact on GGE or its habitat. Translocation or rescue and release prior to or during construction is not considered a measure to mitigate for impact on the species, nor does it omit the requirement for offsets. Under some circumstances where impacts cannot be avoided or minimised, translocation or rescue and release may be considered, accompanied by an appropriate offset.

Offset measures that might be considered include:

- Provision of research funding that would be allocated to improving knowledge on the conservation requirements of the species (this may include translocation and monitoring), and/or;
- Provision of additional conservation security to a population of GGE via a conservation covenant or ontitle agreement.

Determining the appropriate scope and size of an offset package would be influenced by the conservation significance of the GGE population present and the magnitude of impact. Approval from the Commonwealth Environment Minister is required for projects deemed to have a significant impact on matters of national significance under the EPBC Act.

Rescue and release protocols are outlined in Appendix 2 as per the Contingency Plan.

#### 6.2 Recommendations and Management Actions

The following section outlines priorities and management actions that can be undertaken to avoid or minimise impacts on GGE colonies during and post pipeline construction. Mitigation recommendations relating to each GGE colony identified are summarized in Table 2 and are prioritised in order of preference. General project recommendations to reduce impacts are provided below.

To reduce the impacts of the construction phase of the replacement pipeline project on GGE colonies, a detailed Construction Environmental Management Plan should be developed to outline measures to protect GGE habitat during construction activities.

All identified GGE colonies require the installation of a minimum 30 m buffer zone. The area occupied by GGEs (e.g. areas where evidence of GGEs was identified) is described as "current GGE habitat". Buffer zones refer to an area surrounding GGE habitat (generally 30 m) and begin from the edge of GGE habitat.

It is recommended that the footprint of disturbance is kept to a minimum and the following guidelines are implemented.

#### Current GGE habitat

- Ensure key personnel take part in a site induction so that they are familiar with the identification of GGEs, their location along the alignment and the procedure should any undetected populations be discovered (see Section 7, Appendix 3).
- Current GGE habitat should be identified as 'no go' areas for contractors, machinery, waste and storage materials.
- Do not undertake any excavation or soil disturbance within GGE habitat.
- Protect the hydrology of GGE habitat and ensure there are no adjacent impacts that could alter soil moisture conditions.
- Water quality protection measures (e.g. sediment and pollution controls) should be installed during clear and grade.

#### Buffer Zones

Avoid disturbance to buffer zones, except for:

- Employ trenchless construction for pipeline placement if alignment occurs within buffer zone.
- If plant vehicle access within buffer zone cannot be avoided, minimise access particularly during wet periods.
- Ensure appropriate buffers (min 30 m) for pads, launching and retrieval pits for trenchless construction.
- Minimise construction clearing path, soil disturbance and construction footprint.
- Do not remove top-soil for plant clearing access within buffer zone or, if required, not within 20 m of GGE colony.
- Land should be re-instated to existing condition post-construction (including hydrological condition) to prevent changes in soil moisture content.
- See table 2 for specific mitigations measures for buffer zones

#### General Management Actions around GGE habitat and buffer zones

- Pipeline should be inspected for areas of water ponding post construction and managed accordingly.
- Water quality protection measures (e.g. sediment and pollution controls) should be installed during clear and grade.
- When revegetation is planned for a site, consideration should be given to using plants with minimally invasive root systems and low water usage (e.g., use native grasses, sedges and herbs).
- Avoid application of herbicides, pesticides and other chemicals in areas where the species is present or potentially present. Use appropriate herbicides accredited for safe use around waterways (e.g. Bioactive Roundup).
- Consider GGE habitat when determining placement of access roads and associated infrastructure for pipeline construction and avoid where possible.

