APPENDIX T

INLAND RAIL

Spoil Management Strategy

HELIDON TO CALVERT ENVIRONMENTAL IMPACT STATEMENT

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

IR_1434

Inland Rail Helidon to Calvert EIS

Appendix T – Spoil Management Strategy

Australian Rail Track Corporation

Reference: 3300

Document Number:
2-0001-330-EAP-10-RP-0219

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Abbreviations

Abbreviation	Explanation
ASS	Acid Sulfate Soil
C2K	Calvert to Kagaru
CEMP	Construction Environmental Management Plan
Ch	Chainage
CLR	Contaminated Land Register
DAF	Department of Agriculture and Fisheries
EA	Environmental authority
EIS	Environmental impact statement
EMR	Environmental Management Register
EP Act	*Environmental Protection Act 1994*
EP Regulation	Environmental Protection Regulation 2019 (Qld)
G2H	Gowrie to Helidon
H2C	Helidon to Calvert
km	kilometres
m	metres
m^3	cubic metres
QLD	Queensland
SEQ	South East Queensland
The Project	The Helidon to Calvert Inland Rail Project
WRR Act	*Waste Reduction and Recycling Act 2011* (Qld)

1 Overview

1.1 Purpose and scope

This Spoil Management Strategy has been developed in conjunction with Chapter 21: Waste and resource management and Chapter 7: Sustainability of the Environmental Impact Statement (EIS) to guide the decision-making process in the reuse and landfill disposal of spoil material generated by the Inland Rail Helidon to Calvert (H2C) Project (the Project). This Project consists of approximately 47 kilometres (km) single track dual gauge railway with four crossing loops to accommodate double stack container freight trains up to 1,800 metres (m) long.

It will also involve the construction of an approximately 850 m long tunnel through the Little Liverpool Range to facilitate the required gradient across the undulating topography and 31 bridges along the alignment. At the EIS stage, the Project is anticipated to generate a potential excess of approximately 1,349,000 cubic metres (m^3) of spoil (other than rock) during the construction phase through the alignment, with significant volumes from excavation from cuts at the western portal of tunnel (Laidley North to tunnel) and surface works (Helidon to Gatton).

Spoil is the surplus of excavated material that is not required to be reused in the Project's functional formation or is unsuitable for reuse due to its excavated untreated characteristics. Such material may be reused within or outside the Project for landscaping or other purposes, subject to satisfying a range of requirements. Waste rock is not expected to be generated from this Project with all rock considered to be suitable for reuse within the Project area.

The mitigation measures will follow the waste hierarchy outlined in the *Waste Reduction and Recycling Act 2011* (Qld) (WRR Act) with avoidance/reuse to be the preferred approach and landfill disposal to be the least preferred approach.

This management strategy has been prepared in accordance with the final Terms of Reference (ToR) for an Environmental Impact Statement (EIS) issued in October 2017 as detailed in Table 1.1.

Table 1.1 Terms of Reference

Terms of Reference requirements		Where addressed
Impact assessment		
11.169	For wastes, besides wastewater (which is addressed in the Water section of this ToR), describe and quantify all expected significant waste streams (including spoil) from the proposed Project activities during the construction and operational phases of the Project.	Section 2 Chapter 21, Section 21.7
11.170	Describe potential spoil disposal sites and their ability to service the Project.	Sections 2 and 3 Chapter 21, Section 21.7.1.5
11.171	Define and describe the objectives and practical measures for protecting or enhancing environmental values from impacts by waste. Take into account best practice waste management strategies as outlined in the National Waste Policy 2009 and the Waste Reduction and Recycling Act 2011 and the Environmental Protection Regulation 2008.	Section 4 Chapter 21, Sections 21.7.3 and 21.9
11.172	Describe the quantity, and physical and chemical characteristics of waste rock, any attributes that may affect its dispersal in the environment, and its associated risk of causing environmental harm.	Section 2.1 Chapter 21, Section 21.7.1.3
Mitigation measures		
11.173	Assess the proposed management measures against the preferred waste management hierarchy, namely: avoid waste generation; cleaner production; reduce; recycle; reuse; reprocess and reclaim; waste to energy; treatment; disposal. This includes the generation and storage of waste.	Section 4 Chapter 21, Sections 21.7.3 and 21.9

Terms of Reference requirements		Where addressed
11.174	Describe how nominated quantitative standards and indicators may be achieved for waste management, and how the achievement of the objectives would be monitored, audited and managed.	Section 4 Chapter 21, Sections 21.6.5 and 21.9
11.175	Detail waste management planning for the proposed Project especially how these plans would be applied to prevent or minimise environmental impacts due to waste at each stage of the Project.	Section 4 Chapter 21, Sections 21.7.3 and 21.9
11.176	Provide details on natural resource-use efficiency (such as energy and water), integrated processing design, and any co-generation of power and by-product reuse as shown in a material/energy flow analysis.	Natural resource-use efficiency, including by-product reuse, is primarily addressed in Chapter 7: Sustainability. Options for co-generation of energy are identified in Chapter 21, Table 21.11. Integrated processing design and co-generation of power are not applicable to the Project.

1.2 Objectives

The objective of this Spoil Management Strategy is to provide guidance and measures to:

- Manage the production of spoil generated and the associated impacts on the environment and stakeholders
- Maximise the reuse of spoil material in preference to disposal and promote adherence to the principles of the waste management hierarchy.

Based on the principles of the waste management hierarchy, when excavated material cannot be re-purposed in the construction of the railway embankment formation or for ancillary purposes (e.g. roads, laydown areas, maintenance access areas) and the generation of spoil is unavoidable, the preferred management method will involve the reuse of the spoil where possible to rehabilitate the disturbed areas within the Project disturbance footprint; the reuse of spoil as fill material for construction within the Project; reuse in adjoining Inland Rail projects; and reuse in other off-site projects and areas such as quarries.

1.3 Further development

This Spoil Management Strategy will be revised and further developed throughout the design and execution phases of the Project. Additional data will be incorporated to reflect detailed design, encountered field conditions, continuous monitoring of environmental performance and changes or improvements in Project processes. The Spoil Management Strategy will be reviewed and re-evaluated annually during the construction phase against targets set out in the Queensland (QLD) Waste Management and Resource Recovery Strategy and the South East Queensland (SEQ) construction and demolition waste generation and disposal rates set out in Recycling and Waste in Queensland report (Department of Environment and Science (DES) 2018). The aim will be to continually assess the significance of impacts and to optimise the reuse of spoil material. Landfill disposal is not preferred and will be discouraged.

2 Spoil production

The Project is anticipated to generate approximately 3,638,000 m^3 of cut material (other than rock) from tunnelling and rail works during construction. Approximately two-thirds of the excavated material will be reused within the Project as fill, leaving an excess of approximately 1,349,000 $m^3$of spoil that will need to be managed. The rate of spoil generation for the tunnel using a roadheader is slow (approximately 710 m^3/day) with a total spoil volume of approximately 120,000 m^3. The majority of spoil will be produced as a result of excavation works during the surface earthworks stage of the construction with an excavation rate of up to 4,000 m^3 per day.

Spoil can be classified as either rock, or 'other than rock' materials for the purposes of this Project. Spoil classified as 'other than rock' includes anything not classified as 'rock' in geotechnical terminology and may include weathered rock, soil and vegetation.