#### Table 2 Summary of recommendations to mitigate potential impact on GGEs

Property File Number	Description	GGE habitat and buffer in relation to existing pipeline easement	Recommended mitigation (in order of preference)	
11550	GGE occur within study envelope adjacent to Cameron's road.	GGE colony is approximately 400 m north-west of existing pipeline easement.	<ol> <li>Avoid any excavation and major disturbance to identified GGE habitat and associated roadside verge along Cameron's Rd.</li> <li>Install 30 m buffer to current GGE habitat.</li> <li>If GGE habitat cannot be avoided, trenchless construction is required for any trenching works.</li> </ol>	
11600	Potential for some individuals to occur between existing pipeline easement and Mattzed/Serine Close.	Current pipeline easement intersects northern section of 30 m buffer.	<ol> <li>Use trenchless construction below GGE habitat (minimum 3 m) as a precaution if disturbance to occur in area identified as current GGE habitat.</li> <li>Restrict survey envelope and soil disturbance to as small as feasible.</li> <li>Avoid excavation and soil disturbance to identified GGE habitat, (between Serine Close and existing pipeline easement) and GGE relocation sites.</li> <li>Keep machinery and stockpiling above (north) of existing pipeline easement.</li> <li>If open trenching, excavate to north of existing pipeline to reduce impacts on GGE buffer.</li> <li>Reinstate pre-construction drainage patterns.</li> </ol>	

Property File Number	Description	GGE habitat and buffer in relation to existing pipeline easement	Recommended mitigation (in order of preference)
			<ol> <li>Engage specialist to be present if excavation likely to impact on any GGE habitat identified as current.</li> <li>Implement Contingency Plan if GGE encountered during works.</li> </ol>
11610	GGE occur adjacent to southern boundary of survey envelope and likely to extend into envelope under tree canopy adjacent to fenceline.	Survey envelope intersects entire GGE buffer.	<ol> <li>Maintain 10 m area within 30 m buffer along southern edge of survey envelope. Machinery access allowed outside 10 m buffer.</li> <li>Use trenchless construction where pipeline intersects buffer zone.</li> <li>Keep machinery and stockpiling north of existing pipeline easement to ensure maximum distance from current GGE habitat in adjacent property.</li> <li>Implement Contingency Plan if GGE encountered during works.</li> </ol>
11730	No GGE found within study area but recorded approximately 150 m north of survey envelope.	Existing pipeline easement does not impact on GGE colony or GGE buffer zone.	<ol> <li>Implement Contingency Plan if GGE encountered during works.</li> </ol>

Property File Number	Description	GGE habitat and buffer in relation to existing pipeline easement	Recommended mitigation (in order of preference)
11740	GGE found under Swampy Woodland within northern section of survey envelope.	Alignment may intersect southern section of GGE buffer zone.	<ol> <li>Avoid any excavation and soil disturbance to identified current GGE habitat.</li> <li>Install a 30 m buffer around GGE habitat.</li> <li>Trenchless construction where pipeline intersects buffer zone (min. 3 m depth).</li> <li>Install appropriate buffers for launching and retrieval pits (min. 30 m).</li> <li>Engage specialist to be present if any excavation impacts on current GGE habitat identified.</li> <li>Implement Contingency Plan if GGE encountered during works.</li> <li>Keep all associated works and vehicle traffic east of the existing pipeline easement in GGE buffer zone.</li> </ol>

Property File Number	Description	GGE habitat and buffer in relation to existing pipeline easement	Recommended mitigation (in order of preference)
11840	A large GGE colony extends into the southern section of the survey envelope.	Entire survey envelope and current pipeline easement intersects GGE buffer zone and possibly current GGE habitat.	<ol> <li>Avoid any excavation or soil disturbance to current GGE habitat south of the survey envelope.</li> <li>Use trenchless construction below creek and associated GGE habitat (min. depth 3 m) and</li> <li>install appropriate buffers for launching and retrieval pits (min. 30 m).</li> <li>Restrict corridor footprint and soil disturbance to as small as feasible adjacent to GGE habitat.</li> <li>Ensure creek banks within GGE habitat and buffer zone remain intact.</li> <li>Keep all associated works and vehicle traffic to the north of the existing pipeline easement where GGE habitat is less suitable.</li> </ol>
11860 (Current habitat)	GGE occur within northern section of survey envelope adjacent to stand of vegetation. GGE extend approximately 8 m into pasture from edge of vegetation, approximately 20 m north of existing pipeline easement.	Existing pipeline easement intersects southern section of GGE buffer zone.	<ol> <li>Avoid any excavation and soil disturbance to current GGE habitat.</li> <li>Install a 30 m buffer around GGE habitat.</li> <li>Trenchless construction where pipeline intersects buffer zone (min. 3 m depth).</li> <li>Install appropriate buffers for launching and retrieval pits (min. 30 m).</li> <li>Keep all associated works and vehicle traffic east of the existing pipeline easement in GGE buffer zone</li> </ol>