Where possible, cut material will be beneficially reused in the first instance to reduce the quantity of spoil produced. Spoil is the surplus of excavated material that is not required to be reused in the Project's functional formation or is unsuitable for reuse due to its excavated untreated characteristics. Such material may be usable for other on or off-site uses, subject to a number of requirements.

2.1 Spoil generating activities

Project activities associated with the production and management of spoil material include:

- Topsoil removal – after appropriate survey efforts, slashing of grass, tree felling and removal of stumps and mulching (during clearing and grubbing)
- Excavation of earthen material
- Tunnel excavation use of roadheader (or drill and blast)
- Transport/storage/stockpiling of spoil, topsoil and mulch
- Reuse of spoil and topsoil.

Table 2.1 provides the location and approximate quantities of the key Project excavation activities. Excavation activities for the Project will not result in the generation of any waste consisting exclusively of rock material (i.e. waste rock) and only 'other than rock' materials will be excavated for the Project.

Waste rock is a term typically derived from the resources industry, where waste rock sometimes has pyritic qualities. EIS Chapter 9: Land Resources provides information on the physical and chemical characteristics of rock generated from the Project, including management requirements in the event that acidic materials are encountered during Project activities. Based on the assessment of desktop information and field investigations, rock with acid producing qualities has not been identified within the Project. Therefore, all rock that is won through excavation has been assumed to be re-used on the Project and is not defined as a waste (refer EIS Chapter 21: Waste and Resource Management). This is subject to the material being tested to determine the waste classification and suitability for re-use, in accordance with the guidelines, specifications and CEMP adopted for the Project.

If rock is not contaminated it may be crushed and re-used onsite as aggregate for fill, construction pads/laydown areas or road base. Under the Environmental Protection Regulation 2019 (EP Regulation), an approval for Environmentally Relevant Activity (ERA) 33 is not required for the extraction of material from a place for constructing a road or railway at the place. An approval for ERA 33 will only be required for the crushing, milling, grinding or screening of material exceeding 5,000 tonnes per year if the activity is undertaken outside of the Project. It has been assumed that such activities would be undertaken by a third party commercial operation and they would be responsible for obtaining the requisite ERA to allow this activity to occur. As such, these places are not included within this assessment.

In accordance with the Draft Outline Environmental Management Plan (Draft Outline EMP) (refer EIS Chapter 23), soil conditions across the disturbance footprint will be appropriately characterised at a suitable scale through additional geotechnical surveys during the detailed design phase of the Project to inform design and environmental management measures.

The quantities of the excavated material produced will be monitored during excavation to identify the potential for reuse of material within the Project. Approximately two-thirds of the excavated material is expected to be reused as embankment fill and some for the rehabilitation of the disturbance footprint (if deemed suitable for reuse). Table 2.1 also provides an estimate of the quantity of excavated materials to be reused on-site during construction. It is expected that a minimum of 2,034,000 m^3 of excavated material will be used as general fill and 255,000 m^3 as structural fill. Additional structural fill and capping material may be imported if required to conform with Project design specifications.

Table 2.1 Key excavated quantities and volume reused as fill within the alignment

Location	Chainage (approximate) (km)		Cut material produced (m^3)	Excavated material reused as fill (m^3)		
	From	To	OTR (other than rock)	Rock	General fill	Structural fill
Helidon to Gatton	26.00	42.50	2,197,000	-	1,196,000 (some portions are also used in 'Tunnel to Grandchester' and 'Grandchester to Culvert' locations)	106,000
Gatton to Laidley North	42.50	57.35	11,000	-	340,000	118,000
Laidley North to Tunnel	57.35	61.85	1,238,000	-	432,000	31,000
Tunnel	61.85	62.70	120,000 (not included in the earthworks quantity and design summary table)	-	-	-
Tunnel to Grandchester	62.70	67.65	72,000	-	66,000	-
Grandchester to Calvert	67.65	73.50	143	-	-	-
Total			**3,638,000**	**-**	**2,034,000**	**255,000**

Table note:

1 Totals may not exactly add up due to rounding

2.2 Classification

2.2.1 Fill material

Classification of fill within the Project will be determined in accordance with ARTC: ETC-08-03 *Earthworks Material Specifications* (ARTC 2019a) and ETC-08-04 *Earthworks Construction Specification* (ARTC 2019b). The specific classifications include:

- Capping material – Engineered fill, within the Formation, usually provided for the purpose of sealing the earthworks from surface water and structurally supporting the track
- Structural fill material – Engineered fill is usually placed to provide a gradational structural support zone between the Subgrade Level and Capping Layer
- General earth fill material – Fill material consisting of fine and coarse particles distributed throughout the lower embankment layer filling any voids so that when compacted produces a dense stable embankment.

The majority of material generated from the excavation of the Project and the tunnel is expected to be suitable as general earth fill and some as structural fill. General earth fill provides a stable embankment for the support of the rail track infrastructure and a stable construction platform for the placement, compaction and maintenance of the structural fill layer, capping layer and rail track.

2.2.2 Unsuitable fill material

Fill material not meeting the ARTC Specifications will be considered unsuitable for subgrade and embankment construction due to:

- Having insufficient strength to carry the loads without excessive settlement, swell, erosion or loss of stability
- Not meeting moisture requirements for compaction
- Being susceptible to piping, such as fine single sized sand, windblown sand and non-cohesive silt
- Containing high organic content, vegetable matter, large rocks, gypsum, debris, or other materials that could limit suitable compaction
- Containing contaminants or prescribed waste materials, with the exception of materials deemed suitable for reuse from existing formation
- Being oversized material with particle size larger than 150 mm. These materials can be used as rock fill or 'riprap' rock protection.

Where fill material does not the ARTC Specification, this does not mean that the material cannot be used within the Project for other purposes (subject to assessment of suitability). Alternate uses include: landscaping mounds; noise attenuation bunds; being thinly broadcast over disturbed areas; and/or, used for temporary works/infrastructure.

This material may also be suitable for use in the rehabilitation of quarries and mine sites located in close proximity to the Project (refer Section 3.3 for further detail).

2.2.3 Potential contaminated material

Excavated materials are considered to be contaminated based on the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (Amended 2013) procedures and criteria.

Potential issues of contaminated land are discussed separately in EIS Chapter 9: Land resources and EIS Chapter 20: Hazard and risk. Based on the land uses within the land use study area (refer EIS Chapter 8: Land use and tenure) and the findings of a desktop assessment, potential sources of contamination in the vicinity of the Project alignment include:

- Agricultural activities: hydrocarbons (fuel and oil storage and use), pesticides and herbicides, asbestos and lead paint, arsenic (livestock dips or spray races), landfilling
- Quarries: hydrocarbons (fuel and oil storage and use), metals/metalloids, hazardous materials
- Landfilling, waste disposal: hazardous materials, hydrocarbons, metals/metalloids, phenols, polychlorinated biphenyls, phthalates, volatiles and pesticides and herbicides
- Unknown fill material: asbestos, metals/metalloids, hydrocarbons
- Existing rail corridor: metals, asbestos, hydrocarbons, pesticides and herbicides.

Contaminated spoil material if discovered will be managed and the impacts mitigated as outlined in the draft Outline Environmental Management Plan (draft Outline EMP) (refer EIS Chapter 23: Draft outline environmental management plan).

Under Section 424 and Section 739 of the *Environmental Protection Act 1994* (Qld) (EP Act), soil disposal permit(s) will be required to remove contaminated soil for treatment or disposal at a licenced facility able to receive the soil under the conditions of an Environmental Authority.

2.2.4 Regulated waste material

Waste materials are considered to be regulated if they contain a material of a type mentioned in Table 1 of Schedule 9 of *Environmental Protection Regulation 2019* (Qld) (EP Regulation). There are two categories of regulated waste. Category 1 is attributed to liquid waste or solid waste that does not have current test results or to solid waste but the test results show the pH is less than 2 or more than 12.5 and the concentration of the relevant substance is more than the threshold set in Part 2 table of Schedule 9 of EP Regulation. Any regulated waste that is not Category 1, is considered as Category 2 regulated waste.

The EP Regulation (Division 2 Testing Waste) states the requirements to determine the type of waste, using an appropriately qualified person required to sample and test the material under an applicable protocol.

2.2.5 Potential acid sulfate soil and rock

Acid sulfate soil (ASS) or rock are soils, sediment or rock that contain elevated concentrations of iron sulfides or the products of sulfide oxidation that can produce acid when exposed to air and water. Acid sulfate soil and rock can be disturbed by activities such as land excavation, tunnelling, blasting and drilling. Once disturbed, inappropriate management of acid sulfate soil and rock may pose a risk to human health, the environment and built infrastructure.

An assessment of ASS using the National Acid Sulfate Soils Atlas (Fitzpatrick et al. 2011) indicated 'No Known Occurrence' between Helidon and Gatton, a small section between Forest Hill and Laidley and again at Calvert. A 'Low Probability' of ASS underlies the area between Gatton and Forest Hill and between Laidley and Grandchester, with a small patch at Calvert. Two shallow water bodies of 'High Probability' ASS intercept the alignment north-east of Placid Hills and again south of Lawes (refer EIS Chapter 9: Land resources).

However, in the unlikely event ASS or acid rock is present or encountered during the construction phase of the Project, an unexpected finds protocol/procedure will be implemented in accordance with the draft Outline EMP.

2.2.6 Naturally occurring asbestos

There are also no altered ultramafic, serpentinites or mafic rock types present along the proposed Project alignment. None of the rock types that are found along the Project alignment are associated with naturally occurring asbestos.

3 Spoil reduction, reuse and disposal

3.1 Spoil management hierarchy

The spoil management hierarchy has been developed to meet the objectives and principles of the WRR Act. A strategic framework for managing wastes has been provided through a waste and resource management hierarchy that maximises resource recovery. The preferred order to be considered is shown in Figure 3.1.

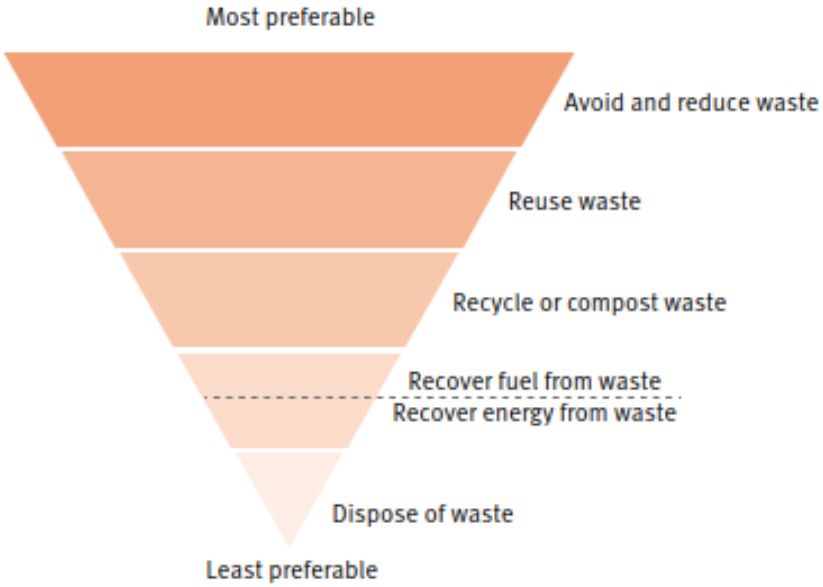


Figure 3.1 Spoil management hierarchy

Source: Waste Management and Resource Recovery Strategy (DES 2019)

Where possible and reasonable, the design will be further optimised to reduce the amount of spoil produced from cutting and blasting. If unavoidable, management options for the reuse of the spoil will be considered. This includes reusing topsoil for rehabilitation and the use of cut material as fill for embankments. Any surplus fill that cannot be used within the Project, can then be used outside the Project either on the adjoining Inland Rail projects or in any other development and site levelling works (provided it satisfies the requirements for these other works).

If no beneficial uses can be found for the remaining spoil after treatment either due to contamination or unsuitability for any identified purpose, landfilling at waste management facilities will be the last option. Spoil that will be disposed to landfill needs to be tested in accordance with relevant guidelines and legislation.

All Project generated spoil material will be managed, in order of preference, by the hierarchy provided in Table 3.1.

Table 3.1 Spoil management hierarchy

Rank	Options	Example
1	Avoid and reduce spoil	Reduce the amount of spoil generated by the Project, through reducing the extent and scale of cut where an immediate reuse opportunity in proximity to the source location does not exist, e.g. sections of the Project where a surplus of material will be generated.
2	Reuse within the rail corridor	Reuse within the Project, subject to the material complying with the ARTC Specification(s), to establish formation, fill embankments and mounds within reasonable haulage distances of the source location.
3	Reuse for environmental works and land restoration	Examples include reuse for: ■ The rehabilitation of native vegetation ■ Landscaping ■ Land reinstatement, including end-of-life mines (Ebenezer Mine, New Hope West Moreton) and quarries, subject to satisfying closure and operational requirements ■ Landfill cover (day and interim covers) and final capping (where deemed suitable).
4	Reuse on other development	Reuse for fill embankments and mounds on other projects within a reasonable haulage distance from the site, prioritising other components of the Inland Rail Program (Inland Rail).
5	Dispose offsite as waste	Disposal of excess spoil as waste at an approved facility licenced to receive the material. Offsite disposal to landfill will only occur if the material is considered unsuitable without treatment for other uses, e.g. due to contamination.

3.2 Spoil reduction

The quantity of spoil generated will be reduced by:

- Refining the horizontal and vertical design and alignments to minimise the quantity of off-site fill required
- Optimising the shape and size of batters to achieve cut and fill balance within the Project disturbance footprint
- Completing an assessment of the availability, quality and volume of materials which are readily accessible and can be used within the Project
- Reusing topsoil where possible and identifying ways to reuse materials normally considered unsuitable for use.