Property File Number	Description	GGE habitat and buffer in relation to existing pipeline easement	Recommended mitigation (in order of preference)
11860 (Potential habitat)	Potential GGE habitat identified in 1) creek bank and 2) edge of dam.		1. Avoid any disturbance to potential habitat.

The project has the potential to impact upon five of the seven colonies identified during the GGE desktop and field assessment. Only one site (Property # 11840) may be directly impacted by the existing pipeline easement (and therefore trenching works) intersecting current GGE habitat. All other sites may be indirectly impacted by works undertaken within GGE buffer zones. However, impacts to the colonies can be avoided or substantially minimised by utilizing trenchless construction within GGE buffer zones and current habitat in addition to implementing the recommendations outlined in this report.

# 7 CONTINGENCY PLAN

A Contingency Plan should be implemented in the event that previously undetected populations of GGE are accidentally exposed (provided in Appendix 3-Guidelines for the accidental unearthing of GGEs). This applies to any works undertaken within the range of the GGE as identified during this survey. This plan should be included in the induction process for any contractors involved in this project.

In brief, the contingency plan requires an immediate halt to works within site where worms unearthed and the establishment of a 50 m buffer zone. This contingency plan requires the local translocation of uninjured worms to a suitable nearby site. Suitable release areas must be secure sites with long-term protection. There should be a minimum of 30 m between the release site and construction. Depending on the scope and size of the impact, a qualified specialist may be required to implement the protocols.

### 8 **REFERENCES**

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- Van Praagh, B.D. (2010). Impact assessment and mitigation options for conservation of Giant Gippsland Earthworms at a five lot subdivision of 201 Armours Rd, Warragul. Unpublished Report to Ross & Worth Pty Ltd, 5/61 Smith Street, Warragul.
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- Woods, R 2006. Genetic diversity and population structure of the Giant Gippsland Earthworm Megascolides australis Unpublished Honours thesis. Department of Genetics La Trobe University, Bundoora, Victoria

Property #	Comments		
	Properties surveyed where evidence of GGEs was found		
11550	GGE identified within study area along the north west boundary of property adjacent to Cameron's Rd. Restricted mainly to less water-logged areas and extend approx 10-15 m south of boundary fence. Found in survey envelope but unlikely to be within existing pipeline easement. Probably on roadside verge of Cameron's Rd.		
11600	Two surveys undertaken. Previous GGE records from site but colony impacted by past construction of access road. One burrow located from second survey. Unclear whether GGE extant. Potential to occur in low density in parts of survey envelope.		
11610	GGE located adjacent to survey envelope around creek and under vegetation. Possibly extend into southern section of survey envelope.		
11730	GGE identified from desktop assessment. Occur approximately 150 m north of existing pipeline easement, outside survey envelope.		
11740	GGE located under Swampy Woodland within northern section of survey envelope.		
11840	GGES found in around large stand of remnant Damp Forest adjacent to the east of the study area around King Parrot Creek. Found very close to existing pipeline easement but possibly not directly within easement.		
11860	One colony identified around edges and within remnant stand of vegetation within survey envelope. Two additional sites within survey envelope were identified with potential GGE habitat but no evidence found.		
	Properties surveyed where no evidence of GGEs identified		
11480	Did not survey entire study area due to size. Sampling concentrated around existing pipeline easement and waterways. Appeared to be large floodplain so low suitability for GGE.		
11560	Visual observation while walking over property. No suitable habitat.		
11590	Suitable habitat around corner of dam under vegetation. No evidence located.		
11620	No suitable habitat.		