3.3 Spoil reuse

The following reuse options can be considered for the management of any material that is not suitable to be reused within the Project formation:

- Used for the construction Rail Maintenance Access Roads, reused to fill embankments and mounds within a reasonable haulage distance of the source, reused for rehabilitation and landscaping, or used as fill material for other Inland Rail projects including Gowrie to Helidon (G2H) and Calvert to Kagaru (C2K)
- Rehabilitation of the existing quarries around Helidon, as identified through discussions with operators
- Daily cover for waste management facilities (e.g. Toowoomba Waste Management Centre)
- Fill material for the development of the Gatton West Industrial Zone
- Fill material for the extension of the rail formation for future crossing loops
- Treatment and/or blending of unsuitable material (due to contamination or geotechnical aspects) to allow for reuse and avoid disposal. The treatment will follow testing protocols to classify and characterise spoil as discussed in Sections 2.2.2 and 2.2.3, in order to specify the appropriate use for the material. The effective treatment will be selected in accordance with ARTC and State guidelines.
- Subject to suitability, incorporation into commercial soil manufacturing processes.

The location of major spoil reuse opportunities outside the Project are presented in Figure 3.2 and Figure 3.3. The adjoining G2H and C2K projects and also the Gatton West Industrial Zone project have the potential to accept the spoil as general fill. In addition, known active quarries in proximity to the Project have the potential to accept spoil to be used for rehabilitation purposes. However, the acceptance of the spoil will be subject to:

- Timing of the production of the spoil corresponding with rehabilitation requirements. To be determined through the detailed design and execution phases of the Project.
- Quality of the material (chemical/contaminant composition), compatible with closure/rehabilitation requirements. Which will require further investigation and assessment as part of future Project phases.
- Rehabilitation needs/closure requirements for the facilities. Subject to operational considerations and the compatibility of the Project spoil for these purposes.
- Closure timing for the facilities. This will ensure that sterilisation of reserves does not occur.
- Bio-security (e.g. weeds and fire ants) characteristics of the spoil. Compatibility with the requirements of the receiving sites as determined through future detailed investigations.

The relative proximity of these quarries to the Project is shown in Figure 3.2 and the threshold capacity of the major quarries is presented in Table 3.2.

Table 3.2 Quarries in proximity to the Project

Quarry	Capacity (tonnes/year)
Wagners Quarries – various locations within Toowoomba region	>5 to <100,000
Boral Resources – various locations across QLD	>1,000,000
Helidon Sandstone Industries	>100,000
Zanow Earthmovers	>5000 to <100,000
Holcim	>100,000 to <1,000,000

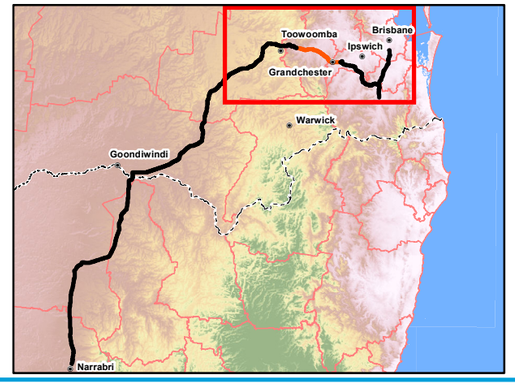
There is also opportunity for the generated spoil to be used as daily and interim covers at waste management facilities. The Toowoomba Waste Management Centre, New Chum Landfill, Ti Tree Bioenergy and Remondis Swanbank Renewable Energy & Waste Management Facility are the closest major facilities (refer Figure 3.3) that have the potential to service the Project. All four facilities accept clean fill material which could be used as daily cover.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Jondaryan Quarry
Boral Quarry Malu
Ravensbourne Sand Quarry
Zanow
Murarrie Looping Gas Pipeline
Murarrie Looping Gas Pipeline
Murarrie Looping Gas Pipeline
Mt Coot-tha Quarry
Brisbane
Gowrie
Helidon Sandstone Quarries
Gatton West Industrial Zone (GWIZ)
Harlaxton Quarry
Quarry Products
Airport Quarry Wellcamp (Wagners)
Helidon
30
40
Toowoomba
Gatton
50
Wellcamp Downs (Boral)
Holcim Australia Toowoomba Quarry
Mount Marrow Blue Metal Quarry
Ipswich
60
70
Calvert
Fulton Hogan
Stapylton
Mutdapilly
Purga
Purga Quarry
Bland Quarries Pittsworth
Beenleigh Holcim Australia Quarry
Hanson Quarry Wolffdene
Boral Quarry Ormeau
Mt Sylvia
Blue Rock Quarry Fulton Hogan
Kagaru
Bluckduck
The Sand and Soil Company
Zanow's Kalbar Hard Rock Quarry
Bromelton North (Nielson) Quarry
Bromelton Quarry
Beaudesert

Legend

- 5 Chainage (km)
- Quarries
- Existing rail
- Gatton West Industrial Zone (GWIZ)
- EIS investigation corridor
- N2NS project alignment
- NS2B project alignment
- B2G project alignment
- G2H project alignment
- H2C project alignment
- C2K project alignment
- K2ARB project alignment



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Coordinate System: GDA 1994 MGA Zone 56

Helidon to Calvert

Figure 3.2:
Potential spoil reuse locations – Adjoining projects and quarries

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Haden
Crows Nest
Esk
Dayboro
Narangba
Redcliffe
Bowenville
Acland
Goombungee
Hampton
Toowoomba Waste Management Centre
Jondaryan
Coominya
Brisbane Valley Hwy
Samford
Oakey
Cabarlah
Highfields
Murphys Creek
Lowood
Fernvale
Brisbane
Kingsthorpe
Gatton Landfill
Gowrie
Glamorgan Vale
Cleanaway New Chum Solid Waste Landfill
Capalaba
Aubigny
Oaky Creek
Minden
Chuwar
Biddeston
Toowoomba
Wellcamp
Withcott
30
40
Helidon
Gatton
Warrego Hwy
Marburg
Ipswich Mway
Gateway Mway
Mount Tyson
Grantham
Lawes
50
Forest Hill
Walloon
Ipswich
Remondis Swanbank Renewable Energy & Waste Management
Westbrook
Ma Ma Creek
Laidley
60
Rosewood
Wyreema
Grandchester
70
Ebenezer
Willowbank
Calvert
Southbrook
Cambooya
Purga
Ti Tree Bioenergy
Beenleigh
Pittsworth
Goolman
Lantrak Waste and Recycling Facility
Gore Hwy
Brookstead
Peak Crossing
Logan Village
Greenmount
East Greenmount
Flinders Lakes
Ormeau
Warrill View
Harrisville
Washpool
Jimboomba
Nobby
Kagaru
Pilton
Munbilla
Woolooman
Tamborine
Eagle Heights
North Tamborine
New England Hwy
Clifton
Cunningham Hwy
Kalbar
Mount Tamborine
Aratula
Boonah
Beaudesert
Dugandan
Canungra
Leyburn

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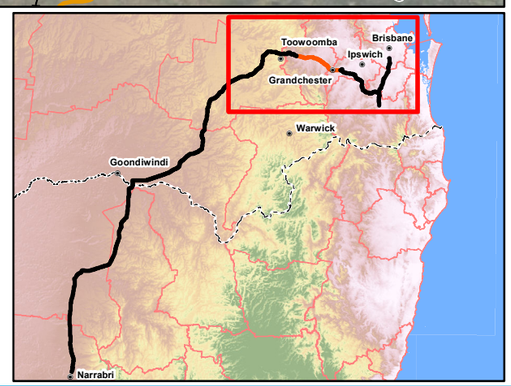
Legend

- 5 Chainage (km)
- Localities
- Spoil disposal
- B2G project alignment
- G2H project alignment
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- Existing rail
- Major roads
- EIS investigation corridor



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0 5 10 15 20 km

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Helidon to Calvert

Figure 3.3:

Potential spoil reuse and disposal location – Waste management facilities

3.4 Spoil disposal to landfill

The management of spoil for the Project will be aligned with the objectives referred to in Section 1.2. Where possible and reasonable, the generation of spoil and disposal to landfill will be minimised. Once all the options for reuse are exhausted, the least preferred option will be disposal at a designated waste facility that accepts spoil.