Appendix 1- Results from Giant Gippsland Earthworm survey along EPRP.

Property #	Comments	
11680	Small roadside verge. No suitable habitat.	
11720	Small roadside verge. Disturbed.	
11730	GGE recorded elsewhere on property (2007) but not recorded within survey envelope during present assessment.	
11750	No suitable habitat.	
11810	No suitable habitat.	
11820	Some suitable habitat but largely disturbed and water-logged in parts.	
11850	Could not sample entire property due to cows coming in from milking. Floodplain, so unlikely to support suitable habitat.	
11950	Site too dry to support suitable habitat.	
11960	No suitable habitat.	
11970	Banks of drainage channel and dam surveyed.	
	Properties assessed visually but no targeted survey undertaken	
11700	Did not sample property site. Increase of survey envelope from original map. Doesn't look like there is potential habitat unless wet area occurs.	
11880	Visual observation from edge of property 11860. No apparent suitable habitat.	
11890	No suitable habitat observed from Road.	
11900	Visual observation from Campbell Rd. No suitable habitat observed from Road.	
11920	Visual from road. Doesn't appear to support suitable habitat.	
11930	Visual. No obvious suitable habitat observed from Thompson Road.	

Appendix 2 GGE polygon information for current habitat and buffer zones

Property #	COMMENTS	EASTING	NORTHING
11550	Current habitat	409487	5774311
11550	Current habitat	409487	5774311
11550	Current habitat	409489	5774311
11550	Current habitat	409489	5774311
11550	Current habitat	409489	5774311
11550	Current habitat	409489	5774311
11600	Site where 10 "rescued" GGE relocated in 2010	407618	5773689
11600	Current burrow	407771	5773598
11600	Potential habitat	407793	5773569
11600	Potential habitat	407793	5773569
11600	Current habitat 30m buffer	407790	5773588
11600	Current habitat 30m buffer	407790	5773588
11600	Current habitat 30m buffer	407790	5773588
11600	Current habitat 30m buffer	407790	5773588
11600	Current habitat 30m buffer	407790	5773588
11600	Current habitat 30m buffer	407790	5773588
11600	Current habitat 30m buffer	407500	5773539
11600	Current habitat 30m buffer	407500	5773539
11600	Original distribution of GGE found during excavation of Serine Close in 2010.	407789	5773589
11600	Original distribution of GGE found during excavation of Serine Close in 2010.	407789	5773589
11600	Original distribution of GGE found during excavation of Serine Close in 2010.	407789	5773589
11610	Current habitat 30m buffer	407500	5773539
11610	Current habitat 30m buffer	407500	5773539
11610	Current habitat 30m buffer	407500	5773539
11610	Current habitat	407498	5773545
11730	GGE colony found in 2007	405189	5773327
11740	Current habitat	404529	5773322
11740	Current habitat 30m buffer	404530	5773322
11740	Current habitat 30m buffer	404530	5773322
11840	Current habitat 30m buffer	401464	5773312
11840	Current habitat 30m buffer	401464	5773312
11840	Current habitat	401464	5773311
11860	Current habitat 30m buffer	399429	5773422
11860	Current habitat 30m buffer	399429	5773422
11860   Current habitat		399428	5773421
11860	Potential habitat	399261	5773369
11860	Potential habitat	399151	5773426

# GUIDELINES FOR THE ACCIDENTAL UNEARTHING OF GIANT GIPPSLAND EARTHWORMS

Even after appropriate survey, assessment and planning have been undertaken at a site, undetected populations of the Giant Gippsland Earthworm may be accidentally unearthed during project works. The following guidelines have been produced to manage these incidents.

# IN THE EVENT OF THE ACCIDENTAL UNEARTHING OF GIANT GIPPSLAND EARTHWORMS THE FOLLOWING ACTIONS SHOULD BE IMPLEMENTED IMMEDIATELY.