The Toowoomba Waste Management Centre, New Chum Landfill, Ti Tree Bioenergy and Remondis Swanbank Renewable Energy & Waste Management Facility are the major facilities that will accept clean fill material and their location is shown on Figure 3.4. However, only New Chum landfill, Ti Tree Bioenergy and Remondis Swanbank Renewable Energy & Waste Management Facility have the capacity to receive contaminated spoil material.

Available and permissible annual capacity of the identified waste management facilities are subject operational information which is not typically disclosed. However, based on preliminary consultation and the assessment of the current licence limits for waste acceptance, it is likely the waste management facilities will be able to accommodate the volume of generated spoil arising from the Project. The waste acceptance criteria and acceptance rate will be confirmed in consultation with the relevant operator(s) once the timing for construction of the Project is determined.

Prior approvals and testing may be required for some of these facilities to determine the fate of the spoil. Should the test results indicate contamination within the spoil material, a disposal permit may need to be obtained.

ARTC will continue to engage with relevant parties prior to the construction of the Project to confirm these potential spoil disposal sites. Consultation undertaken with operators is further described in EIS Appendix C: Consultation Report.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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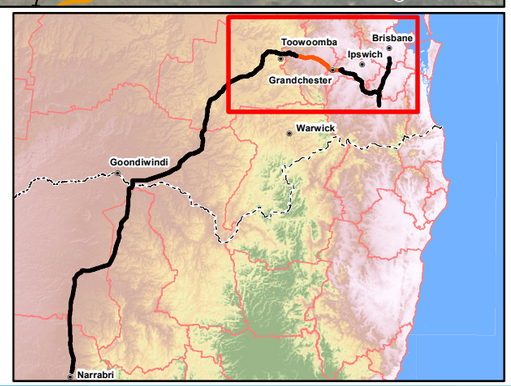
Haden
Crows Nest
Esk
Dayboro
Narangba
Redcliffe
Bowenville
Acland
Goombungee
Hampton
Jondaryan
Toowoomba Waste Management Centre
Coominya
Brisbane Valley Hwy
Samford
Oakey
Cabarlah
Highfields
Murphys Creek
Lowood
Fernvale
Brisbane
Kingsthorpe
Gatton Landfill
Glamorgan Vale
Gowrie
Oaky Creek
Aubigny
Minden
Cleanaway New Chum Solid Waste Landfill
Capalaba
Toowoomba
Biddeston
Wellcamp
Withcott
Helidon
Gatton
Chuwar
Warrego Hwy
Ipswich Mway
Gateway Mway
Mount Tyson
Grantham
Lawes
Marburg
Pacific Mway
Westbrook
Forest Hill
Walloon
Ipswich
Remondis Swanbank Renewable Energy & Waste Management
Ma Ma Creek
Laidley
Rosewood
Wyreema
Grandchester
Ebenezer
Willowbank
Calvert
Southbrook
Cambooya
Purga
Ti Tree Bioenergy
Beenleigh
Pittsworth
Goolman
Lantrak Waste and Recycling Facility
Gore Hwy
Logan Village
Brookstead
Peak Crossing
Ormeau
Greenmount
East Greenmount
Flinders Lakes
Warrill View
Harrisville
Washpool
Jimboomba
Nobby
Kagaru
Pilton
Munbilla
Woolooman
Tamborine
Eagle Heights
North Tamborine
New England Hwy
Clifton
Cunningham Hwy
Kalbar
Mount Tamborine
Aratula
Boonah
Beaudesert
Dugandan
Leyburn
Canungra

Legend

- 5 Chainage (km)
- Localities
- Spoil disposal
- B2G project alignment
- G2H project alignment
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- Existing rail
- Major roads
- EIS investigation corridor



A3 scale: 1:500,000

0 5 10 15 20 km

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Helidon to Calvert

Figure 3.4:
Potential disposal area for spoil – Waste management facilities

4 Spoil management

4.1 Stockpile management

To avoid stockpiling, the Project intends to immediately reuse excavated material as it is generated within the Project disturbance footprint. This is in accordance with the objectives identified in Section 1.2. However, subject to construction planning, should the stockpiling of excavated material as spoil be unavoidable, spoil will be stockpiled within the construction site boundary of the Project. The location of the stockpile areas will be determined during the construction phase and will be kept along the length of the Project alignment and outside any area prone to flooding. Sites will be chosen in close proximity to excavation sites to minimise safety risks, road use and environmental disturbance during haulage and heavy machinery movements.

A Waste and Resource Management Sub-plan under the Construction Environmental Management Plan (CEMP) will be developed and implemented to specify the location and size of the stockpiles at different stages of the construction (prior to works and activities occurring).

Surface water to be diverted from the stockpile area and generated runoff will be treated and managed in alignment with the sediment and erosion control and surface water and hydrology management plans. Stockpiles will be covered by geotextiles to reduce the sediment in runoff and the particulate emissions from dust. Other dust control measures will include staging the development and efficient reuse of spoil generated, installation of wind barriers, limiting the height and slope of stockpiles to reduce wind erosion and orienting stockpiles to have minimum cross wind exposure. It is anticipated that spoil will be stockpiled only temporarily during construction as it will be reused for embankment fill or rehabilitation purposes.

4.2 Tunnel spoil

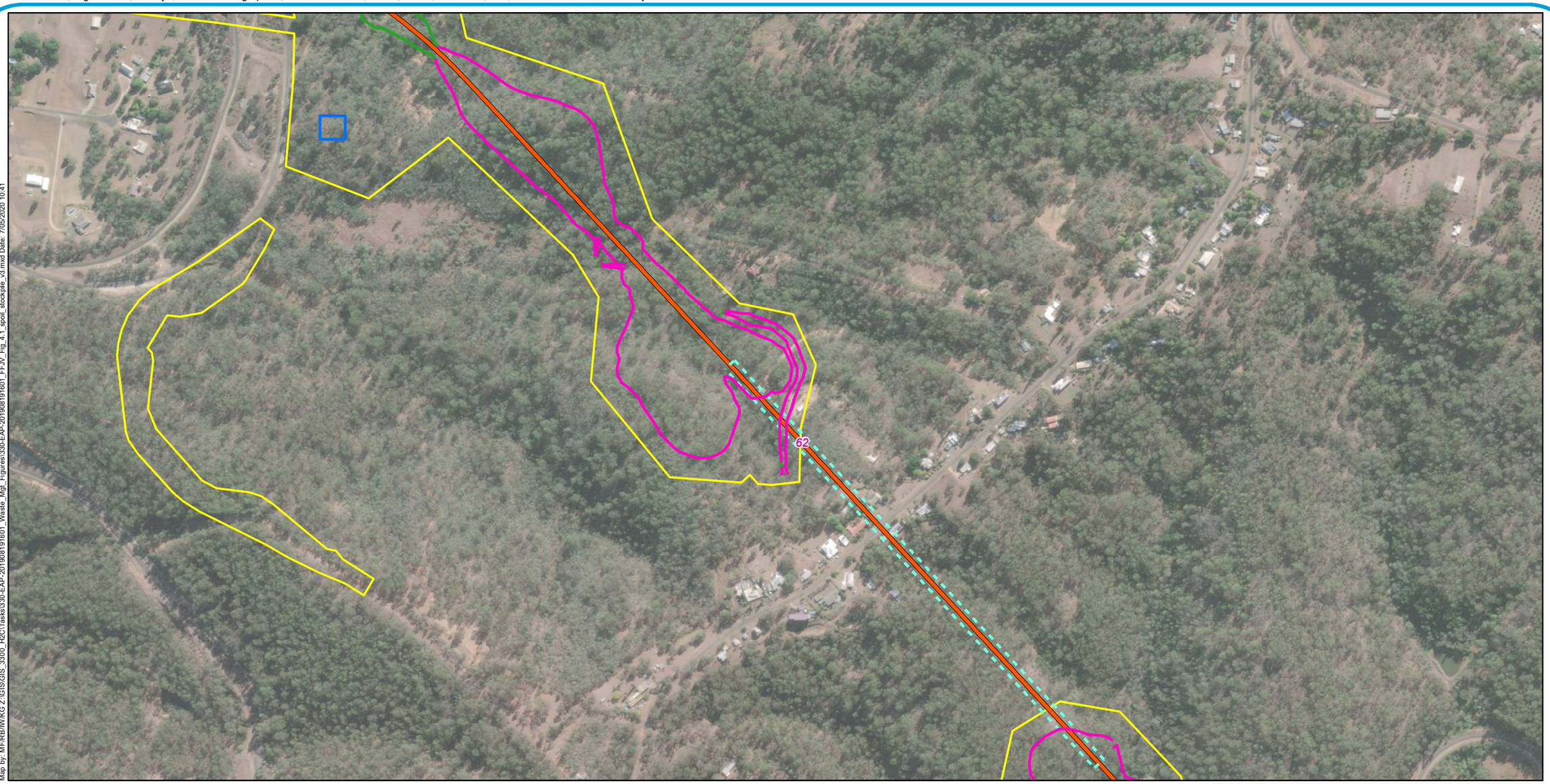
Spoil generated from tunnel excavation will be transported by trucks either to the stockpile areas at the western portal or directly to adjacent embankments. The rate of spoil generation for the tunnel using a roadheader is assumed as approximately 710 m^3/day with a total spoil volume of approximately 120,000 m^3.

Handling and transport of tunnel spoil is assumed to include up to 1,278 m^3 per/day (loose weight), with 65 truck and dog movements per day expected based on roadheader construction method (35 m per week tunnel advance rates, 24 hrs tunnelling and 10 hrs per day truck movement).

The potential location for spoil stockpiles is shown on Figure 4.1.

If the spoil is not going to be reused on the embankments immediately, dust and water management controls will be applied to the stockpiled material. Soil testing according to relevant legislation and guidelines such as *National Environmental Protection (Assessment of Site Contamination) Measure 1999* (Cth) will be carried out as required to determine the classification of the spoil for off-site usage.

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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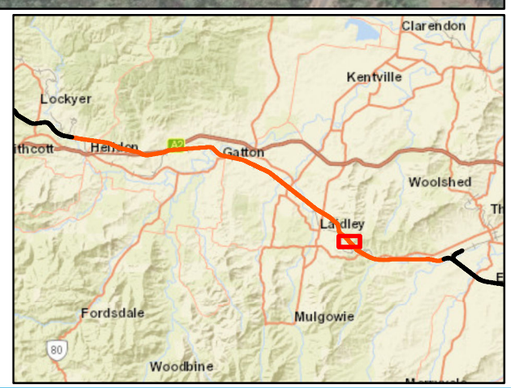
Legend

- 5 Chainage (km)
- Localities
- H2C project alignment
- Major roads
- Minor roads
- Cut
- Fill
- Tunnel
- EIS disturbance footprint
- Spoil stockpile



A3 scale: 1:6,500

0 80 160 240 320m

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Helidon to Calvert

Figure 4.1:
Little Liverpool Tunnel – Western Portal – Spoil Stockpile

4.3 Fire ant carrier materials

Under the *Biosecurity Act 2014* (Qld), ARTC has a general biosecurity obligation to take all reasonable steps to ensure the spread of fire ants does not occur. In terms of fire ants, a biosecurity risk exists when dealing with materials that are relevant to the Project that the pest can be carried in, including:

- Soil
- Turf
- Mulch
- Baled hay or straw
- Mining or quarry products.

The Project traverses through fire ant biosecurity zone 2 from Chainage (Ch) 48.1 km to Ch 73.4 km (end) as shown in Figure 4.2. It is expected the excavation will produce approximately 140,000 m^3 of potential fire ant carrier soil.

The *Biosecurity Regulation 2016* (Qld) prescribes procedures that must be undertaken when moving or storing fire ant carrier material. The QLD Government Fire Ant Biosecurity Zone Map RIFA02 (Department of Agriculture and Fisheries (DAF) 2018) further details fire ant carrier material movement restrictions, including details on the fire ant biosecurity zones and corresponding suburbs.

A Biosecurity Management Sub-plan will need to be prepared (under the CEMP) by the contractor to set out requirements for identification, treatment, storage, transportation and disposal of fire ant carrier materials in a manner consistent with their construction methods and scheduling. The contractor will need to ensure that the management of fire ant carrier materials will be completed in accordance with all agreed plans and procedures prior to construction.

The Biosecurity Management Sub-plan will describe the requirements for material movement from areas of the Project within fire ant biosecurity zone 2 and in particular the requirement for a biosecurity instrument permit from DAF to be obtained, unless:

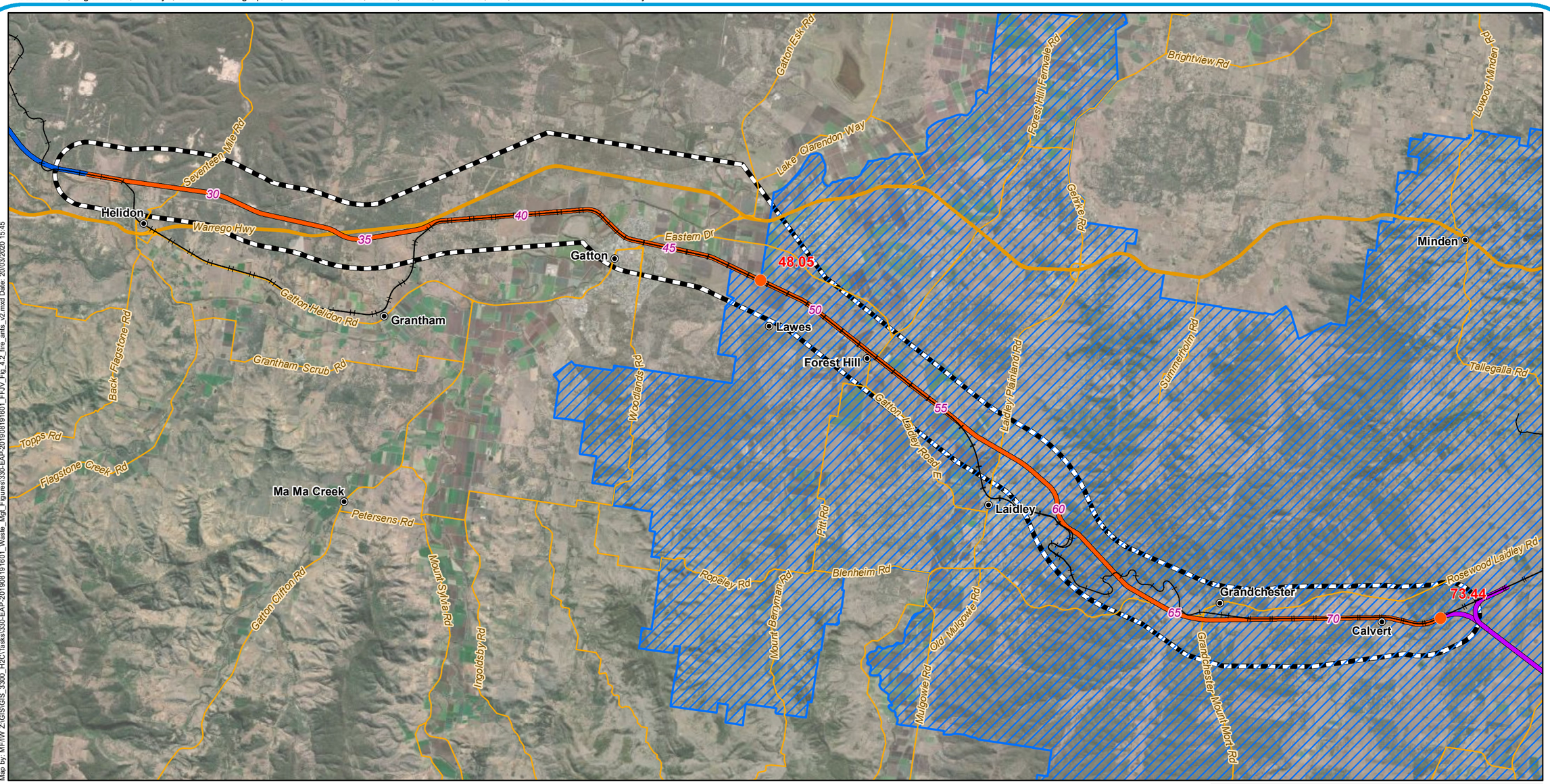
- The soil remains within zone 2
- The soil is moved to a licenced waste management facility within zone 1 or zone 2.

In addition, the contractor will ensure the personnel resources allocated to check for fire ants are suitably trained using the Biosecurity QLD free fire ant training sessions to assist with the identification of fire ants. Before excavating or disturbing the ground, thorough visual checks will be completed for any signs of fire ants. Common areas to inspect will include:

- The perimeter of the site
- Waste material storage areas
- Storage areas for equipment used for dealing with fire ant carriers
- Around buildings
- In and around unused equipment.

In the event that fire ants, or any suspect ants are identified, the occurrence will be reported to Biosecurity QLD within 24 hours. There are facilities within H2C biosecurity zone that can accept fire ant carrier spoil. These facilities are consistent with those identified in Section 3.4 as being suitable for accepting the waste spoil.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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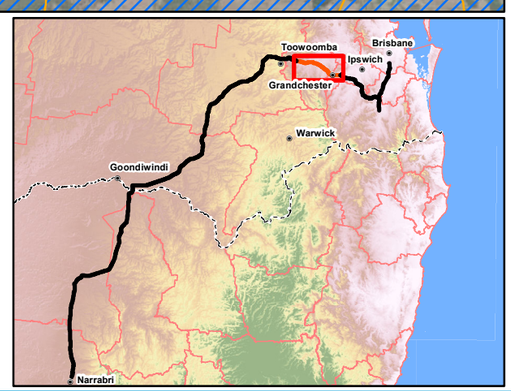
Legend

- Fire ant chainage
- Localities
- Existing rail
- G2H project alignment
- H2C project alignment
- C2K project alignment
- Major roads
- Minor roads
- EIS investigation corridor
- Fire ant biosecurity zone 1
- Fire ant biosecurity zone 2



A3 scale: 1:130,000

0 1 2 3 4 5km

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Helidon to Calvert

Figure 4.2:
Fire Ants Biosecurity Zone for H2C Alignment

4.4 Weeds

Weeds are another biosecurity threat that can be carried in the same way as fire ants in:

- Soil
- Turf
- Mulch
- Baled hay or straw
- Mining or quarry products.

The spread of noxious weeds during movement and handling of spoil and waste material will be controlled by the construction contractor. Appropriate checks and controls will be put in place including identification of weed risk areas, surveillance and audit compliance and vehicle wash downs. The draft Outline EMP provides mitigation measures for the management of weeds.

4.5 Spoil treatment

Treatment of unsuitable material (due to contamination or geotechnical aspects) may be undertaken to facilitate the reuse of spoil material and reduce the need for disposal. The treatment will follow testing protocols to classify and characterise spoil as discussed in Sections 2.2.2 and 2.2.3 to specify the permitted used of the material. The effective treatment will then be selected in accordance with ARTC and State guidelines based on the proposed final use of the material.

4.6 Operational spoil

The majority of the spoil generated for the Project will be during earthworks associated with railway formation construction. Minor quantities of spoil will be generated during the operational and maintenance phase as a result of repairs, maintenance or response to emergencies/spills. The generated spoil will be reused on site where possible to rehabilitate the disturbed area or if categorised as contaminated, to be treated and managed in accordance with Sections 4.5 and 5.2.

5 Spoil transport and handling

5.1 Haulage routes

Spoil that is being reused onsite or will be reused for the adjoining Inland Rail projects, will be transported by articulated dump truck at a rate to match excavator productivity. Figure 5.1 presents the spoil routes for both the tunnel and the remainder of the alignment.

Any spoil material that cannot be reused within the Project disturbance footprint and is being reused offsite or disposed of at a landfill facility will be transported in appropriately licenced vehicles (usually truck and dog), depending on the characterised soil, to the nearest major waste management facilities which have the capacity to receive the spoil. These facilities are discussed in Sections 3.3 and 3.4 and Figure 3.2 and Figure 3.3 provides their location in relation to the Project alignment.

Where it is not used within the Project disturbance footprint, the remaining spoil excess of approximately just over 1,000,000 m^3, expected to be generated predominantly in year 2 and year 3 of construction works, may be used as fill material for surrounding projects. Transport of spoil to these projects will be via State and local government road networks. Key haulage routes and traffic impacts associated with spoil transport are included in EIS Appendix U: Traffic impact assessment. The transport routes will generally use local and State controlled roads and have been selected to minimise the impact to local traffic and the community.