- 1. All works must cease within a 50m diameter AREA around the location of the incident.
- 2. The Site Supervisor must be alerted to the incident
- 3. The Site Supervisor must establish the AREA as an INCIDENT SITE by securing the boundary and preventing any movement of machinery into the site or any further disturbance to the soil.
- 4. The Site Supervisor must ensure that any earthworms left exposed in the soil are left in situ and covered with a 10cm layer of moist soil.
- 5. The Site Supervisor must ensure that any earthworms unearthed and appearing uninjured must be collected and relocated according to the instructions provided.
- 6. The Site Supervisor must ensure that any dead or injured animals are collected and put in FROZEN STORAGE as soon as possible after unearthing for collection by DSE.
- 7. The Site Supervisor must ensure that the Biodiversity Unit, DSE Office, Traralgon (Ph: 03 51722111) is contacted within 24 HOURS regarding earthworms that required collection.
- 8. The Site Supervisor must ensure that an INCIDENT REPORT is completed in the format provided and sent to the Agency responsible for authorizing the works (e.g. DPI, shires, DSE) within 24 HOURS OF THE INCIDENT.

AN ASSESSMENT OF THE IMPACT OF WORKS ON THE GIANT GIPPSLAND EARTHWORM POPULATION MAY BE REQUIRED BY THE AUTHORISING AGENCIES. ADVICE WILL BE GIVEN ON HOW TO PROCEED WITH WORK ACTIVITIES AS QUICKLY AS POSSIBLE.

The Giant Gippsland Earthworm has been officially listed under both Victorian and Federal legislation as a threatened species. As a result, permits from both levels of government may be required to either remove animals or interfere with their habitat. Substantial penalties may apply for non-adherence.

# INCIDENT REPORT FOR THE ACCIDENTAL UNEARTHING OF GIANT GIPPSLAND EARTHWORMS

Name of company/organisation:
Name of contact:
Contact details:
Location of Incident:
Date of Incident:
Size of area from which earthworms unearthed
Number of earthworms recovered in situ
Number of earthworms taken for relocation
This Incident Report must be sent to the authorizing agency within 24 hours

#### INSTRUCTIONS FOR RELOCATING GIANT GIPPSLAND EARTHWORMS

It is important that the following instructions are followed in order to ensure the best possible chance of survival for Giant Gippsland Earthworms that have been accidentally unearthed and need to be placed back into the soil.

1. Collect all uninjured earthworms. Giant Gippsland Earthworms are fragile and must be handled with great care. They cannot support their own weight out of their burrows. They must ALWAYS be carried in a HORIZONTAL position. They should NEVER be held vertically and allowed to dangle. This always results in DEATH.

2. If more than one earthworm is unearthed, they can be kept in plastic box or esky with moist soil with either wet hessian or newspaper over the top for up to ONE HOUR while the relocation site is prepared. If the WEATHER is VERY WARM, earthworms must be relocated as SOON AS POSSIBLE.

3. Earthworms must be kept in a shaded location while being kept for relocation.

4. Relocate uninjured earthworms to a nearby site that will not be subject to any earthworks. This site should have a moist, predominantly clay soil.

5. Dig a small trench to a depth of approximately 30 cm. The length of the trench should be at least as long as the earthworm. The earthworm should be placed in the trench and gently covered with loose moist soil and the removed clods of pasture placed on top.

6. Up to two earthworms can be placed in a single trench.

7. If the soil is dry, wet the trench. Watering may also be required in the following days, particularly in summer. Expert advice is available from the Biodiversity Unit, DSE Office, Traralgon (Ph: 03 51722111) any on-going need for watering of relocation sites.

# Identification of Giant Gippsland Earthworms



Adult :80-150 cm long x 2 cm diametreColour:Dark purple head grading into pink-flesh colour

**Distinguishing Marks:** 3 bands positioned about 1/3 down the body on the ventral side (underneath) the adult worm



# Identification of Giant Gippsland Earthworms Cont-



**Egg Cocoons:** Large (5-9 cm), amber coloured deposited within the burrow system and are found at an average depth of around 20 cm. They can be found all year round due to their long incubation period.