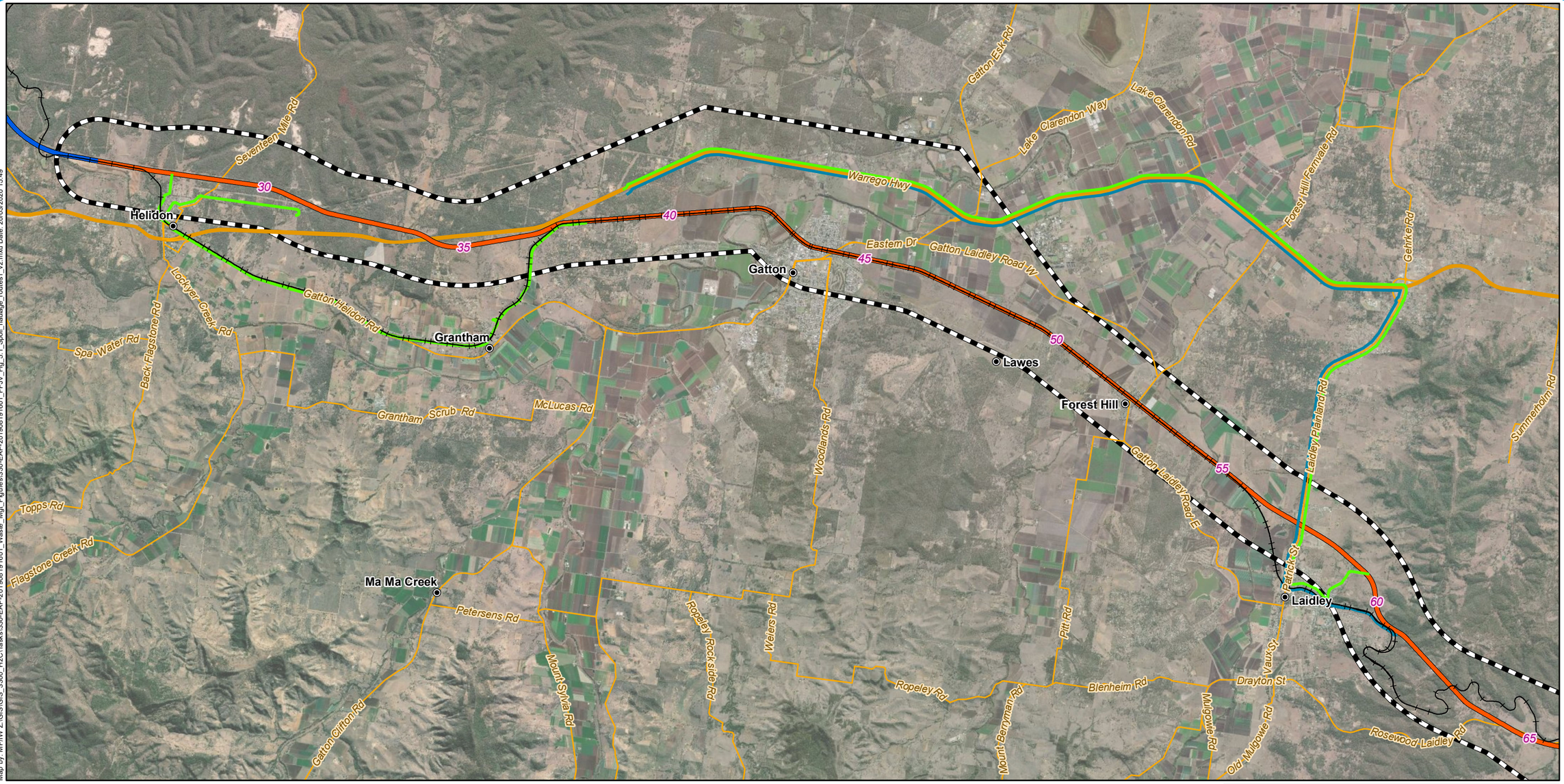
Disposal of excess spoil as waste to an approved facility is not preferred and will be the last option. Should spoil be required to be disposed to landfill, the location of the approved facilities to be utilised, the amount to be disposed and impacts associated with disposal, will be determined at the pre-construction phase of the Project.

5.2 Contaminated spoil handling

Any transport and landfill disposal of contaminated soil from any part of the disturbance footprint that is on the Environmental Management Register (EMR) or Contaminated Land Register (CLR) will be undertaken under a soil disposal permit. The soil disposal permit covers the transport and disposal of the contaminated soil. However, if the contamination is short-term (such as a result of spills) and the parcel of land containing the contaminated soil is not on the EMR or CLR, the waste categorisation provisions (regulated waste) will apply to the transport and disposal of contaminated soil as the waste categorisation provisions of the EP Regulation will not apply to contaminated soil from sites that are on the EMR or CLR.

The transport of regulated spoil will be in accordance with Section 57 of Schedule 2 of the EP Regulation and the transport of the regulated spoil will need to be tracked.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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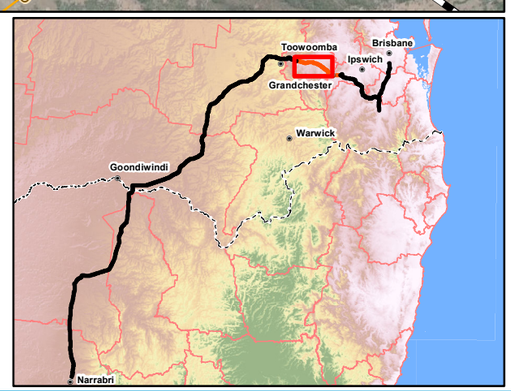
Legend

- 5 Chainage (km)
- Localities
- Existing rail
- G2H project alignment
- H2C project alignment
- Major roads
- Minor roads
- Spoil routes
- Tunnel spoil routes
- EIS investigation corridor

A3 scale: 1:100,000

0 1 2 3 4 km



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Helidon to Calvert

Figure 5.1: Spoil haulage routes

6 Review and improvement

The Spoil Management Strategy will be revisited during detailed design to incorporate changes to the Project which may occur post-EIS and prior to execution of the works. Any Project-specific targets by which the strategy will need to be measured will also be incorporated.

During the construction of the Project, the Spoil Management Strategy will be reviewed and re-evaluated annually against the Project-specific targets. As a minimum, the targets will reflect the objectives set out in the QLD Waste Management and Resource Recovery Strategy and will be optimised based on:

- Unexpected quantities of either geotechnically or environmentally unsuitable material
- Improvements in the handling and transport of spoil material
- Changes in the capacity of the waste management facilities in accepting the spoil material
- Increase in demand for spoil to be used as fill in adjacent Inland Rail projects.

It is estimated that the quantities of the spoil expected to be produced annually from the Project would comprise approximately 26 per cent of the annual construction and demolition waste generation in SEQ. EIS Chapter 21: Waste and Resource Management provides more details on the basis of this assessment using the Recycling and Waste in Queensland report (DES 2018) and how the impacts will be mitigated.

During the execution of the Project, the actual quantities of spoil generated will be re-assessed against these quantities and the proportional contribution to the region's waste streams re-evaluated. Improvements in performance will be sought to maximise the reuse of spoil for beneficial purposes (both within and outside of the Project disturbance footprint) as part of the Project planning.

7 References

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